MISSISSIPPI STATE UNIVERSITY

UNDERGRADUATE RESEARCH AND CREATIVE DISCOVERY

CONTENTS

SPRING 2025 RESEARCH CELEBRATION MISSISSIPPI STATE UNIVERSITY

MISSISSIPPI STATE UNIVERSITY™
UNDERGRADUATE RESEARCH
AND CREATIVE DISCOVERY

Welcome to the Spring 2025 Undergraduate Research Symposium

The Office of Undergraduate Research and Creative Discovery is pleased to host the Spring Undergraduate Research Symposium and to be a part of Mississippi State University's Research Celebration. 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 this exhibition!

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 and creative discovery 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 mentors. The student work presented here represents many hours of mentoring students in their research, planning, and analysis. Many faculty and graduate students have also volunteered their time and expertise to serve as evaluators or judges, so thank you to all of them!

This event is an endeavor that relies on the support and sponsorship by many units. We thank them for their commitment to helping make the Spring Undergraduate Research Symposium a premier event. This includes: Office of Research and Economic Development, Honor Society of Phi Kappa Phi, the Graduate School, and Shackouls Honors College.

We are pleased that fifteen Special Area Competitions are affiliated with the symposium to recognize excellence in scholarship and innovation. We are excited to partner with: Bagley College of Engineering; College of Agriculture and Life Sciences and Mississippi Agricultural and Forestry Experiment Station; College of Arts & Sciences Institute for the Humanities; College of Forest Resources and Forest and Wildlife Research Center; Data Science Program; Department of Agricultural and Biological Engineering and Department of Comparative Biomedical Sciences; Department of English; Department of Food Science, Nutrition, and Health Promotion; Department of Geosciences; Department of Psychology; Engineer Research and Development Center, the Graduate School; Gulf Scholars Program, Theta Tau Professional Engineering Fraternity; and Mitchell Memorial Library.

We are delighted that you have joined us today to honor 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, Shackouls Honors College
Director, Office of Undergraduate Research & Creative Discovery

AT MISSISSIPPI STATE, WE BELIEVE IN THE TRANSFORMATIVE POTENTIAL OF UNIVERSITY-BASED RESEARCH.

WE ARE PROUD OF OUR UNDERGRADUATE RESEARCHERS AND THE INCREDIBLE ACCOMPLISHMENTS ON DISPLAY AT THIS SYMPOSIUM.

YOUR RESEARCH MATTERS, AND WE CAN'T WAIT TO SEE WHERE IT TAKES YOU.

HAIL STATE!
DR. JULIE JORDAN
VICE PRESIDENT FOR RESEARCH
AND ECONOMIC DEVELOPMENT

TAKING CARE OF WHAT MATTERS

MISSISSIPPI STATE UNIVERSITY™
OFFICE OF RESEARCH AND
ECONOMIC DEVELOPMENT

@MaroonResearch

MISSISSIPPI STATE
UNIVERSITY

Office of the Provost and
Executive Vice President
P.O. Box BQ
3500 Lee Hall
Mississippi State, MS 39762

P. 662.325.3742
F. 662.325.4039

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

We are honored to welcome you to Mississippi State University's Spring 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 provides 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 EngagementClassification.

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

A&S RESEARCH

DISCOVERING WHAT MATTERS

The MSU College of Arts & Sciences is a proud sponsor of the MSU Undergraduate Research Symposium. Engaging in research plays a vital role in the academic culture of our college. Our students are celebrated for their dedication to exploration, innovation, and discovery outside traditional classroom settings. The involvement of undergraduates in research initiatives and advocating for interdisciplinary collaboration is a key aspect of scholarly endeavors.

MISSISSIPPI STATE UNIVERSITY™
COLLEGE OF ARTS & SCIENCES

www.cas.msstate.edu

MISSISSIPPI STATE UNIVERSITY™
JAMES WORTH BAGLEY
COLLEGE OF ENGINEERING

OFFICE OF THE
DEAN OF ENGINEERING

Robert A. Green, Ph.D. P.E., F.NSPE
Interim Dean
green@bagley.msstate.edu

17 March 2025

Dear Undergraduate Research Symposium Participants:

Congratulations on your submission to the Undergraduate Research Symposium. The faculty and staff of the Bagley College of Engineering recognize the dedication you've devoted to your research and appreciate the effort this has taken. Research is essential to advancing the engineering profession and serves as a major driver of the modern economy. For decades, the Bagley College of Engineering has conducted fundamental, theoretical, and applied research across all our engineering disciplines. This research often collaborates with fields beyond the college, which is crucial as engineering work impacts social, economic, policy, and everyday life. This type of interdisciplinary research has positioned Mississippi State University as the state's research leader.

As engineers, we are dedicated to the protection of the health, safety, and welfare of the public. One way we honor this ethical commitment is through research. The research you and other engineers conduct improves the quality of life for people across the globe, and by participating in the Undergraduate Research Symposium, you are beginning to make that impact a reality. Furthermore, participating in undergraduate research will enhance your engineering skills and develop your research capabilities, whether you pursue graduate school to build a research-oriented career or enter the workforce as a practicing engineer addressing today's challenges.

As the interim dean of the Bagley College, I commend you for applying your knowledge, stretching the boundaries of that knowledge, and being creative in how you look at problems. Engineers, at their core, are creative individuals, and your research efforts highlight that creativity. The Bagley College remains committed to you and the work you do. We look forward to seeing what heights you rise to during your career. Once again, congratulations on this milestone.

Sincerely,

Robert A. Green, Ph.D. P.E., F.NSPE
Interim Dean

MISSISSIPPI STATE UNIVERSITY™
COLLEGE OF EDUCATION

MAKING AN IMPACT

In Mississippi State University's College of Education, we are translating knowledge into impact. In fiscal year 2024 we were awarded $11.2 million for research and have already surpassed that for fiscal 2025 with $18 million awarded so far. We're inspiring others to explore their passions through five academic departments, a division of education, one research unit and numerous service units. Learn more about the centers and institutes housed in our college below and at educ.msstate.edu.

College of Education Faculty Labs

The College of Education's academic units house a number of faculty-led research labs that provide hands-on learning opportunities for students. The labs include human health and performance, academic and behavior intervention, and virtual reality applications in industry and design.

Mississippi Institute on Disabilities

The Mississippi Institute on Disabilities focuses on support and opportunity for people with disabilities in our state. Including MSU's T.K. Martin Center for Technology and Disability, Autism and Developmental Disabilities Clinic and Career Horizon Center, the institute creates a hub for research, training and collaboration.

National Research & Training Center on Blindness & Low Vision

The National Research and Training Center on Blindness and Low Vision is the nation's only federally funded center focused on employment outcomes for people who are blind or have low vision. The center produces field-leading research and provides training to professionals.

MISSISSIPPI STATE UNIVERSITY

COLLEGE OF AGRICULTURE & LIFE SCIENCES
MS AGRICULTURAL & FORESTRY EXPERIMENT STATION
Office of the Dean and Director
Box 9760
Mississippi State, MS 39762

Dear Undergraduate Students,

Congratulations on your research endeavors! The College of Agriculture and Life Sciences (CALS) and the Mississippi Agricultural and Forestry Experiment Station (MAFES) are pleased to participate in the Spring 2025 Undergraduate Research Symposium. Regardless of your future career, research helps develop critical thinking skills as well as improve your ability to communicate complex information.

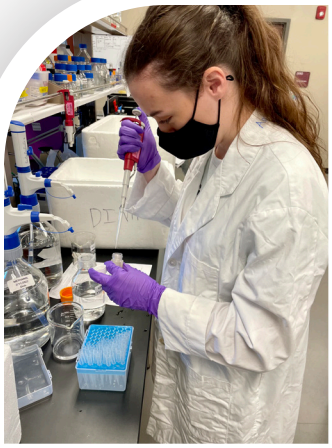
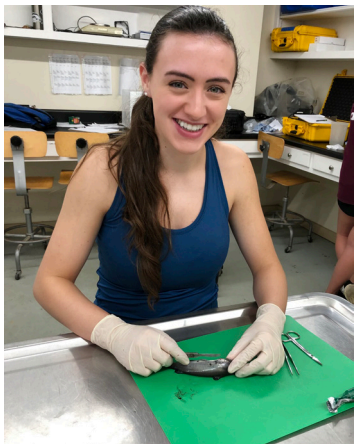
Of special note, I wish to thank the participants of the CALS/MAFES Undergraduate Research Scholars Program. Your contributions have helped Mississippi State University achieve the national ranking of 11th in agricultural research and 12th in agricultural and natural resources research! You are integral to the success of Mississippi State University, and you should be proud of what you have accomplished. Whether it be toiling in a field, taking measurements in a laboratory, or compiling data behind a computer, your efforts matter!

Respectfully,

Scott Willard
Dean of CALS
Director of MAFES

MISSISSIPPI STATE UNIVERSITY™
COLLEGE OF FOREST RESOURCES

THE PLACES YOU'LL GO, THE THINGS YOU'LL SEE, WHILE MAKING THE WORLD A BETTER PLACE.


Congratulations to our Undergraduate Research Scholars Program participants!





MISSISSIPPI STATE UNIVERSITY™
THE GRADUATE SCHOOL

Dear Students,

Congratulations on your submissions and participation in the Mississippi State University three minute research pitch competition hosted by the Graduate School. This competition is modeled after the Three Minute Thesis (3MT) program, which started fifteen 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 three minute research pitch competition and with your future scholarly endeavors.

Best regards,
Angi

Angi Elsea Bourgeois, PhD
Dean - College of Architecture, Art, & Design
Interim Dean - The Graduate School
Mississippi State University

THE OFFICE OF PRESTIGIOUS EXTERNAL SCHOLARSHIPS

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.

Each year, we work with dozens of Mississippi State University students and alumni from a wide variety of backgrounds, areas of study, and interests; helping them to not only develop strong application to their desired scholarships and fellowships, but also to craft strong personal narratives which can be applied beyond external scholarship applications.

Since the office's inception in 2012, Mississippi State has had a Rhodes Scholar, a Churchill Scholar, a Gates Cambridge Scholar, a Marshall Scholar, three Truman Scholars, nine Fulbright Scholars, five Boren Scholars, eleven Astronaut Scholars, nine PPIA JSI winners, nine Goldwater Scholars and more!

UNDERGRADUATE/ NATIONAL

- Astronaut Scholarship
- Goldwater Scholarship
- Udall Undergraduate Scholarship
- Public Policy and International Affairs Junior Summer Institute
- Humanity in Action Fellowship
- Hollings NOAA Scholarship

INTERNATIONAL

- Fulbright U.S. Student Awards
- Fulbright U.K. Summer Institute
- Boren Awards
- Critical Language Scholarship
- DAAD - Rise
- Voyager Scholarship

GRADUATE SCHOOL

- Knight-Hennessy Scholar Program
- Truman Scholarship
- Rhodes Scholarship
- Gates-Cambridge Scholarship
- Marshall Scholarship
- Mitchell Scholarship
- Churchill Scholarship
- Rangel Fellowship

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.

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

19th February, 2025

RE: The Undergraduate Research Symposium – Spring 2025

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 2025 Undergraduate Research Symposium 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! Undergraduate research meets a very important criteria of ensuring that every student engages in some form of experiential learning while attending the university.

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

Respectfully,

Joshua Granger

Joshua Granger, PhD, MSU PKP Chapter President

WE ARE SO PROUD OF YOU!

Congratulations, and thank you for making the 2025 Undergraduate Research Symposium a success!

MISSISSIPPI STATE UNIVERSITY™
JUDY AND BOBBY SHACKOULS HONORS COLLEGE

UNDERGRADUATE RESEARCH SYMPOSIUM SCHEDULE
Spring 2025

Wednesday, April 9th

Session 1 – Engineering and Physical Sciences		
TIME	EVENT	LOCATION
9:00 AM – 9:30 AM	Project Check-in and Student Viewing of Other Posters	Foster Ballroom, Colvard Student Union, Second Floor
9:30 AM – 11:30 AM	Poster Session	
Session 2 – 3Minute Research Pitch		
TIME	EVENT	LOCATION
1:00 PM – 4:00 PM	3Minute Research Pitch Competition, Hosted by The Graduate School *See separate event schedule*	The Dawghouse, Colvard Student Union, First Floor

3MINUTE RESEARCH PITCH:

A competition that challenges undergraduate students to present a compelling verbal presentation of their research topic and its significance in just three minutes. A presentation schedule will be available at the event.

Thursday, April 10th

Session 3 – Biological and Life Sciences		
TIME	**EVENT**	**LOCATION**
9:00 AM – 9:30 AM	Project Check-in and Student Viewing of Other Posters	Foster Ballroom, Colvard Student Union, Second Floor
9:30 AM – 11:30 AM	**Poster Session**	
Session 4a – Social Sciences, Education, Business & Economics, Humanities, Arts, Music, & Design (Posters)		
TIME	**EVENT**	**LOCATION**
1:30 PM – 2:00 PM	Project Check-in and Student Viewing of Other Posters	Foster Ballroom, Colvard Student Union, Second Floor
2:00 PM – 4:00 PM	Poster Session	
Session 4b – Humanities, Arts, Music, & Design (Oral Presentations)		
TIME	**EVENT**	**LOCATION**
1:00 PM – 1:30 PM	Project Check-In	Foster Ballroom, Second Floor
1:30 PM	Group 1 Presentations *See separate event schedule*	Fowlkes Auditorium, Colvard Student Union, Third Floor
2:30 PM	Group 2 Presentations *See separate event schedule*	

HUMANITIES and ARTS, MUSIC, & DESIGN ORAL PRESENTATIONS SCHEDULE

Fowlkes Auditorium, Colvard Student Union
Thursday, April 10th

EVENT SCHEDULE

1:00 PM **Group 1: Arts, Music, & Design and Humanities Check-In**

1:30 PM **Group 1: Arts, Music, & Design and Humanities Presentations**

Tess Higginbotham (267) Assessing the Capabilities of AI in Architectural Analysis and Education
Jesus Morales (268) AI's Potential Involvement Within Architectural History Courses
Wade Parker (269) The Spectrum of Musical Modality and its Emotional Affect
Sydney Bowen-Sweet (270) Lucy Snowe's Compromised Pleasure In Charlotte Brontë's *Villette*
Rowan Feasel (271) Plath's "Mythological Method:" Poetry about Parents

2:30 PM **Group II: Humanities Check-In**

2:45 PM **Group II: Humanities Presentations**

Victoria Garret (272) The Power of Land: Land as a Tool for Maintaining Power in a Neocolonial World
Elena Harman (273) Manipulation and Identity in Shakespeare's *The Taming of the Shrew*
Jackson Holden (274) Questioning *Marbury v. Madison*
Connor McOlgan (275) The Spectacle of The War on Terror
Haylee Morman (276) "I'm Only White in America": Performing Ethnicity Post-9/11 and in Mohsin Hamid's The Reluctant Fundamentalist
Anne Louise Phillips (277) Unrest and Distraction: Fascism in *Cabaret* and *The Great Dictator*

NAME	RESEARCH CATEGORY	PROJECT NUMBER
Umamah Amer	Engineering	001
Sarah Arnold	Engineering	002
Adessa Ballard	Engineering	003
Zachary Barbre	Engineering	004
Madelyn Berry	Engineering	005
Megan Berry	Engineering	006
Jigar Bhatt	Engineering	007
Prashant Bhattarai	Engineering	008
Swarup Bhattarai	Engineering	009
Naima Bradley	Engineering	010
Kenyan Buckner	Engineering	011
Haley Carpenter	Engineering	012
Yasmin Chambers	Engineering	013
Devin Chen	Engineering	014
Katelyn Christy	Engineering	015
Morgan Cochran	Engineering	016
Kyler Colip	Engineering	017
Olivia Draughn	Engineering	018
Eromosele Eigbe	Engineering	019
Kofi Ennin	Engineering	020
Wyatt Fisher	Engineering	021
Cameron Fowler	Engineering	022
Evan Garrison	Engineering	023
Leonel Giacobbe	Engineering	024
Niranjan Giri	Engineering	025
Ryan Goodwin	Engineering	026
Ethan Goolsby	Engineering	027
Erin Harris	Engineering	028
Hinson Hayden	Engineering	029
Kevin Ho	Engineering	030
Martina Hoffmann Meyer	Engineering	031
Daniel Hurley	Engineering	032
Jordon Jasper	Engineering	033
Isabella Jones	Engineering	034
Claire Justis	Engineering	035
Joshua Kelley	Engineering	036
Alexander Ketzle	Engineering	037
Zeedan Khan	Engineering	038
Lalit Kumar	Engineering	039
Parker Lee	Engineering	040
Aditya Mulay	Engineering	041
Olivia Palmer	Engineering	042

NAME	RESEARCH CATEGORY	PROJECT NUMBER
Jacob Phillips	Engineering	043
Austin Prevette	Engineering	044
Mino Razafimino	Engineering	045
Cedric Roberson	Engineering	046
Ethan Rogers	Engineering	047
Mohnish Sao	Engineering	048
Gavin Seiler	Engineering	049
Reid Sewell	Engineering	050
Garrett Simmerman	Engineering	051
Hayward Singletary	Engineering	052
Stephanie Slavick	Engineering	053
Owen Smith	Engineering	054
Jada Stewart	Engineering	055
Jade Thompson	Engineering	056
Jameson Thompson	Engineering	057
Jayla Travis	Engineering	058
Shaheen Vazeii	Engineering	059
Addyson Wheat	Engineering	060
Nolan Arnold	Physical Sciences	061
Caleb Bowman	Physical Sciences	062
Evan Conner	Physical Sciences	063
Corvallis Evans	Physical Sciences	064
Surabhi Gupta	Physical Sciences	065
Asahi Lama Sherpa	Physical Sciences	066
Olivia Marcum	Physical Sciences	067
Ashmit Kumar Mishra	Physical Sciences	068
William Morgan	Physical Sciences	069
Riley Newton	Physical Sciences	070
Zoie Paugh	Physical Sciences	071
Saugat Sapkota	Physical Sciences	072
Guriqbal Singh	Physical Sciences	073
Kayla Taylor	Physical Sciences	074
Justin Traywick	Physical Sciences	075
Tobias Adams	Biological and Life Sciences	076
Anna Anderson	Biological and Life Sciences	077
Bella Antonaros	Biological and Life Sciences	078
John Mathis Arnold	Biological and Life Sciences	079
Savana Ashley	Biological and Life Sciences	080
R. Charles Aurora	Biological and Life Sciences	081
Essence Baker	Biological and Life Sciences	082
Nathan Barnard	Biological and Life Sciences	083
Nathan Baxter	Biological and Life Sciences	084
Mason Beard	Biological and Life Sciences	085

NAME	RESEARCH CATEGORY	PROJECT NUMBER
Lily Ciel Behnam	Biological and Life Sciences	086
Brandon Bernard	Biological and Life Sciences	087
Kylie Birchfield	Biological and Life Sciences	088
Erin Blanchard	Biological and Life Sciences	089
Samantha Blocker	Biological and Life Sciences	090
Piper Bratton	Biological and Life Sciences	091
Tom Brister	Biological and Life Sciences	092
Lillian Butler	Biological and Life Sciences	093
Krystell Cecilia Charles Fajardo	Biological and Life Sciences	094
Logan Collom	Biological and Life Sciences	095
Piper Conrad	Biological and Life Sciences	096
Cerissa Cooley	Biological and Life Sciences	097
Kirsten Cooper	Biological and Life Sciences	098
Emma Creel	Biological and Life Sciences	099
Jocalyn Cruz-Sanders	Biological and Life Sciences	100
Chayse Culbert	Biological and Life Sciences	101
Dennis Dalton	Biological and Life Sciences	102
Jeremy Dawe	Biological and Life Sciences	103
Katherine Delaney	Biological and Life Sciences	104
Shelby DeMorato	Biological and Life Sciences	105
James Dirmeyer	Biological and Life Sciences	106
Marleigh Eekhof	Biological and Life Sciences	107
Reagan Elmore	Biological and Life Sciences	108
Abigail Fagan	Biological and Life Sciences	109
Kinsey Fikes	Biological and Life Sciences	110
Kaeley Filas	Biological and Life Sciences	111
Margaret Franks	Biological and Life Sciences	112
Aidan Gerber	Biological and Life Sciences	113
Tara Grant	Biological and Life Sciences	114
Claire Green	Biological and Life Sciences	115
Victoria Greene	Biological and Life Sciences	116
Alexis Hall	Biological and Life Sciences	117
Parker Hansen	Biological and Life Sciences	118
Joseph Hinton	Biological and Life Sciences	119
Joseph Hinton	Biological and Life Sciences	120
Amelia Horner	Biological and Life Sciences	121
Nick House	Biological and Life Sciences	122
Blake Intorcia	Biological and Life Sciences	123
Jeremiah Jackson	Biological and Life Sciences	124
John Jacobson	Biological and Life Sciences	125
Bria Johnson	Biological and Life Sciences	126
Nyla Jones	Biological and Life Sciences	127
Celeste Kenisky	Biological and Life Sciences	128

NAME	RESEARCH CATEGORY	PROJECT NUMBER
Bailey Khan	Biological and Life Sciences	129
Emma Koeppen	Biological and Life Sciences	130
Tanner Laird	Biological and Life Sciences	131
Asahi Lama Sherpa	Biological and Life Sciences	132
Grace Levine	Biological and Life Sciences	133
Spencer Lile	Biological and Life Sciences	134
Jaiden Linley	Biological and Life Sciences	135
Sophie Maedo	Biological and Life Sciences	136
Tanner Marlow	Biological and Life Sciences	137
August Mayden	Biological and Life Sciences	138
Justin Maynard	Biological and Life Sciences	139
Kelsey Mazeres	Biological and Life Sciences	140
Abigail McBride	Biological and Life Sciences	141
Jacob McGee	Biological and Life Sciences	142
Madeline Merry	Biological and Life Sciences	143
Benjamin Miller	Biological and Life Sciences	144
Christie Miller	Biological and Life Sciences	145
Ashwani Kumar Mishra	Biological and Life Sciences	146
Zoe Molloy	Biological and Life Sciences	147
Molly Montoya	Biological and Life Sciences	148
Evan Moore	Biological and Life Sciences	149
Jessica Moroso	Biological and Life Sciences	150
Sophia Nicholls	Biological and Life Sciences	151
Julia Null	Biological and Life Sciences	152
Dakota Parish	Biological and Life Sciences	153
Colby Phillips	Biological and Life Sciences	154
Claire Potts	Biological and Life Sciences	155
Madeline Raynor	Biological and Life Sciences	156
Sailor Rearden	Biological and Life Sciences	157
Lillie Reid	Biological and Life Sciences	158
Jessica Rutherford	Biological and Life Sciences	159
Jack Sartin	Biological and Life Sciences	160
Maximus Smithey	Biological and Life Sciences	161
Jadyn Snider	Biological and Life Sciences	162
Bradley Stafford	Biological and Life Sciences	163
Anne Marie Sullivan	Biological and Life Sciences	164
Chelsea Sullivan	Biological and Life Sciences	165
Vada Lee Thacker	Biological and Life Sciences	166
Mia Thames	Biological and Life Sciences	167
Sulav Thapa	Biological and Life Sciences	168
Charles Thompson	Biological and Life Sciences	169
Annamarie Thompson	Biological and Life Sciences	170
Madison Vandiver	Biological and Life Sciences	171

NAME	RESEARCH CATEGORY	PROJECT NUMBER
Vineel Vanga	Biological and Life Sciences	172
Kaylynn Walker	Biological and Life Sciences	173
Nina Weinstein	Biological and Life Sciences	174
Tori Welch	Biological and Life Sciences	175
Carlie Willingham	Biological and Life Sciences	176
Kayla Young	Biological and Life Sciences	177
Cole Arrington	Arts, Music, & Design	178
Aven Brasher	Arts, Music, & Design	179
Merideth Farrell	Arts, Music, & Design	180
Michael Gonzalez	Arts, Music, & Design	181
Billy Guevara-Gonzalez	Arts, Music, & Design	182
Nathan Shelton	Arts, Music, & Design	183
Yuria Sloane	Arts, Music, & Design	184
Madelynn Green	Humanities	185
Brennan Butler	Business and Economics	186
Bailey Carpenter	Business and Economics	187
Payton Davis	Business and Economics	188
Ellen DuPré	Business and Economics	189
Niraj Gupta	Business and Economics	190
Emily K Hubbard	Business and Economics	191
Joshua King	Business and Economics	192
Samata Luintel	Business and Economics	193
Abigail Martrain	Business and Economics	194
Spencer Sanderson	Business and Economics	195
Jimmy Sieja	Business and Economics	196
Joshua Whitehead	Business and Economics	197
Taylor Yelvington	Business and Economics	198
Autumn Baukman	Education	199
Rachel Bowers	Education	200
Ariel Colburn	Education	201
Caroline Gardner	Education	202
Jamya High	Education	203
Caitlin Morrow	Education	204
Pranavi Paudel	Education	205
Rachel Apperson	Social Sciences	206
Hunter Appleton	Social Sciences	207
Kourtney Barfield	Social Sciences	208
Mary Barnes	Social Sciences	209
Chandleigh Barton	Social Sciences	210
Claire Boudreaux	Social Sciences	211
Taylor Boyt	Social Sciences	212
Anastasia Brooks	Social Sciences	213
Campbell Carter	Social Sciences	214

NAME	RESEARCH CATEGORY	PROJECT NUMBER
Dominic Chavez	Social Sciences	215
Hayden Cherry	Social Sciences	216
Sarah Catherine Childs	Social Sciences	217
Sydney Collum	Social Sciences	218
Annaleise Coughlin	Social Sciences	219
Kaigan Davis	Social Sciences	220
Jose De Hoyos	Social Sciences	221
Karlene Deng	Social Sciences	222
Emily Dew	Social Sciences	223
Nevaeh Dyle	Social Sciences	224
Nicole Esquibel	Social Sciences	225
Harper Evers	Social Sciences	226
Caroline Flint	Social Sciences	227
Megan Forrester	Social Sciences	228
Katie Garcia	Social Sciences	229
Lizbeth Garduno- Cruz	Social Sciences	230
Poonum Gill	Social Sciences	231
Isabel Gomez	Social Sciences	232
Grace Goodloe	Social Sciences	233
Grace Gough	Social Sciences	234
Lauren Hamilton	Social Sciences	235
Olivia Hamilton	Social Sciences	236
Christopher Jolivette	Social Sciences	237
Savannah Jones	Social Sciences	238
Jacob Matkin	Social Sciences	239
Avery McDaniel	Social Sciences	240
Ashley Middleton	Social Sciences	241
Henry Miller	Social Sciences	242
Emily Montgomery	Social Sciences	243
Olivia Osborne	Social Sciences	244
Siddhi Pathak	Social Sciences	245
Tatum Pettit	Social Sciences	246
Abby Pulver	Social Sciences	247
Read Robertson	Social Sciences	248
Read Robertson	Social Sciences	249
Katie Roman	Social Sciences	250
Madeline Rossi	Social Sciences	251
Janiya Rutherford	Social Sciences	252
Henry Sanders	Social Sciences	253
Madison Smith	Social Sciences	254
Emma Claire Spradling	Social Sciences	255
Savanah Stewart	Social Sciences	256
Avery Tate	Social Sciences	257

NAME	RESEARCH CATEGORY	PROJECT NUMBER
Avery Treloar	Social Sciences	258
Olivia Trotter	Social Sciences	259
Muneebah Umar	Social Sciences	260
Gracie Walters	Social Sciences	261
Arisa Washington	Social Sciences	262
Katherine Weatherford	Social Sciences	263
Sara Anne Weaver	Social Sciences	264
Nena Williams	Social Sciences	265
Kallen Zhou	Social Sciences	266
Tess Higginbotham	Arts, Music, & Design (OP)	267
Jesus Morales	Arts, Music, & Design (OP)	268
Wade Parker	Arts, Music, & Design (OP)	269
Sydney Bowen-Sweet	Humanities (OP)	270
Rowan Feasel	Humanities (OP)	271
Victoria Garrett	Humanities (OP)	272
Elena Harman	Humanities (OP)	273
Jackson Holden	Humanities (OP)	274
Connor McOlgan	Humanities (OP)	275
Haylee Morman	Humanities (OP)	276
Anne Louise Phillips	Humanities (OP)	277
Madalynn Clawson	Biological and Life Sciences	278
Nicholas McNew	Biological and Life Sciences	279
Daniel Grebner	Biological and Life Sciences	280
Andrew Trepagnier	Engineering	281

76.
Name: Adams, Tobias
Major: Biochemistry - Bachelor of Science
Faculty Research Mentor: Richard Baird, Agricultural Science & Plant Protec
Co-Author(s): Hannah Purcha
Funding: College of Agriculture and Life Sciences URSP
Project Category: Biological and Life Sciences

Evaluating the Impacts of Drought and *Macrophomina phaseolina* Infection on ROS Production in Soybean
Eukaryotic cells produce highly reactive molecules known as reactive oxygen species (ROS). The compounds are derived from the tendency of the O_2 molecule to accept electrons, which generate subsequent unstable molecules such as hydrogen peroxide (H_2O_2), hydroxyl radicals (OH^-), and superoxide (O_2^-). Stable levels of ROS are crucial to the normal function of cells, and excess ROS results in cellular damage due to oxidative stress. *Macrophomina phaseolina* (MP) is a hemibiotrophic, generalist, soilborne fungus that causes severe damage to many crops, especially during hot and dry conditions. MP is believed to upregulate ROS production in its host, leading to membrane damage and cellular death. The goal of this study is to assess the impact of drought (D) and MP infection on the ROS levels in soybean (*Glycine max* (L.) Merr.). In a greenhouse trial, soybean plants were subjected to four treatments: MP-/D-, MP+/D-, MP-/D+, and MP+/D+. Foliar tissue from these plants was harvested across three dates (9/22/23, 10/06/23, and 08/24/23), and the tissue was assayed for key ROS-associated compounds. The results of these analyses are presented in the poster.

1.
Name: Amer, Umamah
Major: Mechanical Engineering - Bachelor of Science
Faculty Research Mentor: Lauren Priddy, Ag & Bio Engineering
Co-Author(s): Matthew Priddy, Jaydon Gibson
Funding: BCOE UG Research Award
Project Category: Engineering

Optimizing a Perfusion-Compression Bioreactor via Python Integration
Bioreactors are widely used in tissue engineering to support cell and tissue growth under controlled conditions. Perfusion-compression bioreactors, like the one developed by our lab, replicate physiological loading of bone on 3D printed scaffolds. These scaffolds, when seeded with osteogenic cells and subjected to mechanical loading, can be used as a model to study osteogenesis. To simulate physiological conditions, the bioreactor must apply 1000 compression cycles up to 200 N at low speeds, three times daily for 14 days. Upon implementation, validation testing and experimental studies exposed several limitations in the bioreactor's control code. The system was initially programmed in LabVIEW, which is expensive, closed source, and not readily adaptable to changing research needs. During testing, the LabVIEW code frequently overloaded bone explant samples. To resolve these issues, the bioreactor's control code is being transitioned to Python, an open-source, non-graphical programming language that offers more flexibility and customization. Transitioning to Python will also allow for a more user-friendly, customizable graphical user interface (GUI) to improve accessibility for future researchers. The transition has been implemented step by step, starting with enabling timers to control the retraction and extension of the NEMA 17 linear actuator, which applies the compressive forces. The load cells have been verified to ensure data is acquired accurately. Next, actuator and load cell functions must be integrated so the actuator adjusts based on the force applied to the samples during cyclical loading. Once this is achieved, the Linear Variable Differential Transducer (LVDT) displacement sensor will be incorporated to measure small displacements, used to calculate the stiffness of the scaffold. Beyond optimizing data handling and visualization, this transition from LabVIEW to Python will ensure the bioreactor remains adaptable to new technologies, making it more efficient and sustainable for future research.

77.
Name: Anderson, Anna
Major: Biological Sciences - Bachelor of Science
Faculty Research Mentor: Matthew Brown, Biological Sciences
Co-Author(s): Idan Banson, Felicity Kleitz-Singleton
Funding: NSF
Project Category: Biological and Life Sciences

Optimizing Protist Genomic Analysis through Selective Bacterial DNA Degradation
Laboratory cultured microbial eukaryotes (protists) often consume E. coli and other bacteria as food, leading to bacterial contamination challenges during genomic DNA extraction and analyses. Most E. coli strains carry the dam gene, which encodes Dam methylase--an enzyme that methylates adenine residues in GATC sequences, occurring approximately once per 256 bp in random DNA. Importantly,

this type of methylation pattern has not been observed in eukaryotic DNA. We leveraged this molecular distinction to develop a post-extraction protocol using dpnI, a restriction enzyme from Diplococcus pneumoniae G41 that specifically cleaves fully adeno-methylated dam sites while cleaving hemi-adeno-methylated sites 60× more slowly. DpnI has an extremely high specificity. Because eukaryotic DNA lack dam methylation, it remains unaffected by this digestion. The dpnI enzyme effectively degrades bacterial DNA from that of the protist grown on E. coli. To validate our approach, we extracted DNA from dam-methylated E. coli and the eukaryotic yeast O. polymorpha grown axenically on LB agar. We prepared mixtures with varying ratios, subjected them to DpnI digestion, and efficiently removed the short, digested fragments using size-selective DNA precipitation. Gel electrophoresis visualized successful digestion, while quantification demonstrated eukaryotic DNA retention. Further, we tested the protocol on an amoeboid eukaryote, V. fimicola, performing long-read sequencing to assess the impact on eukaryotic vs bacterial read composition. Out results highlight a simple but powerful solution to address the bacterial contamination in protist genomics, particularly for species that rely on *dam methylated bacteria* as a food source. Our digestion protocol substantially improves sequencing efficiency and eukaryotic read generation, which is major challenge in protist genomics research.

78.
Name: Antonaros, Bella
Major: Biological Sciences - Bachelor of Science
Faculty Research Mentor: Heather Jordan, Biological Sciences
Co-Author(s): Jordan Smink, Bria Johnson
Project Category: Biological and Life Sciences

Exploring Antimicrobial Potential of Black Soldier Fly Larvae: A Sustainable Approach to Combat Veterinary Pathogens
Antimicrobial peptides (AMPs) play a crucial role in innate immunity and are considered promising alternatives to antibiotics in livestock farming. The black soldier fly (*Hermetia illucens*) has been identified as a valuable source of novel AMPs due to its ability to thrive in microbe-rich environments. This study investigated the antimicrobial potential of a slurry derived from Black Soldier Fly larvae (BSFL), with a focus on its capacity to combat veterinary pathogens. BSFL were reared to the 5th instar stage, sacrificed via freezing, and processed to obtain a crude homogenate. The larvae were ground in 10% phosphate-buffered saline, centrifuged to remove solid debris, and the supernatant was sequentially filtered (0.45 µm and 0.22 µm) to eliminate bacterial contamination. Extract sterility was confirmed by plating on LB agar, and antimicrobial activity of the BSFL slurry was assessed using the Kirby-Bauer disc diffusion method, with sterile water chloramphenicol as negative and positive controls, respectively. No antimicrobial activity was observed in this preliminary study, suggesting the need for further optimization of extraction methods to isolate bioactive AMPs. Given that BSF larvae are known to produce a range of AMPs with broad-spectrum activity against Gram-positive and Gram-negative bacteria, future studies should aim to refine extraction techniques and characterize these peptides. This research provides a foundation for further exploration of BSFL-derived AMPs as a sustainable, non-antibiotic alternative to improve animal health while addressing the growing concern of antimicrobial resistance.

206.
Name: Apperson, Rachel
Major: Psychology - Bachelor of Science
Faculty Research Mentor: Allison Jaeger Berena, Psychology
Co-Author(s): Micheal Poe, Emma Day
Funding: NSF REU: NSF grant funding: #230099
Project Category: Social Sciences

The Earth is Like a Peach: Understanding the Impact of Analogies on Learning from Geoscience Texts
Research shows that analogies can help improve understanding of difficult science concepts by connecting unfamiliar, complex ideas to pre-existing frameworks (Gentner, 1983). However, other research has shown that the effectiveness of analogies for supporting learning can depend on how clearly they provide mappings between existing knowledge and to-be-learned information (Duit, 1991). The goal of this experiment was to examine how the presence of analogies in geoscience texts impact comprehension and judgment accuracy. In this study, 237 participants from a Survey of Earth Sciences Lab class read a series of 6 texts on geosciences topics. Students were randomly assigned to one of three conditions (Analogy, No Analogy, Mixed). In the analogy condition, all 6 texts included simple analogies, in the no analogy condition students read the base texts with no analogies present and in the mixed condition only half the texts included analogies. After reading each text, students were prompted to judge how well they thought they would perform on a test of the material they just read. After reading and judging all 6 texts, they completed a set of multiple-choice tests, one for each topic. Results showed that test performance was significantly worse in the analogy condition compared to the no analogy or mixed conditions. To examine the accuracy of judgments of learning, two measures were computed: absolute accuracy and confidence bias. For absolute accuracy, results showed that students in analogy condition demonstrated more error in their judgments than students in the no analogy and mixed conditions. Similarly, results showed that while all students were over-confident in their judgments of learning,

students in the analogy condition demonstrated more over-confidence than students in the no analogy and mixed conditions. Overall, these results indicate that the presence of analogies can negatively impact text comprehension and judgments of learning accuracy.

207.
Name: Appleton, Hunter
Major: Biochemistry - Bachelor of Science
Faculty Research Mentor: Megan Holmes, Department of Kinesiology
Co-Author(s): Ian Macali, Po-Lin Chen, Sarah Childs, Kaigan Davis
Project Category: Social Sciences

Physical Activity on Gameday Among Collegiate Marching Band Members
Participation in marching band requires significant physical exertion, as members engage in prolonged periods of movement, precise formations, and instrument handling, all of which contribute to overall physical activity (PA) levels. The combination of sustained marching, rapid directional changes, and weight-bearing demands makes marching band a unique form of PA. Understanding the PA demands of marching band is essential for optimizing performance and ensuring adequate recovery. This study examines PA levels and intensity among collegiate marching band members on gameday. Participants (n=22, 14 females) were members of a Southeastern university marching band. PA was measured using Actigraph GTX3+ accelerometers. Gamedays were assessed during home football games. Total physical activity (PA) and time spent in Light PA (LPA), Moderate PA (MPA), Vigorous PA (VPA), and Very Vigorous PA (VVPA) levels were determined using Freedson VM3, with a mean wear time of 979.55 minutes (SD = 174.70). Step count information was also collected from the accelerometer. Gameday, participants averaged 869.8 minutes of light PA (SD = 187.2), 97.3 minutes of moderate PA (SD = 31.1), 4.0 minutes of vigorous PA (SD = 2.9), and 0.51 minutes of very vigorous PA (SD = 0.52). Counts per minute averaged 727.2 (SD = 164.2), average total steps reached 19,168.4 (SD = 4674.8), and steps per minute were 20.0 (SD = 4.2). Most of the PA on gameday was spent at moderate intensity. No sex differences in PA variables were observed. Marching band members take part in a considerable amount of PA on gameday. The high level of PA on gameday, underscores the physical demands of performances and movement throughout the day, highlighting the need for optimized training and recovery strategies. Future research should examine differences between gamedays, weekdays, and off-days to better understand the physical activity profiles of this group.

79.
Name: Arnold, John Mathis
Major: Agronomy - Bachelor of Science
Faculty Research Mentor: Te-Ming Paul Tseng, Plant and Soil Sciences
Co-Author(s): Alaina Richardson
Funding: ORED Undergraduate Research Program
Project Category: Biological and Life Sciences

Effects of Soil Steaming Durations on Yellow Nutsedge Tuber Germination at Different Soil Depths
Soil steaming is a relatively new method when it comes to weed control; however, it is an effective method for producers who may want to transition to the organic market. This study aimed to evaluate the effectiveness of three steaming durations and various planting depths on the germination of yellow nutsedge tubers. The steaming durations tested were 1 minute, 5 minutes, and 45 minutes, while the tuber depths were 2 inches, 5 inches, and 8 inches below the soil surface. Replication was achieved across controlled greenhouse and field settings. Pots were placed under a steamproof tarp and subjected to the designated steaming treatments, with a non-steamed group serving as the control. Comparative analysis revealed significant differences in weed suppression based on steaming duration, tuber depth, and germination outcomes, including initial and total germination rates. Tuber excavation was conducted 28 days after treatment to assess the effects. These findings highlight the interplay between steaming duration and tuber depth in suppressing yellow nutsedge germination. For 1-minute steaming, initial and total germination were reduced by 97% at a 2-inch depth, 99% at 5 inches, and 96% at 8 inches, with no additional germination after tuber excavation, indicating depth had no significant effect. For 5-minute steaming, reductions were 99% at 2 and 5 inches and 98% at 8 inches, with no further changes in total germination. With 45-minute steaming, germination was completely suppressed (100%) at all depths. In comparison, the non-steamed control showed the highest germination rates: 97% at 2 inches, 80% at 5 inches, and 53% at 8 inches. These results demonstrate that 45 minutes of steaming was most effective. Overall, this study supports soil steaming as a viable nonchemical alternative for managing yellow nutsedge in systems where herbicides are not an option.

61.
Name: Arnold, Nolan
Major: Biological Sciences - Bachelor of Science
Faculty Research Mentor: Vicky Montiel Palma, Chemistry
Co-Author(s): Miguel Cabrera Briseno
Funding: NSF Project #2102689
Project Category: Physical Sciences

Mild and Efficient Synthesis of 1,2,3-Triazoles through Additive-Free Click Chemistry Catalyzed by Cu(I) Silylphosphine Complex

Silyl phosphine ligands are highly versatile species that enable the stabilization of transition metals such as Rh, Ir, Ru, and first-row transition metals like Ni, Co, and Cu. As excellent σ-donors via the phosphorus lone pair, and potential interactors with the Si-H bond in a non-classical manner or through oxidative addition, these ligands are an excellent choice for stabilizing late transition metals like Copper(I). The coordination of these ligands provides diverse properties to the metal, including enhanced solubility and reactivity in catalytic reactions that are not observed in their counterparts, Cu(I) and Cu(II) chlorides. This work presents the synthesis of a silyl phosphine complex wherein Cu(I)Cl is stabilized by two silyl phosphine ligands, and its catalytic activity in the Cu(I)-catalyzed azide-alkyne cycloaddition (CuAAC) reaction. Notably, CuAAC reactions typically employ Cu(II) salts and/or complexes in conjunction with reducing agents like ascorbic acid and sodium ascorbate as reductants. In this approach, the synthesis of triazoles bearing electron-donating groups (EDGs), electron-withdrawing groups (EWGs), and bulky substituents was achieved using [CuCl(k1PSiMe)2] complex without the addition of additives at ambient temperature, this simplistic nature of the CuAAC reaction allows for the easy formation of heterocycles that can then be used for pharmaceutical or fine chemical purposes.

2.
Name: Arnold, Sarah
Major: Biomedical Engineering - Bachelor of Science
Faculty Research Mentor: Jessica Gonzalez Vargas, Industrial and Systems Engineering
Co-Author(s): Alaina Herrington, Anna Geter
Funding: ORED Undergraduate Research Program
Project Category: Engineering

Leveling Up Peripheral Intravenous Training: Designing and Evaluating a Low-Fidelity Interface for Pediatric Difficult Intravenous Access

Approximately 300 million peripheral intravenous catheters (PIVCs) are placed annually. However, failure rates in pediatric patients with difficult intravenous access (DIVA) reach up to 60%, leading to complications, delays, and distress. A contributing factor to failure rates is the reliance on "on-the-job" learning, as current training methods do not adequately prepare clinicians about DIVA patients.
To address this gap, a low-fidelity training interface was developed to train users about pediatric DIVA characteristics. This process began with an extensive literature review identifying key factors such as: medications, past experience, prior history, age, blood vessel size, skin color, and weight. Insights from this review informed the design of the interface. To determine the utility of this interface, we conducted a pilot study with eight students (three graduate and five undergraduate students) at Mississippi State University. Participants began by providing consent and completing a demographic survey. They then completed a pre-test to assess their baseline knowledge of pediatric DIVA characteristics. Next, participants interacted with the interface to learn about these characteristics. Following the training, participants completed a post-test to measure any changes in their knowledge. Then, they completed a System Usability Scale (SUS). Finally, they participated in an interview to gather feedback and identify potential areas for improvement. Results from a paired-samples t-test showed a significant knowledge increase from pre-test to post-test, with a mean increase of 0.563, $t(7) = 5.169$, $p < .001$. The SUS survey yielded an average score of 89.06, indicating high usability. Interview feedback highlighted areas for improvement, including adding case studies, images, and references. We can conclude that the interface enhances knowledge of pediatric DIVA characteristics and maintains a high usability, as a SUS score surpassing 80 is considered above average. Future work will focus on refining the interface, incorporating feedback, and having a larger sample size.

178.
Name: Arrington, Cole
Major: Architecture - Bachelor of Architecture
Faculty Research Mentor: Silvina Lopez Barrera, School of Architecture
Co-Author(s): Arturo Hernandez
Project Category: Arts, Music, & Design

Restoring and Revitalizing Biloxi's Main Street
Twenty years after Hurricane Katrina, coastal communities in Mississippi still struggle with economic, social, and environmental issues. Our mission is to inspire sustainable practices and create new public development to restore its historical value, local economy, and resilience against climate change and future storms. We gathered information from community meetings, professionals, organizations, articles, and the Mississippi State University library database. Feedback received in Gulfport, MS, addressed sustainability, architectural restoration, and resiliency in response to Hurricane Katrina. Despite challenges like affordable housing shortages, Biloxi's Main Street holds potential for sustainable design due to its historical significance. We identified the need for sustainable strategies and resilient design to address climate change and storm surges. Our project proposes redeveloping empty lots and vacant spaces, boosting the local economy and community engagement. We suggested redesigning roads for better traffic flow, pedestrian safety, and walkability alongside mixed-use buildings to introduce housing units and support local businesses. Our design focuses on sustainable practices such as stratavault cell systems, underground cisterns, sponge parks, and reed beds along the Back Bay to reduce foreign objects in the water. The proposed state park for Biloxi, MS, aims to restore the bayou and protect wildlife while promoting biodiversity. By implementing mixed-use development, we are encouraging businesses to come to the area of Main Street and improve the economy of the city. The purpose of the mixed-used developments is to create a tight-knit community through recreational spaces, linear parks on the roads, and outdoor dining spaces. This project aims to transform a neglected area into a thriving hub of economic and social success. However, zoning laws, particularly single-family residential zoning, present barriers to change by limiting the housing supply. We hope to inspire designers to advocate for density and multifamily developments that would increase housing availability and foster diverse, inclusive communities.

80.
Name: Ashley, Savana
Major: Poultry Science - Bachelor of Science
Faculty Research Mentor: Maryam Mohammadi-Aragh, Ag & Bio Engineering
Co-Author(s): Jessica Drewry, Katie Elliott
Funding: College of Agriculture and Life Sciences URSP
Project Category: Biological and Life Sciences

The impact of spatiotemporal environment in a poultry incubator on eggshell surface E. coli and aerobic bacteria populations
Bacterial contamination within a poultry incubator, including Escherichia coli (E. coli) contamination, can pose a significant health risk to chicks, including increased post-hatch mortality rates and impaired chick growth. This study investigated the spatiotemporal variability of E. coli and aerobic bacterial populations on the eggshell surface within hatching egg incubators during the setter incubation phase. Three replicate trials were conducted in two Pas Reform Smart Pro Combi incubators, consisting of 1,800 total hatching eggs per trial. In each trial, eggs were disinfected with 3% H_2O_2, and then a subset (180 eggs) were inoculated with an overnight E. coli culture. Inoculated eggs were then placed on the top, middle, and lower incubator rack levels and on either the right or left side of the rack. Control eggs were placed in all remaining locations within each rack. Eggs were incubated and sampled on days 0, 6, 12, and 18. E. coli and aerobic bacterial enumeration were performed using Chromocult agar and Petrifilms, respectively. Data was analyzed using PROC MIXED in SAS. E. coli was undetectable after 12 days, with only minimal traces present on days 0 and 6. While aerobic bacterial counts did not significantly vary by rack level or side, they exhibited a significant temporal decline, decreasing from 5.40 $\log_{10}$ CFU/g on day 0 to 3.69 $\log_{10}$ CFU/g on day 18—an average reduction of 1.72 $\log_{10}$ CFU/g. These findings suggest that a standard incubation environment may contribute to a rapid decline in E. coli on the eggshell surface during early incubation and the decline of total aerobic bacteria. While this study found no spatial differences in eggshell surface aerobic bacterial populations within an incubator, these may yet still exist in larger commercial incubator models and would require further study.

81.
Name: Aurora, R. Charles
Major: Biological Sciences - Bachelor of Science
Faculty Research Mentor: Megan Smith, Biological Sciences
Co-Author(s): Kerry Cobb
Project Category: Biological and Life Sciences

Using machine learning to infer the drivers of diversification in cornsnakes
An important problem in evolutionary biology is finding the processes that have shaped genetic variation within populations. Of particular significance are migration between populations, reproductive isolation, and changes in population size. The southeastern US contains many geographic barriers such as massive rivers that can drive speciation, decrease habitat size, and reduce connectivity between populations. During Pleistocene glacial cycles, glaciation separated previously connected populations into isolated refugia, and this division of habitat shrank population sizes and limited migration between refugial populations. In short, it represents a great environment in which to study the events that lead to diversification. Inferring such events, however, remains difficult. Existing

approaches are limited either due to excessive computation time or poor ability to scale to large genetic sequences. Machine learning has shown promise for overcoming these limitations. We created a new machine learning software called popai and used it to investigate the processes driving diversification in corn snakes from the southeastern US. popai was developed to overcome the limitations of previous approaches to demographic model selection. While it performs well on simulated data, its use has not been demonstrated with empirical data. We performed model selection using data from four populations of North American cornsnakes to infer their evolutionary history, and we compare our results to a previous analysis from a non-machine learning approach. Comparing this large set of models using genomic data was computationally demanding. For some sets of models, popai had high power to distinguish amongst different evolutionary histories. Compared to previous approaches, popai offered improve flexibility with respect to the numbers and types of models that could be compared. Overall, our results highlight that machine learning approaches offer promise for comparing complex evolutionary histories using large-scale genomic data from non-model empirical systems.

82.
Name: Baker, Essence
Major: Biological Sciences - Bachelor of Science
Faculty Research Mentor: Ryan Folk, Biological Sciences
Co-Author(s): Pranoti Giram, Dexcum Pantinople, Shamim Ahmed, Heather Jordan
Funding: ORED Undergraduate Research Program
Project Category: Biological and Life Sciences

A target capture strategy for metagenomic characterization of eukaryotic DNA and root nodule symbiosis genes.
Metagenomic approaches enable comprehensive characterization of microbial communities, yet challenges remain in accurately identifying and quantifying community metrics. Targeted enrichment strategies can improve the resolution and efficiency of sequencing efforts while reducing methodological bias. Here, we develop a target capture strategy for metagenomic characterization of eukaryotic ribosomal DNA and root nodule symbiosis (RNS) genes and test it in the metagenomes of plant root nodules. Our method utilizes hybridization-based target enrichment in the form of biotinylated RNA probes to selectively capture genomic regions of interest from complex environmental DNA (eDNA) samples, overcoming the need for conserved priming sites often lacking in functional genes and avoiding forms of PCR bias that can undermine community characterization. We designed custom probe sets targeting known root nodule symbiosis (RNS)-related genes and flanking regions of eukaryotic ITS (the internal transcribed spacer) and tested it on a selection of 100 diverse root nodule metagenomes. Among these, we directly compared community metrics between amplicon sequencing and target enrichment for 21 samples, as well as mock communities of known composition. This approach will enable deeper insights into the phylogenetic diversity of eukaryotic symbionts, their genomic adaptations, and the functional potential of symbiotic interactions in a cost-effective manner suitable for large-scale projects. Our work identifies further value and applications of target enrichment techniques, historically more often used in macroorganisms, for studying microorganisms in diverse natural and anthropogenic ecosystems, advancing our understanding of symbiotic relationships and microbial community dynamics.

3.
Name: Ballard, Adessa
School: Starkville Christian School
Faculty Research Mentor: Nayeon Lee, CAVS Research
Project Category: Engineering

The Relationships of Nanostructures and Superhydrophobic Properties of Flower Petals
This study investigates the structure of flower petals by observing their nanostructures, measuring their characteristics, and ultimately exploring a relationship between surface structure and hydrophobicity. Six different species of flowers were collected. Petals of each flower were used to make a negative impression of their front and back surface. A water droplet of ten microliters was dropped onto the petal impressions several times. Then, the impressions were viewed at a 90-degree angle through an optical microscope (Keyence VHX), where the contact angles of the droplets on the impression surface were measured. The greatest difference between the front and the back side of the contact angle mean belonged to the zinnia (38.72 degrees), and the least difference belonged to the Mexican petunia (4.40 degrees). The zinnia flower had the greatest difference in contact angle mean from the control, measuring at 40.68 degrees higher; the back of the chrysanthemum had the lowest differences from the control, measuring at 2 degrees lower. The contact angles of the front sides were higher than those of their complimentary backsides. The current results only provide measures of contact angle means, limiting this study and its descriptive nature. A future study measuring the nanostructure of each flower would give an insight into its impact with hydrophobicity. By pairing contact angles and nanostructure measurements, the existence of a correlation could be investigated. Findings from this study could help in the development of self-cleaning surfaces, used in the medical or engineering field.

4.
Name: Barbre, Zachary
Major: Mechanical Engineering - Bachelor of Science
Faculty Research Mentor: Gang Li, Mechanical Engineering
Funding: NSF OIA-2429540
Project Category: Engineering

Enhanced Wind Energy Forecasting using an Extended Long Short-Term Memory Model
This paper presents an innovative approach to wind energy forecasting through the implementation of an extended long short-term memory (xLSTM) model. The research addresses fundamental limitations in time-sequence forecasting for wind energy by introducing architectural enhancements to traditional LSTM networks. The xLSTM model incorporates two key innovations: exponential gating with memory mixing and a novel matrix memory structure. These improvements are realized through two variants, i.e., scalar LSTM and matrix LSTM, which are integrated into residual blocks to form comprehensive architectures. The xLSTM model was validated using SCADA data from wind turbines, with rigorous preprocessing to remove anomalous measurements. Performance evaluation across different wind speed regimes demonstrated robust predictive capabilities, with the xLSTM model achieving an overall coefficient of determination value of 0.923 and a mean absolute percentage error of 8.47%. Seasonal analysis revealed consistent prediction accuracy across varied meteorological patterns. The xLSTM model maintains linear computational complexity with respect to sequence length while offering enhanced capabilities in memory retention, state tracking, and long-range dependency modeling. These results demonstrate the potential of xLSTM for improving wind power forecasting accuracy, which is crucial for optimizing turbine operations and grid integration of renewable energy resources.

208.
Name: Barfield, Kourtney
Major: Psychology - Bachelor of Science
Faculty Research Mentor: Danielle Nadorff, Psychology
Co-Author(s): Maia McLin
Project Category: Social Sciences

Adverse Childhood Experiences, Socioeconomic Status, and Caregiver Type as Predictors of Police Perceptions
Past literature has found multiple individual and combinations of factors that have an influence on attitudes toward and perceptions of police in different populations and countries. Some of these factors include individuals' demographic characteristics, contact with police, contextual community factors, neighborhood type (e.g. rural), socioeconomic status (SES), parenting styles, and experiences of victimization or adverse childhood experiences (ACEs). It is important to understand what influences perceptions of police, as these play a role in the ability and likelihood that the community will trust the police and contact them with information about a crime or victimization, as well as contribute to how effective police are at their job. These factors also play a role in police-community relations, policy creation, and police practices. The aim of this study is to analyze the correlations and predictive ability and value of multiple potential factors influencing police perception, including some not commonly examined in past literature in a southeastern college sample. Data was gathered from 358 college students (M age = 21.52) who completed a series of surveys assessing ACEs, SES, and caregiver type (i.e. parental or non-parental caregiver). To analyze data, correlational and multiple regression analyses were conducted using SPSS. A multiple regression was run to predict perceptions of police from ACEs, SES, and caregiver status. These variables significantly predicted perceptions of police, $F(3,354) = 9.363$, $p < .001$, $R^2 = .074$. Two of the three variables independently predicted perceptions of police, SES ($p < .05$) and ACEs ($p < .05$). Caregiver status did not independently predict perceptions of police ($p = .23$). Evaluating caregiver status among different neighborhoods in association with these variables may provide information of how caregiver status may play a role in perceptions of police.

83.
Name: Barnard, Nathan
Major: Forestry - Bachelor of Science
Faculty Research Mentor: Courtney Siegert, FWRC - Forestry
Project Category: Biological and Life Sciences

Woody Decomposition and Carbon Sequestering potential of Conservation Reserve Program tree planting practices
The Conservation Reserve Program (CRP) helps provide financial support for landowners who want to reforest marginal agricultural land to later improve soil health and ecosystem services. There is a growing interest for the CRP tree plantings due to their capacity to mitigate greenhouse gas emissions through the process of Carbon Sequestering. Forest will sequester carbon overtime within aboveground biomass and in the soil through organic matter decomposition. Even though decomposition is widely researched, the understanding of this process across many diverse landscapes where CRP trees are planted is not well known, especially within the

southeastern United States. To try and fill the knowledge gap, we are investigating CRP sites throughout Mississippi, Alabama, Louisiana, Tennessee and Arkansas. To standardize measurements, we have deployed yellow poplar dowels contained inside of mesh bags across all sites and collected the bags after 6, 12, and 18 month time frames to assess mass loss and carbon change as a function of tree types, stand structures, different soil properties, and interesting site characteristics. This poster will present the findings of our study. We will expect the findings of this study to provide useful insight into both the ecological and economic value of CRP tree planting practices to help teach us more about effective conservation and climate efforts.

209.
Name: Barnes, Mary
Major: Agribusiness - Bachelor of Science
Faculty Research Mentor: Ayoung Kim, Agricultural Economics
Co-Author(s): Dr. Anna Grace Tribble
Funding: College of Agriculture and Life Sciences URSP
Project Category: Social Sciences

Urban-Rural Disparities in Teen Birth Rates: Examining Contributing Factors and Policy Implications
In 2020, the average teen birth rate in the U.S. was 15.4 per 1,000 teenage girls. However, this issue is more severe in rural areas, where rates are significantly higher. Elevated teen birth rates can negatively affect individuals in society, leading to lower education attainment, reduced labor market opportunities, and long-term income disparities. Also, high teen birth rates place a financial burden on government-funded welfare programs. This study examines the urban-rural disparity in teen birth rates and analyzes demographic, socioeconomic, health-access, and policy factors influencing teen birth rates. Preliminary findings reveal a pronounced contrast: the teen birth rate in urban counties is 14.35 per 1,000, while in rural counties, it rises to 22.85. Counties with smaller populations and those not adjacent to metropolitan areas show even higher rates. Potential contributors to higher teen birth rates also can include limited sexual education, limited healthcare services, and cultural differences between urban and rural communities. To further investigate these factors, regression analysis will be conducted using county-level data. Understanding the drivers of teen births is essential for developing policies and programs aimed at reducing teen birth rates, particularly in rural areas. This research contributes to the broader discussion on rural health inequalities and provides insights for effective interventions to improve outcomes for teenage populations.

210.
Name: Barton, Chandleigh
Major: Psychology - Bachelor of Science
Faculty Research Mentor: Hilary DeShong, Psychology
Co-Author(s): Benjamin Green
Project Category: Social Sciences

Investigating the Shared Underlying Impulsivity Traits as an Explanation for the Comorbidity between Borderline Personality Disorder and Eating Disorder Symptoms
Borderline personality disorder (BPD) and eating disorders (ED) are comorbid disorders marked by impulsivity. Sensation seeking is a primary factor for eating disorders while impulsivity broadly underlies BPD. It is unclear, however, whether BPD and ED may share underlying impulsivity traits, which would explain their comorbidity. Using a self-report survey, the current study investigated the relationship between impulsivity, BPD, and ED using the Five Factor Borderline Inventory-Short Form, the UPPS-P Impulsivity Scale, and the Eating Attitudes Test. It was hypothesized that: 1. FFBI trait rashness would correlate most strongly with the UPPS factor of premeditation and FFBI trait behavioral dysregulation would correlate most strongly with the UPPS factor of negative urgency; 2. BPD traits behavioral dysregulation, affective dysregulation, and anxious uncertainty would significantly correlate with ED; and 3. Both BPD and ED would be significantly related to the UPPS factor of negative urgency, but that only ED would be significantly related to sensation seeking, and only BPD would be significantly related to lack of premeditation. Results indicated that: 1. FFBI trait rashness has the highest significant positive correlation with the UPPS factor of premeditation ($r=.408, p<.001$) and behavioral dysregulation has the highest significant correlation with negative urgency ($r=.591, p<.001$); 2. All BPD traits had a significant relationship with ED including behavioral dysregulation ($r=.299, p<.001$), affective dysregulation ($r=.249, p<.001$), and anxious uncertainty ($r=.205, p<0.001$); 3. BPD ($r=.609, p<.001$) and ED ($r=.293, p<.001$) were both significantly related to negative urgency and only BPD was significantly related to premeditation ($r=.280, p<.001$). ED was not significantly related to sensation ($r=.069, p=.256$). This study adds to the literature by attempting to break down BPD and impulsivity into specific traits and factors, which has not previously been done.

199.
Name: Baukman, Autumn
Major: Educational Psychology - Bachelor of Science
Faculty Research Mentor: Kasia Gallo, CounselHEdEdPsyFound (CHEF)
Project Category: Education

Exploring the Effectiveness of Online Classes in College Education
Online learning is a new way of learning in which students take classes exclusively through online learning applications, such as Canvas. Due to the COVID-19 pandemic, this form of classes is growing in popularity and is used by most colleges today. This paper contains twenty empirical studies that analyze social interaction, student-teacher satisfaction, learning styles, and barriers as it relates to e-learning. All participants were either professors or college students. Many different methods were used to gather information, but the most frequently used method was self-reported information. Taking all information into account, it was determined that online classes can only be as effective as in-person classes if the right methods are used in e-learning, such as using pre-testing and flipped learning. Overall, students and teachers were not satisfied with their past e-learning experiences. However, many methods of online teaching were found to be effective when implemented correctly. More research needs to be done with efficiently-built online classes in order to conclude if online classes can have the same learning results as in-person classes.

84.
Name: Baxter, Nathan
Major: Culinology - Bachelor of Science
Faculty Research Mentor: Shecoya White, Biochemistry Nutrition Health Promo
Co-Author(s): Kyle Sharpe
Funding: College of Agriculture and Life Sciences URSP
Project Category: Biological and Life Sciences

The Impact of Sweet Potato Cooking Methods on the Physicochemical and Organoleptic Attributes of Sweet Potato Beer
Sweet potatoes (*Ipomoea batatas*) are an important agricultural product in the state of Mississippi, the third largest producer in the United States, and across the world. Sweet potatoes provide many nutrients such as fiber and beta-carotene for gut and eye health, respectively. Beer uses the diastatic power of malted barley to convert starches into sugars during mashing for the development of alcohol during fermentation. Utilizing sweet potatoes in the production of beer is a potential industry overlap that offers new ways to decrease food waste, to increase the use of sweet potatoes year-round, and to provide new beer ingredient options to local craft and home brewers. This project aims to investigate the optimization of sweet potato starches and sugars for alcohol production and overall flavor impact in beer. Sweet potato beers were tested under three different treatment variations (raw, boiled, and baked) to determine if the sweet potato cooking method impacted the overall product viability through intrinsic measurements and sensory characteristics. The samples of each cooking variation were peeled, dehydrated, and added to the beer mash as chips with an equal weight in barley. Hop varieties were also compared in preliminary testing to make an acceptable and balanced beer. This hop mix was then kept consistent for all sweet potato beers for each sweet potato cooking treatment. Intrinsic properties such as pH, absorbance (color/SRM), and potential alcohol were compared between the three different beers. Untrained panelists evaluated sensory attributes to give feedback to individual attributes and the most preferred sample. Sweet potato cooking treatments and hop variety combinations can alter the beer profile allowing for new consumer appeal for an alternative beer.

85.
Name: Beard, Mason
Major: Biochemistry - Bachelor of Science
Faculty Research Mentor: Galen Collins, Biochemistry Nutrition Health Promo
Co-Author(s): Vineel Vanga
Project Category: Biological and Life Sciences

Do Ubiquitin Conjugates Activate Ddi2?
DNA damage-inducible homolog 2 (Ddi2)'s shuttling and protease activity is imperative to protein quality control and its involvement in endoplasmic reticulum associated degradation[1,2] and cancer immune evasion[2,3]. These activities are in separate regions of the protein; the shuttling associated with its ubiquitin-like (UBL) and ubiquitin-associated (UBA) domains at the ends of the molecule, while the retroviral protease (RVP) activity is associated with its own RVP domain in the middle.[4] Ddi2 would need to undergo a conformational change to promote different activity, but the factor for which causes it is unknown. Ddi2's protease activity is involved with the addition of long ubiquitin chains, as seen with a known targets Nrf1,[5] so we hypothesize that these ubiquitin chains associate with Ddi2 to activate its protease function in a trans manner. In trans activation, ubiquitin conjugates could bind Ddi2 in an allosteric site, leading to conformational change and more efficient binding of substrate to the proteolytic domain. In this present study, we have designed a

peptidase assay utilizing ubiquitinated E6AP as a carrier for the ubiquitin as it can be autoubiquitinated,[6] removing the need for another purified protein target. We have run tests using another known substrate, Nrf3,[7] modified with a fluorescence inhibitory sequence and a fluorescent marker flanking the protein. We use this to measure the degradation kinetics as Ddi2 cuts the substrate, allowing its fluorescence to be read. While testing is just beginning, an inverse relationship between recorded fluorescence and concentration of ub-E6AP indicates an antagonist role of E6AP.

86.
Name: Behnam, Lily Ciel
Major: Wildlife, Fisheries & Aqua - Bachelor of Science
Faculty Research Mentor: Kristine Evans, FWRC-Wildlife,Fisheries&Aquaculture
Funding: ORED Undergraduate Research Program
Project Category: Biological and Life Sciences

Assessment of Olfactory Recognition of Mates in Zebra Finches
For much of the 20th century, passerine songbirds were believed to have weakly developed olfactory systems. However, research in the latter half of the century began to reveal that passerine songbirds do, indeed, respond to olfactory cues. The role of chemical olfactory information in avian communication has since been found to extend beyond previously thought functions, such as kin recognition and navigation. This study investigated whether zebra finches can recognize and exhibit a preference for their monogamous partners based on olfactory signals. Using a Y-maze apparatus, female zebra finches were repeatedly presented with their partner's scent, an unfamiliar male's scent, and/or a no-scent control in a series of trials. We assessed olfactory recognition in 12 female zebra finches, running three treatments including a control trial absent of scent, a treatment with their partner's familiar scent and no-scent, and finally a treatment with the familiar scent and an unfamiliar male scent. Each female spent 5 minutes in the Y-maze across 3 repeated trials per treatment through which choice was determined based on time spent on either branch of the Y-maze. We used generalized linear regression models to evaluate the effect of the scent treatment on the time spent making a choice and the proportion of correct choices with respect to partner recognition. The results indicate that zebra finches can detect and show a preference for the scents of other birds over an absence of scent. Furthermore, while females exhibited a positive association towards the familiar scent, variability in individual responses was notable due to small sample size resulting in insignificant results. These findings suggest that olfactory cues play a role in kin recognition, navigation, and potentially mate recognition. Future studies with larger sample sizes and diverse songbird species could further elucidate the role of olfaction in mate selection and communication.

87.
Name: Bernard, Brandon
Major: Biochemistry - Bachelor of Science
Faculty Research Mentor: Peixin Fan, Animal & Dairy Science
Co-Author(s): Himani Joshi, Caleb Lemley, Brian Rude, Chuan-yu Hsu
Funding: College of Agriculture and Life Sciences URSP
Project Category: Biological and Life Sciences

***In Vitro* Assessment of the Neuroactive Potential of the Rumen Microbiome**
The gut harbors commensal microbes that can synthesize neuroactive compounds and neurotransmitters, which can modulate stress responses through the gut-brain axis. However, the neuroactive potential of rumen microbiota in such responses remains underexplored. This study aimed to investigate whether rumen microbiota can synthesize neuroactive compounds and to identify correlations between specific bacterial species and neuroactive compounds. Three rumen fluid samples collected from beef cattle were anaerobically incubated *in vitro* for 48 hours. Targeted metabolomics via Liquid Chromatography Mass Spectrometry (LCMS), and full-length 16S rRNA gene amplicon sequencing of the rumen microbiome were both performed at 0h, 4h, 12h, 24h, and 48h. Bacterial species correlated with neuroactive compound presence were identified using Pearson correlation analysis. LCMS detected neurotransmitters acetylcholine, gamma-aminobutyric acid (GABA), and glutamate, and precursors, 3,4-dihydroxyphenylacetic acid (DOPAC), tryptophan, and tryptamine A. GABA concentration tended to increase from 0h to 24h ($P = 0.058$) and tended to decrease at 48h ($P=0.07$), potentially indicating reduced microbial viability. A similar pattern was observed in glutamate, though this trend was not statistically significant ($P = 0.83$). Other neuroactive compounds fluctuated between 0 to 24h with non-significant trends. Pearson analysis identified 8 bacterial species significantly positively correlated with GABA concentration, the most significant of which was *Helcococcus sueciensis* ($Rp = 0.678$, $P = 0.005$). For glutamate, 6 species were significantly positively correlated, the most significant being *Odoribacter splanchnicus* ($Rp = 0.650$, $P = 0.009$). Untargeted metabolomics was further employed, identifying additional neuroactive metabolites, with 5-hydroxyindole and indole-3-propionic acid exhibiting over a 2-fold increase from 0h to 48h. These findings indicate the great potential for rumen microbes to synthesize neuroactive compounds, which may influence host physiology through the nervous system and shed light on developing novel probiotics and postbiotics to mitigate stress behaviors through regulating rumen-microbiome-brain axis.

5.
Name: Berry, Madelyn
Major: Aerospace Engineering - Bachelor of Science
Faculty Research Mentor: Keith Koenig, Aerospace Engineering
Co-Author(s): Angie Carraway, Oliver Chapman, Phillip Dominguez, Alondra Arreola-Espino, Kaitlyn Hebig, Samuel Swanner
Funding: Mississippi/NASA Space Grant Program, Mississippi/NASA ESPCoR Program
Project Category: Engineering

Development of a Low-Cost System for the Detection of Wildfires

Early detection of wildfires is essential to prevent damage to life, the environment, and property. The peak electromagnetic energy emission of wildfires, at temperatures on the order of 1,000 K, occurs near 3,000 nm within the Mid InfraRed (MIR) region. Most current systems for fire detection and monitoring use relatively expensive sensors that are sensitive to MIR radiation. This project explores the potential of using very low-cost silicon-based sensors, commonly found in consumer and hobbyist cameras, to be implemented in drones, small satellites, or other vehicles. Silicon-based sensors are sensitive in the range of approximately 400 to 900 nm, the visible and near-infrared regions. Although the energy in this range is small compared to in the MIR, there is a unique feature of burning vegetation in the very near infrared region that can be detected. Most vegetation contains potassium in meaningful quantities. Hot or burning potassium has a strong emission peak at about 770 nm wavelength. The system designed is focused on detecting this peak. The system uses Raspberry Pi computers and modified Raspberry Pi cameras. The filter which blocks most light above 700 nm wavelength and, occasionally, the color mask were removed. Thus, the cameras have useful sensitivity out to 900 nm. Narrow-band optical filters are used to make the cameras a customizable multispectral system. These systems have been used to look at samples of burning vegetation and a variety of other substances by teams at Mississippi State University and Meridian Community College. Present goals include determining if the system can detect the potassium emission peak and if it can distinguish burning vegetation from other burning substances. So far, the 770 nm peak has been successfully observed in almost all examples of burning vegetation and very few cases of false positives have occurred when observing materials containing no potassium.

6.
Name: Berry, Megan
Major: Mechanical Engineering - Bachelor of Science
Faculty Research Mentor: Alta Knizley, Inst for Clean Energy Technology
Co-Author(s): Daniel Ellis
Project Category: Engineering

Design Considerations for Electrospinning Manufacturing in Polymer-based Filter Media Research

Filtration systems are critical elements in nuclear power production to ensure environmental protection from air contamination. The United States Department of Energy uses high-efficiency particulate absorbing (HEPA) filter requirements which require 99.97% aerosol removal efficiency as a widely adopted standard. A major contributor to HEPA costs is waste due to moisture damage, creating the need for longer-lasting filter material. A possible solution to this is the use of electrospun polymer nanofibers as filter media. Electrospun fiber is known for its extremely fine, fibrous structure, as well as its waterproof applications in biomedical and environmental engineering. To evaluate the viability of select polymers in electrospun media solutions, a manufacturing apparatus had to be developed. This apparatus had to be versatile enough to produce media with a vast variety of polymers. Safety during production and long-term reliability are also key factors to consider. Because of this, the following must be accounted for in the design of the apparatus: ambient humidity, room temperature, ventilation, and insulation of the environment. Ambient humidity can impact fiber diameter and filter pore size. In addition, many water-insoluble polymers require solvents that have hazardous fumes. Electrospinning functions in high voltage ranges and water-insoluble polymers typically require exceptionally higher voltages, as opposed to their water-soluble counterparts. Due to these factors, careful considerations must be made in the apparatus design. This set up is intended for long-term electrospun filter media research and the stand must be dependable and adaptable to research needs. Results and conclusions are to be discussed in the poster to follow.

7.
Name: Bhatt, Jigar
Major: Computer Engineering - Bachelor of Science
Faculty Research Mentor: Amirtaha Taebi, Ag & Bio Engineering
Project Category: Engineering

Design, Development, and Testing of a Wireless Multimodal Cardiovascular Monitoring Device
The availability of a low-cost monitoring device can help in the early detection and management of cardiovascular diseases, leading to reduced morbidity, mortality, and associated healthcare costs. The objective of this work is to design a compact, wireless, multimodal device capable of measuring different aspects of cardiovascular activity. The wireless design of the device is achieved by the creation of multiple outer nodes that communicate to a central node using the nRF24L01 radio transceiver module. Each outer node's behavior is driven by an Arduino Nano microcontroller. One outer node uses the AD8232 and MPU6050 sensors. This node, when placed on the chest surface of a subject, collects and transmits electrocardiogram (ECG), triaxial seismocardiogram (SCG), and triaxial gyrocardiogram (GCG) signals. The other outer node uses a MAX30102 sensor to collect photoplethysmography (PPG) signals and transmits the pulse oximetry data. Data collected by the outer nodes is sent wirelessly to the central node, which operates using an Arduino Uno microcontroller. The sampling rate of each data collection algorithm at each outer node has been controlled and limited to receive a reliable stream of data. The central node uses an algorithm to categorically collect data from each outer node and streamlines and stores it in one location. The microcontroller of the central node is also connected to a local computer, allowing for easy data analysis and post-processing of the signals. Each individual outer node is powered using a lithium-ion battery pack, to ensure remote use. The battery is also capable of being recharged using a USB-C cable, which allows for longer periods of device usage. The implementation of the polished design of the multimodal device requires human subject testing to prove the performance, reliability, and practical usability of such a device.

8.
Name: Bhattarai, Prashant
Major: Mechanical Engineering - Bachelor of Science
Faculty Research Mentor: Ethan Salmon, CAVS Research
Co-Author(s): John McIntosh, Riku Kikuta, Dr. Chris Goodin, Dr. Bohumir Jelinek
Project Category: Engineering

Global/Local localization for robot and GPS/IMU fusion on ROS1
Robot localization is a fundamental aspect of autonomous navigation, encompassing both global and local contexts. Global localization refers to a robot's ability to determine its position within a given environment, often using global positioning systems (GPS), while local localization focuses on tracking a robot's movement relative to a known starting point, relying on inertial measurement units (IMU). Localization is essential for robots to avoid obstacles and interact efficiently with their surroundings, making it a cornerstone of autonomous navigation functionality. This research aims to explore how transformations from global to local contexts occur by integrating data, specifically from GPS and IMU sensors. The methodology involves fusing multi-sensor data to transition from absolute global coordinates provided by GPS to relative local positioning derived from IMU readings. Key properties of these sensors, such as GPS's ability to offer global position data with meter-level accuracy and IMU's high-frequency data on acceleration and angular velocity, facilitate precise localization. The fusion process mitigates errors by compensating for GPS signal loss and IMU drift, enhancing overall accuracy. The conclusion highlights the importance of multi-sensor data fusion in robot localization, affirming that an integrated approach leveraging both global and local sensor inputs optimize positional accuracy.

9.
Name: Bhattarai, Swarup
Major: Electrical Engineering - Bachelor of Science
Faculty Research Mentor: Gray Turnage, Geosystems Research Institute
Co-Author(s): Daniel McCraine, Sathishkumar Samiappan, Piyush Chaudhary
Funding: ERDC
Project Category: Engineering

Towards Cost Effective Autonomous Mapping of Invasive Aquatic Plants Using Deep Learning and a GPU Enabled Microcomputer
In this research, a cost-effective NVIDIA Jetson based computer vision system has been developed to detect and classify eight aquatic invasive plants commonly found in the southeastern United States. A comprehensive image dataset comprising 1,963 visible spectrum high-resolution images was collected, representing eight plant classes: 1) Alligator weed, 2) Cuban bulrush, 3) Giant salvinia, 4) Primrose, 5) Torpedo grass, 6) Water hyacinth, 7) Water lettuce, and 8) Water lily. The following six deep learning models were trained and

evaluated to detect and classify plant classes: MobileNetV2, ResNet50, InceptionV3, EfficientNet, VGG19, and ViT. These trained models were then transferred to a NVIDIA Jetson Nano microcomputer interfaced with an Arducam IMX 219 visible camera. The computer vision hardware was extensively tested in the field. We observed that there is a trade-off between classification accuracy and inference time. ResNet50 and InceptionV3 achieved the highest accuracy in real-world testing. A notable reduction in performance was seen in models such as MobileNetV2 and EfficientNet. This research demonstrates the potential of deep learning models for automating the monitoring of invasive species, offering a cost-effective, scalable solution for environmental monitoring and the management of aquatic ecosystems.

88.
Name: Birchfield, Kylie
Major: Forestry - Bachelor of Science
Faculty Research Mentor: Adam Polinko, FWRC - Forestry
Co-Author(s): Esteban Galeano, Getrude Aturu
Project Category: Biological and Life Sciences

Analysis of five longleaf pine provenance seedlings under heat and drought conditions
Longleaf pine (*Pinus palustris*) is an important pine species to the ecology of the southeastern US. Longleaf pine is valued for its resistance to fire, high-quality wood, and ability to tolerate droughty site conditions. Interest has been increasing in targeting genetic improvement to advance restoration across longleaf pine's native range. While field studies has confirmed that longleaf pine can tolerate drought as well as warm temperatures, the provenance specific variation of these traits is unknown. For this research project, we studied heat and drought resistance of five provenances of longleaf pine. We organized a randomized complete block design with treatments of heat, drought, heat and drought and an untreated control across seeds collected in five provenances, with the provenances being Mississippi, Texas, Florida, Alabama, and Louisiana. These seeds were also collected between 2009 and 2022. Seeds were stratified in cold temperatures at 1° C for 14 days and them were sown in November 2024. Seeds will be germinated and allowed to establish for a four-month period before treatments will be implemented in the greenhouse at Mississippi State University. Preliminary growth results will be presented, and management implications will be discussed.

89.
Name: Blanchard, Erin
Major: Biochemistry - Bachelor of Science
Faculty Research Mentor: Carrie Vance, Biochemistry Nutrition Health Promo
Co-Author(s): Grace Beddingfield, Cassandra Barber, Florencia Meyer
Funding: Agriculture and Food Research Initiative Competitive Grant no.2022-67016-36978
Project Category: Biological and Life Sciences

Bovine Respiratory Syncytial Virus Infection Challenge Using Different Doses to Study the Range of Clinical Disease and Develop a Virus Model
Bovine Respiratory Syncytial Virus (BRSV) is one of the main contributors to Bovine Respiratory Disease (BRD), a disease complex of respiratory infections that causes severe economic losses to the cattle industry every year. BRSV primarily targets the lower respiratory tract and can cause a wide variety of both subclinical and clinical signs. Clinical signs include fever, nasal and ocular discharge, increased and labored respiratory rate, and interstitial pneumonia. The purpose of this study was to establish an infection gradient to observe all subclinical and clinical signs and use collected biofluid samples to identify unique biochemical markers associated with BRSV to establish a predictive diagnostic model using Near Infrared Spectroscopy (NIRS). A total of 22 calves were transported one week after birth and raised in research pens at Mississippi State University. At approximately 12 weeks of age, calves were randomly split into 4 groups and challenged with 10*3, 10*4, and 10*5 TCID50 units of BRSV via aerosol, establishing a low, medium, and high dose respectively. The control was nebulized with cell culture medium. Following the challenge, clinical signs, blood, nasal secretions, breath condensate, and saliva were collected daily for 14 days. Clinical signs were assessed using both the Wisconsin scoring system and the modified Gershwin score. After the challenge, the Gershwin scores ranged from 0 to 300, with the low group peaked under 200, the medium group peaked slightly above 200, and the high peaked between 200 to 300. Peak clinical signs occurred on days 9 and 10 and resolved by day 14. As determined by Gershwin and Wisconsin scores and supported by PCR analysis, a gradient of clinicals signs was created. Analysis of the collected biofluids using NIRS is in progress and could provide a non-invasive alternative to BRSV diagnosis.

90.
Name: Blocker, Samantha
Major: Data Science - Bachelor of Science
Faculty Research Mentor: Will Davis, Agricultural Economics
Project Category: Biological and Life Sciences

Investigating Health Events in Dairy Cattle
The dairy industry plays a pivotal role in the global food and beverage industry by meeting the demand for high-quality, nutrient-dense food sources in the form of milk and related dairy products. Understanding the timing of health and disease events is required for optimizing herd productivity and maintaining health. This research focuses on performing survival analysis to determine the time until a cow develops a health or disease event. To model these events, we plan to use the Cox Proportional Hazard (CPH) model. However, one limitation of the CPH model is its assumption of linear relationships and proportional hazards.
To address this, we propose enhancing the CPH model by incorporating Neural Networks (NNs) and Extreme Gradient Boosting (XGB). NNs can replace the linear component of CPH, allowing for modeling of non-linear relationships between features and hazard rates. Additionally, XGB has been shown to perform better than CPH modeling when dealing with large datasets. As this research is ongoing, these two approaches will be compared to see which can better improve the accuracy of survival predictions and provide insights into factors that influence the timing of health events.

211.
Name: Boudreaux, Claire
Major: Psychology - Bachelor of Arts
Faculty Research Mentor: Cliff McKinney, Psychology
Project Category: Social Sciences

Parenting and Body Satisfaction: The Impact of Maternal Overcontrol on Body Satisfaction in Emerging Adults
This study examined the relationship between maternal overcontrol and emerging adults' body appearance satisfaction, and how media influence mediated this relationship. Maternal overcontrol, often linked to negative psychological, behavioral, and social outcomes in emerging adults (Cui et al., 2022), has been associated with disordered eating (Mesnick, 2008). Parental psychological control also contributes to body shame and disordered eating in women (King et al., 2022), yet few studies explore this across genders. This study extended findings to male emerging adults, examining maternal overcontrol's impact on body appearance satisfaction with consideration of media influence. Body dissatisfaction is a risk factor for developing eating disorders, and it was hypothesized that parental overcontrol would have an indirect negative effect on body appearance satisfaction. Participants included 567 emerging adults (72.1% women, 27.9% men; 72.3% White, 23.6% Black, 1.4% Asian, 1.1% Hispanic, 1.6% other). Maternal overcontrol was measured by The Parenting Scale (Arnold et al., 1993), body dissatisfaction with the Body Esteem Scale for Adults and Adolescents (Mendelson, et al., 1997) and media influence with the Sociocultural Attitudes Towards Appearance Questionnaire-3 (Thompson et al., 2000). Results indicated that maternal overcontrol significantly negatively affected body image ($B = -0.38$, $SE = 0.29$, $p = .002$), media influence significantly affected body image ($B = -0.54$, $SE = 0.40$, $p > .001$), but no significant interaction between was found ($B = 0.01$, $SE = 0.02$, $p = .639$). This study finds significant relationships in emerging adults between maternal over control and body satisfaction and media influence and body satisfaction.

270.
Name: Bowen-Sweet, Sydney
Major: English - Bachelor of Arts
Faculty Research Mentor: Kelly Marsh, English
Project Category: Humanities

Lucy Snowe's Compromised Pleasure In Charlotte Brontë's *Villette*
Analyzing Lucy Snowe in Charlotte Brontë's *Villette* from a narrative psychoanalytical viewpoint reveals how narrative strategies allow women, even in a highly patriarchal society, to experience their desires. Lucy Snowe uses narrative strategies, including disnarration, delayed discourse, and personification, to gain proximity to her desires without having to directly acknowledge them. Lucy keeps the narrative as close as she can to reality in order for her to still be able to derive pleasure from an altered narrative, which allows her to evade explicitly acknowledging the discontent she feels with Dr. John's true character and the shame she feels for her unrequited feelings. The connection between Lucy's narration and her experience of desire is explained by Luce Irigaray's book *This Sex Which is Not One*, which reevaluates Freud's conception of how women experience pleasure. Unlike much psychoanalytic criticism, I focus not on the consciousness of Brontë, the author, but that of Lucy, the narrator. Lucy's use of narrative strategies explains the seemingly peculiar elements of her narration as more than just eccentricity but as a mode for her to experience pleasure in a patriarchal society.

200.
Name: Bowers, Rachel
Major: Landscape Architecture - Bachelor of Landscape Arch
Faculty Research Mentor: Taze Fulford, Landscape Architecture
Funding: College of Agriculture and Life Sciences URSP
Project Category: Education

Utilizing Word Clouds: Analyzing and Contrasting Multiple Text Documents to Identify Learning Gaps in Landscape Architecture Curriculum
Writing in Landscape Architecture studios is essential for articulating designers' ideas, processes, and approaches, as well as demonstrating comprehension of concepts. While traditional methods often involve using narratives to explain design processes and technical drawings to instructors or clients, low-stakes writing - such as personal narratives and reflections - can help educators identify student understanding and gaps in learning. Student reflections provide valuable insights into their learning, which can be analyzed using tools like Word Clouds for quick comparative analysis. Historically, Word Clouds have visualized word frequency in single texts or speeches, which have later been used as a visual model for data comparison. Now, using coding programs like R and data science, we can aggregate multiple text documents into a single Word Cloud for comparative purposes. This study investigates the lexicon generated from individual student and class cohort Word Clouds and its relationship to the Landscape Architecture Design Process and design curriculum. By assessing individual language for the retention of key terms in relation to project statements and the syllabus, we can examine basic understanding of landscape architecture lexicon and pin-point topics that may need to be reinforced or modified in the classroom setting. Analyzing the frequency of specific words in relation to core course topics enables us to identify teaching and learning gaps, paving the way for informed adjustments to the Landscape Architecture curriculum and teaching methodologies. This research has the potential to transform how Landscape Architecture studios are designed and taught, enhancing content delivery, and clarifying studio topics. Furthermore, students from outside of the curriculum can also be compared to Landscape Architecture students to evaluate how to best inform non-design-based majors on concepts involved with Landscape Architecture and the design field.

62.
Name: Bowman, Caleb
Major: Geoscience - Bachelor of Science
Faculty Research Mentor: Boniface Fosu, Geosciences
Co-Author(s): Yen-Heng Lin, Jamie Dyer, Shrinidhi Ambinakudige, Brett Violett
Funding: NSF EPSCoR
Project Category: Physical Sciences

Validating Gridded Hydroclimate Datasets Against Station Observations for Agricultural Applications in the Mississippi Delta
Weather data (such as precipitation, temperature and humidity) is important for characterizing regional climates and for making weather and climate forecasts which have a variety of applications including in the field of agriculture. Since data from meteorological instruments is limited to a specific point location, gridded datasets are often used to fill in the gaps between these observations. Gridded datasets are products that collect data from sources like weather stations, satellites, and weather/climate models and interpolate this data over grid boxes to depict what is occurring in the climate system. This study investigates the efficacy of gridded datasets in the Mississippi Delta, a agriculture-dependent region in northwest Mississippi where station-based observations are limited. By comparing three gridded datasets with weather station observations, this study aims to discern what types of gridded products most accurately represent precipitation and temperature in the Mississippi Delta and thus are best suited for use in this region.

212.
Name: Boyt, Taylor
Major: Fashion Design & Merchandising - Bachelor of Science
Faculty Research Mentor: JuYoung Lee, School of Human Sciences
Co-Author(s): Tommy Phillips, Lauren Burgett, Ava Marie Kelly, Brooke Broussard, Madison Edmondson
Project Category: Social Sciences

The Relationship between Identity and Body-Esteem
This proposed study examines the relationship between self-identity and body-esteem, focusing on how an individuals' perception of self influences confidence in their physical appearance. Self-identity encompasses personal values, beliefs, and social roles, shaping how individuals perceive themselves and present their bodies. Body esteem, a crucial aspect of esteem, reflects satisfaction with ones's physical appearance and overall body image. Prior research suggests that individuals with strong sense of identity may struggle with body dissatisfaction and external validation. Additionally, the concept of "enclothed cognition" suggests that clothing choices influence psychological processes, affecting confidence and self perception. Given the rise of social media and its impact on self expression and

body image, this study focuses on young adult women, ages 18-25, within Generation Z. Generation Z is a demographic particularly influenced by social comparison and evolving beauty standards. This proposed research will employ a quantitative study design using a Qualtrics survey to measure self- identity and body-esteem among participants. The independent variable, self identity, will be assed through validated psychological scales. Body Esteem, the independent variable, will be evaluated though body imagined self perception measures. Statical analyses will be conducted to determine the strength and direction of the relationship between self-identity and body-esteem. It is expected that Individuals with a well developed sense of self-identity will report a sense of higher body esteem, whereas those with lower self identity will show a sense of lower body-esteem. Furthermore fashion choices may serve as an extension of self-identity, reinforcing body confidence for individuals who align their appearance with their self concept. This study aims to contribute to the understanding of identity formation and body image, providing insights in to how self-identity influences body-esteem that is strongly related to confidence and well being.

10.
Name: Bradley, Naima
Major: Biomedical Engineering - Bachelor of Science
Faculty Research Mentor: Steve Elder, Ag & Bio Engineering
Project Category: Engineering

Controlled Drug Release in Osteoarthritis Treatment: Kinetics of Punicalagin from Polymeric Implants
Osteoarthritis-related joint degeneration is a significant challenge in orthopedic healthcare, where inflammation and cartilage degradation lead to pain and reduced mobility. Intra-articular drug delivery provides a targeted therapeutic approach to slow disease progression and enhance localized treatment efficacy. This research focuses on developing a polymeric implant system for the controlled release of punicalagin, a naturally derived polyphenol with anti-inflammatory and antioxidant properties, to mitigate osteoarthritic cartilage degradation. The purpose of this study is to compare two PLGA-based implant formulations with similar molecular weight, lactide:glycolide ratio, and ester end-capping but sourced from different manufacturers**.** While these formulations share key structural properties, proprietary differences such as crystallinity may influence drug release kinetics and polymer degradation, impacting their therapeutic effectiveness. Implants were formulated using N-methyl-2-pyrrolidone (NMP), benzyl benzoate (BB), punicalagin, and poly(lactic-co-glycolic acid) (PLGA, 70,000-100,000 MW) from two different suppliers, along with Pluronic F-68 (Poloxamer-188) to create 20% PLGA implants. They were formed by pipetting ~200 µL into 3-5 mL water/0.25% SDS solutions and incubated at 37°C to simulate physiological conditions. Absorbance readings at 378 nm were taken at designated time points over several weeks to monitor drug release. Using in vitro release assays and kinetic modeling, we analyzed drug diffusion profiles, polymer degradation, and release efficiency to determine the impact of manufacturer-specific polymer properties on drug release. The goal of this experiment was to identify the formulation that provides the most sustained release over time with minimal burst release. The findings of this study contribute to the advancement of sustained intra-articular drug delivery systems, offering a potential therapeutic strategy for osteoarthritis and related degenerative joint diseases.

179.
Name: Brasher, Aven
Major: Landscape Architecture - Bachelor of Landscape Arch
Faculty Research Mentor: SaMin Han, Landscape Architecture
Co-Author(s): Simon Powney, Dylan Lahey
Project Category: Arts, Music, & Design

Backyard Bayou: Enhancing Coastal Mississippi for Nature, People, and Play
Located in the heart of Biloxi, Mississippi, "Backyard Bayou" is a forward-thinking landscape architecture project that embraces the region's natural beauty while addressing key local challenges. Biloxi's coastal environment is heavily influenced by the bayou ecosystem, which shapes the community's lifestyle and ecological footprint. With an ever-present risk of flooding, urban planning in this area demands resilience and adaptability, especially when developing affordable housing solutions that provide safety, security, and comfort. Backyard Bayou is designed as a mixed-use community space that integrates affordable housing with recreational, social, and environmental amenities. The project includes affordable housing units that are elevated on the first floor to allow parking beneath them, effectively mitigating flood risks. In addition, Backyard Bayou features a public recreational center, community gardens, a children's playground, a dog park, a botanical garden, an amphitheater, and a bayou overlook with bayou trails. Each component is strategically placed to foster community engagement, enhance local biodiversity, and encourage outdoor activities. The project addresses critical community needs, from affordable housing to recreational spaces, creating a cohesive environment that caters to a wide range of interests and age groups. Biloxi's unique bayou landscape presents challenges, especially in terms of flood management and biodiversity conservation. By elevating the housing structures, the design prioritizes flood resilience, safeguarding residents and property. Additionally, features like community gardens and the botanical garden provide residents with sustainable food sources, educational opportunities, and a strengthened connection to their natural environment. Backyard Bayou is an innovative landscape

architecture project that harmoniously integrates affordable housing with diverse community-centered amenities. Designed with flood resilience in mind, it addresses local environmental challenges while offering residents a vibrant, inclusive space, fostering a connection to the bayou's natural beauty and ensuring accessible recreation. Backyard Bayou aims to become a model for sustainable, resilient community design in coastal regions.

91.
Name: Bratton, Piper
Major: Landscape Architecture - Bachelor of Landscape Arch
Faculty Research Mentor: Guihong Bi, Plant and Soil Sciences
Funding: College of Agriculture and Life Sciences URSP
Project Category: Biological and Life Sciences

Plant Biostimulants for Sustainable Production of Specialty Crops
Plant biostimulants (PBs) have the potential to enhance plant growth, crop yield and quality, nutrient use efficiency, and resilience to environmental stresses such as heat and drought. The use of PBs in agriculture has been steadily increasing, as local growers in the agricultural industry are interested in PBs to improve productivity and promote sustainability. However, questions arise regarding the appropriate PB selection and management practices. PBs include a variety of substances and microorganisms, such as humic and fulvic acids, seaweed and plant extracts, protein hydrolysate, and beneficial microbes. The effectiveness of PBs can be affected by many factors, including the bioactive ingredients of the product, application methods and rates, plant species or cultivars, and growing conditions. The objective of this project was to evaluate the effects of selected PB products on specialty crop production. Five biostimulants were tested: Kelpak, Continuum V2 Microbial Inoculant, Smart Algae, Dune, and Huma Pro®16. Four plant species or cultivars were selected for testing: Arugula, 'Powerhouse' red lettuce, 'Reyes' green lettuce, and 'Rover' Radish. In general, plants treated with Huma Pro®16 had higher leaf fresh weight and leaf area compared to the control group and other biostimulants tested. There were no significant differences found in leaf SPAD readings among all the treatments. For 'Reyes' lettuce and radish, the plant growth index (PGI) did not differ significantly among treatments. However, for arugula and 'Powerhouse' lettuce, plants treated with Huma Pro®16 and Dune had higher PGI than the controls. For the radish, root size, and fresh weights did not differ among treatments. Preliminary data from this study suggest that Huma Pro®16 performed the best among the five biostimulants evaluated. Further research should explore additional plant species and cultivars, different biostimulant types and rates, and various application methods (e.g., foliar spray, soil drench).

92.
Name: Brister, Tom
Major: Animal and Dairy Science - Bachelor of Science
Faculty Research Mentor: Caleb Lemley, Animal & Dairy Science
Co-Author(s): Megan Mills
Funding: College of Agriculture and Life Sciences URSP
Project Category: Biological and Life Sciences

Impact of oral melatonin supplementation testicular artery hemodynamics and scrotal temperature in the bull
Heat stress is one of the most common issues faced by Southeastern cattle producers. Past work within our lab has shown that melatonin supplementation improved testicular artery blood flow and may have subsequently decreased scrotal temperature. The objective of this study was to examine the impact of oral melatonin supplementation on testicular artery hemodynamics and scrotal temperature in the bull. Yearling Angus bulls (n = 21) were randomly allocated into two groups, either melatonin fed (MEL; n = 11) or control fed (CON; n = 10) for 90 days of treatment. MEL bulls were supplemented with 200 mg/kg of body weight of melatonin dissolved in ethanol, while CON bulls were supplemented with an equivalent ethanol vehicle control. Supplementation was top-dressed in a grain mix, fed daily via the CALAN gate feeding system from October 2024 to January 2025. Body weight was collected, and melatonin supplementation was adjusted weekly. Testicular artery hemodynamic measurements, collected via Doppler ultrasonography, and scrotal temperatures, collected via FLIR E75 thermal camera, were collected on d 0, 14, 28, 42, 56, 70, and 88. Data were analyzed using the MIXED procedure of SAS specific for repeated measures with treatment as a fixed effect. Melatonin supplementation decreased ($P = 0.0273$) minimum scrotal temperatures in MEL (24.0 ± 0.4°C) compared to CON bulls (25.3 ± 0.4°C). There also tended ($P = 0.0666$) to be a decrease in overall average scrotal temperatures in MEL (29.3 ± 0.3°C) compared to CON bulls (30.1 ± 0.3°C). There were no differences ($P > 0.05$) in testicular artery hemodynamics as a result of melatonin supplementation. Despite supplementation occurring from fall to winter, in cooler ambient conditions, a notable decrease in scrotal temperatures was still evident in melatonin treated bulls.

213.
Name: Brooks, Anastasia
Major: Psychology - Bachelor of Science
Faculty Research Mentor: Cliff McKinney, Psychology
Project Category: Social Sciences

Parental Incarceration Impacting Delinquency with a Moderating Factor of Authoritative Parenting
Poehlmann-Tynan et al. (2021) found that parental incarceration was negatively associated with adjustment in children. Sun et al. (2024) found that being an only child as well as authoritarian and permissive parenting increased the likelihood of delinquency. Thus, the current study examined the role of parental incarceration on delinquency during the first 16 years of life as moderated by authoritative parenting. Participants included 499 emerging adults with 4.2% and 9.4% reporting their mother or father, respectively, being incarcerated at some point. Participants completed the Self Report of Delinquency scale (Thornberry et al., 2023) and the Parental Authority Questionnaire (Buri, 1991) online. PROCESS 4.2 (Hayes, 2022) model 1 was used to conduct a moderation analysis. The model for paternal characteristics used to predict delinquency trended toward significance, $R^2 = .02$, $F(3, 452) = 2.54$, $p = .06$. Paternal incarceration was associated with delinquency, $B = 3.10$, $SE = .20$, $p < .001$, whereas other relations were not significant (i.e., paternal authoritative parenting, $B = -.01$, $SE = 0.27$, $p = .70$, and its interaction with paternal incarceration, $B = -.01$, $SE = .08$, $p = .92$). The model for maternal characteristics was significant, $R^2 = .04$, $F(3, 480) = 5.97$, $p < .001$. Maternal incarceration, $B = 1.05$, $SE = .92$, $p = .25$, or the interaction, $B = .12$, $SE = .14$, $p = .38$, were not associated with delinquency, but maternal authoritative parenting was, $B = -.11$, $SE = .03$, $p < .001$. Results show that paternal incarceration, but not authoritative parenting, was a significant predictor of delinquency, whereas the opposite pattern was found for mothers. Implications include gender effects of parents on children.

11.
Name: Buckner, Kenyan
Major: Industrial Engineering - Bachelor of Science
Faculty Research Mentor: Anna Grace Dill, Athlete Engineering Institute
Funding: ORED Undergraduate Research Program
Project Category: Engineering

Mental Workload (GRAIL) Assessment
The objective of this study is to see how mental work load affects reaction time and target accuracy. We also tried to find if there was a significant difference of accuracy and reaction timing from the effect of mental work load. This study will be done at the Mississippi State University's Athlete Engineering research lab. The equipment that will be used in the study are the Gait Real-time Analysis Interactive Lab (GRAIL) and projected visual training aid or the Kite Flyer Simulator. Understanding how task complexity influences cognitive-motor performance is crucial for optimizing training and rehabilitation strategies. Mental workload assessments is important in many different work domains such as healthcare, shipbuilding, and the industrial field where mental demands can affect impact performance and safety. Traditional Mental work load assessments lack real time capabilities and do not cover dynamic changes during a task's execution. This study utilizes the Motek Gait Real-time Analysis Interactive Lab (GRAIL) to examine the impact of increasing task complexity on accuracy and speed in a treadmill-based simulated game. The study had 10 volunteers who were undergraduates and graduate students. Participants engage in interactive tasks of varying difficulty levels while walking on a fixed pace treadmill within an immersive virtual environment. Performance is assessed using game scores, measuring accuracy and response time across different conditions. This ongoing research aims to explore how cognitive load affects real-time decision-making and task execution, with potential applications in sports training, rehabilitation, and human performance optimization. Future work will focus on refining task designs and analyzing performance trends to better understand cognitive-motor interactions in dynamic settings.

186.
Name: Butler, Brennan
Major: Data Science - Bachelor of Science
Faculty Research Mentor: Johnathan Barlow, Data Science
Project Category: Business and Economics

Using AI to Improve Digital Customer Interaction: A Proof of Concept
In today's digital landscape, effective customer communication is essential, particularly as online transactions continue to dominate commerce. This project aims to enhance customer experience and sales efficiency for a laser cutting and modeling business that primarily operates through Instagram direct messages. Since most orders are custom, ongoing communication is required to confirm design details, material preferences, and dimensions. The objective of this research is to leverage AI-driven text analysis to optimize messaging strategies. By analyzing past customer interactions, patterns in successful transactions can be identified to refine communication approaches, streamline order discussions, and improve sales conversion rates. Data will be ethically sourced through

business message archives or manual input. Various analytical methods, including natural language processing, will be explored within the broader domain of digital customer interaction analysis, incorporating elements of customer relationship management (CRM), conversational analysis, and sales optimization. Rather than focusing on automation, this project seeks to integrate AI insights to enhance personalized communication strategies, improving both customer satisfaction and operational efficiency.

93.
Name: Butler, Lillian
Major: Biomedical Engineering - Bachelor of Science
Faculty Research Mentor: Tibor Pechan, Inst for Genom, Biocom, Biotec
Co-Author(s): Olga Pechanova, Jeremy Winder, Zonia Caro-Carvajal
Funding: ORED Undergraduate Research Program, Mississippi INBRE
Project Category: Biological and Life Sciences

Identification of antifungal metabolites in maize cob using liquid chromatography-mass spectrometry
Maize is the most grown crop (1.2 billion metric tons in 2024), with the United States leading the global production (31%). However, corn is susceptible to a pathogenic fungus, Aspergillus flavus L, which not only causes ear rot in the crop but also produces the most potent carcinogenic mycotoxin, Aflatoxin B1. The FDA limits the amount of aflatoxin that can be present in crops intended for human consumption to 20 ppb due to the toxin leading to hepatocellular carcinoma and immunosuppression. Previously, it has been found that the cob is the conduit tissue for the spread of the fungal pathogen across the kernels. This study aims to identify corn cob metabolites that can be linked to resistance against the fungi. The discovery/untargeted metabolomics methodology based on liquid chromatography-mass spectrometry was employed. Due to the limited spectral database of plant compounds available when the experiments were performed, only a small number of metabolites (28) were confidently identified using the mzCloud database. With the recent exponential growth of spectral entries in the database, reanalyzing the existing experimental data will reveal more of known and novel antifungal corn cob metabolites. The obtained knowledge will serve as a building block for a future effort to develop new, fungi-resistant and commercially successful corn cultivars, either by targeted breeding or genetic manipulation.

187.
Name: Carpenter, Bailey
Major: Agribusiness - Bachelor of Science
Faculty Research Mentor: Sean Fox, Agricultural Economics
Co-Author(s): Kevin Kim
Funding: College of Agriculture and Life Sciences URSP
Project Category: Business and Economics

Organizational Structure and Resource Allocation of State Extension Systems
Land-grant universities in the United States, established under the Morrill Acts of 1862 and 1890, play a vital role in education, research, and community outreach. These institutions were created to improve access to higher education, particularly in rural areas, and are funded through federal land grants. The core mission of land-grant universities is to serve the public through research and extension services, with the latter providing programs in areas such as youth development, community development, and family and consumer sciences. Extension services deliver outreach through workshops, online resources, and publications, tailored to the specific needs of local communities. Despite the established presence of extension services, questions remain regarding how different land-grant universities are organized to meet the local needs. To our knowledge, no study has examined the comprehensive structure of extension programs on a regional level. The research explores how different universities structure their extension programs and employees, as well as how they are funded and tailored to meet community needs. It focuses on resource allocation and program design across different states. The study seeks to understand the operations of extension services better and identify opportunities for optimizing resource use. To examine the above, data for this research is being collected through a survey sent to extension directors in the Southern U.S. The survey will gather information on staffing, resource allocation, program priorities, and outreach methods. By analyzing the responses, the research intends to identify patterns and differences across extension services, offering insights that could help optimize resource distribution and program effectiveness. Beyond filling a gap in the existing literature on university extension services and enhancing the understanding of these services, this research will also garner meaningful discussion at the research symposium as the topic is directly tied to the core mission of Mississippi State University as a land-grant university that seeks to help various stakeholders in the state.

12.
Name: Carpenter, Haley
Major: Biomedical Engineering - Bachelor of Science
Faculty Research Mentor: David Van Den Heever, Ag & Bio Engineering
Co-Author(s): Ann Lauren Schmidt
Project Category: Engineering

The Role of Flavor in Context-Dependent Memory: *A Study on Word Recall*
This study explores the effect of flavor on memory encoding and retrieval, testing the hypothesis that flavor can serve as a contextual cue for memory. 100 participants were asked to study a list of words while sucking on a flavored lollipop. Two days later, they were given either the same or a different flavored lollipop and asked to recall the words. Results indicated that participants who received the same flavor during both encoding and retrieval did not recall significantly more words than those who received a different flavor, or those who did not receive a flavor at all. The results showed no significant difference in recall performance between participants who experienced the same flavor at both encoding and retrieval, those who had different flavors, and those who had no flavor. These findings challenge the hypothesis that flavor can enhance memory recall through context-dependent mechanisms, as suggested by previous studies (e.g., Overman et al., 2009). However, the findings of this experiment do support an existing study that depicted no impact of flavor on a context-dependent memory test regarding chewing gum (e.g., Johnson & Miles, 2007). This study highlights that the potential for sensory cues, such as taste, have no influence on cognitive processes like memory.

214.
Name: Carter, Campbell
Major: Sociology - Bachelor of Arts
Faculty Research Mentor: Aimee Imlay, Sociology
Funding: ORED Undergraduate Research Program
Project Category: Social Sciences

Rural Community Well-Being: The Economic Impact and Consequences of Industrial Animal Farming in Mississippi
Confined Animal Feeding Operations (CAFOs) and Animal Feeding Operations (AFOs) are forms of industrial agriculture that present numerous challenges for workers and surrounding communities. The density of animals on these farms creates hazardous conditions for workers and various forms of pollution that negatively impact the quality of life for neighboring households. Agriculture is vital to Mississippi's economy, with $2.65 billion in revenue being produced from poultry and eggs and $96 million from hogs, positioning the state as one of the leading producers in the country (Mississippi Department of Agriculture and Commerce 2022). Despite this output Mississippi has historically been one of the poorest states in the nation, which raises questions about whether CAFOs and AFOs have a positive impact on the economic well being of rural counties in Mississippi (United States Census Bureau 2021). Previous literature has noted the negative impacts of industrial farming practices on adjacent communities, but this study presents a unique approach by utilizing a time series analysis of economic and environmental data from state sources using STATA. Results indicated that the presence of CAFOs and AFOs did not mitigate poverty within rural counties, and that their presence contributed to income disparities.

13.
Name: Chambers, Yasmin
Major: Computer Engineering - Bachelor of Science
Faculty Research Mentor: Megan Richardson, Social Science Research Center
Funding: ORED Undergraduate Research Program
Project Category: Engineering

An Evaluation of Open Source Intelligence Tools
Numerous open-source intelligence (OSINT) tools exist, but selecting the right tool for analyzing digital data can be challenging and time-consuming. This study evaluates 100 OSINT tools across various analysis types, including data scraping, social media analysis, network analysis, spatial analysis, sentiment analysis, metadata analysis, and data visualization. These tools apply to diverse digital data sources, including the web, forums, social media, and the dark web, as well as platform-specific sources such as Reddit, Twitter (X), and YouTube. To assess these tools, a codebook with guided instructions was developed to evaluate key attributes, including log-in requirements, programming knowledge, costs, and the availability of tutorials. Additionally, the codebook measures usability (e.g., usefulness for keyword selection and social media analysis) and learnability (e.g., time and depth required to learn the tool). A computational framework was implemented to automate data analysis. It extracts key statistics, visualizes data distributions, and generates word clouds to highlight qualitative insights. Findings indicate that 19% of tools require the user to log-in, 30% require programming knowledge, 56% provide tutorials, and 49% are free to use. Among the analysis types, social media analysis is the most common, accounting for 17% of tools. A qualitative analysis of 15 selected tools identified a key theme: ease of access

influences perceived usability. Tools without programming requirements or login restrictions tend to be more accessible. A word cloud visualization of qualitative feedback highlights common usability and learnability concerns, such as tool flexibility and data integration challenges. The results of this study will aid in refining OSINT tool selection for social media analysts at Mississippi State University, ensuring they have the most efficient resources for investigative work.

94.

Name: Charles Fajardo, Krystell Cecilia
Major: Food Sc Nutr. Health Prom (UG) - Bachelor of Science
Faculty Research Mentor: Shecoya White, Biochemistry Nutrition Health Promo
Co-Author(s): Morgan Mosby, Paola Becerra
Funding: ORED Undergraduate Research Program
Project Category: Biological and Life Sciences

Development of Blueberry-Based Dairy and Non-Dairy Ice Cream

Blueberries (Vaccinium spp.) are Mississippi's state fruit and its largest commercial fruit crop, primarily grown in the Pine Belt region due to ideal soil pH and climate. Poplarville, Mississippi, is the state's blueberry production hub, known for high-quality yields. The industry contributes approximately $13 million annually, with distribution through grocery stores, roadside stands, "U-Pick" farms, and interstate trade, particularly to Texas. However, growers face challenges, including high labor costs, pest infestations, and the need for advanced harvesting technologies. Although available year-round in frozen form, fresh blueberries are mainly harvested between May and July. Many blueberries are culled due to cosmetic imperfections, leading to food waste. To reduce waste and promote year-round consumption, developing value-added blueberry-based products is a viable solution. This study assessed the consumer acceptability and physicochemical properties of dairy and non-dairy blueberry-based ice cream formulations. Three formulations (X, Y, and Z) were developed. Fresh blueberries were washed, pureed, and processed into a jam-like consistency. The dairy and non-dairy blueberry milk mixtures were heated with liquid pectin. Ice cream bases were mixed, heated to 170°F, cooled to 30–40°F, then churned before incorporation with the blueberry mixture and frozen. Sensory analysis, pH, and water activity measurements were conducted. Among 114 panelists, formulation (dairy-based with flavoring) had the highest acceptability score (7.2^{a}), though not significantly different from formulation (dairy-based without flavoring, 6.9^{a}). Both were significantly preferred over formulation (plant-based, 5.7^{b}). The pH and water activity ranged from 4.79 to 5.25 and 0.9361 to 0.9837, respectively. These findings indicate that formulations 7.2^{a} and 6.9^{a} have strong commercialization potential. Mississippi State University and the Farm Bureau Federation support blueberry industry advancements, fostering innovation and reducing agricultural waste.

215.

Name: Chavez, Dominic
Major: Biochemistry - Bachelor of Science
Faculty Research Mentor: Arazais Oliveros, Department of Psychology
Co-Author(s): Kristina Schoenthaler, Deemah Alturkait
Project Category: Social Sciences

Protective and Risk-Related Factors Associated with College Student Burnout

According to the American Psychological Association (2020), 87% of college students from ages 18 to 23 feel that their education serves as a significant stressor in their lives. Burnout syndrome is an occupational phenomenon commonly defined by the exhaustion, cynicism, and a lack of efficacy that one expresses in regard to their education. This phenomenon is multifaceted and, unfortunately, a recurring theme of the college experience. Compulsiveness (Lee & Lee, 2018), low socioeconomic status (Luo et al., 2016), poor emotional resilience (Gong et al., 2021), and high levels of perceived mental health stigma (Weiss et al., 2021) all serve as risk-related factors in the development of academic burnout. Conversely, adaptive coping and optimism (Vizoso et al., 2019), as well as high core self-evaluations and perceived organizational support (Leupold et al., 2019), play variable roles in protecting a student from developing burnout. Most of this research focuses on academic burnout in the context of healthcare students or students of foreign countries. Thus, the current study aims to analyze the role in which protective and risk-related factors play in the development of academic burnout specifically in American university students. Furthermore, this project will seek to examine the varying relationships between academic burnout, perceived stigma of burnout, help-seeking behaviors, resilience, perceived difficulty of education, socioeconomic status, and perceived social support. Data will be collected by surveying students that are at least 18 years of age and enrolled at a college or university within the U.S. A moderated multiple regression (MMR) will be used to test the hypotheses. The results of this study will be used to inform future research on academic burnout and university policy geared towards student retention and improving the overall college experience.

14.
Name: Chen, Devin
Major: Cyber Security & Operations - Bachelor of Science
Faculty Research Mentor: George Trawick, Computer Science and Engineering
Co-Author(s): Shelly Hollis, Gavin Seiler
Funding: Bagley College of Engineering AY 2024-2025 Undergrad Research Award
Project Category: Engineering

An Evaluation of Common Vulnerabilities in Mississippi K-12 School Districts
Public K-12 school districts are vulnerable due to limited funding, inadequate cybersecurity, and vast amounts of sensitive information, making them prime targets for cyberattacks. An attack can jeopardize student and family data, compromise student safety, affect school finances, and disrupt learning resources. To address this, Mississippi State University's Computer Science and Engineering Department, in partnership with the VICEROY program, conducts student-led cybersecurity assessments for these districts. These assessments align with a set of cybersecurity guidelines developed by the U.S. Cybersecurity and Infrastructure Agency (CISA) known as the Cybersecurity Performance Goals (CPG). Despite the importance of these assessments, districts often hesitate to share vulnerability information due to fear of public backlash and reputational damage. This reluctance impedes collective learning and improvement across districts. To overcome this challenge, we propose a research initiative involving students and faculty to anonymize and analyze data from these cybersecurity assessments. This research aims to identify common security vulnerabilities in K-12 systems, understand their persistence, and recommend actionable steps for improvement. By analyzing these vulnerabilities, the MSU team can publish insights that highlight the unique cybersecurity needs of public schools. This research will inform government and university initiatives, helping to create a roadmap of resources to bolster the cybersecurity posture of K-12 districts nationwide.

216.
Name: Cherry, Hayden
Major: Ag Educ., Leadership & Comm - Bachelor of Science
Faculty Research Mentor: Cory Gallo, College of Ag & Life Sciences
Funding: College of Agriculture and Life Sciences URSP
Project Category: Social Sciences

Reap What You Sow: Using Demographic and Geographic Data to Craft Effective Marketing Strategies in CALS
As the higher education landscape continues to become more competetive, adapting our marketing strategies to affordably recruit students will be imperative to maintaining both relevance and financial stability. Research has predicted an increase in tension as institutions weather the enrollment cliff, a period characterized by a steep decline in the number of college-age students in the United States. While this research is useful in informing our outlook in the coming years, there is little research surrounding the most efficacious methods for recruiting college students. Using data from Mississippi State University's Office of Institutional Research and Effectiveness on student status and residency, I analyzed each College of Ag and Life Sciences (CALS) major's composition on first-time/transfer and in-state/out-of-state students to compose a list of recommendations for CALS administration. This set of recommendations was formulated to decrease the use of blanketed marketing tactics and improve the cost-per-acquisition of each student in the college. Although the recommendations have not been implemented, the research showed that there were previously undiscovered trends in the college's recruitment and areas of low return that could be reevaluated in the coming months to create a more cost-effective set of campaigns for the individual departments and college as a whole.

217.
Name: Childs, Sarah Catherine
Major: Kinesiology - Bachelor of Science
Faculty Research Mentor: Megan Holmes, Department of Kinesiology
Co-Author(s): Ian Macali, Po-Lin Chen, Olivia Osborne, Travione Smith, Hunter Appleton
Project Category: Social Sciences

Global Stress and Its Influence on Life Satisfaction in Collegiate Marching Band Members
Undergraduate life can be stressful, but extracurricular activities like band can contribute to quality of life. Limited research on overall well-being or general life contentment of marching band members exists. The purpose of this study was to understand how life satisfaction is impacted by perceived stress among marching band members, as well as to explore the role of other co-variables. A total of 47 band members, (25 males and 22 females) were asked to complete the Satisfaction and Life Survey (SWLS) and the Perceived Stress Scale (PSS). These questionnaires were completed electronically via Qualtrics. Additional covariates including body fat %, muscle mass, sex, race, and medications were assessed. Regression analysis was performed to examine if PSS and other co-variables can predict SWLS. Statistical significance was set at $p < .05$. Mean SWLS, (25.32 ± 5.06) PSS, (27.87 ± 2.47) body fat %, (25.46 ± 10.24) and muscle

mass (54.86 ± 11.11 kg) were measured. Forty-three percent of participants take medications. Eighty-one percent of the participants were Caucasian and 15% were African American. Linear regression analysis considering PSS and other co-variables effects on SWLS was non-significant. Therefore, a nested model including just PSS and SWLS was performed and yielded a significant model ($R^2 = .096$, $F = 4.77$, $p < .001$). PSS significantly affected SWLS ($\beta = -0.63$, $p = .034$). Normality and heteroskedasticity was measured using Shapiro-Wilks and Breusch-Pagan test ($p = .43$ & $.80$) respectively. The covariates (body fat %, muscle mass, sex, race, and medications) were not significant. The higher the PSS score resulted in a lower SWLS score. This shows the PSS has a moderate effect on SWLS. Those with greater stress also report less satisfaction with life. Therefore, it may be beneficial to consider providing stress management resources to marching band members.

15.
Name: Christy, Katelyn
Major: Mechanical Engineering - Bachelor of Science
Faculty Research Mentor: Daniel Johnson, CAVS Research
Co-Author(s): Luke Peterson
Funding: ORED Undergraduate Research Program
Project Category: Engineering

Optimizing Additive Manufacturing: Thermal and Stress Analysis in Directed Energy Deposition
Directed Energy Deposition (DED) is an additive manufacturing process that builds metal components layer by layer using a head source to melt and deposit materials. However, the rapid heating and cooling cycles introduce residual stress and distortions, which can affect part quality. These issues affect the internal structure and quality of the final part. This study uses Abaqus to perform a sequential thermomechanical analysis of the DED process. The thermal analysis captures the heat input, conduction, and cooling effects while the mechanical analysis evaluates stress accumulation and potential deformations. The effect of process parameter variation is investigated to generate build strategies that reduce defects and residual stress magnitudes in additive manufactured components. This research contributes to the broader goal of improving simulation-based predictions for additive manufacturing by reducing residual stress.

16.
Name: Cochran, Morgan
Major: Electrical Engineering - Bachelor of Science
Faculty Research Mentor: Lauren Priddy, Ag & Bio Engineering
Co-Author(s): Matthew Priddy, Jordyn Johnson, Nathaniel Bosque, Halleigh Faulkner, Sworup Thapa
Funding: MSU-MSMS Research Partnership
Project Category: Engineering

Differences of Transforaminal Lumbar Interbody Fusion (TLIF) in Cadaver versus Benchtop Testing during Spinal Implant Insertion
The transforaminal lumbar interbody fusion (TLIF) procedure involves complex forces on the spine that influence interbody fusion device (IFD) performance and, ultimately, surgical outcomes such as implant stability and fusion success. This study explores the similarity between impact forces and energies in cadaveric TLIF procedures and those in an in-vitro benchtop testing system. A custom-designed benchtop drop-weight device, featuring a lateral compression mechanism and drop-weight tower, was utilized to simulate the forces experienced by the IFD during TLIF procedures. The device is equipped with sensors to measure impact forces, implant displacement, and lateral compressive loading applied to the IFD during benchtop testing. Benchtop testing using 24 mm × 14 mm implants showed that the peak impact forces in cadaveric and benchtop testing were nearly identical, though the impact duration in the cadaveric spine was half that of the benchtop. This difference is likely due to variations in manual malleting techniques versus the controlled drop-weight system. Additionally, the initial impact slope was higher in cadaveric testing, leading to a slightly lower impulse area compared to benchtop testing. These discrepancies highlight the influence of anatomical variations in the cadaveric spine and differences in the dynamic response of each testing environment. To improve the fidelity of benchtop testing, adjustments such as modifying the coefficient of restitution of the drop weight and calibrating lateral compression spring stiffness to match spinal stiffness can be implemented. These refinements would enhance the ability of the benchtop system to replicate cadaveric conditions more accurately. In conclusion, our benchtop model serves as a reliable alternative to cadaveric testing, facilitating meaningful comparisons between mechanical testing models and real-life surgical scenarios.

201.
Name: Colburn, Ariel
Major: Kinesiology - Bachelor of Science
Faculty Research Mentor: Stamatis Agiovlasitis, Department of Kinesiology
Co-Author(s): Maria Haider, Jamya High, Katerina Sergi, Guillermo R. Oviedo
Funding: ORED Undergraduate Research Program
Project Category: Education

How does an Adapted Dance Program Promote Learning and Confidence in Adults with Down Syndrome? A Qualitative Study
Social Cognitive Theory (SCT) may provide insight into how adapted dance programs promote learning and confidence. A more nuanced understanding of this phenomenon can be gained by viewing these programs from the lens of participants (i.e., adults with DS, parents, and volunteers) who engage in these programs. We investigated how an 8-week adapted dance program supported observational learning, skill development, and confidence in adults with DS, from the perspectives of adults with DS, parents, and volunteers. The adapted dance program was offered for 8 weeks (once a week; 60 min/session). Two dance styles – 4 weeks of hip hop and 4 weeks of jazz – were used. At the end of the program, semi-structured interviews were conducted with 5 adults with DS (2 men; age 35 ± 12 years), 5 parents (2 men; age 61 ± 12 years), and 5 volunteers (1 man; age 20 ± 1 years). Thematic analysis was done using open, axial, and focused coding. In alignment with SCT's emphasis on observational learning, parents and volunteers reported that adults with DS learned dance skills through observing and imitating volunteers and peers with DS. Adults with DS conveyed that the program provided opportunities for learning and social interactions (e.g., group activities, dance battles). Parents and volunteers noted that the adults with DS gained skills and confidence through practice, repetition, and positive reinforcement. Adults with DS mentioned that their confidence grew as they mastered new skills and received positive social persuasion, aligning with SCT's self-efficacy aspect. Themes included: (a) observational learning and imitation; (b) skill development and repetition; (c) self-efficacy, mastery experience and confidence; (d) social interaction and positive reinforcement; and (e) enjoyment of dance. All participants agreed that the adapted dance program effectively supported learning, skill development, and confidence in adults with DS.

17.
Name: Colip, Kyler
Major: Aerospace Engineering - Bachelor of Science
Faculty Research Mentor: Vilas Shinde, Aerospace Engineering
Funding: Bagley College of Engineering
Project Category: Engineering

Optimization of Ionization Probability for Electric Space Propulsion
Ion thrusters are a method of electric spacecraft propulsion that propel ionized gas through an electro-magnetic chamber. Neutrally charged gaseous Xenon atoms are injected into the ion thruster's chamber, where an electron plasma ionizes them. The plasma is contained inside the chamber by magnetic fields. Once the Xenon atoms are ionized, electric fields accelerate the particles out of the thruster's nozzle, creating thrust. Ion thrusters produce very low thrust but have an extremely long lifetime, making them useful for deep-space and satellite applications. Though very reliable, they have issues with ionization probability, preventing the thruster from achieving maximum specific impulse and maximum efficiency. To improve ionization probability, the injection and trajectory of the neutral Xenon atoms in the chamber before ionization are changed from a radial linear trajectory to a tangential spiral trajectory. Using data collected by NASA's NEXT-C ion thruster, the mechanics and operation systems of ion thrusters are investigated. Based on this information, ionization probability increases with the distance a neutral atom travels through the ionization region. This improves efficiency, thrust, and specific impulse. The further the neutral atom travels in the chamber, the higher the ionization probability. Increasing the distance a neutral particle travels must also prevent erosion and energy losses due to high ion density and particle collisions. It is determined that a spiral trajectory both increases the distance a neutral atom travels, increasing the ionization rate to practically 100%. The spiral trajectory also reduces the number of collisions between neutral atoms and ions, minimizing erosion and energy losses. Applying these findings to NASA's NEXT-C ion thruster demonstrates significant improvements in efficiency and performance with potential benefits for future space propulsion.

95.
Name: Collom, Logan
Major: Wildlife, Fisheries & Aqua - Bachelor of Science
Faculty Research Mentor: Andy Kouba, FWRC-Wildlife,Fisheries&Aquaculture
Co-Author(s): Carrie Vance
Project Category: Biological and Life Sciences

Ultrasonography as a Biological Sex Identification Method in Captive Hellbenders (Cryptobranchus alleganiensis): A Case Study
The hellbender (*Cryptobranchus alleganiensis*) is the United States' largest aquatic salamander and is mainly found across the eastern

U.S. There are two subspecies of hellbenders, one of which is listed as endangered by the U.S. Fish and Wildlife Service and the other considered a species of conservation concern and a candidate for listing under the Endangered Species Act. There have been several captive breeding programs established at zoos and universities across the U.S., which require a dependable method for sexing their individuals. Ultrasonography is becoming increasingly common to identify biological sex in amphibians that lack defining external sex characteristics. This method has previously been used to track the reproductive status of hellbenders in captive breeding programs, such as the Nashville Zoo. However, this often requires the presence of a professional with substantial amphibian ultrasound experience. Small or newly established breeding programs may not have access to or funding for this expertise. This study investigates the ability of an individual with basic amphibian ultrasound experience to sex captive hellbenders. Seven hellbenders were randomly chosen from a captive population and examined via ultrasound over three different trials using no sedation or anesthesia. During each trial, individuals were labeled as female, male, or unknown, based on the presence or absence of reproductive structures. Confidence in this prediction was ranked on a scale of 0-5 for each trial. It was found that only one individual was predicted to be the same sex for all three trials, with an average confidence greater than 2.5. All other individuals had at least one trial where reproductive structures were unable to be visualized and were labeled "unknown." These results indicate a need to test further, potentially with a large sample size and more trials. A different restraint technique may also be necessary, along with light anesthesia or sedation.

218.
Name: Collum, Sydney
Major: Psychology - Bachelor of Science
Faculty Research Mentor: Hilary DeShong, Psychology
Co-Author(s): Adyson Massengill, Abigail Pulver
Project Category: Social Sciences

Do Mental Health Symptoms Make Interpersonal Problems Worse for People with Elevated Antagonistic Personality Traits?
The Antagonistic Triad consists of narcissism, psychopathy, and Machiavellianism, which are primarily recognized for their antagonistic qualities and typically have problematic, socially undesirable consequences for others (Rauthmann & Kolar, 2012). These traits and their corresponding attributes—notably, neuroticism, disinhibition (low conscientiousness), and antagonism (low agreeableness)—have been associated with adverse psychological and interpersonal outcomes, like anxiety, depression, paranoia, social problems, interpersonal sensitivities, and deficits in recognizing emotions (Jonason et. al., 2015; Miller et. al., 2017; Mullins-Sweatt & Widiger, 2010; Rogers et. al., 2017). Existing literature has yet to consider the combined impact on close relationships. Specifically, considering the potential moderating effects that mental health symptoms may have on antagonistic traits and social functioning. As such, the purpose of the current study was: 1. Establish that the antagonistic triad domains are associated with interpersonal problems; 2. Assess whether mental health symptoms strengthen this association. The current study hypothesized that Machiavellianism, narcissism, and psychopathy would all be positively correlated with interpersonal problems; additionally, mental health symptoms would moderate the relationship between each antagonistic trait domain and interpersonal problems. The sample included 599 undergraduate students who completed the Five-Factor Model Antagonistic Triad Measure, the Social Functioning Questionnaire, and the Symptom Checklist-90. As expected, results demonstrated significant positive correlations for narcissism and psychopathy with interpersonal problems. Unexpectedly, Machiavellianism bore a negative correlation. For the moderation analyses, none of the antagonistic triad traits were significantly moderated by mental health symptoms. The current study demonstrated that psychopathy and narcissism are indeed associated with interpersonal problems, but that this was irrelevant of mental health symptoms. Interestingly, Machiavellianism had negative associations with both the outcome and moderating variables. Future research should consider investigating interpersonal problems in a clinical sample with comorbid personality disorders and varying mental health diagnoses.

63.
Name: Conner, Evan
Major: Data Science - Bachelor of Science
Faculty Research Mentor: Jonathan Barlow, Data Science
Project Category: Physical Sciences

Exoplanet Detection and Characterization Using Kepler/K2 Data
Exoplanets are critical for our understanding of planetary formation and the potential for life beyond Earth. This research explores the use of data from the Kepler and K2 missions to identify exoplanet candidates. Specifically light curve data, which is found in the Mikulski Archive for Space Telescopes (MAST). Periodic dips in brightness found in the light curve data indicate a potential exoplanet transit. Transit detection algorithms like Box Least Squares (BLS) and machine learning classification techniques are employed to distinguish true planetary signals from background noise. Exoplanet characteristics like orbital period, size, and habitable zones are determined based on transit depth and stellar properties. The results of this research will contribute to what is known about exoplanet detection research and offer potential insights and improvements in detection techniques. This research shows the importance of signal processing in enhancing the reliability of exoplanet detection.

96.
Name: Conrad, Piper
Major: Biochemistry - Bachelor of Science
Faculty Research Mentor: Erika Peoples, Mississippi State Chemical Lab
Co-Author(s): Madeline Raynor, Christina Childers, Chiquita Price, Ashley Schulz, Elizabeth Esser
Funding: USDA-USFS
Project Category: Biological and Life Sciences

Chemical Profiling of Cogongrass (*Imperata cylindrica*) Leachate
Cogongrass (*Imperata cylindrica*) is an invasive, fast-growing grass species plaguing ecosystems in Mississippi and the southeastern United States. Originally introduced for soil stabilization and foraging purposes in the early 1900s, it has since become a noxious weed due to its aggressive spread that outcompetes native plant species. It can also cause weight loss in grazing animals, and is highly flammable, increasing wildfire risk. Cogongrass is also notoriously difficult to eradicate, with repeated applications of herbicide as the primary control method. Plant secondary metabolites, which can function as allelochemicals, may offer a promising method for managing cogongrass, but need further assessment. Some of the main phytochemicals found in cogongrass include flavonoids (i.e., compounds that protect against stressors and promote cell growth) and lignans (i.e., compounds that have antiviral and antibacterial properties), both of which are secondary metabolites. Endogenous biocides (i.e., endocides), another type of secondary metabolite in plants, kill other organisms of the same species via autotoxicity. If these secondary metabolites can be successfully extracted from samples of cogongrass, then they could be reapplied to that same plant at a high concentration as a growth inhibitor. The purpose of this experiment was to examine the chemical profile of phytochemicals found in cogongrass leachate to explore their role in autotoxicity within cogongrass. Cogongrass rhizomes were harvested from Bulldog Forest in Winston County, MS, then washed, de-sheathed, weighed, and brought to the Mississippi State Chemical Laboratory for the experiment. After samples were soaked in deionized water for 24 (n=10), 48 (n=10), and 72 (n=10) hours, the leachate was collected. Chemical profiles were determined by gas chromatography-mass spectrometry (GC-MS) and analyzed using the NIST mass spectral library. The characterization of phytochemicals and endocides in cogongrass may play a critical role in developing alternative, natural strategies for controlling this invasive grass in Mississippi.

97.
Name: Cooley, Cerissa
Major: Culinology - Bachelor of Science
Faculty Research Mentor: Shecoya White, Biochemistry Nutrition Health Promo
Co-Author(s): Morgan Mosby, Paola Bacerra Ossa, Krystell Charles Fajardo, Kala Morris, Kenisha Gordon
Funding: College of Agriculture and Life Sciences URSP
Project Category: Biological and Life Sciences

Development of Sweet Potato-Based Dairy and Non-dairy Ice cream
Sweet potatoes are one of Mississippi's top produced agricultural commodities; with Vardaman, Mississippi being the sweet potato capital. Vardaman has a history of cultivating high-quality sweet potatoes due to ideal soil conditions. This nutritious commodity is available year-round; however, typically purchased seasonally, between late august through November and Christmas, for pies, casseroles, or side dishes. Many sweet potatoes are culled or discarded due to appearance, leading to food waste. To decrease food waste and increase the sales and consumption of sweet potatoes year-round, development of other food uses for sweet potatoes is a solution. The purpose of this study was to evaluate consumer acceptability and physiochemical characteristics of dairy and non-dairy sweet potato-based ice cream. Three sweet potato-based formulations (A, B, and C) were created for this study. Sweet potatoes were baked for 75 minutes at 400°F, peeled, blended, and mashed through a strainer twice to eliminate the string like fibers. Next, the sweet potato milk mixtures (dairy and non-dairy) were prepared, boiled, and liquid pectin was added. Simultaneously, the dairy and non-dairy ice cream base was mixed and boiled until it reached 170°F for homogenization and then churned. The sweet potato milk mixture and churned ice cream were mixed and stored in a freezer. Sensory analysis (9-point-hedonic scale), pH, water activity, and Brix data were collected from the three formulations. Out of the three, formulation A, the dairy based ice-cream with less sweet potato mixture had an average ranking of 7.7^a. Followed by 7.2^b for formulation B with more sweet potato mixture, then 6.8^c for formulation C, plant-based ice-cream. The pH, water activity, and Brix between the various formulations ranged from 6.15-6.97,1.0-1.05, and 28-35%, respectively. Based on consumer evaluations, all three formulations have the potential for commercialization.

98.
Name: Cooper, Kirsten
Major: Wildlife, Fisheries & Aqua - Bachelor of Science
Faculty Research Mentor: Brian Davis, FWRC-Wildlife,Fisheries&Aquaculture
Co-Author(s): Kara Hall, Avery Wissmueller, Beth Baker
Funding: College of Agriculture and Life Sciences URSP
Project Category: Biological and Life Sciences

Species Richness and Diversity of Amphibians on Wetland Reserve Easements in Mississippi
The extensive modification of the Mississippi Alluvial Valley (MAV) for agriculture and other purposes has resulted in the loss of more than 75% of bottomland hardwood forests and associated wetlands. The Wetland Reserve Easement (WRE) program, administered by the Natural Resources Conservation Service (NRCS), represents one of the most extensive restoration efforts in the Lower Mississippi Alluvial Valley (LMAV). The WRE seeks to protect, enhance, and restore functions and values of wetland ecosystems, and quantify the benefits of conservation programs. While the WRE can provide myriad benefits, understanding influences of easement management practices on amphibian species richness and abundance is limited. Therefore, as part of a larger study, we surveyed amphibians for 5 randomly selected sites across the LMAV, including (1) cultivated cropland (agriculture), (2) WRE (wetlands), and (3) mature bottomland hardwood forest (e.g., reference sites). We sampled amphibians with minnow traps and checked them once every 24 hours for 3 consecutive days between May – July 2024. We identified and counted captured individuals to assess species composition. Future plans are to use taxonomic data to assess species richness and abundance to better understand diversity in these aquatic systems. Preliminary data analysis suggests diverse amphibian communities within WRE wetlands, with varying species composition and abundance across restored and reference wetland sites. We hope to provide novel information in an area where few studies exist for amphibian species in these restored wetlands.

219.
Name: Coughlin, Annaleise
School: Mississippi School for Mathematics and Science (MSMS)
Faculty Research Mentor: Arazais Oliveros, Psychology
Co-Author(s): Kristina Schoenthaler, Deemah Alturkait
Project Category: Social Sciences

Beyond the Positive and Negative: A Deeper Look at Educators' Perceptions and Responses to Child Behavior
Attributions—how individuals explain the causes of behavior—play a critical role in shaping educators' perceptions of children's behavior and their disciplinary responses. Prior research indicates that attributions influence discipline decisions, with punitive responses more likely when behavior is seen as internal, stable, and controllable, and more supportive approaches when behavior is perceived as external, temporary, or uncontrollable (Beckerman et al., 2017; Okonofua et al., 2016; McIntyre et al., 2019). However, prior studies have largely classified attributions as either positive or negative without further examining specific subdomains. The present study expands on previous work by analyzing Five-Minute Speech Samples (FMSS) from 37 educators, initially coded as broadly positive or negative (Russo & Oliveros, 2024), using the Parental Attributions Speech Sample (PASS) framework. This coding system allows for a more nuanced analysis of attributions based on four subdomains: permanence (stable vs. changeable), intentionality (deliberate vs. unintentional), likability (likeable vs. unlikeable), and moral character (good vs. bad). By investigating these dimensions, we aim to determine whether specific attributional patterns predict educators' disciplinary preferences and trauma-informed attitudes. Educators in this study completed an attribution retraining program designed to shift their attributions of child behavior from fixed and blame-oriented explanations to more contextual and flexible interpretations. The training incorporated research on child development, trauma-informed care, and behavioral science, emphasizing the role of situational factors in shaping behavior. Findings of these subdomains analyses could provide insight into how attributional shifts relate to changes in discipline preferences and trauma-informed attitudes. If certain attributional patterns predict punitive responses, future interventions could refine training methods to promote adaptive, evidence-based approaches. These findings have implications for educator training, offering a framework to foster more supportive and developmentally appropriate responses to child behavior.

99.
Name: Creel, Emma
School: East Central Community College
Faculty Research Mentor: Molly Nicodemus, Animal & Dairy Science
Co-Author(s): West Watkins
Project Category: Biological and Life Sciences

Does the temperature of an incubation system affect the chicken sex ratio within small-scale chicken farming?
Poultry is one of Mississippi's highest commodities, and with the recent rise in poultry product prices, there is a growth in Mississippi of poultry-specific hobby farms. When selecting egg-layers for these small-scale chicken farms, most producers will select a flock of chickens that consist primarily of hens. However, sexing chickens can be difficult for the first-time producer, and yet, improving the female-male ratio within poultry production will assist in facilitating a sustainable small-scale chicken farm. Incubation systems have been proposed as a solution for improving productivity levels, but research is limited concerning the effect of variables within the incubation system on hen rate production within a small-scale chicken farm. Therefore, the objective of this study was to explore the impact of temperature management within an incubation system for improving the female-male ratio within a small-scale chicken farm. Two incubation systems were set up within a small-scale chicken production system within Mississippi with both incubators set at a continuous humidity level of 50-70%. One incubator was set at 99-100oF (Low Temperature Group, n=20) and the other at 100-101oF (High Temperature Group, n=20). Eggs were candle-lit on day 14. Chicks were sexed within one day after hatching followed by another sexing at 6 months. Total hatched was 13 within the low temperature (65%) and 19 within the high temperature (95%) group. The low temperature group had a lower percentage of hens hatched (Hens: 54%, n=7; Roosters: 46%, n=6), while the high temperature group hatched a higher percentage of hens (Hens: 58%, n=11; Roosters: 42%, n=8), however, the difference between groups was insignificant. Results indicate that temperature selection for an incubator system within a small-scale chicken farm does not facilitate improvement of the female-male ratio, but did improve hatchability within a higher temperature environment, which can promote sustainability within a small-scale chicken farm.

100.
Name: Cruz-Sanders, Jocalyn
Major: Biochemistry - Bachelor of Science
Faculty Research Mentor: Richard Baird, Agricultural Science & Plant Protection
Co-Author(s): Hannah Purcha
Project Category: Biological and Life Sciences

Assessing the Vertically Transmitted Microbial Diversity in Oak Acorns
Keystone species are the foundation of any ecosystem, as they are essential to the success of the species within their ecosystem. Along the eastern seaboard region of the United States, white oak (*Quercus alba*) is an essential keystone species across multiple forest ranges. However, excessive deforestation has reduced their numbers, and the introduction of novel pathogens has further complicated repopulation efforts. White oak is plagued by multiple diseases, including sudden oak death (*Phytophthora ramorum*) and oak decline complex (*Phytophthora cinnamomi*), and understanding the prevalence and mechanisms of transmission of these pathogens is critical to improving reforestation effort. In this study, microbes that are potentially vertically transmitted from the parent oak to the child acorns were assessed using traditional culturing methods by plating components of the acorn embryo onto three types of media: water agar, PDA, and PARPH. Isolates that grew out in these cultures were further subcultured, and identifications were performed microscopically. Photos and results are presented in the poster.

101.
Name: Culbert, Chayse
Major: Animal and Dairy Science - Bachelor of Science
Faculty Research Mentor: Caleb Lemley, Animal & Dairy Science
Co-Author(s): Kasey Elder, Christie Miller, Marcus McGee
Funding: U.S Department of Agriculture and Agricultural Research Service
Project Category: Biological and Life Sciences

The Use of Melatonin in Late Gestating Cattle to Observe the Effects on Growth and Performance of Calves.
Melatonin, a hormone produced by the pineal gland, is known for regulating biological rhythms and enhancing performance traits in livestock. This study aims to determine the effects of feeding melatonin to late-gestating cows and identify changes in growth and development of calves. Late gestating Angus beef cows (n=24) were separated into either a control group (CON) or melatonin group (MEL). The MEL group received melatonin (200 µg/kg of body weight), dissolved in ethanol, and fed over supplemental feed once daily, whereas CON cows received ethanol alone. The feed with treatments sat undisturbed overnight to allow the ethanol to evaporate.

Treatments began around day 209 of gestation and continued for 54 days. After parturition, calf morphometrics were recorded, including body weight (BW), heart girth (HG), abdominal girth (AG), hip height (HH), curved-crown rump length (CCR), and ponderal index (BW [kg]/CCR [m]3), were collected at birth, 30, 60, 90, 120, and 150 days. Monthly average daily gain (ADG) was also recorded at each collection. Calf morphometrics were analyzed using the MIXED procedure in SAS. ADG is significant for treatment ($P<0.04$), with CON cows gaining more. There was a tendency for treatment ($P=0.06$) in body weights and AG ($p=0.07$), with CON calves being larger and wider than MEL calves. No differences in treatment were seen for HG, HH, CCR, and ponderal index. For all calf morphometrics, time was significant ($P<0.05$), indicating growth changes over time regardless of treatment. These results indicate that the current dose and duration of maternal melatonin supplementation had negative effects on the growth and development of calves. However, additional research is needed to evaluate growth hormone production and metabolism and their potential long-term impacts on calf performance.

102.
Name: Dalton, Dennis
Major: Forestry - Bachelor of Science
Faculty Research Mentor: Adam Polinko, FWRC - Forestry
Funding: CFR USRP
Project Category: Biological and Life Sciences

50-years of structural change in managed bottomland hardwood forests of the Lower Mississippi Alluvial Valley.
Bottomland hardwood forests historically dominated the Mississippi Alluvial Valley as well as the surrounding minor bottoms. However, land type conversion to agriculture and negligible economic incentives to sustain and reestablish such forests have resulted in a major reduction in bottomland hardwood forests across this landscape. This study will evaluate the stand structure and changes in species composition associated with differing silvicultural practices in bottomland hardwood forests and the subsequent accuracy of stand projections using the Forest Vegetation Simulator (FVS). Specifically, we will use a 50-year permanent inventory dataset to 1) evaluate recorded changes in stand structure and species composition across a range of sites in the lower Mississippi alluvial valley, 2) evaluate changes in individual tree and stand level growth through time and 3) compare the projected data to the actual composition and structure. We will present the results and discuss management implications, simulation accuracies, and projection discrepancies for this unique forest type.

220.
Name: Davis, Kaigan
Major: Kinesiology - Bachelor of Science
Faculty Research Mentor: Megan Holmes, Department of Kinesiology
Co-Author(s): Ian Macali, Po-Lin Chen, Sarah Catherine Childs, Travione Smith, Huter Appleton
Project Category: Social Sciences

Body Composition in Marching Band Participants
Body composition is a crucial aspect of overall health, influencing physical performance and risk for chronic disease. This study examines the body composition of college band members compared to population averages. Understanding adiposity relative to the general population may help inform wellness initiatives for collegiate band members. Demographics and anthropometry were assed first. Body composition was assessed using bioelectrical impedance analysis (Tanita,Tokyo Japan). Participants stood on the Tanita scale, making contact with foot electrodes, allowing a slight electrical current to measure foot-to-foot impedance. Variables of interest included lean body mass (kg), muscle mass (kg), body fat (%), and total body water (%). Descriptive characteristics were calculated and average body fat percentage for men and women were compared to age adjusted population estimates (NHANES 2017-18). Forty-seven participants (25 male, 22 female) were included in the analysis; height (171.6 ± 9.6 cm), weight (78.2 ± 17.1 kg), body fat (25.5 ± 10.2%), total body water (52.6 ± 6.5%), and muscle mass (54.9 ± 11.1 kg) was calculated. In males, the proportion in each body composition category was 4% very lean, 16% lean, 25% average, 32% overfat, and 28% obese. In females, the proportion in each body composition category was 0% very lean, 9.1% lean, 9.1% average, 18.2% overfat, and 63.6% obese. The average male band participant was significantly leaner compared to general population estimates ($p < .001$) while the female population did not differ from general population estimates ($p = 0.64$). Male band participants were leaner than the general population. Female band members showed no significant difference in body composition compared to the general population. Future research should examine physical activity patterns of marching band members to better understand if the activity associated with marching-related activities may be sufficient to influence body composition.

188.
Name: Davis, Payton
Major: Environmental Econ & Sustain - Bachelor of Science
Faculty Research Mentor: Seong Yun, Agricultural Economics
Funding: College of Agriculture and Life Sciences URSP
Project Category: Business and Economics

The Impact of Urban Sprawl and Agricultural Expansion on Local Water Quality in the US
Numerous factors affect water quality, and one of these factors that has become of more concern recently is an expansion of uniform land use for agriculture and urban purposes, which is called agricultural extensive margin and urban sprawl. These expansions contribute to water quality degradation through increased pollution sources and reduced natural filtration buffers found in natural and undeveloped areas. This study examines the effects of urban sprawl and agricultural expansion on local water quality in the US. We construct the county-level panel data for 2008-2022 of water quality from the monitoring site data collected by the USGS, USDA, and EPA, land use data from the USDA Cropland Data Layers, and socio-economic indicators related to water quality, including population data from the Census Bureau. The analysis first establishes the trend of increasing urban sprawl and agricultural expansion across the US and then quantifies its impact on key water quality indicators, such as transparency and chemical contaminants linked to urban and agricultural pollution sources, using panel fixed effects and long-term difference regression models. Findings suggest that urban sprawl and agricultural expansion significantly contribute to water quality degradation alongside agriculture. These results highlight the critical role of the EPA's Clean Water Act and USDA conservation programs in mitigating the adverse effects of both urban and agricultural land use on water quality.

103.
Name: Dawe, Jeremy
Major: Data Science - Bachelor of Science
Faculty Research Mentor: Jean-Francois Gout, Biological Sciences
Project Category: Biological and Life Sciences

Testing the impact of selection on transcription fidelity
Accurate transcription of genes is fundamental for proper cellular function across the entire tree of life. Errors during this process can introduce nucleotide substitutions in RNA molecules, which can change the amino acid sequence of protein being expressed. These disruptions of the amino acid chain can impact the correct folding of protein being expressed, potentially resulting in a loss of function with detrimental fitness loss. Notably, local genomic contexts such as neighboring nucleotides and epigenetic marks can modulate transcription error rates, resulting in genome-wide variation in transcription fidelity. For example, the probability of a transcription error at a given position is strongly impacted by whether the adjacent nucleotide is a purine or a pyrimidine. This suggests that natural selection could operate to minimize transcription errors by favoring less error-prone contexts. In this work, I test the hypothesis that natural selection favors a high-accuracy genomic context around transcription errors that would be the most harmful when expressed. Directly estimating fitness consequences of transcription errors is challenging. Therefore, this investigation proceeds on the premise that the fitness effect of a transcription error is correlated with that of the corresponding genomic mutation. To test this hypothesis, I have collected large datasets on genome-wide fitness effects in humans and cross-referenced them with transcription error rate estimates. By comparing the local transcription error-rate at sites where errors would have different effects on fitness, I reveal the patterns of selection on genome-wide modulation of transcription fidelity.

221.
Name: De Hoyos, Jose
Major: Psychology - Bachelor of Arts
Faculty Research Mentor: Cliff McKinney, Psychology
Project Category: Social Sciences

Religion and Its Effect on Risky Sex
Simons et. al. (2009) revealed that high religiosity would deter emerging adults from participating in risky sexual behaviors. Haglund and Fenring (2009) found that students with high religious beliefs, backed by parental support, were 14% more likely to avoid having sex. Milne et al. (2021) found that the more severe the trauma and maltreatment, the more likely participants would be to engage in risky sex behavior. The current study examined how religiosity influences risky sex, and how strong that influence remains when moderated by parental psychological maltreatment. Participants included 585 emerging adults. Participants completed the Stearns-McKinney Assessment of Religious Traits (Stearns &McKinney, 2018), the Student Sexual Risks Scale (DeHart and Birkimer, 1997), and the Conflict Tactics Scale (Straus et al., 1998). PROCESS 4.2 (Hayes, 2022) model 3 was used to conduct a moderation analysis. The model predicting risky sex behavior was significant, $R^2 = .04$, $F(7, 502) = 2.72$, $p = .009$. Private religiosity was associated negatively with risky sex

behaviors, B = -0.20, SE = .07, p = .002. Maternal psychological maltreatment was not significantly associated with risky sex behavior, B = .01, SE = .03, p = .63. Paternal psychological maltreatment was also not significantly associated with risky sex behaviors, B = .05, SE = .03, p = .14. The interaction between private religiosity and maternal psychological maltreatment was not significant, B = .003, SE = .003, p = .276. The interaction between private religiosity and paternal psychological maltreatment was not significant, B = -0.002, SE = .004, p = .64. The interaction between maternal and paternal maltreatment was not significant, B = -0.0004, SE = .0011, p = .706. The three-way interaction between private religiosity and both maternal and paternal psychological maltreatment was trending towards significance, B = -0.0002, SE = .0001, p = .099.

104.
Name: Delaney, Katherine
Major: Biochemistry - Bachelor of Science
Faculty Research Mentor: Krish Krishnan, Agricultural Science & Plant Protec
Co-Author(s): Sydney Davis, Madelyn Hunter
Funding: College of Agriculture and Life Sciences URSP
Project Category: Biological and Life Sciences

Clocking Out: Disruptions to Circadian Rhythms and Sleep-Wake Cycles in Drosophila melanogaster Due to Loss of Queuosine tRNA Modification
tRNA, essential for protein synthesis, is regulated at multiple levels including transcription, transcript processing, localization and ribonucleoside base modification. Post-transcriptional modification of tRNA occurs at several base and sugar positions which influences specific anticodon - codon interactions, regulates the fidelity of translation, and structural diversity with over 100 modified nucleosides. Queuosine (Q), a hypermodified base modification of guanosine at position 34 of the GUN anticodons of four tRNA species (tRNA)Tyr, Asn, Asp, His, is found in many organisms. In animal cells, changes in the abundance of Q correlate with diverse phenomena including alterations in stress tolerance, cell proliferation, and tumor growth, but its precise role remains unknown. The enzyme responsible for modification of Q-tRNA is tRNA-guanine transglycosylase (TGTase) that catalyzes replacement of G34 by Q. Drosophila melanogaster TGTs are composed of a catalytic subunit (QTRT1) and a homologous accessory subunit (QTRTD1) that complex to catalyze Q insertion into target tRNAs. The working hypothesis is that knocking down tgt, its accessory subunit, or the potential Q-salvage protein DUF2419 (NP_611573.1) will reduce Q-tRNA levels. Drosophila fly lines with UAS-RNAi constructs for QTRT1, QTRTD1, and DUF2419 were crossed to the Ubi-GAL4 driver to knock down these specific genes. Circadian rhythms in sleep-wake cycles were studied in a Drosophila Activity Monitor and analyzed using Sleepmat (v2022.2). Our results showed a distinct disruption of sleep-wake cycles with lack of Q-tRNA compared to parallel controls. Coupled to this, we also document a significant decline in dopaminergic neurons and dopamine levels. These results suggest a role for Q-tRNA in the formation of tyrosine, a precursor for dopamine which participates in arousal and circadian rhythms of sleep. Based on this, we hypothesize that Q-tRNA is essential for clock neuron function and removing Q-tRNA may lead to aberrant clock neural behavior or circuitry formation/maintenance and disruption of sleep-wake rhythms.

105.
Name: DeMorato, Shelby
Major: Animal and Dairy Science - Bachelor of Science
Faculty Research Mentor: Molly Nicodemus, Animal & Dairy Science
Co-Author(s): Ed North
Funding: ORED Undergraduate Research Program
Project Category: Biological and Life Sciences

Genetic Ocular Diseases in Stock-type Horse Breeds: A Selected Review of Recent Literature
Stock-type horse breeds make up the largest percentage of horses within the United States and the breed associations within the United States that register stock-type horses include the American Quarter Horse Association (AQHA), American Paint Horse Association (APHA), Appaloosa Horse Club (ApHC), Palomino Horse Breeders of America (PHBA), and American Buckskin Registry Association (ABRA). All of these associations besides AQHA register horses based off of coat color phenotype. Coat color phenotype, specifically the silver dilution allele, has been linked to equine genetic ocular diseases; however, the research has mostly targeted less known American breeds such as the Rocky Mountain Horse. Thus, the objective of this study was to review recent literature covering equine genetic ocular diseases impacting stock-type horse breeds. The review targeted literature published between 2000-2024 with keywords covering the focus of the study. A total of twelve publications were found that met review criteria. Of these publications, three stock-type breeds were addressed within the literature, AQHA, ApHC, and APHA. The four diseases with ocular involvement that have a genetic link identified within all three of these stock-type breeds included multiple congenital ocular anomalies, hereditary equine regional dermal asthenia, squamous cell carcinoma, and equine recurrent uveitis. Additional ocular conditions reported included aniridia and cataracts (AQHA) along with congenital stationary night blindness (ApHC). For most of these conditions, genetic testing is available

as discussed within the reviewed literature, suggesting that with responsible breeding practices horse owners of stock-type breeds can select a breeding herd that will limit the potential of offspring that will suffer from these ocular conditions.

222.
Name: Deng, Karlene
Major: Accounting - Bachelor of Accountancy
Faculty Research Mentor: Nicholas Cicone, School of Accountancy
Co-Author(s): Brad Lang
Project Category: Social Sciences

Addressing the Accounting Pipeline Leak: Tackling Socioeconomic Barriers to Entry and Retention
Many undergraduate students express an early interest in accounting, yet the actual number who later go on to matriculate into the profession is significantly lower. Despite efforts by educational institutions and the accounting industry to attract students to the profession, accounting programs experience high attrition rates. Using a survey-based approach, this research provides insights into factors that influence students to (1) enter university as declared accounting majors, (2) switch into accounting during their time at university, or (3) leave the accounting program. Additionally, this study examines the role of socioeconomic status in shaping these decisions. By pinpointing potential "leaks" in the accounting pipeline, this study provides actionable insights for universities and industry professionals to bolster recruitment, improve retention, and support students transitioning into the field, ultimately fostering a profession that better reflects the students initially drawn to it.

223.
Name: Dew, Emily
Major: Psychology - Bachelor of Science
Faculty Research Mentor: Allison Jaeger Berena, Psychology
Co-Author(s): Rachel Apperson, Nicole Esquibel, Joanna Lambert, Anna Lockhart-Marchese, Olivia Sanders
Funding: NSF REU: 2307285
Project Category: Social Sciences

Visualizing vs. Generating: How Diagram Modality Affects Learning and Metacomprehension
Successful self-regulated learning requires students to evaluate and monitor their learning to effectively allocate studying time and effort (Griffin et al., 2018). In STEM domains, learning can be especially challenging. Instructional visuals are often included in science texts because they can display complex phenomena more efficiently and meaningfully than text alone (Mayer, 2020). Although meant to support understanding, visuals can interfere with students' ability to monitor their own learning (Jaeger & Fiorella, 2024). In this study, we examined the effect of generating drawings on the accuracy of students' judgments of learning (JOL) immediately (T1) and after a delay (T2). A sample of 241 undergraduate participants read a set of 4 chemistry texts and were randomly assigned to either a generate condition or a no-generate condition. In the generate conditions, participants either generated their own diagrams while reading or saw videos of someone generating diagrams. In the no-generate conditions, participants either read the texts with provided diagrams or no diagrams. After reading each text, participants completed a JOL asking them to rate how well they would perform on a final test. After reading and judging all 4 texts, they completed a set of multiple-choice tests for each topic. After a 4–8-day delay, participants completed the JOLs and comprehension tests again without rereading the texts. For JOL magnitude, there was a main effect of time such that judgments were lower at T2 than T1, and an interactionindicating that the reduction in JOLs at T2 was greater in the no-generate conditions. Surprisingly, there was no effect of condition or time on test performance. For judgment accuracy, there was a marginal interaction between condition and time indicating that students in the no-generate conditions made more accurate JOLs at T1, whereas students in the generate conditions made more accurate JOLs at T2.

106.
Name: Dirmeyer, James
Major: Wildlife, Fisheries & Aqua - Bachelor of Science
Faculty Research Mentor: Michael Sandel, FWRC-Wildlife,Fisheries&Aquaculture
Project Category: Biological and Life Sciences

The Use of Seining To Replicate Size Class Distributions Found in Electrofishing in Small Impoundments
Small impoundments are prevalent throughout the southeastern United States. These impoundments are typically described as bodies of freshwater up to 100 acres in surface area. Many landowners and fishermen commonly desire to learn the fish population structure of these impoundments in order to target certain species while gaining both recreational experience and knowledge. Most landowners go about this by assessing what fish they have caught through angling efforts. However, this method is limited by bias based on the type

of bait used, and the size of the lure used. Swingle developed a method of surveying fish populations using a seine net to determine the population structure of fish in a given impoundment. The purpose of this study is to replicate Swingle's results. Swingle used a minnow seine to determine reproduction efforts and a larger sein to assess harvestable fish. These surveys would be carried out early summer to fall in order to gather data after the spawning season. The current study modifies Swingle's methods by collecting data in the early spring before and during the spawning season to develop a length distribution chart of the fish present before the spawn. Thus far, the modified method has been able to capture and record data on bluegill up to 100 millimeters. The current study is being conducted on a farm pond located in Starkville, Mississippi. The pond was initially built for cattle, but it is primarily used for aesthetic enjoyment. Sampling has been conducted using a 4x10' seine net with ¼" mesh. Further sampling will be done using a net with a larger mesh size, and electrofishing will be completed to develop a control distribution.

18.
Name: Draughn, Olivia
Major: Mechanical Engineering - Bachelor of Science
Faculty Research Mentor: Matthew Priddy, Mechanical Engineering
Co-Author(s): David Failla
Funding: Mechanical Engineering
Project Category: Engineering

Design and Optimization of Lattice-Integrated PLIF Cages Using Additive Manufacturing and Finite Element Modeling
As biomedical implants are increasingly favored for replacing bone tissue, the customization, characterization, and development of these implants through additive manufacturing and finite element modeling becomes imperative to the success of surgical operations and patient satisfaction. To combat stiffness mismatches and prevent stress shielding between implant and bone tissue, lattice structures can be implemented within bone implant design to reduce the effective Young's modulus (EYM) of the implant as well as to promote osteointegration within bone tissue. Lattice structures are highly customizable, three dimensionally repeated patterned unit cells that can be manipulated to mimic the porous nature of bone tissues, increasing implant-bone interface longevity. The study presents the design and optimization of diamond lattice-integrated post lumbar interbody fusion (PLIF) cages, tailored for fabrication via laser powder bed fusion (LPBF). The use of LPBF enables the precise and reproducible fabrication of complex geometries, allowing for the creation of lattice integrated implants with controlled porosity and mechanical properties. Conventional PLIF cages created from traditional manufacturing techniques are typically solid structures with limited porosity, which can lead to suboptimal long-term performance. By implementing unit cellular lattice structures within implant design, the study aims to enhance implant porosity while maintaining mechanical integrity, ultimately improving the implant's biomechanical compatibility with surrounding bone tissue while addressing critical limitations of traditional PLIF cages. In addition, the approach demonstrates the limitations of the intra-lattice propagation throughout the implant with regards to strength while offering an increased potential for osteointegration compared to more open cellular implants as well.

189.
Name: DuPré, Ellen
Major: Marketing - Bachelor of Business Adm
Faculty Research Mentor: Bingyan Hu, Marketing/Quant Analysis/Bus Law
Project Category: Business and Economics

The Impact of Screen Size on Desire to Self-Improve
Nowadays, screen time takes up a significant portion of people's daily life. While surfing online, one may use a variety of devices such as a phone, tablet, or desktop. It is important to understand how using these devices influences behaviors. This study aims to discover if people's moods and online self-improvement behaviors change based on the size of the screen used. Multiple studies will be conducted to explore this question. In study 1, participants were assigned to take a survey using a laptop, tablet, or phone to report their current mood and self-improvement motivation. This result showed that female participants reported being less positive, less happy, less excited, and less focused when using their phones compared to those using their computers and tablets. However, the males had no significant difference. In studies 2 and 3, we plan to utilize physiological measurement to see if the usage of different screen sizes will influence mood, which in turn, influences performance in self-improvement tasks. Businesses can use this information to better market self-improvement products to their customers, and individuals can use this information to better plan their self-improvement tasks.

224.
Name: Dyle, Nevaeh
Major: Psychology - Bachelor of Science
Faculty Research Mentor: Cliff McKinney, Psychology
Project Category: Social Sciences

Maternal Coping Predicts Emerging Adult Coping as Moderated by Maternal Aggression
Caregivers are thought to be contributory in emotion regulation and the development of these skills. There is strong evidence that for infants, caregivers' sensitivity to their emotional signals, modeling positive emotions, and helping the infant maintain an ideal arousal level, are highlighted as crucial factors in the development of successful emotion regulation (Segal & Moulson, 2024). Psychological aggression is one of the most common forms of harsh discipline by parents (Qiao et al., 2024). VanMeter and colleagues (2020), stated that maltreated children can develop negative coping patterns from early dismissive interactions with their caregivers.
To extend findings to emerging adults, the current study examined the relation between maternal emotion focused engagement and coping strategies in emerging adults with the consideration of maternal psychological aggression. It was hypothesized that maternal emotion focused engagement would associate positively with adult coping strategies, with this relation being stronger in the absence of maternal psychological aggression. Participants included 430 emerging adults (69.3% women; 79.7% White, 15.4% Black). They completed the Coping Strategies Inventory (Tobin, 2001) and Conflict Tactics Scale: Parent-Child Version. PROCESS 4.2 (Hayes, 2022) model 1 was used to conduct a moderation analysis. The overall model predicting self-emotion focused coping was significant, R^2 = .13, $F(3, 388) = 19.64$, $p < .001$. Maternal emotion focused coping was associated positively with self-emotion focused coping, B = .38, SE = .05, $p < .001$. Maternal psychological aggression is not significant with self-emotion focused coping, B = .02, SE = .08, p = .84. The interaction was not significant, B = -.01, SE= .01, p = .12. This study demonstrated that maternal emotion-focused engagement, but not psychological aggression, is significantly related to effective coping. This study supports future research to further explore the interplay between maternal engagement, psychological aggression, and coping outcomes in emerging adults.

107.
Name: Eekhof, Marleigh
Major: Microbiology - Bachelor of Science
Faculty Research Mentor: Donna Gordon, Biological Sciences
Project Category: Biological and Life Sciences

Using the *S. cerevisiae aan1* deletion mutant to uncover occidiofungin's mechanism of action
In the budding yeast, *Saccharomyces cerevisiae*, actin filaments are central to many biological processes including molecular transport activities, the organization and function of organelles, and cell division. Therefore, disruption of actin organization with the introduction of mutations or loss of actin associated proteins can lead to reduced cell viability. Interestingly, strains with deletion of genes that code for several actin-associated proteins demonstrate reduced sensitivity to compounds that specifically target actin. For example, recent work has found that the *aan1* deletion strain is resistant to the monomeric actin binding drug, latrunculin A; while work in our lab on the actin-disrupting agent, occidiofungin, has found that deletion of *TPM1* leads to a resistance profile. As both agents target actin, we aimed to determine whether the *aan1* mutant strain exhibited any cross-resistance to occidiofungin with the goal of better understanding the mechanism of action of this compound. To this end, susceptibility assays were carried out for occidiofungin. Following 48hr growth at 30°C, the lowest concentration of drug shown to inhibit growth for both the wild type and the *aan1* deletion mutant strains was 0.25µg/ml. While no differences in occidiofungin susceptibility were identified, short term kill kinetics are planned to confirm the occidiofungin sensitivity and latrunculin A resistance for *aan1*. The identification of a yeast strain that responds differently to two different actin-targeting agents would suggest that these compounds impact actin differently, information that can be used to further our understanding of occidiofungin bioactivity.

19.
Name: Eigbe, Eromosele
Major: Mechanical Engineering - Bachelor of Science
Faculty Research Mentor: Rahel Miralami, CAVS Research
Co-Author(s): Shanti Bhushan, Gehendra Sharma, Andy Shores, Melvy Fernandes
Funding: Bagley College of Engineering
Project Category: Engineering

Optimizing Semi-open Catheter Shunt Designs for Hydrocephalus Treatment
Hydrocephalus is a neurological disorder characterized by an abnormal and excessive buildup of cerebrospinal fluid (CSF) in cavities within the brain and subsequently, tissue damage due to increased intracranial pressure. Ventriculoperitoneal (VP) shunt placement remains the leading treatment for hydrocephalus. Shunts remain highly prone to failure with previous studies highlighting a 50%

revision rate in pediatric patients, and a 17-33% complication rate in adult patients. Obstruction is the most common cause of shunt failure, accounting for 23.2% of shunt revisions. Obstruction of the ventricular catheter has been linked to stagnation zones of low shear stress, typically at the closed end of the proximal catheter. This study investigates novel proximal catheter designs with semi-open catheter tips. The geometries will be generated by varying the diameter of the catheter's lumen (SD), the distance between the hole axes in the catheter shunt (ISD), the diameter of the holes (HD) as well as the shape of the semi-open tip. The semi-open tip may act as a suction point, potentially pulling brain tissue, CSF debris or ventricle wall matter into the catheter. Concerns include localized tissue damage, bleeding, or intraventricular hemorrhage, all of which may counteract the intended benefits and lead to further obstruction or complications. The flow of CSF through VP shunts will be analyzed using computational fluid dynamics (CFD) to understand the wall shear distribution, flow patterns, and pressure gradients across different geometries. Each design will be assessed on its ability to maintain proper flow dynamics, prevent cell obstruction, and ensure safety by mitigating tissue damage risks. The results of the CFD simulation will be discussed as well as the implications of its validity. Through this approach, we aim to contribute to the development of safer, more reliable shunt systems for hydrocephalus treatment, improving patient outcomes and reducing the frequency of surgical revisions.

108.
Name: Elmore, Reagan
Major: Biochemistry - Bachelor of Science
Faculty Research Mentor: Galen Collins, Biochemistry Nutrition Health Promo
Funding: College of Agriculture and Life Sciences URSP
Project Category: Biological and Life Sciences

Stimulating Proteasome's with the PSMC5 P320R mutation using Forskolin.
The Ubiquitin Proteasome Pathway is a major cellular process responsible for the efficient degradation of proteins tagged with ubiquitin molecules. The 26S proteasome is the key executioner of the Ubiquitin Pathway, and its activity is crucial for efficient protein degradation. When compromised proteasome function, it can lead to the accumulation of misfolded proteins associated with various neurodegenerative disorders. The P320R PSMC5 mutation causes proteasome dysfunction by weakening the connection between the 19S regulatory and the 20S core particle. This connection is crucial in protein degradation due to its involvement in recognizing and unfolding substrates. This dysfunction from the P320R mutation has been shown in several patients who have developed neurodevelopmental disorders. In this study, we sought to test if forskolin, which raises cAMP and activates wild-type proteasomes, can also stimulate proteasome with the PSMC5 P320R mutation. Three CRISPR-engineered BE(2)-M17 cell lines containing the P320R mutation were constructed. A Western Blotting assay was conducted to measure PKA, protein kinase A, activity within the cell lines. In this assay, we expect to see high levels of phosphorylation when treated with forskolin. Forskolin indirectly activates PKA, which phosphorylates the 19S subunit to enhance the degradation of short-lived proteins. In addition to Western Blotting, an LLVY-lysis peptidase assay was conducted to measure proteasome activity levels. Phosphorylation is crucial in proteasome activation. So, if there is phosphorylation activity, the cell lines should also show high levels of proteasome activity. Based on the results of the two assays, a viability assay will be performed to determine whether different concentrations of the drug affect cell viability. Different concentrations of Rolipram will be used instead of forskolin due to forskolin's short-lived period. Cell lines will be treated and measured on the same day for an initial time point and then measured 3 days later.

20.
Name: Ennin, Kofi
Major: Computer Science - Bachelor of Science
Faculty Research Mentor: Lalitha Dabbiru, CAVS Research
Co-Author(s): Daniel Carruth
Funding: Center for Advanced Vehicular Systems
Project Category: Engineering

CAVS Off-Road LiDAR Dataset: Data, Benchmarks and Analysis
In autonomous driving and robotics, the RGB images from the camera may not always be effective. Point cloud LIDAR information can be used to complement the view because of its consistency to always bounce back regardless of fogginess and most image-distorting effects. A well-rounded 360° view, which gives depth and density information of the environment, makes the LiDAR point clouds even more adaptable than other sensors' data. The research would be demonstrating the relevance of our proposed off-road point cloud lidar dataset by experimenting with 3D lidar segmentation architectures. While most 3D LiDAR datasets focused on city scenes with buildings, paved roads, etc., our dataset consists of trees, bushes, trails, obstacles such as electric poles etc., proving relevant for creating models for agricultural robotics and other unstructured off-road scenarios.

225.
Name: Esquibel, Nicole
Major: Psychology - Bachelor of Arts
Faculty Research Mentor: Allison Jaeger Berena, Psychology
Co-Author(s): Phuc Xuan Nhi Nguyen, Tanner Grubbs, Rachel Apperson, Anna Lockhart-Marchese
Project Category: Social Sciences

Helpful or Harmful: The Effect of Strategy Training on Spatial Visualization
Research has shown that spatial skills predict success in STEM subjects (Wai et al., 2009) and that they are one of the few cognitive capacities that can be strengthened through training, and transfer to other tasks (Uttal et al., 2013). To further explore these relationships, this study examined the effect of two different strategy training conditions on a measure of spatial visualization called the Paper Folding Task. In this study, 385 undergraduates were randomly assigned to one of two training conditions (Response Elimination or Visualization). In the Elimination strategy condition, participants were directed to count the number of folds in the paper and estimate the location of the final hole to eliminate incorrect answer choices. In contrast, the Visualization strategy required participants to mentally visualize the folding and unfolding of the paper and generate a drawing of what they thought the final answer would be. After training, participants completed a set of 27 paper folding items that included three different item types: 1) Analytic items that could be fully solved using the Elimination strategy, 2) Partial items that could be partially solved using Elimination, and 3) Visualization items that could not be solved using Elimination. Results showed a main effect of training condition; overall performance was higher for the Visualization condition than the Elimination condition. Further, there was a main effect of item type such that performance was highest for the Analytic and Partial items compared to the Visualization items. Finally, there was an interaction between training and item type. This interaction indicated that participants in the Visualization condition performed better on Partial items than those in the Elimination condition. Despite our prediction that Elimination training would support performance overall, results suggest it may have actually harmed performance, especially for items that may require mental visualization for successful solution.

64.
Name: Evans, Corvallis
Major: Kinesiology - Bachelor of Science
Faculty Research Mentor: Zack Gillen, Department of Kinesiology
Funding: ORED Undergraduate Research Program
Project Category: Physical Sciences

Optimizing Air Force ROTC Physical Training Programs to Improve Fitness Test Performance
Physical fitness is essential for military readiness, and Air Force ROTC cadets must meet standardized fitness benchmarks to progress in their training. This ongoing study seeks to optimize physical training (PT) to improve cadet performance on the Air Force Physical Fitness Assessment (PFA). Physical abilities were assessed in FA (Fitness Assessment), running, push-ups, and sit-ups. Scores are given for the following exercises. The maximum score for running is 60, maximum score for pushups is 20, and maximum score for sit-ups is 20. Points for each category is added up to a composite score of 100 possible points. For assessment purposes, failing is under 75 points total, and scores between 75-89.9 are considered at-risk and extra training is advised. Cadets scoring 90+ points are considered at-risk and extra training is advised. Cadets scoring 90+ points are considered ready for the Air Force ROTC Fitness Assessment. The research involves developing and implementing a structured training regimen incorporating periodization, high-intensity interval training (HIIT), and resistance training. Data collection includes baseline fitness assessments, program adherence tracking, and feedback from cadets and instructors. While results are still forthcoming, preliminary observations will highlight challenges in program implementation and provide insights into potential strategies for enhancing ROTC training effectiveness. Future analyses will assess the impact of the optimized training program on cadet performance and overall firness outcomes.

226.
Name: Evers, Harper
Major: Fashion Design & Merchandising - Bachelor of Science
Faculty Research Mentor: Tommy Phillips, School of Human Sciences
Co-Author(s): JuYoung Lee, Lillian Dean, Laila Sparks, NaKimberly McGee, Caitlin Hayes
Project Category: Social Sciences

Adolescent Identity Development and Consumer Behavior: A Study on Female College Students' Fashion Purchasing Behavior and Psychology
This study investigates the relationship between adolescent identity development and consumer behavior, focusing on female college students' fashion purchasing decisions. Specifically, it examines three key factors: self-congruity for sustainability, trend awareness, and

their impact on attitudes toward fast fashion and purchase intentions. The research problem centers on understanding how self-identity, shaped by sustainability concerns and trend awareness, influences fashion consumption patterns among young women. The study will use quantitative survey via Qualtrics and will use statistical analysis through SPSS. Participants will be selected using MechanicalTurk to ensure a diverse sample of college-aged females familiar with fast fashion. The data collected will be analyzed through multiple regression to assess the relationships between the variables, with self-congruity, trend awareness, and attitudes toward fast fashion as the primary focus. The study is anticipated to find that self-congruity for sustainability is negatively related to attitudes toward fast fashion, as sustainability-conscious consumers are less inclined to purchase from fast fashion brands. On the other hand, trend awareness will be positively related to attitudes toward fast fashion, suggesting that those more attuned to current fashion trends are more likely to engage in fast fashion consumption. Furthermore, positive attitudes toward fast fashion will directly influence purchase intentions, with convenience, affordability, and social influences playing significant roles. In conclusion, while sustainability concerns drive resistance to fast fashion, the influence of trend awareness and the desire to stay fashionable often override ethical considerations. This study highlights the tension between personal values and social conformity, suggesting that interventions in marketing could encourage a balance between trend-driven consumption and ethical purchasing behavior.

109.
Name: Fagan, Abigail
Major: Biochemistry - Bachelor of Science
Faculty Research Mentor: Seung-Joon Ahn, Biochemistry Nutrition Health Promo
Co-Author(s): Mary Jane Lytle, Donald Cook
Funding: ORED Undergraduate Research Program
Project Category: Biological and Life Sciences

Insecticide Resistance of the Rice Stink Bug: Comparative Analysis of the Voltage-Gated Sodium Channel Between the Susceptible and Resistant Strains
Oebalus pugnax, more commonly known as the rice stink bug, is causing rice crops to deplete in the Mississippi Delta as well as other regions of the southern United States. Controlling this damage is becoming increasingly difficult as insects mutate and evolve to resist insecticides, threatening food sources and giving way to insect-vectored diseases. Voltage gated sodium channels (VGSC) are the target of pyrethroid insecticides and have been often involved in the pyrethroid resistance. In this study, the VGSC gene of *O. pugnax* (OpVGSC) was sequenced and compared between the susceptible and resistant strains. Firstly, the transcriptome sequencing obtained fragmented sequences of OpVGSC, which was mapped and aligned with other insect VGSC sequences to identify missing sequences. Secondly, the PCR and cloning strategies with gene-specific primers fill the gap sequences, resulting in a partial sequence of OpVGSC. Thus far, two out of five target regions, OpVGSC-F4/R4 and OpVGSC-F1/R1, have been cloned into the pJET vector for sequencing. Two more of the target regions, OpVGSC-F2.1/R2.1 and OpVGSC-F3.1/R3.1, are currently being amplified for further analysis. Upon completion of the cloning and characterization process, screening for mutations linked to pyrethroid resistance will be performed.

180.
Name: Farrell, Merideth
Major: Landscape Architecture - Bachelor of Landscape Arch
Faculty Research Mentor: SaMin Han, Landscape Architecture
Co-Author(s): Simon Powney, Magdalene Valentine
Project Category: Arts, Music, & Design

Refuge in the Marsh
The MS coast is a destination for many travelers and locals alike to enjoy the unique scenery and atmosphere the coast has to offer- yet much of what makes the coastland special is in danger. Rising sea levels and ever-encroaching development has claimed much of the coastland's marshes, forests, and bayous. All of these are crucial nurseries for many birds, crustaceans, and marine life. If the marshes go, they go. The tip of east side Biloxi has experienced economic declines since Hurricane Katrina. The site boundary we chose consists predominantly of a salt marsh and open field that we have identified as key habitat areas in danger due to the threat of more development. Also, on site are some residential areas as well as a public park. Many of these areas are in immediate threat of flooding. To remedy this, our site proposes relocating the vacant homes to higher ground in a nearby neighborhood, changing the topography of the land to act as a berm protect the neighborhoods on the other side, and giving the existing park the multi-purpose function of park and storm water sponge. The majority of the site will be returned to its natural state and water mitigation properties with access for the public to encounter the wonders of this intricate, adapted system through boardwalks, outlooks, and outdoor class rooms. The Refuge in the Marsh site has a main priority - connecting community - connecting the people of East Biloxi and the unique plants and animals that also call the coast home. Our design strategy seeks to do this by preserving and enhancing the tidal salt marsh that exists in the back bay of Biloxi. Establishing a living shoreline, rebuilding a healthy pollinator habitat and redefining coastal forest area all while improving the salt marsh and allowing it natural room to flood. By restoring the salt marsh and surrounding habitat, Refuge in the

Marsh is a natural attraction that engages and educates visitors about the importance of restoring the marsh, all while operating as a stormwater mitigation strategy to protect the surrounding community.

271.
Name: Feasel, Rowan
Major: English - Bachelor of Arts
Faculty Research Mentor: Tommy Anderson, Shackouls Honors College
Project Category: Humanities

Plath's "Mythological Method:" Poetry about Parents
In his review of James Joyce's *Ulysses*, T.S. Eliot discusses Joyce's effective use of what he calls the "mythological method." For Eliot, Joyce's use of myth reveals truths about the present by exploring parallels with the past, and this conversation between past and present leads to a better understanding of human nature that can help people navigate current social and emotional problems. In other words, myth provides a common language of familiar symbols that authors can use to relay their dark observations about humanity under the protection of another story removed from their immediate and often private, controversial context. The confessional poet Sylvia Plath uses myth in this way in her poetry, especially to convey her frustration surrounding her father's painful absence and her mother's stifling presence. In poems like "Electra on Azalea Path" and "Medusa," Plath has the opportunity to explore and expand upon the emotions she feels in her relationships with her parents under the guise of myth. She uses the characters of Electra and Medusa respectively to portray truths about family life, and she protects herself by connecting her bitter and bold statements to the stories of other female characters in mythology whom many people have already understood and used. Plath scholars have connected Plath to Eliot, but many have not analyzed the connection between Plath's "mythological method" and her depictions of family specifically. Through analysis of Plath's poems, Heather Clark's biography *Red Comet: The Short Life and Blazing Art of Sylvia Plath*, and other secondary sources, I argue that Plath's use of myth allows her to explore and question the ones who are most familiar in a way that may lead to better understanding of family and identity in the future.

110.
Name: Fikes, Kinsey
Major: Environmental Econ & Sustain - Bachelor of Science
Faculty Research Mentor: Brenna Jungers, Agricultural Economics
Co-Author(s): Joshua Abbott, Lucas Bair
Funding: College of Agriculture and Life Sciences URSP
Project Category: Biological and Life Sciences

Understanding Barriers to Participation in Recreational Harvest Incentive Programs for Invasive Species Control
Invasive Carp have been an issue of increasing importance across the Mississippi River Basin for decades for several reasons, including threats to native and sport fish food chains, threats to native plant species, and impacts on recreational fishing and boating. However, with limited research focused on the species, there is little to build any form of management or control plan around. This study aims to analyze anglers' characteristics and ethics and link them to participation, or lack thereof, in an aquatic invasive species harvest program, and use this information to inform management policies in the southeast. This study investigates how anglers' characteristics and ethics are related to their willingness to participate in an incentivized harvest program for invasive brown trout in the Colorado river, then uses the findings of that analysis to begin investigating the potential for a similar program to help control the population of invasive carp in the southeast. The data we use to investigate the Colorado River program comes from a stated preference survey of anglers who fished at Lees Ferry—the site of the brown trout incentivized harvest program—but did not necessarily participate in the incentive program itself. We used this survey data to estimate a logistic regression that investigates factors that make an angler more or less likely to participate in an invasive species bounty program, including their education level, gear usage, and income, among other factors. Our findings indicate that participants who are white, report using spin fishing gear, and have a higher level of education while working at a job that requires more hours, all make individuals more likely to participate in an invasive species bounty program. We were then able to use this information about the angler population to structure an interview with a state fisheries manager to gain insight into the history of management of invasive carp in the region, to determine potential policy implications. This knowledge will allow agencies across the southeast to make more informed decisions about aquatic invasive species control when considering incentivized harvest programs, as well as having a better understanding of what drives anglers' beliefs behind invasive species control.

111.
Name: Filas, Kaeley
Major: Biological Sciences - Bachelor of Science
Faculty Research Mentor: Nick Fitzkee, Chemistry
Co-Author(s): Gabriel Alcantara
Funding: NSF DMR 2405018 and NIH R01 AI139479
Project Category: Biological and Life Sciences

Use of Biomagnetic Beads Separation Technique to Isolate the Protein Corona on Liposomes
A liposome is a self-assembled vesicle that can encapsulate many different molecules. Due to this ability, liposomes are now utilized as nanocarriers, allowing drug delivery throughout the human body. In the presence of blood, liposomes can adsorb numerous molecules, including proteins, onto their surface, which leads to a shell forming around the liposome, termed the protein corona. This corona confers new biological properties and an identity to the liposomes, influencing the body's response to the particle. To study the corona, protein-coated liposomes must first be separated from the serum used to form the corona. Most approaches to characterize the nanoparticle corona involve centrifugation. However, strong forces in centrifugation can damage liposomes. We chose to investigate an alternative separation technique using magnetic beads (avidin beads), with centrifugation as a control. Avidin is a protein that binds strongly to biotin, so we designed biotin-labeled liposomes to facilitate separation. The magnetic separation technique uses magnetic avidin beads to capture biotin-labeled liposomes, facilitating separation from serum without centrifugation. The magnetic bead approach led to higher protein corona yields than centrifugation. From the magnetic beads, we obtained a total protein recovery of 3.1 ± 0.5 mg/mL; for centrifugation, we obtained 0.7 ± 0.3 mg/mL. With dynamic light scattering, we observed an increase of about 14 nm in the size of liposomes after the isolation of the protein corona by centrifugation and an increase of 40 nm by magnetic separation. These results demonstrate that the magnetic separation approach captures more proteins. We also found changes in zeta potential and noticed different protein bands in sodium dodecyl sulfate-polyacrylamide gel electrophoresis (SDS-PAGE), suggesting that different protein coronas were isolated. Ongoing work involves identifying the specific proteins bound to the liposomes using mass spectrometry-based proteomics.

21.
Name: Fisher, Wyatt
Major: Computer Science - Bachelor of Science
Faculty Research Mentor: Sungkwang Mun, CAVS Research
Co-Author(s): Ayantha Senanayaka Mudiyanselage
Funding: ORED Undergraduate Research Program
Project Category: Engineering

Optimizing the DEMUCS Model for Industrial Sound Separation
Predictive maintenance in manufacturing industries plays a crucial role in identifying mechanical faults early, which supports effective machine health monitoring. However, the various interactive uses of machines can complicate the monitoring process due to the complex environments in which they operate. To tackle this challenge, we propose an industrial sound separation algorithm designed to isolate specific sounds from multiple sources in complex acoustic environments. In particular, this project adapts the Deep Extractor for MUsiC Sources (DEMUCS), a deep learning-based source separation model initially developed for music, to isolate industrial sound sources from mixed acoustic recordings. As for the dataset, we use a Machinery Fault Simulator (MFS) to generate sounds associated with various mechanical faults. This is accomplished by mounting certain known defective components, such as faulty bearings, into the MFS and recording the audio from the machine. By applying DEMUCS to audio signals captured from the MFS, we aim to separate and analyze two distinct fault conditions, a bearing ball fault, and an eccentric rotor fault, from background noises such as voice interference. This enhances diagnosis accuracy for machine health by distinguishing sound interference, ultimately improving monitoring in complex machine sound environments. A key aspect of this research is optimizing the DEMUCS's performance for industrial signals rather than music. This is accomplished through systematic testing and analyzing the impact of different hyperparameters on model accuracy and convergence. We focus on analyzing five hyperparameters. Depth refers to the number of layers used in both the encoding and decoding stages of the model. The channel number determines the number of feature maps processed at each layer. The learning rate controls how quickly the model updates its weights during training. Repeats control how many times the model trains over a set of data during a single epoch. Augmentations involve modifying the already collected data to arbitrarily alter data for training, such as switching left and right audio channels, to enrich the diversity of the dataset. By testing different values for these hyperparameters, we identified configurations that improve the model's ability to distinguish between faulty conditions and background noise while also reducing computational time. We hope this study provides meaningful insights into refining deep learning models for industrial applications, demonstrating the feasibility of using sound source separation techniques for machine health monitoring.

227.
Name: Flint, Caroline
Major: Communication - Bachelor of Arts
Faculty Research Mentor: Uyanga Bazaa, Communication
Project Category: Social Sciences

Defining Organization-Public Relationships from Public Perspectives
Public relations centers on building and maintaining relationships between public members and organizations, such as corporations, governments, local grocery stores, churches, etc. However, the organization-public relationships (OPR) model sometimes lacks explanatory and predictive power in deciphering complex dynamics between public members and organizations. To fill the relationship management literature gap, this study explored how people perceive and interpret their relationships with various organizations, such as corporations, religious groups, educational institutions, and nonprofits. Based on the findings, the organization-public relationship is defined as an individual's need-based interaction with organizations that results in varying degrees of personal-level goal achievement, such as self-actualization, securing a job, or convenience, some of which happen to be organizational goals. Focus group and individual interview (13) results suggest the OPR does not necessarily result in public trust, commitment, and satisfaction with organizations. However, interviewees provided numerous examples of need-based interaction with organizations, resulting in the organization-public goal achievements, such as repeated visits, continued affiliations, and, sometimes, pseudo-associations. A key finding is the unstable nature of OPRs, shaped by individuals' evolving value priorities and their influence on the relationships. This research led to the development of five major OPR types that categorize how individuals shuffle priorities and decide to maintain or end a relationship with an organization based on one's agenda, including need-based (i.e., must, want, need), goal-driven, organization-affiliated, character-building, and activism-inspired relationships, which illustrate how individuals assess and respond to their affiliations with organizations, including untrustworthy or controversial organizations. This research found that individuals make varying levels of efforts to maintain an organizational relationship and are often influenced by the degree of importance they assign to personal and societal goals and expectations, and these findings help individuals become more aware of OPRs, effectively address grievances, and leverage individual resources and collective influences in solving conflicts with organizations.

228.
Name: Forrester, Megan
Major: Psychology - Bachelor of Science
Faculty Research Mentor: Clifford McKinney, Psychology
Funding: ORED Undergraduate Research Program
Project Category: Social Sciences

Effects of Negative Urgency on Risky Sexual Behavior Moderated by Conservative Religiosity
Risky sexual behavior has a significant, negative outcome linked to emerging adulthood and impulsiveness (Moussa Rogers et al., 2021). Negative urgency, such as PTSD, has been linked to risky sexual behavior. Although there is not much information available when it comes to the relation between negative urgency and risky sexual behavior, it is apparent that there are significant interactions between the two (Flores et al., 2022). Conservative religiosity plays an important role in the actions of risky sexual behavior. Maternal conservatism has a significant, positive association with risky sexual behavior in women, therefore influencing emerging adult risky sexual behavior (Holt & McKinney, 2024). The current study examined the effects of negative urgency on risky sexual behavior in emerging adult men and women moderated by conservative religiosity. It was hypothesized that negative urgency (SUPPS) would have a direct effect on risky sexual behavior moderated by conservative religiosity (SMART). Participants included 1,789 emerging adults. The participants completed the Short UPPS-P Impulsive Behaviour Scale (SUPPS-P; Lynam, 2013), the Student Sexual Risks Scale (SRS; DeHart and Birkimer, 1997), and the Stearns-McKinney Assessment of Religious Traits (SMART; Stearns & McKinney, 2018). PROCESS 4.2 (Hayes, 2022) model 1 was used to conduct a moderation analysis. The model predicting risky sexual behavior was not significant, R^2 = .02, $F(3, 243) = 1.80$, $p = .148$. Negative urgency was not associated with risky sexual behavior, $B = -0.12$, $SE = 0.09$, $p = .213$. Conservative religiosity was associated negatively with risky sexual behavior, $B = -0.06$, $SE = 0.03$, $p = .033$. The interaction between negative urgency and conservative religiosity was not significant, $B = -0.003$, $SE = 0.009$, $p = .729$. While negative urgency does not appear to play a role in risky sex behavior, conservative religiosity does, although only as a main effect.

22.
Name: Fowler, Cameron
Major: Industrial Engineering - Bachelor of Science
Faculty Research Mentor: Lesley Strawderman, Industrial and Systems Engineering
Co-Author(s): David Saucier
Funding: Shackouls Honors College Research Fellowship, Athlete Engineering
Project Category: Engineering

Reporting Ergonomic Data from a Wearable Smart Sleeve on an Automotive Paint Line
Wearable technology offers a promising way to collect ergonomic risk data. This case study describes the integration of a smart sleeve device into operations at an automotive paint line in North Mississippi. Data from the wearable devices was used to calculate a modified RULA score and an asymmetry index for each operator to measure risk of ergonomic injuries to the wrist and arm. Options for communicating risk are also presented in this case study, such that results can be understood by both ergonomists and untrained stakeholders. Possible risk displays developed in Power BI are presented.

112.
Name: Franks, Margaret
Major: Biomedical Engineering - Bachelor of Science
Faculty Research Mentor: Lauren Priddy, Ag & Bio Engineering
Co-Author(s): Eden Tanner, Grace Levine, Nathaniel Bosque, Claylee Chism
Funding: Shackouls Honors College Research Fellowship, NSF E-RISE RII
Project Category: Biological and Life Sciences

Antimicrobial efficacy of choline-based ionic liquids against *Staphylococcus aureus* biofilms
Osteomyelitis is a bone infection commonly caused by *Staphylococcus aureus*. Infection is challenging to treat due to the inability of antibiotics to penetrate bone tissue and the rise in antibiotic resistance. Infection is incurable in 30% of chronic osteomyelitis cases, often resulting in limb amputation. Developing a localized, biodegradable treatment that delivers high concentrations of antimicrobials while minimizing systemic side effects is crucial. Ionic liquids (ILs) are biocompatible solvents composed of asymmetrical organic cations and anions, with a positively charged, hydrophilic headgroup and a negatively charged carbon chain tail, which demonstrate antimicrobial properties dependent on the anion type and carbon chain length. In this study, the antimicrobial efficacy of choline-based ionic liquids was tested by varying carbon chain length and testing the ILs at different concentrations. The ILs tested for this study were choline decanoate (10C), choline undecanoate (11C), choline dodecanoate (12C), choline tetradecanoate (14C), and choline hexadecanoate (16C). It was hypothesized that increasing IL concentration would increase antimicrobial activity. To test this hypothesis, the ILs were diluted with sterile water to concentrations ranging from 1% to 6% (v/v%). *S. aureus* biofilms were exposed to the ILs for 24 hours and analyzed for bacterial growth. For the shorter-chained ILs (10C, 11C, and 12C), a 2% IL concentration resulted in complete bacterial eradication. Decreasing the shorter-chained IL concentration to 1% resulted in decreased bactericidal activity, but complete eradication was not observed. Interestingly, the longer-chained ILs (14C and 16C) showed no signs of antimicrobial activity at a 2% concentration, and increasing the concentration to 4% and 6% showed a similar lack in antimicrobial activity. To conclude, increasing concentration for ILs with shorter carbon chains results in increased antimicrobial activity. On the other hand, concentration played no significant role in the ability of the IL to affect *S. aureus* biofilms.

229.
Name: Garcia, Katie
Major: Fashion Design & Merchandising - Bachelor of Science
Faculty Research Mentor: JuYoung Lee, School of Human Sciences
Co-Author(s): Caroline Kobia
Funding: College of Agriculture and Life Sciences URSP
Project Category: Social Sciences

Market Potentials and Supply Chains of the Cellulosic Handicraft Industry in Kenya
The handicraft industry in Africa, originally born out of necessity, has become a significant economic sector, generating substantial revenue across various countries. Some of the countries with the highest revenue attributed to handicrafts include Kenya and South Africa. Although much of Africa is still impoverished, the sale of handicraft goods provides valuable supplemental income for craft producers. Many handicrafts are made from cellulosic materials such as cotton, bamboo, and grass. This study focuses on the use of cellulosic fibers to create handicrafts because Africa has an abundance of native cellulosic materials. Moreover, the cellulosic craft industry benefits both the environment and the economy, particularly by supporting sustainable farming practices in Africa. Despite being skilled in the craft and having an abundance of resources, African cellulosic craft producers fail to find substantial success through the sale of their products. It is mainly because there is a significant gap between producers and consumers due to a disconnect in the supply chain. This inability to understand consumer demand limits the potential of craft producers. Therefore, this research aims to examine the supply chain challenges in the African cellulosic craft industry and to explore opportunities to address these issues and better align production with consumer needs using the theory of constraints. The study plans to interview stakeholders in the Kenyan handicraft industry using Qualtrics to gain insight. Future implications of this research hope to find ways to industrialize rural, impoverished communities in Kenya that can be generalized to the rest of Africa.

202.
Name: Gardner, Caroline
Major: Educational Psychology - Bachelor of Science
Faculty Research Mentor: Mehdi Ghahremani, CounselHEdEdPsyFound (CHEF)
Project Category: Education

Exploring the interaction between Narcissism and Social Media
This research looks to examine the relationship between narcissistic personality traits and social media usage, focusing on how digital platforms may reinforce or weaken narcissistic behaviors. Using a correlational design, the study gathered self-reported data from mostly undergraduate students through surveys measuring narcissism (using scales like the FLUX and Narcissistic Personality Inventory) and social media behaviors, such as frequency, content types, and motivations for use. Results revealed no significant correlation between narcissism and social media engagement, stretching previous research linking these constructs. The findings emphasize the need for further investigating into contextual factors like platform type and user motivations. This research contributes to understanding the nuanced interplay between personality traits and digital behaviors in shaping online identity.

230.
Name: Garduno- Cruz, Lizbeth
Major: Human Development & Family Sci - Bachelor of Science
Faculty Research Mentor: JuYoung Lee, School of Human Sciences
Co-Author(s): Tommy Phillips, Susannah Case, Iesha Jamison, Ariana McCoy
Project Category: Social Sciences

Parental Financial Socialization Effects on Young Adults' Spending Behaviors
Financial socialization plays a crucial role in shaping young adults' spending habits that carry on into adulthood. This study examines how parental financial socialization influences children as they grow into young adults that make financial decisions of their own, including their financial decision-making, habits, and priorities. The goal of the study is to measure the different ways parents teach their children through both direct teachings and allowances as well as indirect observations of parental spending habits. This study will use Qualtrics to conduct an online survey to 18- to 23-year-olds to assess the impact of parental financial socialization on young adults' spending behaviors. The survey will also include demographic questions, financial socialization measures, and spending behavior assessments. Participants will answer a questionnaire designed to measure the influence of parental teachings on their current spending behaviors. The survey will consist of a 5-point Likert scale to evaluate variables such as communication, parental role modeling, and financial independence. This research will use two scales (Parent Financial Socialization Scale – 20 items and Spending Perception Scale – 18 items) to measure parental influence and young adults spending behaviors. With this study we hope to find out the difference between males' and females' financial behaviors, along with how parental financial socialization positively impacts young adults' spending behavior. The study is expected to show that parental financial socialization significantly influences young adults' spending behaviors. It is hypothesized that those with strong parental financial guidance will tend to be more responsible with money. Gender differences will be observed, with young women focusing more on saving and young men taking more financial risks. These results will emphasize the lasting impact of parental financial teaching on young adults' financial habits.

272.
Name: Garrett, Victoria
Major: Anthropology - Bachelor of Arts
Faculty Research Mentor: Dhanashree Thorat, English
Project Category: Humanities

The Power of Land: Land as a Tool for Maintaining Power in a Neocolonial World
Land has often been used to broker power. From European colonialism in the fifteenth century, to modern neocolonial ambitions, the stewardship of land constitutes a large portion of how power structures are maintained. Countries have often used seizing land as a way expand their territory and increase bargaining power with other countries. In the modern era, countries no longer have colonial empires and instead seek to exercise power through economic rather than physical means. Popular tourist destinations depend on tourists to support their economies, however much of this money is never realized by the local populations, instead going to large multinational corporations, thereby decreasing the bargaining power of the local populations. Tourist economies often also result in the commoditization of indigenous cultures. In commodifying these cultures, the populations themselves become commodities in the tourist economy thus continuing to decrease their bargaining power. Many tourist destinations also market the natural world in which they exist as being beautiful and untouched by man, thus turning the undeveloped land into a commodity necessary to support their economies. In turning undeveloped land into a marketable product, local populations are limited in how they are able to develop and join a larger world economy, instead remaining in a position of little power. In tracing the roots of land as a tool for determining power,

long term effects on indigenous populations, often perpetuated by unwitting tourists, can be seen and in understanding these power imbalances and inequalities, steps to rectify these historic issues can be taken.

23.
Name: Garrison, Evan
Major: Aerospace Engineering - Bachelor of Science
Faculty Research Mentor: Matthew Priddy, Mechanical Engineering
Co-Author(s): Santanu Kundu, Luke Salisbury, Charlotte Thompas
Funding: Bagley College of Engineering Undergraduate Research Grant
Project Category: Engineering

Optimization of an Open-Source High-Temperature FDM 3D Printer for High-Performance Thermoplastic Materials
This work discusses the optimization of a high-temperature FDM 3D printer tailored specifically for printing polyetheretherketone (PEEK) and polyetherimide (ULTEM/PEI) materials to be released open-source to the public. These materials hold immense promise for applications in medical implants and aerospace systems. However, existing printers designed for processing these materials are cost-prohibitive costs, limiting their use in academia. The printer outlined in this work is designed to expand the ability for cost-effective research on the materials. The printer employs readily available materials and open-source software to increase access to these materials within academia. Optimizing the print quality of high-temperature polymers will be analyzed and discussed. This work will further discuss the changes to the mechanical and thermal systems to optimize print quality. The impact of hot end temperature, bed temperature, volumetric flow rate, and extrusion width on part quality was also analyzed and used to further optimize results. Based on these results, this work aims to further optimize this open-source printer design for high-temperature polymers to further the knowledge base within academia.

113.
Name: Gerber, Aidan
Major: Biochemistry - Bachelor of Science
Faculty Research Mentor: Barbara Kaplan, Department of Comparative Bio Scien
Co-Author(s): Arpita Deb
Funding: MSU CVM Office of Research and Graduate Studies
Project Category: Biological and Life Sciences

Potential for a Combination of Antidepressant, Probiotic, and Plant-Derived Compound as a Treatment for Multiple Sclerosis
Multiple sclerosis (MS) is a neurodegenerative autoimmune disease for which there is no known cure. In addition to disease modifying drugs, individuals use various alternative therapies to treat pain, spasticity, and insomnia. For example, a compound from cruciferous vegetables, indole-3-carbinol (I3C), or the probiotic Lactobacillus paracasei was shown to modestly suppress disease and antibody production in mouse model of MS, experimental autoimmune encephalomyelitis (EAE). Therefore, the goal of this work was to determine if the efficacy of I3C could be improved by including Lactobacillus or by including the antidepressant duloxetine, which is often used by MS individuals to improve quality of life. We hypothesized that the combination of I3C, duloxetine, and Lactobacillus would attenuate EAE disease more than any component alone. We initiated EAE in 36 female C57BL6 mice, then dosed orally with I3C (50mg/kg/day), duloxetine (20µg/kg/day), Lactobacillus (5 x 10^8 CFU/mouse/day), or the combination for five days. Disease was allowed to develop in the mice out to day 15. Mice were weighed and clinical signs were evaluated. Mice developed disease as evidenced by weak tail tone and partial paralysis, and this was modestly prevented with the combination treatment. Time to disease onset was delayed by combination treatment, although area under the curve for clinical scores was not significantly affected by any treatment. In contrast to published work, Lactobacillus did not provide any protection for disease. Disease specific IgG1, IgG2a, and IgG2b were increased in EAE mice. I3C alone slightly inhibited all, while combination slightly inhibited IgG2a and IgG2b. Lactobacillus alone did suppress antibody production. These studies show that either I3C or the combination treatment provided modest protection from EAE disease. These studies support the possibility of using I3C as an adjunct therapy for MS.

24.
Name: Giacobbe, Leonel
Major: Computer Science - Bachelor of Science
Faculty Research Mentor: Jingdao Chen, Computer Science and Engineering
Co-Author(s): Chuangchuang Sun, Tanner Grantham
Funding: BCOE Undergraduate Research Program
Project Category: Engineering

Reinforcement Learning with Vision-based State Estimation for Generalized Robotic Assembly
Robotic manipulation is a promising technology that has the potential to further automate construction tasks such as bricklaying, concrete printing, or crane assembly of prefabricated components. With the increasing complexity of modern construction projects, more sophisticated planning algorithms are needed to optimize the efficiency of robotic manipulator operations. Reinforcement learning (RL) has emerged in recent research as a way to solve planning problems in high-dimensional state spaces or where the world model is unknown or noisy. Most RL algorithms for robotic manipulation target low-level control and are not scalable to multi-object or complex assembly tasks. This research proposes a reinforcement learning framework with integration of vision-based state estimation and inverse kinematics for generalized robotic assembly tasks. The advantage of the proposed framework is a generalized formulation of robotic assembly tasks that leverages inverse kinematics to speed up the reinforcement learning process that can also be adapted to arbitrary initial states. The proposed framework is validated through a physics simulation as well as a lab-based experimental setup with robotic assembly of wooden blocks. The initial visual state estimation is achieved by a camera mounted to the wrist of a 7 degrees of freedom robotic arm. Linear regression is utilized to estimate the best end effector pose given the target object's position from camera image coordinates. After the position and orientation of the target object are computed, the end effector of the robotic arm is manipulated utilizing an autonomous process comprised of inverse kinematics and relative pose adjustments. Our optimized model is able to assemble a 3-layer tower of wooden blocks in 37% less time compared to the baseline model.

231.
Name: Gill, Poonum
Major: Psychology - Bachelor of Science
Faculty Research Mentor: Cliff McKinney, Psychology
Project Category: Social Sciences

Democratic Family Functioning Influencing Substance Use Moderated by Psychological Problems
Growing research suggests that substance use is impacted by family functioning. Extensive research studies have shown that depression and substance use disorders are often comorbid (Swendsen & Merikangas, 2000). Some research has also shown that adolescents with more cohesive families and who reported remembering caring mothers showed less increase in substance use during adolescence and emerging adulthood (Sánchez-Queija et al., 2015). Emerging research shows that there may be a significant relationship between family functioning and substance use, with a moderator of psychological problems. Participants included 585 college students from a large university in the southern United States. Participants included 65.5% women. These participants completed the following measures: Adult Self Report (ASR; Achenbach & Rescorla, 2003), which measures psychological problems, Drug Abuse Screening Test (DAST-10; Skinner et al., 1982), which measures substance use, Family Functioning Scale (FFS; Bloom, 1985), which measures democratic family functioning. It was hypothesized that democratic family functioning would negatively associate with substance use, and that psychological problems would weaken the negative relation between family functioning and substance use. PROCESS 4.2 (Hayes, 2022) model 1 was used to conduct a moderation analysis. The model predicting substance was significant, $R^2 = .06$, $F(3, 418) = 8.92$, $p < .001$. Substance use was not related to family functioning, $B = 0.003$, $SE = 0.02$, $p = .898$. Psychological problems were associated positively with substance use, $B = 0.009$, SE = 0.002, $p < .001$. The interaction between democratic family functioning and psychological problems was significant, $B = 0.002$, $SE = 0.001$, $p = .021$. High democratic family functioning with high psychological problems was associated with higher substance use, but high democratic family functioning with high psychological problems was also associated with moderate substance use. High democratic family functioning and high psychological problems are related to high substance use.

25.
Name: Giri, Niranjan
Major: Computer Science - Bachelor of Science
Faculty Research Mentor: Christopher Hudson, CAVS Research
Co-Author(s): Tyler Hannis, Daniel Carruth
Funding: BRIDGES
Project Category: Engineering

Integration of LiDAR into Autonomous RC Car
Autonomous vehicles rely on a variety of sensors to make decisions about navigation. These sensors must provide accurate, real-time data about objects within the operational environment. This research evaluates the integration of a Sick Tim 551 LiDAR for obstacle detection and compares its performance with data obtained from a depth-sensing camera to assess the effectiveness of these two sensing technologies. An Nvidia Jetson AGX Orin serves as the central computing platform, managing sensor data processing and vehicle navigation tasks. The vehicle uses the Robot Operating System 2 (ROS2) framework, combined with the NATURE stack, providing a robust and scalable software platform. This integration explores the tradeoffs in using a scanning LiDAR compared to a depth sensing camera in obstacle detection and avoidance.

232.
Name: Gomez, Isabel
Major: Political Science - Bachelor of Arts
School: Louisiana State University
Faculty Research Mentor: Danielle Thomas, Sociology, LSU
Project Category: Social Sciences

Policy Analysis (Comparison) of English Second Language Programs in Louisiana
Louisiana has one of the most rapidly growing populations of immigrants in the United States, including school aged immigrants. Many of these children are put into English Second Language in their new schools to; however, most of these programs are not equipped to handle the needs of these students. In the United States, there are few policy regulations for these programs nationwide, and Louisiana has a broad description of how these programs should be structured to help these students. The current system is not serving the students in a manner that would allow them to gain a proper education from these programs. Luckily, other states have also experienced an influx of English Language Students in the past and have studied different aspects of these programs that need to be targeted and improved to be successful. I plan to do a policy analysis between states, specifically Texas, to see what policies other states have in place regarding English Second Language programs and how they compare to Louisiana policy. I plan to set up a framework to compare policies between states English Second Language policies. I plan to use files, documents, and policies found publicly on state websites which describe the current policies in place. I plan to form my analysis based on the information that I gather from my framework/finding. With these findings, I plan to analyze what policies should be changed and altered in the current landscape of English Second Language policies in Louisiana to help the programs and improve the education of the students.

181.
Name: Gonzalez, Michael
Major: Architecture - Bachelor of Architecture
Faculty Research Mentor: Silvina Lopez Barrera, School of Architecture
Project Category: Arts, Music, & Design

Sustainability with Concrete in Latin America
Latin American architecture has long been known for its rich material culture, blending Indigenous practices with colonial legacies and modern innovations. In recent years, architects across the region have increasingly embraced sustainability, incorporating eco-friendly strategies into their designs and materials to address environmental challenges, promote social equity, and respect cultural heritage. Materiality plays a significant role in Latin American architecture in terms of functionality and aesthetics and in responding to the region's climate, geography, and socio-economic realities. Sustainable architectural strategies in Latin America are informed by contemporary environmental challenges such as climate change, urbanization, and a deep cultural connection to the land and local resources. Natural ventilation, thermal mass, and strategic shading devices should be used to reduce reliance on artificial heating and cooling systems. Integrating green roofs and courtyards helps reduce the urban heat island effect, improve air quality, and create valuable green spaces for social interaction. Sustainable materials in Latin America have become an increasingly important focus due to the region's rich biodiversity, environmental challenges, and growing demand for eco-friendly solutions. Many countries in Latin America are pioneering the use of sustainable materials in construction. By drawing on local materials, and integrating natural building strategies, Latin American architecture is setting a global example of how sustainability can be both environmentally responsible and culturally enriching due to the variety of experiences with climate change in Latin America, including tropical, desert, and temperate zones. Some materials can be sustainable and durable and withstand extreme weather conditions, from heavy rain in the Amazon to intense heat in arid regions. Materials and sustainability in Latin American architecture are intertwined with the region's diverse cultural and environmental context and the contemporary need to address climate change and social inequality.

233.
Name: Goodloe, Grace
Major: Fashion Design & Merchandising - Bachelor of Science
Faculty Research Mentor: Tommy Phillips, School of Human Sciences
Co-Author(s): JuYoung Lee, Adryana Mar, Elizabeth Frederickson, Laken Madison
Project Category: Social Sciences

Parental gift giving and its effect on their children's gift giving behavior in relationships.
This study will examine how parents' gift-giving behaviors influence their young adult children's gift-giving behaviors in relationships. Grounded in Bandura's Social Learning Theory, the research will explore the extent to which parental modeling shapes young adults' approach to gift-giving. While prior studies have analyzed parental influence on relationship dynamics, limited research has specifically addressed its impact on gift-giving behaviors. Survey methodology will be utilized to collect data from participants aged 18-25. Participants will provide insights into their perceptions of their parents' gift-giving habits and how these behaviors may have influenced

their own. The study aims to explore the relationship between parental gifting styles and young adults' gift giving behaviors. The anticipated findings are expected to suggest a significant relationship between parental gift-giving behaviors and young adults' gift-giving behaviors. It is expected that respondents who observed frequent and thoughtful gifting from their parents were more likely to engage in similar practices in their relationships. Conversely, it is expected that those with minimal exposure to parental gift-giving will be less likely to engage in gift giving behaviors. We expect results will reinforce the notion that gift-giving is a learned social behavior shaped by early experiences. In conclusion, the study is anticipated to highlight the intergenerational transmission of gift-giving behaviors via modeling and its implications for relationship-building and maintenance. Understanding these influences can provide insights for consumer behavior research and interpersonal relationship development.

26.
Name: Goodwin, Ryan
Major: Computer Science - Bachelor of Science
Faculty Research Mentor: Chuangchuang Sun, Aerospace Engineering
Project Category: Engineering

Offline State-Action Classification in Imbalanced Datasets
We propose a novel method for accurately classifying fragmented state-action pairs in offline reinforcement learning (RL), addressing the challenge of mixed-quality data commonly encountered in domains such as autonomous driving and robotics. Our approach leverages on-the-fly clustering of Q-value distributions from a well-trained critic to differentiate between varying action qualities. Specifically, we achieve 80% accuracy in distinguishing medium-quality from expert-quality actions and 99% accuracy in identifying expert actions from random ones. Additionally, we employ k-means clustering to discretize the state space, improving dataset representation and state distribution. While we evaluate our method within the context of Diffusion Q-learning, our approach is theoretically applicable to any offline RL algorithm that relies on value-based estimation. By enhancing the ability to classify state-action pairs, our method facilitates more efficient reinforcement learning on imbalanced datasets by enabling targeted data utilization. Furthermore, this framework provides a scalable solution for mitigating the challenges of learning from noisy and heterogeneous datasets, offering significant implications for real-world reinforcement learning applications.

27.
Name: Goolsby, Ethan
Major: Aerospace Engineering - Bachelor of Science
Faculty Research Mentor: Shreyas Narsipur, Aerospace Engineering
Co-Author(s): Rob Wolz, Evan Cavalier
Funding: Aerospace Engineering Senior Seminar
Project Category: Engineering

Load Analysis of Ice Formation on Propeller Performance
Uncrewed Aerial Vehicles (UAVs), utilized extensively across varying environments encounter substantial operational challenges in cold climates primarily due to ice accumulation on small propeller blades. This ice build-up can significantly diminish efficiency and potentially lead to propulsion system failure. This study specifically investigates the aerodynamic effects of ice formation on UAV propellers, concentrating on the APC 10"x5" propeller model. Employing LEWICE software, a computational tool for simulating ice accretion, this research delineates the patterns of ice formation on propeller blades under diverse operational conditions, including varying rotational speeds (RPM) and different durations of exposure. Subsequent to the simulations, the ice accretion patterns were precisely replicated using Computer-Aided Design (CAD) software, and physical models were fabricated using high-resolution 3D resin printing. These models facilitated direct experimental testing. The experimental phase was conducted at the Patterson Engineering Laboratory at Mississippi State University, where static tests on these propellers were performed to evaluate the effects of ice on propeller performance. The primary focus was on observing variations in thrust and torque outputs due to ice accumulation. The findings from this study aim to provide critical insights into the specific aerodynamics penalties imposed by ice formation when UAVs are in a hovering state. By quantifying these impacts, the research seeks to contribute to the enhancement of UAV design and operational strategies, ensuring better performance and reliability under icy conditions. This research not only broadens the understanding of UAV operational limitations in cold weather, but also serves as a pivotal resource for future developments in UAV technology and anti-icing mechanisms.

234.
Name: Gough, Grace
Major: Agricultural Science - Bachelor of Science
Faculty Research Mentor: Jessica Benson, School of Human Sciences
Funding: College of Agriculture and Life Sciences URSP
Project Category: Social Sciences

The M.E.N.T.O.R. Project: Understanding Student Needs for Mentorship and Networking
With the growing demand for students to be prepared to enter the workforce, mentorship plays a vital role in student success, career readiness, and personal development. However, little research explores what students expect from a high-quality mentorship experience. This study examines undergraduate students' perspectives on effective mentorship, the types of mentor-mentee relationships they find most beneficial, and potential benchmarks for success. Findings indicate while students recognize the benefits of mentorship, they often struggle to find meaningful opportunities. Rather than seeking a single mentor, students pursue guidance in specific areas such as networking, career development, academic success, mental health, leadership, financial planning, and work-life balance. Additionally, participants expressed interest in a university-facilitated mentorship program that matches them with mentors based on career goals and prospective industries. These results highlight the need for higher education institutions to recognize the diverse mentorship needs of students and develop initiatives that provide targeted support. By aligning mentorship opportunities with student expectations, universities can foster meaningful mentor-mentee relationships to enhance both personal and professional growth.

114.
Name: Grant, Tara
Major: Animal and Dairy Science - Bachelor of Science
Faculty Research Mentor: Tim Boltz, Poultry Science
Co-Author(s): Emily Magee, Michael Carrol
Funding: College of Agriculture and Life Sciences URSP
Project Category: Biological and Life Sciences

Evaluation of Formaldehyde and Glycerol Monolaurate Products on the Reduction of Salmonella and Escherichia Coli in Mash Broiler Feed
Pathogen control in feed has gained more attention over recent years. Currently, some specific pathogens of interest are Salmonella and Avian Pathogenic Escherichia Coli (APEC). These pathogens can reduce bird performance and lead to a food safety concern that can cause human illness. One solution manufacturers can utilize is feed-safe antimicrobials to disinfect equipment and feed. The current study investigated the efficacy of using formaldehyde (Product 1) and glycerol monolaurate (Product 2) at two different inclusion rates (75g and 150g) as antimicrobials to reduce pathogen numbers in mash broiler feed. A corn and soybean meal diet was batch-mixed before treatment with antimicrobials. This study was repeated 3 times, with each run consisting of 8 treatments. Depending on the treatment, Product 1 or 2 were applied to feed contaminated with either Salmonella or an APEC inoculum. After each treatment was mixed, feed and swab samples were taken from the mixer. Samples were assessed for Salmonella or APEC colony enumeration and prevalence. Each sample was plated and diluted for enumeration on Xylose-Lysine-Tergitol 4 or MacConkey agar. For prevalence, Salmonella samples were enriched in Tetrathionate broth, and APEC was enriched in LB broth before being plated. All data was analyzed using SAS with a one-way ANOVA for enumeration and Chi-square for prevalence data. Significance was set at $\alpha \leq 0.05$. For Salmonella results, the use of formaldehyde demonstrated significantly lower counts ($P<0.0001$) and prevalence ($P<0.0001$) when compared to all other treatments. Similar results were observed for APEC, with formaldehyde having the lowest counts compared to all other treatments, with Product 2 at 150g being intermediate to the untreated treatment ($P<0.0001$). No differences were observed for APEC prevalence. These data suggest that formaldehyde was a stronger antimicrobial than this glycerol monolaurate at two inclusion rates.

115.
Name: Green, Claire
Major: Biochemistry - Bachelor of Science
Faculty Research Mentor: Priyadarshini Chakrabarti Basu, Entomology, Washington State University
Co-Author(s): Blake U'ren, Ethan Eaton, Asmita Gautam, Pierre Lau
Funding: College of Agriculture and Life Sciences URSP
Project Category: Biological and Life Sciences

Creating a phenology wheel for the Southeast Region
Beekeepers often choose habitat for bees without an understanding of the availability of floral resources that bees forage upon. Better

understanding of floral resources would aid researchers in choosing the right habitat as they aim to strengthen bee populations, which are critical for agricultural production worldwide. The objective of this project is to create a database of pollen samples collected throughout the state of Mississippi that beekeepers and researchers can use to improve their knowledge of bee habitats. The database will show the phenology of numerous plant species. The project involves working with beekeepers as citizen scientists to obtain pollen samples from honey bee colonies every month. The samples are then color sorted and acetolyzed for plant identification. The long-term goal of the project is to capture the seasonal plant diversity across the region which can be good sources of pollen for all bee species.

185.
Name: Green, Madelynn
Major: Anthropology - Bachelor of Arts
Faculty Research Mentor: Olivia Elliott-Smith, English
Project Category: Humanities

Traveling Jack: Tracing Settler Identity through Appalachian Folklore
Archaeology and Folklore have long had a tense relationship, but in an era of archaeology focusing more and more on the current and descendant communities, archaeologists must begin to engage folklore traditions in their work. By engaging archaeology and folkloric methods both fields can benefit. In the case of this study, I have used the "Traveling Jack" story, a common folk tale with English, Scottish, Irish, and Appalachian versions that involves a young man using his wits to overcome a series of challenges to achieve various happy endings, to trace Scottish and Irish settlement and reinvention in the Appalachian Mountains of the United States South. By analyzing various "Traveling Jack" tales and comparing motifs across cultures I argue that Scottish and Irish identities are maintained in Appalachian identity through these tales.

116.
Name: Greene, Victoria
Major: Wildlife, Fisheries & Aqua - Bachelor of Science
Faculty Research Mentor: Michael Sandel, FWRC-Wildlife,Fisheries&Aquaculture
Co-Author(s): Kayla Fast, Marcus Drymon
Funding: College of Forest Resources Undergraduate Research Scholars Program
Project Category: Biological and Life Sciences

Microplastic and Mesoplastic Quantification in Cartilaginous Fishes in the Northern Gulf of Mexico
Humans produce 400 million metric tons of plastic waste per year. It is estimated that every year 8 million metric tons of plastic enter our oceans. Microplastics are plastics <5 mm in diameter and mesoplastics are larger particles ranging 5 mm to 2.5 cm in diameter. Microplastics and mesoplastics are becoming a greater concern because they can be found virtually everywhere including food, air, plants, and corals. These plastics have a high affinity to heavy metals and may absorb them. Since they are unmoving, microplastics are easy targets for consumers. This sparks the question of how these microplastics affect organisms and how microplastics move through the trophic levels. To understand the complex relationships between trophic levels and microplastics, we collected the lower intestines of cartilaginous fishes caught at Deep Sea Fishing Rodeos in the northern Gulf of Mexico. Collections included rays (n = 5) and sharks (n = 15). Microplastics and mesoplastics were extracted from tissues using KOH organic digestion and isolated via filtration. The amount of microplastics in the lower intestines of cartilaginous fishes was quantified using a light microscope. From the samples that have been analyzed, numerous microplastics have been found in each sample. There is one category of microplastics that is most abundant in each sample, which are microfibers. This could be because of ingesting fishing line during capture times (fishing).

182.
Name: Guevara-Gonzalez, Billy
Major: Architecture - Bachelor of Architecture
Faculty Research Mentor: Silvina Lopez Barrera, School of Architecture
Project Category: Arts, Music, & Design

Cultural Significance Through Materiality in Latin America
Throughout Latin America, materiality has been utilized to express cultural significance through contextual, historical, and social responses in terms of designing in the built environment. The use of traditional materials can tie into the form and function of a structure by informing the user through visual and interactive experiences. Concrete and adobe are common building materials that are used in design throughout Central America as they have been a key component in response to the context and culture that surrounds the people and how they view and interact in the built environment. The use of these materials is integrated and expressed in different design elements of a building such as in structural and aesthetical components. Designers take into consideration site context and how they use these materials to maintain a cohesive union between weather conditions and how it affects the users of a space on a day-to-

day basis. Such use of the materials reflects the way a building is designed to function in terms of implementing vernacular strategies that allow a space to take a traditional approach as reference to Latin American culture. The form of these structures is more integrated into the cultural context due to the flexibility of concrete and adobe as a building material. A key factor to why these materials have been utilized so much is credited to adapted local construction techniques that have been placed throughout time and are still practiced due to their low environmental impact. This serves as a connection to the culture placed in different contexts with the traditional design values that have been embedded in the culture that surrounds these materials in Latin American architecture. Concrete and adobe are two examples that are commonly used to express these design values that reflect into the cultural context that surrounds the built environment.

190.
Name: Gupta, Niraj
Major: Computer Science - Bachelor of Science
Faculty Research Mentor: Sabhyata Lamichhane, FWRC - Forestry
Co-Author(s): Sushma Bhattarai
Funding: Department of Forestry
Project Category: Business and Economics

The Economic Contribution of Mississippi's Forestry and Forest Products Industry Across Counties: An Input-Output Analysis
Mississippi's forestry and forest products industry plays a vital role in local economies, generating employment, income, and economic output across multiple counties. This study evaluates the industry's economic contributions at a county level using 2022 data, focusing on direct, indirect, and induced impacts. The analysis employs the Impact Analysis for Planning (IMPLAN) system, which categorizes the industry into four major forest product sectors, forest support services, and related non-forestry sectors. Findings indicate that the industry supported between 140 and 2,280 jobs, representing 6.23% to 29.76% of total county employment. Total labor income ranged from $4.6 million to $101.9 million, accounting for 5.78% to 32.59% of countywide income. Economic output contributions varied between $14.7 million and $473.3 million, making up 0.45% to 36.57% of total county economic output, while value-added impacts, reflecting new wealth generation, ranged from $6.1 million to $142.1 million, comprising 4.07% to 28.43% of county value-added. Among the counties analyzed, Chickasaw County exhibited the highest economic contribution, whereas Benton County had the lowest. These findings underscore the forestry sector's critical role in sustaining Mississippi's county economies through direct employment and stimulating broader economic activity. Continued industry support and strategic policy planning are essential to ensuring long-term growth and maximizing the sector's economic impact at the county level.

65.
Name: Gupta, Surabhi
Major: Wildlife, Fisheries & Aqua - Bachelor of Science
Faculty Research Mentor: Adam Skarke, Geosciences
Funding: Shackouls Honors College Research Fellowship, ORED Undergraduate Research Program
Project Category: Physical Sciences

Predictive modeling for deep-sea corals using geophysical data
Seafloor seeps are locations where gas is discharged from marine sediments into the deep sea. Methane released at seeps drives a wide range of interconnected biogeochemical processes, resulting in unique chemosynthetic ecosystems with high biodiversity. Due to their remote location, these ecosystems are understudied and there is a particular lack of information on benthic species distribution. Limited seafloor data collected by submersibles at seeps are available; however, it is labor intensive to manually evaluate species distribution with these data. Here, we develop a spatial distribution model for deep sea corals of genus *Paragorgia*, at the Veatch Canyon seep site. A presence only maximum entropy model was developed to predict the spatial distribution of the corals based upon surveyed seafloor acoustic backscatter and bathymetry data. Ten-fold cross validation was used to evaluate model predictive skill. This approach predicted coral presence with 72.97% accuracy with only 11.45% of the study area classified as having potential presence. Seafloor depth and slope as well as distance from the seeps, had the most impact on the probability of coral presence. This method is complimentary to traditional ecological methods of species distribution modeling where geophysical data are available and leverages the multi-disciplinary nature of science. Future work will incorporate additional environmental data including angular range analysis seafloor classification to improve model predictive skill.

117.
Name: Hall, Alexis
Major: Animal and Dairy Science - Bachelor of Science
Faculty Research Mentor: Molly Nicodemus, Animal & Dairy Science
Co-Author(s): Emma Farnlacher, Emily Curran, Madison Vandiver, Clay Cavinder, Marcus McGee
Funding: College of Agriculture and Life Sciences URSP
Project Category: Biological and Life Sciences

Is equine interaction performed through virtual reality as effective in reducing cortisol concentrations within college students compared to working directly with the horse?

Equine interaction is emerging as an alternative therapeutic intervention and has proven to be beneficial to the mental health and wellness of college students; however, accessibility to the equine environment can be a limiting factor to potential participants. On the other hand, virtual mental health services have grown in popularity due to accessibility and convenience, but current telehealth services do not offer virtual equine interaction opportunities. Therefore, the purpose of this study was to determine whether equine interaction performed through virtual reality is effective in reducing stress within college students as observed through cortisol concentrations compared to working directly with the horse. Salivary cortisol samples were collected from two sample populations: A) college students directly interacting with a horse (n = 14) and B) college students interacting with a horse through virtual reality (n = 12). Both treatment types were performed at the same location and lasted under one hour with equine activities that included ground-based handling. Collections of salivary cortisol were taken pre- and post- the equine interaction for both treatment types with t-tests utilized to compare pre-post samples within treatment type and comparison between treatment types were evaluated using analysis of variance (ANOVA). The significance level was set at 0.05. Cortisol concentrations did not change with direct equine interaction (P = 0.053) nor with virtual reality equine interaction (P = 0.091). Cortisol concentrations were not influenced by treatment type (P = 0.071). The results suggest that direct interaction with the horse does not offer additional benefits over virtual equine interaction, thus, allowing more accessibility to participants that may have limited accessibility or other restrictions that would hinder working directly with the horse.

235.
Name: Hamilton, Lauren
Major: Psychology - Bachelor of Science
Faculty Research Mentor: Cliff McKinney, Psychology
Project Category: Social Sciences

Maternal Involvement Effects on Emerging Adults' Psychological Problems

The current study examined the effects of maternal involvement (MI) on psychological problems (PP) in emerging adult men and women via parental solicitation (PS). Results indicated that maternal involvement had a negative indirect effect on psychological problems, focusing mainly on the mother-child dyad. Prior research has highlighted the significance of parental involvement in adolescent well-being. Agarwal et al. (2024) found that perceived parental involvement was the strongest predictor of well-being. Desmarais & Poulin (2023) explored maternal knowledge acquisition during childhood, finding that maternal solicitation declined for girls but remained stable for boys. Romm & Metzger (2021) examined a broader range of parenting behaviors, linking them to various adolescent problem behaviors. Mounts & Valentiner (2021) analyzed mother-adolescent discussions about peer relationships, noting higher conflict predicted lower prosocial behavior and greater victimization. The current study expands on this research by focusing on maternal involvement in emerging adulthood. It was hypothesized that MI, in conjunction with PS, would negatively correlate with PP. Participants included 604 emerging adults (77.2% women, 22.8% men), aged 18 to 25 (M = 18.72, SD = 1.16). PROCESS 4.2 (Hayes, 2022) Model 1 was used for moderation analysis. The model was significant, R^2 = .16, $F(3, 432)$ = 26.51, p < .001. MI was negatively associated with PP (B = -1.09, SE = 0.18, p < .001). PS was also negatively associated with PP but not significant (B = -0.34, SE = 0.28, p = .23), and the interaction of the moderator was non-significant (B = -0.001, SE = 0.03, p = .96). This is the first study to examine maternal involvement's impact on psychological problems in emerging adults within the context of solicitation. Findings reinforce the importance of maternal support in emerging adulthood but suggest that the method involvement is expressed may be more influential in mitigating psychological distress.

236.
Name: Hamilton, Olivia
Major: Psychology - Bachelor of Science
Faculty Research Mentor: Julia Soares, Psychology
Project Category: Social Sciences

Paper or Digital? Comparing Vocabulary Learning from Internet Search to a Physical Dictionary
With an increasingly technology based educational environment, there are many questions if there is a change in the effectiveness of learning when information can be re-accessed with the click of a mouse. Information is more accessible than ever online but expecting to be able to rely on the internet might make learning less effective than it otherwise would be. Research has shown possible deficits such as digital amnesia, which could imply a digital basis is harming the learning environment. Internet searches are so easy to conduct that people sometimes mistake information found online for their own knowledge. The goal of the study conducted was to investigate whether there was a difference in foreign language vocabulary learning and metacognitive expectations of learning when participants learned using internet search (Google Translate) compared to using a paper dictionary. At total of 136 participants were tasked with translating English words using either a paper dictionary or Google Translate into Dutch. Then participants completed both a math distractor task and a metacognitive analysis survey, in which participants estimated how many of the Dutch words they would be able to translate back to English on a later test. Finaly, participants were tested on the words they had learned. The test presented Dutch words and required the participant to type in the English translation. They then repeated the task with a new set of words using the opposite strategy (Google Translate or the paper dictionary) as they did in the first round. This study found no significant difference in memory test performance between conditions. Further, participants did not make significantly different metacognitive predictions between the two conditions. These findings are inconsistent with the findings of previous studies. Previous studies indicated that there is an increased confidence in learning with an internet search but an increased testing accuracy utilizing a paper source.

118.
Name: Hansen, Parker
Major: Nat Res & Envir Conservation - Bachelor of Science
Faculty Research Mentor: Courtney Siegert, FWRC - Forestry
Co-Author(s): Waqar Shafqat, W. Cade Booth, Austin Himes, Heidi Renninger
Funding: Department of Energy Bioenergy Technologies Office (DE-EE0009280)
Project Category: Biological and Life Sciences

Exploring how soil microbial amendments alter root structure across six poplar genotypes
Poplar species are ideal woody bioenergy crops, due to their fast growth rates. In these production systems, trees can be harvested through coppicing at 2-3 year intervals, leaving intact root systems that enhance underground carbon sequestration. Recent field trials have demonstrated that soil microbial amendments with endophytes have the potential to enhance productivity and provisioning of ecosystem services. In order to better understand these relationships, we excavated and destructively sampled the root systems of 36 trees across six poplar genotypes, half of which were inoculated with endophytes at the start of a field trial four years ago. Roots were then cleaned and categorized based on root diameter (fine: <2mm, small: 2-5mm, coarse: 5-10 mm, large: >10mm). In addition to destructive root sampling, total belowground biomass and biomass partitioning across varying root sizes was also determined. While results are still pending, we expect to find structural differences in root partitioning across the several genotypes. Furthermore, we expect these differences to be correlated between aboveground growth and belowground carbon sequestration.

273.
Name: Harman, Elena
Major: Secondary Education - Bachelor of Science
Faculty Research Mentor: Eric Vivier, English
Project Category: Humanities

Manipulation and Identity in Shakespeare's *The Taming of the Shrew*
Shakespeare's *The Taming of the Shrew* presents two interwoven narratives that explore the power of manipulation in shaping identity: the Lord's deception of Christopher Sly in the induction scenes and Petruchio's taming of Katherine in the main play. This essay examines how both the Lord and Petruchio employ environmental, psychological, and perceptual manipulation to dismantle their subjects' realities and impose new identities upon them. While much critical discourse focuses on the induction as a theatrical device to highlight Petruchio's methods, this analysis extends the conversation by emphasizing the parallel outcomes of Sly and Katherine's transformations. Unlike interpretations that view Katherine's final speech as either ironic resistance or genuine submission, this essay argues that her speech is the culmination of sustained manipulation, much like Sly's acceptance of his fabricated nobility. By drawing

connections between the methods used in both narratives, this study demonstrates how *The Taming of the Shrew* reveals the unsettling ease with which identity can be reconstructed through coercion, ultimately questioning the stability of identity under external control.

28.
Name: Harris, Erin
Major: Computer Science - Bachelor of Science
Faculty Research Mentor: Michael Navicky, HPC2
Co-Author(s): Matthew Brockhaus
Funding: MSU HPC2
Project Category: Engineering

Hands-On Parallel Computing: Empowering Undergraduates Through HPC-Driven Learning
High-Performance Computing (HPC) is a crucial skill for solving large-scale computational problems, but undergraduate students – as well as prospective graduate students – often have limited exposure to both the HPC environment and general parallel programming. This project provides students with hands-on experience in developing parallel versions of open-source C codes in a student-driven learning environment. Unlike traditional coursework, students select their own problems, allowing them to take full ownership of their work. Throughout the semester, they develop, test, and optimize their codes on HPC^2 's cluster (Ptolemy), becoming proficient in parallel programming and comfortable in the HPC environment. Students begin by selecting small-scale algorithms based on perceived complexity, relevance to past coursework, and personal interest. Using MPI, they implement parallel versions, analyze performance improvements, and refine their approaches through load balancing and optimization techniques. Weekly group meetings provide students a collaborative space for troubleshooting and supporting personnel a diagnostic tool to gauge each students' progress. By semester's end, students compile their codes, documentation, and benchmarks into an open-source repository aimed at accelerating the learning process for those new to parallel computing. The project concludes with students presenting their quantitative and qualitative results to HPC^2 personnel. Preliminary results show that direct engagement with an HPC cluster and its supporting personnel enhances technical proficiency and HPC literacy, equipping students with practical skills for research and industry. Students perceive working in an HPC environment as a valuable "stepping stone" for future careers. The project will expand in the next semester to tackle more complex, real-world problems and GPU-based parallelization, further advancing students' computational expertise. This presentation will outline the project's structure, key results, and its impact on undergraduate HPC education.

29.
Name: Hayden, Hinson
Major: Business Administration - Bachelor of Business Adm
Faculty Research Mentor: Jonathan Barlow, Data Science
Co-Author(s): Jason Colleran
Project Category: Engineering

Data Recording Arm Sleeve
This Data Recording Arm Sleeve will need to contain sensors that can record arm speed, angle, and torque on the ball being thrown. These sensors are called IMU's. There is an app that is programmed and connected to the arm sleeve sensors where all the data is recorded. Using Data Science, the app will use all the data and calculate an output for the amount of throws is needed without damaging or hurting your arm. Using this data analysis for baseball, a team, trainer, or a player may overlook certain underlying values of arm health, and continue to play or practice. These outputs from IMU's will help determine how big of a risk of injury a player really is. The use of statistical analysis is used for initial data exploration and to understand the relationship between these different variables. These outputs can also help determine the player's mechanics of throwing, injury prediction, and their fatigue or recovery.

267.
Name: Higginbotham, Tess
Major: Architecture - Bachelor of Architecture
Faculty Research Mentor: Aaron White, School of Architecture
Funding: College of Architecture, Art, and Design Research Grants Program
Project Category: Arts, Music, & Design

Assessing the Capabilities of AI in Architectural Analysis and Education
This research explores the capabilities of ChatGPT image analysis and production in the context of architectural education, particularly through the lens of architectural history. Research proceeded along two trajectories: 1) providing a detailed description of a building or element and asking ChatGPT to produce an image based on the said description, 2) providing an image and asking ChatGPT to analyze or make improvements to the image. Throughout the process a few common threads have surfaced: ChatGPT's default is producing images that rely on novelty of artistic aesthetics, the suggestion of reiterations or image edits results in a completely new and

sometimes unrelated result, and detail elements of images that are not a part of a pattern it can "read" will not be recognized. AI appears to "read" images based on pixelation patterns it recognizes and similarity to other images it has access to. With every image produced, ChatGPT attaches a list of criteria apparently followed to produce drawings, particularly if the requested drawing is meant to fit into a specific architectural style. This list stays at surface level though and does not drastically change with each new iteration, as if AI does not fully perceive the two formats, text and image, as a pair but rather their own individual deliverables. These patterns raise questions about whether AI is capable of diagramming historic buildings similarly to a precedent analysis, whether ChatGPT can consolidate and reproduce the distinctive features that define architectural styles, and to what extent it maintains its own artistic style or if the said style can be changed upon request. This deeper awareness of how AI corresponds text to imagery, particularly where the discrepancies lie, offers a valuable perspective for shaping how this tool can be utilized for architectural instruction.

203.
Name: High, Jamya
Major: Kinesiology - Bachelor of Science
Faculty Research Mentor: Stamatis Agiovlasitis, Department of Kinesiology
Co-Author(s): Maria Haider, Ariel Colburn, Katerina Sergi, Guillermo R. Oviedo
Funding: ORED Undergraduate Research Program
Project Category: Education

Self-Determination Theory in an Adapted Dance Program: Perspectives of Adults with Down Syndrome, Parents, And Volunteers
Adapted dance programs for adults with Down syndrome (DS) grounded in Self-Determination Theory (SDT) may increase motivation for physical activity. Insight on this may be gained by examining the perspectives of adults with DS, parents, volunteers who contribute to such programs. We investigated how an 8-week adapted dance program supported autonomy, competence, and relatedness in individuals with DS, from the perspectives of adults with DS, parents, and volunteers. The program was conducted for 8 weeks (once a week; 60 min/session). Two dance styles were used – 4 weeks of hip hop and 4 weeks of jazz. Semi-structured interviews were conducted with 5 adults with DS (2 men; age 35 ± 12 years), 5 parents (2 men; age 61 ± 12 years), and 5 volunteers (1 man; age 20 ± 1 years) after the program. Data were analyzed using open, axial, and focused coding to identify themes. All groups highlighted the importance of social interaction in the program. Adults with DS reported that they enjoyed dancing with others and gained skill and confidence. Adults with DS mentioned that they felt a sense of freedom and independence in the program, as they could choose music, suggest activities, and dance in a preferred style. Parents and volunteers reported that the program fostered autonomy by allowing participants to choose, competence by helping them master new moves, and relatedness by promoting meaningful connections. Participants expressed enjoyment and pride in their progress, aligning with SDT's intrinsic motivation aspect. All groups reported that participants enjoyed the program. Themes included: (a) autonomy and self-expression; (b) competence, skill development and positive feedback; (c) social connection and belonging; and (d) enjoyment of dance as a motivator. Adults with DS, parents, and volunteers concurred that the dance program promoted autonomy, competence, and relatedness in individuals with DS.

119.
Name: Hinton, Joseph
Major: Biochemistry - Bachelor of Science
Faculty Research Mentor: Federico Hoffmann, Biochemistry Nutrition Health Promo
Co-Author(s): Wes Schilling, Hunter Walt, Sawyer Smith
Funding: College of Agriculture and Life Sciences URSP
Project Category: Biological and Life Sciences

Transcriptomic responses in Ham Mites (*Tyrophagus putrescentiae*) to propylene glycol exposure
Tyrophagus putrescentiae, commonly called ham mite, are tiny arachnid pests that infest dry-cured ham and aged cheeses costing producers millions of dollars every year. In the past, methyl bromide fumigation was utilized to stop these infestations. However, regulatory changes and environmental concerns are forcing the industry to look for alternatives. Propylene glycol can be used as an effective treatment to prevent ham mite infestation. Our goal is to better understand how mites respond to this agent. To do this, we decided to examine how exposure to propylene glycol impacts overall gene expression of ham mites. We collected twelve samples of ham mites from prepared ham cubes, with six being treated with propylene glycol, and six being untreated controls. Total RNA was extracted from pooled ham mites sequenced with mRNA enrichment. The resulting reads were used to quantify transcript abundance and used for differential expression analysis. Our results show how propylene glycol impacts the ham mite's transcriptome, providing insights to its efficacy as a method of ham mite control.

120.
Name: Hinton, Joseph
Major: Biochemistry - Bachelor of Science
Faculty Research Mentor: Federico Hoffmann, Biochemistry Nutrition Health Promo
Co-Author(s): Hunter Walt, Jose Ramirez, Kristen Duffield
Funding: USDA ARS
Project Category: Biological and Life Sciences

Differential Gene Expression in the Tropical House Cricket and its Iridovirus in Heathy versus Diseased Populations
The tropical house cricket, Gryllodes sigillatus, is a mass-produced cricket that is often used as a protein source for pets and livestock. Mass-rearing creates ideal conditions for the spread of pathogenic microbes due to crowding and the cricket's high genetic relatedness. Cricket iridovirus (CrIV) is a pathogen that impedes cricket growth and can cause a significant loss of product for cricket farmers. Interestingly, recent studies have shown that that CrIV is present in most G. sigillatus populations, yet it is unknown why symptoms arise in some populations more than others. To address this, we sampled populations of healthy and diseased crickets and examined differences in cricket and CrIV gene expression. Using differential expression analysis and functional enrichment analysis, we found that there are large differences in gene expression between healthy and diseased crickets, including genes involved in immunity. When we investigated patterns of CriV gene expression, we found that while diseased populations have high expression across the entire CriV genome, healthy populations only have high expression at a single locus. Our results shed light on the cricket immune response to CrIV infection and identify a gene that is implicated in covert infections of CrIV, which likely works to suppress the host's immune response.

30.
Name: Ho, Kevin
Major: Computer Science - Bachelor of Science
Faculty Research Mentor: Zhiqian Chen, Computer Science and Engineering
Funding: ORED Undergraduate Research Program
Project Category: Engineering

Infrastructure Interactions: A Simulation-Based Study of Power and Traffic Networks
This project examines the interplay between two interconnected dynamical systems: a power network and a transportation network. By integrating PyPSA for power grid modeling and SUMO for traffic simulation, we investigate how power failures in a region directly affect traffic congestion. The study gives statistics on congestion in different areas of roads to understand the effects of power outages on traffic flow. Power network failures are modeled using localized outages in substations and transmission lines, affecting traffic lights and routing behaviors within the transportation network. The SUMO simulation models the traffic congestion caused by these power disruptions. The results highlight the nonlinear dependencies between power availability and traffic efficiency, offering a framework to build upon for investigating the interplay between dynamical systems.

31.
Name: Hoffmann Meyer, Martina
School: Starkville High School
Faculty Research Mentor: Christopher Hudson, CAVS Research
Co-Author(s): Riku Kikuta, Christopher Goodin, Daniel Carruth
Project Category: Engineering

Assessment of Autonomous Vehicle Localization
This work evaluates the localization accuracy of the Polaris MRZR vehicle using LiDAR sensors and odometry. Understanding the precision of these localization methods is critical for enabling autonomous off-road operations in GPS denied environments. Three driving scenarios – stationary, loop, and trajectory – were evaluated to assess the localization accuracy. In the stationary task, the MRZR remained stationary at three predefined locations, each representing different canopy conditions: a closed canopy forest location, a partially covered canopy, and an open field. Five localization data collections, each lasting ten minutes, were conducted at each stationary location. The loop task involved the MRZR repeatedly navigating a predefined route within a parking lot, consistently beginning and ending at the same point, with fifteen data collections conducted. For the trajectory task, the vehicle traversed a gravel road featuring multiple hills, also with fixed start and end points, collecting fifteen sets of localization data. All data collections occurred across multiple days and at varying times, ensuring a thorough evaluation of localization performance under diverse conditions.

274.
Name: Holden, Jackson
Major: Business Administration - Bachelor of Business Adm
Faculty Research Mentor: Whit Waide, Political Science and Public Adm
Project Category: Humanities

Questioning *Marbury v. Madison*
The ruling of Marbury v. Madison has been unchanged since 1803, a phenomenon uncommon with the United States Supreme Court. Previous research points to the age of the case, politics, and the timeframe of which Marbury was decided as factors that have largely cemented it into history. Legal scholars debate this issue in detail spanning several law review journals. This article is an attempt to resolve the arguments between these scholars and summarize the history and significance of Marbury v. Madison, and why it remains relevant two-hundred years later.

121.
Name: Horner, Amelia
Major: Wildlife, Fisheries & Aqua - Bachelor of Science
Faculty Research Mentor: Chris Ayers, FWRC-Wildlife,Fisheries&Aquaculture
Funding: 2024-25 CFR/FWRC Undergraduate Research Scholars Program
Project Category: Biological and Life Sciences

Fire Ant Disturbance Frequency
Fire ants are an invasive species, with the most persistent problems being in the Southeastern United States. These insects cost the American economy millions of dollars in damages every year towards infrastructure and crops. Fire ants are proven to prefer disturbed areas, but we search to answer the question of what the point of too much disturbance is. This study will examine how frequent disturbance affects the density and frequency of fire ant mounds, to therefore determine disturbance's effects on survival and reproduction. For the experiment, we will quantify the amount of fire ant mounds on a few acres of land, split into four equal quadrants. We will disturb these mounds once a day, every other day, every three days, and leave one with no disturbance at all, and the study will run for 30 days each trial. An active mound will be determined by the presence of ants upon disturbance. The individual mounds will be marked by both GPS coordinates and flags, and the disturbance will be made equal with the use of a garden hoe to flatten each mound to equal disturbance. Our hypothesis is that the increased disturbance will decrease the amount of fire ant mounds in each area with the most mounds disappearing from the site that is disturbed every day, and the disappearance time increasing with increased gaps between disturbances. We also hypothesize that disturbance will decrease the size of each fire ant mound the more often it is disturbed. With our outcome, we believe that this research can be used to influence management to minimize the cost spent dealing with this threat and possibly preventing some percentage of fire ant stings.

122.
Name: House, Nick
Major: Finance (Undergraduate) - Bachelor of Business Adm
Faculty Research Mentor: Galen Collins, Biochemistry Nutrition Health Promo
Project Category: Biological and Life Sciences

Impact of Antibiotics on Chicken Muscle Growth
The widespread use of antibiotics in poultry farming has raised concerns about its impact on chicken muscle development and overall meat quality. While antibiotics are often used to promote growth and prevent disease, their potential effects on muscle degradation remain unclear. This study seeks to determine whether the removal of antibiotics from chicken diets leads to increased muscle protein breakdown by measuring 3-methylhistidine levels in fecal samples. Since 3-methylhistidine is a specific marker released during muscle protein degradation, its presence in feces offers a detailed view of the extent of muscle degradation. To address this question, we will compare fecal samples from antibiotic-treated and antibiotic-free chickens. This study involves extracting proteins from these samples, hydrolyzing them to release amino acids, and isolating 3-methylhistidine using reverse-phase chromatography with a C18 column. To ensure precise detection, amino acids will be fluorescently labeled with ortho-phthalaldehyde (OPA) and analyzed using high-performance liquid chromatography (HPLC) with fluorescence detection. This method allows for accurate quantification of 3-methylhistidine levels across different treatment groups. We anticipate that chickens raised without antibiotics will exhibit higher levels of 3-methylhistidine, indicating greater muscle degradation compared to those receiving antibiotics. These findings will provide valuable insights into the role of antibiotics in preserving muscle integrity and influencing poultry meat quality. By understanding these effects, this research may contribute to shaping antibiotic use policies and best practices in the poultry industry.

191.
Name: Hubbard, Emily K
Major: Business Administration - Bachelor of Business Adm
Faculty Research Mentor: Myles Landers, Marketing/Quant Analysis/Bus Law
Co-Author(s): Colin Gabler
Funding: College of Business
Project Category: Business and Economics

"From Eco-Hero to Eco-Villian: How Product and Service Signals Influence Customer Choice"
Environmental concerns have gained significant attention due to growing awareness of the harmful effects of carbon emissions, advancements in sustainable technology, and increased media coverage. As consumers become more conscious of corporate environmental impact, research suggests a positive association between environmental corporate initiatives and consumer support. In response, companies have started publicizing sustainability savings for product and service choices in hopes of influencing customer choice. For example, airlines now report their carbon emissions, and major retailers are reducing packaging waste by offering order consolidation. The prevailing literature has looked at factors influencing green purchase behavior and why it is important for companies to pursue green initiatives. However, what remains underexplored is how customers balance key signals (such as price, delivery time, emission savings, etc.) when purchasing products and services. Given this gap, our research will explore consumer purchase behavior when given the choice between eco-friendly or harmful emission options under different pricing conditions. We will conduct two data collections. The first will provide a baseline, keeping all factors equal except for carbon emission information. The second collection will simulate a more complex decision process by adding price differences. We expect these results to provide meaningful insights to managers about how to promote key product and service attributes to their customers.

32.
Name: Hurley, Daniel
Major: Aerospace Engineering - Bachelor of Science
Faculty Research Mentor: Rob Wolz, Aerospace Engineering
Co-Author(s): Madelyn Berry, Elijah Frazure, Mims Hillis
Funding: Mississippi Space Grant Consortium
Project Category: Engineering

Utilization of a Portable Ground Station to Conduct Site Surveys in the S-Band Frequency for CubeSat at MSU's Mission
CubeSat at MSU is an undergraduate student-led design team working to construct, launch, and operate Mississippi's first satellite. The 1-Mississippi mission is focused on wildfire detection through hyperspectral imaging and thus requires a ground station that will accommodate a large bandwidth at a high frequency. An efficient ground station operating in the S-band frequency (2-4 GHz) is vital to downloading the large image files for a successful mission. A simplified and portable ground station was constructed to conduct site surveys on and around the Mississippi State University campus to test the feasibility of a permanent location, the Line of sight (LOS), possible radio interferences, and the noise floor. The system consists of a 1.76 GHz 6.5 turns Helicone antenna, 2.4 GHz Grid antenna, Yaezu 5500 Elevation-Azimuth Dual Controller, counterbalanced boom, 4ft mast, linux based base station, G-Predict antenna and satellite tracking software, SDR++ SDR software, CaribouLite dual channel 6GHz sub 1GHz transceiver, and custom Arduino based RS232 controller to interface to the G5500. This research details the design and construction of the test ground station within the constraints of the mission, the site survey test procedure, and the results of the experimentation.

123.
Name: Intorcia, Blake
Major: Food Sc Nutr. Health Prom (UG) - Bachelor of Science
Faculty Research Mentor: Mandy Conrad, Biochemistry Nutrition Health Promo
Funding: College of Agriculture and Life Sciences URSP
Project Category: Biological and Life Sciences

Understanding Dietary Habits, Challenges, and Barriers during the First 1,000 Days in the Rural Western Highlands of Guatemala
Nutrition is a key determinant of health and proper development for both pregnant women and young children, especially during the first 1,000 days, which represents the time between conception to a child's second birthday. However, this window is often overlooked due to factors beyond individuals' control, despite its significance in brain development and overall growth. Specifically, a lack of key nutrients during the first 1,000 days has serious implications on behavior, learning capacity, and ability to regulate emotions. In many areas across the world, notably in the rural Western Highlands region of Guatemala, gaps in nutrition education and resources contribute to long-term health challenges associated with insufficient nutrient intake during the first 1,000 days. This is demonstrated by

low dietary diversity with low intakes of leafy greens and animal-based products. To gather deeper insights, focus groups and interviews were conducted among community members and healthcare providers in the Western Highlands to assess dietary habits, challenges, cultural beliefs, and barriers. The information gained from this project will be used to inform future initiatives aimed at addressing nutritional deficiencies and improving overall health outcomes in the communities located in the rural Western Highlands of Guatemala.

124.
Name: Jackson, Jeremiah
Major: Biochemistry - Bachelor of Science
Faculty Research Mentor: Richard Baird, Agricultural Science & Plant Protec
Funding: College of Agriculture and Life Sciences URSP
Project Category: Biological and Life Sciences

Investigating the Impact of *Macrophomina phaseolina* and Drought on the Metabolome of Soybean
Macrophomina phaseolina (MP), is a soil-born fungus that can infect hundreds of species. Soybeans (*Glycine max*) are especially susceptible to MP when grown in dry and hot conditions. Soybeans are an essential component of agriculture across the world, and MP poses a substantial threat to global food security due to its high virulence across soybean fields. Though MP has been widely studied, the impact of MP on the metabolism of soybean is not yet fully understood. In this research project, the metabolome of soybean was compared in 4 treatments: control, with MP, with drought, and with both MP and drought. The foliar metabolites were extracted and analyzed using the nuclear magnetic resonance (NMR) platform, and the results of these analyses are presented in the poster.

125.
Name: Jacobson, John
Major: Forestry - Bachelor of Science
Faculty Research Mentor: Adam Polinko, FWRC - Forestry
Co-Author(s): Ashley Schulz
Funding: ORED Undergraduate Research Program
Project Category: Biological and Life Sciences

Quantifying the Impact of Prescribed Fire on Mid-Rotation Loblolly Pine Growth: A Dendrochronological Analysis
The southern United States continues to be the leading region for prescribed fire implementation. Despite the widespread utilization of prescribed fire across the region, there remains mixed evidence regarding the effect and role that prescribed fire has on tree growth, especially in production forests. Previous studies suggest that prescribed fire enhances the growth of other fire-adapted pines. Additionally, numerous studies have examined the role of herbicide on tree growth and stand development, suggesting that herbicide application in mid-rotation loblolly pine (*Pinus taeda*) stands can result in increased growth rates. This study examines the growth response of loblolly pine to prescribed fire and herbicide application. Three stands near Starkville, MS were selected to test the effect of prescribed fire and herbicide application on loblolly pine increment. Selected stands were primarily made up of loblolly pine (≥ 90% basal area dominated) with documented burns in 2014 and 2017. Prior to treatment, each stand was thinned to the same residual basal area, then treated with prescribed fire only, herbicide and prescribed fire, or received no treatment (i.e., control). At least six co-dominant or dominant pine trees were haphazardly selected from each treatment. Increment cores were taken from the north and east sides of each plot center tree. Cores were dried, mounted, scanned, and dated using standard dendrochronological methods. Dating was performed with CooRecorder imaging software, and cross-dating was conducted using the dplR package in R. The relationship between annual and interannual growth variation was assessed with a linear mixed-effects model. Growth rates were compared across different treatment types by subtracting the natural growth rate from the control stand from the growth rate of the treated stands. Preliminary results will be discussed. Results from this study will help inform management practices aimed to promote loblolly pine growth and vigor in the southeastern United States.

33.
Name: Jasper, Jordon
Major: Computer Science - Bachelor of Science
Faculty Research Mentor: Christopher Hudson, CAVS Research
Co-Author(s): Leo Giacobbe, Daniel Carruth
Project Category: Engineering

Autonomous Navigation of a 1/10th Scale RC Vehicle Using ROS2 and A* Path Planning
This research presents the development of an autonomous navigation system for a 1/10th scale remote-controlled (RC) vehicle using

Robot Operating System 2 (ROS2) and the Navigation 2 (NAV2) stack. The goal is to create a reliable map-based path planning framework that enables the RC vehicle to travel from a start to a goal position, serving as a model for future full-scale autonomous platforms at the Center for Advanced Vehicular Systems (CAVS). Early challenges included excessive noise from the onboard OAK-D Short Range Stereo Camera, limiting accurate environmental perception. In response, development focused on a static occupancy grid built in C++ and integrated into RViz2, providing a controlled map for path planning. The system runs on a NVIDIA Jetson AGX Orin, with an ACEINNA OpenRTX IMU for localization and a VESC (Vedder Electronic Speed Controller) for communication between sensors and the vehicle's drive system. After confirming basic movement through a straight-line planner, an A* search algorithm was implemented to generate paths across the occupancy grid. The complete system integrates the A* planner with a waypoint follower and odometry feedback, allowing the RC vehicle to navigate autonomously from Point A to Point B in both straight and diagonal paths. Currently, obstacle avoidance is limited to static obstacles defined within the occupancy grid, and future work will focus on dynamic obstacle avoidance using real-time point cloud data from the stereo camera. Results show successful autonomous navigation with accurate localization, waypoint following, and path execution, demonstrating a transferable framework for autonomous navigation on resource-constrained platforms and providing a foundation for future improvements in dynamic obstacle detection and avoidance.

126.
Name: Johnson, Bria
Major: Biochemistry - Bachelor of Science
Faculty Research Mentor: Heather Jordan, Biological Sciences
Co-Author(s): Jordan Smink, Bella Antonaros
Project Category: Biological and Life Sciences

Utilizing Sweet Potatoes as a Sustainable Feed Source for Black Soldier Fly Larvae: Addressing Agricultural Waste in Mississippi
Black soldier fly larvae (*Hermetia illucens*, BSFL) have gained attention for their ability to upcycle organic waste into valuable insect protein and nutrient-rich frass, contributing to sustainable agriculture. This study evaluates BSFL survivability on a diet incorporating sweet potatoes, a major agricultural product in Mississippi, to explore its potential as an alternative feed source. The project is particularly relevant for addressing agricultural and pre-consumer food waste, offering a sustainable solution for waste reduction while benefiting local farmers. Two experimental groups were established: One fed a diet of 50% sweet potatoes and 50% control diet (Gainesville Diet, 50% wheat bran, 30% alfalfa, and 20% corn) with 70% moisture content, and the control group receiving a 100% Gainesville diet. The experiment was conducted using 60 oz food storage containers, with four containers per group and 133 BSFL per container. This research highlights the feasibility of using sweet potatoes as a sustainable feed ingredient for BSFL, providing a cost-effective waste management strategy for agricultural industries. By integrating surplus sweet potatoes into BSFL production, Mississippi farmers and food manufacturers could reduce waste while contributing to circular agriculture and sustainable insect farming practices.

237.
Name: Jolivette, Christopher
Major: Psychology - Bachelor of Science
Faculty Research Mentor: Allison Jaeger Berena, Psychology
Co-Author(s): Phuc Xuan Nhi Nguyen, Sepideh Jafarizaveh
Project Category: Social Sciences

'Picture This!': The Role of Spatial Skills in Geometric Problem Solving
Prior research has shown that math anxiety has a negative correlation with math performance (Barroso et al., 2021). Other research has shown a positive correlation between spatial skills and math performance (Atit et al., 2022). Learning in geometry in particular, may rely heavily on spatial skills and may be influenced by math anxiety. The goal of the present study was to begin to examine these relationships more clearly. In this study, 41 undergraduate participants completed a set of 29 geometric word problems. These problems varied in terms of complexity, shape, and dimensionality. Participants also completed a measure of spatial skills and a measure of general math anxiety. Initial results indicate that spatial skills are positively correlated with overall math performance, such that students with higher spatial skills demonstrate better math performance than those with low spatial skills. Further, results showed a marginal negative correlation between math anxiety and math performance such that those with higher anxiety demonstrated worse performance. A closer look at the various item types indicated that the relationship between spatial skills and problem solving and the relationship between math anxiety and problem solving were especially strong for items that required students to think and reason about 3-dimensional shapes. Ongoing coding and analysis of students' math work and drawings will also be discussed. These analyses will examine the frequency and type of errors students make during problem solving. These data will be used to create stimuli for future studies examining how learning from erroneous problem-solving strategies may positively correlate with math performance.

34.
Name: Jones, Isabella
Major: Landscape Architecture - Bachelor of Landscape Arch
Faculty Research Mentor: Jason Walker, Landscape Architecture
Funding: College of Agriculture and Life Sciences URSP
Project Category: Engineering

Mapping Sidewalks to Assess Pedestrian Network Connectivity
Sidewalk data is crucial for cities to assess community walkability. Since 2009, Starkville, Mississippi has enforced a sidewalk ordinance requiring walkways as part of lot or subdivision development in the city. In addition to the ordinance required walkways, the city of Starkville built sidewalks using public funds. The sidewalk ordinance and city-built sidewalks resulted in increased walking paths, but like many communities they do not have up-to-date sidewalk information. This research mapped the sidewalks and measured the linear feet of walkways in ArcGIS Pro using development data provided by the city of Starkville from 2009-2024. The sidewalk ordinance resulted in approximately 113,119 linear feet or 21.4 miles of new sidewalks since 2009. Publicly funded sidewalks accounted for a large percentage of this total. The sidewalk infrastructure mapping revealed gaps in the sidewalk network that limit walkability and connectivity. However, the sidewalk ordinance and publicly funded walkways have improved pedestrian connectivity in Starkville, Mississippi. Additional analysis regarding gaps in the pedestrian network can assist the city in prioritizing publicly funded walkway infrastructure and assist in reviewing the sidewalk ordinance's efficacy.

127.
Name: Jones, Nyla
Major: Nat Res & Envir Conservation - Bachelor of Science
Faculty Research Mentor: Courtney Siegert, FWRC - Forestry
Co-Author(s): Brooke Dominici, Waqar Shafqat, Sarah Havens, Austin Himes, Heidi Renninger
Funding: DOE DE-EE0009280
Project Category: Biological and Life Sciences

Impacts of Biodiversity of Short-Rotation Woody Crops on Water Quality
Mitigating agricultural nutrient runoff and improving water quality is a key challenge in meeting food and energy demands. To address this challenge, short-rotation woody bioenergy crops, specifically *Populus deltoides* (eastern cottonwood) and its hybrids, can be planted at the interface of riparian areas and agricultural production fields to alleviate fertilizer runoff into adjacent bodies of water. This research employed an experimental design to evaluate the effects of *P. deltoides* diversity on tree productivity and nutrient uptake and how it mitigates agricultural runoff. We deployed ion exchange resins 0.5 meters below the soil surface at four different sites in Mississippi that contained either monoculture plantings of a single *P. deltoides* genotype or a mixture of two genotypes for the entire growing season. Across three years and in all of the sites, nitrate concentrations were reduced by 19%, and ammonia concentrations were reduced by 53% relative to concentrations in agricultural soils. In all years, multi-genotype plots reduced soil ammonia concentrations more than single-genotype plots by an average of 19%. This trend was reversed for soil nitrate, with single-genotype plots reducing soil nitrate by an average of 2% more than multi-genotype plots. The results of this study display the efficiency of the short-rotation woody crops in reducing water quality degradation that may have positive downstream impacts. This study can be used as an example of mitigation techniques for fertilizer runoff in agricultural fields to limit such degradation of water quality and prevent monetary/economic loss for agricultural producers.

238.
Name: Jones, Savannah
Major: Wildlife, Fisheries & Aqua - Bachelor of Science
Faculty Research Mentor: Michael Ntow, Political Science and Public Adm
Project Category: Social Sciences

Emergency Wetlands Resources Act: Policy Analysis and Future Directions
The Emergency Wetlands Resources Act (EWRA) of 1986 is a seminal federal policy that seeks to conserve wetlands by focused land acquisition programs and inventory programs at the national level. Through mandating wetland assessments and facilitating conservation efforts, the EWRA has assisted in safeguarding critical ecosystems that foster biodiversity, water quality, and flood control. However, the achievements of the EWRA have been undermined by persistent challenges, including a lack of funding, limited enforcement authority, and shifting regulatory regimes that have left wetlands increasingly vulnerable. Recent changes in policy, such as the restriction of federal jurisdiction over wetlands under the Clean Water Act, have also added to these vulnerabilities by removing legal safeguards for certain categories of wetlands. The study aims to critically evaluate the successes and failures of the EWRA in achieving its conservation goals and examines how rollbacks in regulations have amplified wetland ecosystem threats. As a response to

the above challenges, the study suggests a new policy framework that blends provisions of the EWRA with the Endangered Species Act (ESA) to establish a new class of conservation: "endangered lands." The category would prioritize the protection of wetlands that are under imminent danger of degradation due to climate change, development pressure, and habitat fragmentation. By enhancing financial inputs, reinforcing enforcement mechanisms, and taking complementary legislative measures, this policy framework seeks to assist the consolidation of wetlands conservation efforts. The strengthening of EWRA and its coordination with environmental protection strategies at the larger level will hold the clue to preserving the ecological integrity, economic value, and hydrological functions of wetlands for future generations.

35.
Name: Justis, Claire
Major: Software Engineering - Bachelor of Science
Faculty Research Mentor: Jonathan Barlow, Data Science
Project Category: Engineering

Assessing Tornado Warning System Lead Time: Visualizing Local Weather Broadcast Coverage of the March 24th 2023 Tornadoes in Mississippi
Tornado prediction in the United States has a long and storied history. While new methods of detection and research into the origin of tornado formation (tornadogenesis) are ongoing, tornado warning systems have remained mostly unchanged for many years. The National Weather Service (NWS) and local broadcast stations work closely to give communities early warning of tornadoes both probable and confirmed. Inspired by a recent focus on local weather broadcast meteorology, this project visualizes this process and assesses the frequency and latency of updates provided to the public during a tornado event. The project uses the OpenLayers JavaScript library to create a dynamic map displaying approximate tornado tracks from the severe storm that impacted Mississippi on March 24th, 2023. General information will be viewable, such as start time, end time, coordinates, damage, EF rating, and post-event narrative of each tornado track. Additionally, each track will have interactive points corresponding to an update broadcast through the NWS emergency alert system or local broadcast networks giving meteorological coverage live during the event available from publicly available videos. The goal is to assess the performance of the tornado warning system with respect to lead time given on tornado warnings.

36.
Name: Kelley, Joshua
Major: Computer Science - Bachelor of Science
Faculty Research Mentor: Rejane Paulino, Ag & Bio Engineering
Co-Author(s): Lucas Borges, Vitor Martins
Project Category: Engineering

Advancing high-resolution mapping of lake surface water across Mississippi
Water masking is crucial for managing lakes, which serve as vital ecosystems for both human and ecological health. Existing water masking products, such as OPERA and Global Surface Water, provide global coverage at a 30-meter resolution but often lack the spatial detail required to accurately identify smaller water bodies. This study improves water masking by leveraging Sentinel-2 imagery to generate high-resolution (10-meter) water masks using spectral indices and machine learning. We use Mississippi State lakes as a case study. To develop the water masks, we filtered lakes (n = X) from the LAGOS dataset to create labeled training samples of “water” and “non-water.” Water samples were selected using the Global Surface Water occurrence product (1984–2021) to identify permanent water regions (frequency > 90%), ensuring reliable training data. Random points were placed at least 50 meters apart in these areas, yielding 10,064 samples for the “water” class. The “non-water” class consisted of 3,321 random samples from land cover within 5 km of each lake. A Random Forest model was trained on these samples using three Sentinel-2 spectral indices: ARVI, EVI, and IBSI. The dataset was split into 70% training and 30% testing, and a Monte Carlo approach identified the best-performing model based on global accuracy. The results show that the Random Forest model achieved a high classification accuracy of 98%, effectively mapping lake water surfaces at a 10-meter resolution. This study highlights the potential of machine learning, specifically Random Forest, for high-resolution water masking in the U.S. Future work should expand this method to other regions, incorporating diverse water types and refining sampling strategies to enhance accuracy. Our findings contribute to improving water body mapping, supporting better water resource management and ecological monitoring.

128.
Name: Kenisky, Celeste
Major: Animal and Dairy Science - Bachelor of Science
Faculty Research Mentor: Kelsey Harvey, Prairie Research Unit
Co-Author(s): Isaac Jumper, Brooklyn Laubinger, Anna Beth McGehee, Jules Rimmer, Cole Miles, Allie Windham
Funding: College of Agriculture and Life Sciences URSP
Project Category: Biological and Life Sciences

The impact of fecal egg count during gestation on productive outcomes in beef cattle
The impact of gastrointestinal parasite loads on cattle performance, particularly during gestation, is not explored in research. The objective of this study was to investigate the impact of parasite load at the time of calving, specifically fecal egg count (**FEC**), on cow and offspring productivity. A total of 68 Angus × Charolais commercial crossbred beef cows housed at the Prairie Research Unit were enrolled in this study during the spring 2024 calving season. Fecal samples were obtained via rectal palpation from all cows on the median day of the calving season, based on expected days of gestation. Samples were analyzed using the modified McMaster technique at the College of Veterinary Medicine, and cows were classified as having observable FEC (**YES**; n = 38) or not (**NO**; n = 30). At calving, calf birth body weight (**BW**)**,** gender, and cow body condition score (**BCS**) at calving and weaning were recorded. Upon weaning, calf BW, cow BCS, and cow final pregnancy rate were recorded. Quantitative and binary data were analyzed using the MIXED and GLIMMIX procedures of SAS, respectively. As designed, FEC during calving season was greater ($P < 0.01$) in YES vs. NO cows, whereas no differences were detected ($P \geq 0.25$) for cow age, BCS at calving, or calf birth BW. At weaning, NO cows had greater ($P = 0.01$) BW and tended ($P = 0.09$) to have greater BCS, however no differences were detected ($P = 0.20$) for final pregnancy rate. No differences were detected ($P = 0.73$) for calf BW at weaning, although calves born to NO cows were younger ($P = 0.03$) at weaning and tended ($P = 0.09$) to have greater average daily gain from birth to weaning. Collectively, these results demonstrate elevated parasite load in beef cattle negatively impacts cow and offspring productivity.

37.
Name: Ketzle, Alexander
Major: Aerospace Engineering - Bachelor of Science
Faculty Research Mentor: Mohsen Azimi, Mechanical Engineering
Funding: Bagley College of Engineering Undergraduate Student Research Award
Project Category: Engineering

Characterization of Surface Temperatures of Solid Rocket Motors During Flight
Solid rocket motors are used extensively in defense in civilian aerospace, primarily in missile and sounding rocket systems, as well as a growing global hobby community. NFPA code 1125 sets the standards by which hobby motors are certified for use, and section 7.4.1 limits motors to a maximum external casing temperature of 220 ℃ (428 ℉) during and after operation. Publicly accessible data on casing temperatures is sparse, primarily comprising of anecdotal information passed by word of mouth without hard numbers to back it up. This leads to poor engineering practice, as construction techniques could be overcompensating for extreme temperatures and failure modes can go undetected. This limits innovation in novel construction techniques utilizing additive manufacturing that could benefit the wider aerospace industry and reduces the success of civilian science. This research measures motor casing surface temperatures during the flight of a typical hobby rocket to establish the relationship between rocket motor performance and casing temperature. It also provides a methodology by which others can reproduce and expand upon the data collected. By utilizing a rocket instead of the typical static test stand, results represent typical effects introduced by aerodynamic cooling and heating and the rocket structure acting as an insulator and heatsink.

129.
Name: Khan, Bailey
Major: Biochemistry - Bachelor of Science
Faculty Research Mentor: Shien Lu, Agricultural Science & Plant Protec
Co-Author(s): Lindsey Robinson, Ehtasham Ali, Shi-En Lu
Funding: College of Agriculture and Life Sciences URSP
Project Category: Biological and Life Sciences

Identification and Characterization of Antimicrobial Bacterial Isolates from the Mississippi Delta
Plant diseases pose a severe threat to global crop production, increasing the demand for biological control agents as an alternative to chemical pesticides. This study aims to identify bacterial isolates with antimicrobial properties for potential use in plant disease management. Bacterial isolate EA59 was obtained from the root system of soybean plants collected from the Mississippi Delta. The antimicrobial activity of this isolate was evaluated against eight bacterial pathogens: Xanthomonas citri pv. Malvacearum MSCT1,

Pectobacterium carotovorum EC101, Bacillus megaterium, Pseudomonas syringae pv. syringae B301D, Erwinia amylovora 2029, Burkholderia glumae 291, Escherichia coli, and Clavibacter michiganensis subsp. michiganensis Lu-01. Initial results indicate that this isolate exhibits strong antimicrobial activity against both gram-positive and gram-negative bacteria. Preliminary analysis of 16S rRNA sequence indicates the isolate EA59 belongs to the genus Bacillus. While this research provides valuable insight into the development of natural antimicrobial agents for sustainable agricultural practices, further research is ongoing to identify the isolate and characterize its antimicrobial activity.

38.
Name: Khan, Zeedan
Major: Computer Science - Bachelor of Science
Faculty Research Mentor: Chuangchuang Sun, Aerospace Engineering
Co-Author(s): Alaa Chriat
Project Category: Engineering

Koopman-Inspired Learning-Based Control of Soft Robotic Actuators
Controlling soft robotic actuators poses significant challenges due to their inherently non-linear and complex dynamics. Recent advancements in machine learning, specifically Koopman Operator theory, present a promising avenue by embedding these non-linear dynamics into a linear framework, significantly simplifying the control strategy. This research focuses on improving deep learning models integrated with Koopman embeddings, aiming to more accurately predict complex physical interactions encountered in soft robotic systems. While existing studies have explored Koopman operator applications to relatively simple physical models such as spring dynamics and Lorenz equations, there remains a gap in applying these techniques effectively to more intricate, real-world robotic systems. Addressing this gap is crucial because accurate, linear embeddings of non-linear systems can enable faster, simpler, and more robust control methods for soft robots, significantly advancing robotic flexibility and adaptability. Our approach involves constructing and rigorously testing a neural network-based Koopman model across increasingly complex scenarios—from basic spring and chaotic systems to a quadcopter platform. Using graph neural networks (GNNs) and message passing techniques, we successfully demonstrate that the Koopman-inspired model can predict quadcopter dynamics with considerable accuracy. Currently, we are investigating alternative loss functions and advanced learning strategies, such as meta-learning and reinforcement learning, to enhance the quality and generalizability of the Koopman embeddings. Initial results showcase significant improvements in accurately modeling simple physical interactions and achieving precise control of quadcopter dynamics. These findings hold substantial promise, indicating that further refinement of our methods could lead to generalizable control frameworks applicable to a wide array of soft robotic systems. Ultimately, this research contributes toward developing highly adaptable, efficient, and precise control systems capable of handling the complexities inherent in soft robotics and beyond.

192.
Name: King, Joshua
Major: Data Science - Bachelor of Science
Faculty Research Mentor: Catherine Shi, Mathematics & Statistics
Co-Author(s): Randall Campbell
Project Category: Business and Economics

The Money Behind March: Linking Financial Metrics to NCAA Basketball Success
With recent shifts in NIL governance, athletic programs prepare to adapt to new regulations on NIL payments, salary caps, and revenue sharing—pressing financial restructuring. While past studies link total expenditures to NCAA tournament qualification in collegiate basketball, rising financial pressures are shifting the focus toward identifying the specific investments that drive success. This paper investigates the financial impact on NCAA men's basketball programs' success at a more granular level, leveraging publicly available Financial Reporting System (FRS) reports for men's basketball seasons spanning 2016–2023, combined with historical NCAA tournament data (excluding 2020). First, we assess the relationship between financial investment and tournament success to establish baseline associations before proceeding to primary modeling. Our primary analysis employs probit regression and marginal effects estimation on three-year rolling averages to address endogeneity and assess the directional effects of specific financial investment areas on tournament success. Conference power controls account for at-large bid discrepancies and institutional differences, isolating high-impact spending across varied financial structures. Our results indicate that within high-major programs, coaching salaries, guarantees, and 'other' budgets have the strongest influence on tournament success, while in mid-major programs, operations, recruiting, and 'other' budgets play a more significant role. These findings refine existing holistic expenditure analyses and general probit models by identifying key investment areas with the greatest impact on tournament success, offering insights into how financial strategies should be adjusted across different institutional levels.

130.
Name: Koeppen, Emma
Major: Biological Sciences - Bachelor of Science
Faculty Research Mentor: Ling Li, Biological Sciences
Co-Author(s): Rezwan Tanvir
Project Category: Biological and Life Sciences

Unraveling the dual functional role of *Arabidopsis thaliana QQS*: insights into its regulation of plant metabolism as both a protein-coding and noncoding entity
Arabidopsis thaliana QQS (Qua-Quine Starch) stands out as an orphan gene exclusive to Arabidopsis, regulating carbon and nitrogen allocation. This orchestration leads to the elevation of total protein levels, a reduction in starch accumulation, and fortification of plant defenses against pathogens and pests. Despite the well-established functions of *QQS*, significant gaps persist in understanding its regulatory mechanisms, particularly concerning *QQS*'s functional manifestation as a small protein with 59 amino acids and whether it functions solely as a protein, RNA, or both. To address these gaps, we conducted a comprehensive study where genetically modified Arabidopsis lines were engineered to exclusively synthesize *QQS* protein or *QQS* mRNA. This was attempted by using alternative codons instead of *QQS* mRNA to synthesize *QQS* protein or deleting the start codon to terminate *QQS* protein translation. Employing Columbia-0 (Col-0) and *QQS* knockout (*qqs*) backgrounds, we validated the presence or absence of *QQS* transcript or modified transcript in different mutants via RT-qPCR. Our comparative metabolic profiling of these mutant lines encompassed starch staining, starch quantification, and protein quantification, juxtaposed with Col-0, *qqs*, and *QQS-OE/Col-0* (*QQS* overexpressing plants with Col-0 background) counterparts. Our findings unveiled that plants expressing either *QQS* mRNA or altered *QQS* mRNA should contain only *QQS* protein exhibited lower starch content than *qqs* but higher than *QQS-OE/Col-0* lines. Simultaneously, they displayed elevated protein levels relative to qqs but lower than *QQS-OE/Col-0* lines. These observations indicate there could be a dual functionality of *QQS*, potentially operating both as an RNA and a protein to modulate plant metabolism and influence the protein-starch equilibrium. However, further investigation is necessary to confirm bifunctionality, delineate the comprehensive scope of *QQS*'s potential bifunctional role as both a protein-coding and noncoding entity, elucidate its coordination mechanism, and unveil additional regulatory factors at play.

39.
Name: Kumar, Lalit
Major: Computer Science - Bachelor of Science
Faculty Research Mentor: Daniel Carruth, CAVS Research
Co-Author(s): Christopher Hudson, Lalit Yadav
Funding: ORED Undergraduate Research Program
Project Category: Engineering

Web-Based Command and Control for Autonomous Vehicle Formation Management
Effective real-time communication between frontend interfaces and robotic frameworks is crucial for autonomous vehicle control. Traditional command-based interfaces, although functional, lacked user-friendliness and accessibility for broader use. This poster presents a React-based web application enabling interactive and remote control of multiple autonomous vehicles simultaneously. Leveraging roslibjs and WebSocket communication with ROS Bridge servers, the application ensures reliable, secure, and low-latency interaction for monitoring vehicle states and executing commands. The design emphasizes scalability and ease of multi-vehicle coordination through a unified interface. This work contributes valuable insights into enhancing human-robot interaction, particularly for ROS-integrated systems, facilitating future advancements in remote operations and autonomous mobility.

131.
Name: Laird, Tanner
Major: Horticulture - Bachelor of Science
Faculty Research Mentor: Heather Jordan, Biological Sciences
Co-Author(s): Jordan Smink, Bella Antonaros
Funding: NSF IUCRC CEIF
Project Category: Biological and Life Sciences

Utilizing Sweet Potato Waste as a Sustainable Substrate for Black Soldier Fly Larvae (*Hermetia illucens*) Growth and Development on a Falcon Tube Scale
Sweet potatoes, (Ipomoea spp.) are a major export of Mississippi totaling 30,100 acers that represent a $92 million economy. Sweet potatoes are a nutritious food that are high in fiber, vitamins, and several minerals. Despite their nutrient value, many sweet potatoes are lost during the harvesting process, during transportation, or at the preconsumer stage in the grocery store. Black soldier fly (BSF)

larvae (Hermetia illucens) are a potential solution to reducing this agricultural and preconsumer food waste. BSF can be used as potential food sources for animals and humans. In this study we evaluated the growth and development of BSF raised on increasing diet inclusion percentages of sweet potato substrate compared the control diet (Gainesville Diet, 67% water, 17% wheat bran, 6.6% maize flour, and 9.9% alfalfa). We tested substrates of 100% raw sweet potato, 50% Sweet potato and 50% Gainesville, and 100% Gainesville. Our hypothesis was that 50% sweet potato and 50% Gainesville mixture would be more beneficial to BSF because it would offer a wider variety of nutrients and do a better job at retaining moisture. This experiment evaluates how healthy larvae may be reared on agricultural and preconsumer food wastes which will represent lower input costs for producers.

66.
Name: Lama Sherpa, Asahi
Major: Computer Science - Bachelor of Science
Faculty Research Mentor: Jaspreet Randhawa, Physics & Astronomy
Funding: Strategic Research Initiative
Project Category: Physical Sciences

Tracking the Invisible: The Search for the X-17 Boson
The X-17 boson, if exists, could be a potential link between the dark sector (dark matter) and the visible Universe. Only one group (ATOMKI group) has claimed to observe this boson. Independent investigations are required to either substantiate or refute these claims. In search of this elusive boson, an experiment was performed at the University of Notre Dame, where a proton beam impinged on a lithium target and electron-positron pairs from the nuclear transitions were recorded using an Active Target Time Projection Chamber (AT-TPC). Since AT-TPC provides the 3D-imaging of charged particles (electrons and positrons in this case), this project implements the computational techniques to analyze 3D point cloud data from experiment searching for the hypothetical X-17 boson. We are developing a multi-stage data processing pipeline to classify and visualize particle events. Initial data visualization revealed triplet events alongside the anticipated electron-positron pairs, creating significant classification challenges. Our approach includes visualization tools for 3D event reconstruction, clustering algorithms to identify particle tracks, and an interactive system to efficiently examine hundreds of recorded events. By implementing a framework to separate electron-positron pair events from triplet events and background noise, our analysis aims to determine whether the ATOMKI anomaly represents a new particle or stems from previously unaccounted experimental artifacts. This data-driven approach establishes methodologies applicable to future rare event detection experiments at the Facility for Rare Isotope Beams (FRIB), while focusing exclusively on the computational aspects rather than the experimental setup.

132.
Name: Lama Sherpa, Asahi
Major: Computer Science - Bachelor of Science
Faculty Research Mentor: Haifeng Wang, Industrial and Systems Engineering
Funding: ORED Undergraduate Research Program
Project Category: Biological and Life Sciences

The Restless Brain: Unmasking ADHD's Hidden Sleep Patterns
This innovative project bridges engineering, data science, and neurology to address the critical challenge of sleep disturbances in Attention-Deficit/Hyperactivity Disorder (ADHD). Our cross-disciplinary approach involved regular collaboration through monthly research presentations to a diverse team of professors, undergraduate researchers and medical experts. Using advanced signal processing and machine learning techniques, we've developed a computational framework that identifies distinctive spectral power signatures across sleep stages that differentiate ADHD from non-ADHD individuals. The pipeline processes EEG data through automated sleep stage classification, frequency band extraction, and statistical comparison between groups, with particular focus on frontal lobe activity patterns during slow-wave and REM sleep. While our research is ongoing, our preliminary findings suggest potential biomarkers that could eventually revolutionize ADHD classification and diagnosis, addressing a condition affecting millions of Americans. The computational tools being developed have promising applications for healthcare providers facing diagnostic challenges, particularly in rural areas. Beyond ADHD, our data science methodologies establish a framework applicable to a spectrum of neurological and psychiatric conditions, positioning our research at the intersection of computational neuroscience and clinical practice with substantial potential for technology transfer, implementation in medical settings, and economic development through healthcare innovation.

40.
Name: Lee, Parker
Major: Mechanical Engineering - Bachelor of Science
Faculty Research Mentor: Ethan Salmon, CAVS Research
Co-Author(s): Lalitha Dabbiru, Katie Hardwick
Project Category: Engineering

The Creation of a Digital Twin Off-Road Environment for Vehicular Modeling and Testing
Creating an accurate digital twin of an environment that an off-road vehicle would encounter is crucial for accurately evaluating autonomous driving algorithms. Trees, shrubs, grasses, and other terrain characteristics are often key elements in off-road simulated environments. Our research sought to include often overlooked environmental factors such as downed dead wood, leaf litter, and other varied ground cover, which is essential for realistic simulations of off-road conditions. By conducting field measurements and analyzing the physical environment, we recreate a detailed virtual representation of the terrain, incorporating these elements to ensure accuracy in the simulation. The resulting digital twin serves as a virtual counterpart to the physical environment, providing a sample platform for the testing of autonomous systems under environmental conditions similar to our sample test area. Our sample test area is a forested temperate environment with a majority of deciduous trees. This digital twin can be used to assess the performance and adaptability of autonomous vehicles in complex off-road environments, considering dynamic factors such as surface textures and natural obstacles. Through this approach, we demonstrate how more detailed virtual simulations can enhance the accuracy and reliability of simulated environments for off-road vehicles.

133.
Name: Levine, Grace
Major: Animal and Dairy Science - Bachelor of Science
Faculty Research Mentor: Lauren Priddy, Ag & Bio Engineering
Co-Author(s): Eden Tanner, Margaret Franks, Nathaniel Bosque, Claylee Chism
Funding: College of Agriculture and Life Sciences URSP, NSF
Project Category: Biological and Life Sciences

Choline Based Ionic Liquids as an Alternative Antimicrobial for Combating *Staphylococcus aureus*
Osteomyelitis is an infection of bone commonly caused by *Staphylococcus aureus*. Unfortunately, *S. aureus* species are developing resistance to antibiotics due to their overuse and thus have become less effective at penetrating biofilms. For effectively treating biofilms, alternative antimicrobials are a critical need. The objective of this study was to determine the effectiveness of choline-based ionic liquids (ILs) as an antimicrobial agent. The ILs are composed of a double anion tail with a single choline cation head. The anion tail, which has been theorized to inhibit the growth of bacteria by penetrating the cell membrane, was tested at varying carbon chain lengths: choline decanoic (10C), choline undecanoic (11C), choline dodecanoic (12C), choline tetradecanoate (14C), and choline hexadecanoate (16C). We hypothesized longer chained carbon tails would have an increased antimicrobial effect on biofilm growth over a 24-hour period. ILs were applied to *S. aureus* (ATCC 6538-GFP) biofilms in varying concentrations between 1% and 6% to determine their antimicrobial effects. When tested at 2%, the 16C showed minimal antimicrobial properties, and the 14C inhibited the growth of biofilm, but it was not as effective as the shorter chained ILs. When 10C, 11C, and 12C were applied at 2%, the biofilm was completely eradicated. These shorter chained ILs were then evaluated at 1%. At 1%, there was no longer complete eradication of the biofilm, but the ILs successfully inhibited the growth of the biofilm significantly compared to the control. In conclusion, ILs within the range of 10-12 carbon chain length present the greatest potential as antibiotic alternatives, demonstrating strong antimicrobial properties against S. aureus biofilms. The 14C presented moderate antimicrobial properties, and the 16C was unable to affect the growth of the biofilm at concentrations up to 6%.

134.
Name: Lile, Spencer
Major: Biomedical Engineering - Bachelor of Science
Faculty Research Mentor: Christopher Johnson, Chemistry
Co-Author(s): Steven Gwaltney, Garrett Knotts, Emily Campbell, Rita Gyawu
Project Category: Biological and Life Sciences

Improved Descriptions of Voltage-Gated Sodium Channel C-Terminal Domain Interactions
Voltage-gated sodium channels (Na_V) are complex macromolecular proteins that are responsible for the initial upstroke of an action potential in excitable cells. Appropriate function is necessary for many physiological processes such as a heartbeat, voluntary muscle contraction, nerve conduction and neurological function; dysfunction can have life-threatening consequences. During the past decade, there have been significant advancements with ion channel structural characterization by CryoEM; yet descriptions of cytosolic

components are often lacking. Many investigations have biophysically characterized reconstituted cytosolic components and their interactions, however, extrapolating the structural alterations and allosteric communication within a full-length intact ion channel can be challenging. To address this, we have developed a series of all-atom models of the human cardiac sodium channel ($Na_V1.5$) in a lipid bilayer with explicit salt and water. Our simulations contain descriptions of cytosolic components that are poorly predicted by AlphaFold and lacking in many CryoEM structures. Leveraging the latest advancements of the AMBER forcefield (ff19sb and Lipid21) and water model (OPC), our simulations improved protein backbone torsion angles, as well as generated structural information across time (four independent one microsecond simulations). Here we present three unique poses of the cytosolic C-terminal domain and explore their structural arrangements in the context of a full-length channel.

135.
Name: Linley, Jaiden
Major: Animal and Dairy Science - Bachelor of Science
Faculty Research Mentor: Shecoya White, Biochemistry Nutrition Health Promo
Co-Author(s): Kenisha Gordon, Derris Burnett
Funding: College of Agriculture and Life Sciences URSP
Project Category: Biological and Life Sciences

Effects of Chitosan and Carvacrol on the Shelf Life of Refrigerated Rabbit Meat Patties
Rabbit meat is gaining recognition as a sustainable alternative protein source in the United States, offering low fat, high protein content, and a minimal environmental footprint. Despite its nutritional benefits, the shelf life of raw ground meat is limited to about 2-3 d, which restricts its commercial viability. Natural antimicrobials, chitosan, a versatile, nontoxic precursor of chitin, and carvacrol, a phenolic monoterpene present in oregano and thyme, have been explored for their potential to extend the shelf life of meat products. This study aimed to assess the effectiveness of incorporating chitosan and carvacrol into rabbit meat patties. The whole carcass of mixed breed rabbits was trimmed, ground, and divided into four groups: Control (no antimicrobial), 1.5% Chitosan, 0.5% Carvacrol, and a blend of 1.5% Chitosan and 0.5% Carvacrol. The ground meat was homogenously mixed and formed into patties that were aerobically packaged and stored at 4 ± 1°C for 12 days in a retail display case. The physicochemical properties (pH, cook loss, color, and water holding capacity) and microbial (mesophilic) properties were assessed intermittently throughout storage. The results revealed that the pH for all the treatments ranged from ~5.49 - 6.58. The cook loss decreased during storage for the blend of chitosan and carvacrol. Differences were observed between treatments for the values of L*, a*, b*. Chitosan demonstrated the lowest water holding capacity on days 3-9. Carvacrol alone and the blend of chitosan and carvacrol slowed the growth of mesophilic bacteria compared to the control, which was spoiled by day 6 (>6 log CFU/g). Overall, the results suggest that chitosan and carvacrol were the best treatments. This offers a practical application for the use of natural antimicrobials, chitosan and carvacrol to increase the shelf life and quality of refrigerated rabbit patties.

193.
Name: Luintel, Samata
Major: Supply Chain Logistics - Bachelor of Business Adm
Faculty Research Mentor: Jonathan Barlow, Data Science
Project Category: Business and Economics

Demand Prediction and Inventory Optimization Using Time Series Data Analysis and Visual Analytics
Accurate demand forecasting is crucial for optimizing inventory management, reducing stockouts, and preventing overstocking. This research leverages time series forecasting models, including ARIMA, exponential smoothing, and neural networks, to predict demand patterns based on historical sales data. By analyzing demand fluctuations across different product categories, customer segments, and geographic regions, we develop a data-driven approach to optimizing inventory levels and procurement strategies. In addition to predictive modeling, we integrate geospatial analytics to assess the impact of delivery methods on supply chain efficiency. By analyzing variables such as shipping times, late delivery risks, and regional transportation trends, we identify logistical bottlenecks that influence demand fulfillment. This allows businesses to optimize shipping strategies, reduce delays, and enhance customer satisfaction. To further support decision-making, we develop interactive visual analytics dashboards that provide real-time insights into demand trends, inventory performance, and logistics efficiency. These tools enable stakeholders to dynamically monitor supply chain operations and make data-driven adjustments. Our findings demonstrate how combining predictive modeling, geospatial analysis, and interactive visualizations enables better decision making. Future work will focus on improving model accuracy, incorporating real-time data streaming, and refining geospatial analytics to further optimize inventory and delivery strategies.

136.
Name: Maedo, Sophie
Major: Biochemistry - Bachelor of Science
Faculty Research Mentor: Federico Hoffmann, Biochemistry Nutrition Health Promo
Co-Author(s): Amy Dapper
Project Category: Biological and Life Sciences

Is More Always Merrier: The Effect of Increased Copy Number of Recombination Genes in Baker's Yeast
Homologous recombination is a vital process in the life of eukaryotes because it maintains genetic stability and aids in DNA repair. In most known lineages, successful recombination is essential for gamete production. Thus, it is essential for sexual reproduction and defects in recombination are associated with fertility problems. We know that most recombination genes return rapidly to single copy after whole genome duplications, suggesting that having extra copies of these genes is deleterious. In this study, we test the hypothesis that increased copy number of recombination genes is deleterious by using data from experimental studies in yeast where researchers artificially increased the copy number of over 4000 genes and tracked the associated fitness effects in 15 different strains of yeast. Using simulations and bootstrapping methods, we investigated whether recombination genes had more negative fitness effects than expected at random. We found that the fitness effect of increased copy number was not as clear as we initially anticipated, as some recombination genes had higher fitness following an increased copy number. Our results suggest that although it is rare, it may be beneficial to have increased copy number of some recombination genes.

67.
Name: Marcum, Olivia
Major: Mathematics - Bachelor of Science
Faculty Research Mentor: Tamer Oraby, University of Texas Rio Grande Valley
Co-Author(s): Hansapani Rodrigo, Jackson Schwedler, Lorelei Linkel, Marissa Llamas, Daniel Estrada, Zeinab Mohamed
Funding: NSF REU: 2150478
Project Category: Physical Sciences

Physics-Informed Neural Networks for Modeling Particulate Matter (PM2.5) Particles within California
The burning of fossil fuels for industry has come under scrutiny for its degrading effect on human health, and the major concern is the release of fine particulate matter into the atmosphere, which we refer to as pollution. In this research, we aim to model concentrations of particulate matter on the order of 2.5 micrometers (PM2.5). Microscopic pollutants can penetrate deep into the respiratory system, causing inflammation and long-term tissue damage which is especially difficult for our body to repair. To improve our understanding of particulate matter diffusion models, we employ a physics-informed neural network (PINN) to predict PM2.5 concentrations across California. PINNs, pioneered by Raissi et al. in 2019, are a class of deep neural networks that adhere to the principles of physics during training, making them particularly suitable for solving forward and inverse problems associated with Partial Differential Equations (PDEs). In our study, we model the two-dimensional spatial diffusion of real environmental data collected from civilian sensors. We implement loss functions that enforce PDE constraints from the advection-diffusion and heat equations and compare the results with those from a standard neural network lacking physics-based constraints. While the standard neural network achieves higher predictive accuracy overall, its solutions in training regimes with sparse data lack physical plausibility. This is evident in the predictive Mean Absolute Error (MAE) results: with only 2% training data, the HE, CDE, and NN models yield MAEs of 0.095, 0.096, and 0.080, respectively. With 80% training data, the NN model improves significantly (0.035 MAE), whereas the HE model remains stable (0.089). This highlights the importance of incorporating PDE residuals to "inform" the model, ensuring physically relevant predictions.

137.
Name: Marlow, Tanner
Major: Agronomy - Bachelor of Science
Faculty Research Mentor: Richard Baird, Agricultural Science & Plant Protec
Co-Author(s): Hannah Purcha
Funding: Shackouls Honors College Research Fellowship
Project Category: Biological and Life Sciences

Evaluating the Impact of Macrophomina phaseolina on the Metabolome of Soybeans Grown in Field Conditions
Macrophomina phaseolina (MP) is a generalist, soil-borne fungus that causes a disease known as charcoal rot in many types of crops, including but not limited to pulses, cotton, corn, and melons. One crop that is incurring significant losses due to this pathogen are soybeans, a major crop in the southeastern United States. In 2023 alone, charcoal rot resulted in an estimated loss of 9,485,000 bushels of soybean in just the United States. MP's destructive capacity is exacerbated by hot and dry conditions, which are becoming more common across many centers of soybean production. Previous research in the Baird Lab has shown that MP and drought conditions

significantly alter the metabolome of soybeans, but these findings utilized highly controlled greenhouse conditions. Thus, this study seeks to evaluate the metabolomic impact of MP infection on soybeans grown in the field to evaluate whether similar trends in metabolomic profiles are observed. Samples of two different varieties (Delta Grow 47XF90STS and Dyna-Gro S48XF35) were collected from the Mississippi State Delta Research Extension Center in Stoneville. The metabolites were extracted from the foliar tissue of these plants and were analyzed using the 500 MHz NMR platform. Evaluations of the metabolic profiles, root disease severity, and other growth parameters were conducted, and the results are presented in the poster.

194.
Name: Martrain, Abigail
Major: Data Science - Bachelor of Science
Faculty Research Mentor: Jonathan Barlow, Data Science
Project Category: Business and Economics

Bridging the Gap: Combining Data Acquisition, Machine Learning, and Business Intelligence to Improve Retail Inventory
The retail industry increasingly relies on data science to optimize supply chain and inventory management. Currently, businesses lack an accessible, predictive intelligence tool for inventory that is tailored to businesses of different sizes. This research considers how to build a dashboard that allows small, medium, and large retail businesses to input inventory, sales, and consumer behavior data for real-time analysis and forecasting. By utilizing an equilibrium method from both point-of-sale (POS) and customer order data, the system will help improve inventory accuracy and prediction of sales. This dashboard will use predictive analytics using machine learning and traditional statistical modeling to recommend future inventory purchases. This dashboard will bridge the gap between data acquisition, machine learning, and business intelligence to demonstrate how an efficient and adaptable retail inventory management system can be created.

239.
Name: Matkin, Jacob
Major: Anthropology - Bachelor of Arts
Faculty Research Mentor: Shane Miller, Anthropology/Middle Eastern Culture
Co-Author(s): Tony Boudreaux
Project Category: Social Sciences

Archeological Predictive Model of Chickasaw Sites in Lee County, Mississippi
Archaeology provides a unique avenue to study Chickasaw lifeways prior to Removal in 1837. The traditional literature (Stubbs 1983, Sparks 1987, Morgan 1994) supports the idea of Chickasaw settlement patterns being centered on ridgetops surrounded by tributary streams. Here, I present an archaeological predictive model (APM) based on maximum entropy that supports this hypothesis and identifies locations where future surveys could be directed for preservation and research.

138.
Name: Mayden, August
Major: Biochemistry - Bachelor of Science
Faculty Research Mentor: Richard Baird, Agricultural Science & Plant Protec
Co-Author(s): Federico Hoffmann, Hannah Purcha
Funding: College of Agriculture and Life Sciences URSP
Project Category: Biological and Life Sciences

Evaluating the Impact of Selenium Nutrition on the Metabolome in a Murine Model
Elemental selenium intake is an important part of dietary health because of its usage in selenoproteins, which are essential to many pathways and have been implicated in insulin resistance. In this study, we investigated the effects of dietary selenium deficiency and knockout of a gene encoding a selenoprotein in the common house mouse (*Mus musculus*) to determine the significance of selenium as it applies to downstream metabolite concentrations. Test groups of both wildtype (WT) and selenoh knockout (KO) mice were split into groups (n=7-9) and were provided with either a selenium positive (Se(+)) or a selenium negative (Se(-)) diet. The effects of these treatments on the concentration of metabolites within their serum and liver tissues were then explored. Using both univariate and multivariate analyses, we found that while there was not a significant amount of variation in concentrations among the serum groups, there was a significant effect of genotype and diet on the polar liver metabolites. These findings provide support for the hypothesis that the uptake of selenium within the diet and the ability to utilize selenium are important to maintaining and regulating many different metabolic pathways, especially those related to glucose metabolism. This study could have implications for human health, indicating the

importance of dietary selenium and selenoproteins in metabolic pathways whose dysregulation could cause a propensity towards diseases such as type 2 diabetes

139.
Name: Maynard, Justin
Major: Animal and Dairy Science - Bachelor of Science
Faculty Research Mentor: Caleb Lemley, Animal & Dairy Science
Co-Author(s): Megan Mills, Notsile Dlamini, Serge Kameni, Hala El Daous, Shiveeli Rajput
Funding: College of Agriculture and Life Sciences URSP
Project Category: Biological and Life Sciences

Impact of oral melatonin supplementation on sperm quality parameters in the bull
Melatonin has been shown to influence reproductive physiology and may play a role in sperm quality, however its in vivo effects on sperm quality in the bull remain unclear. This study evaluated the impact of oral melatonin supplementation on sperm morphology, motility, and kinematic parameters including average path velocity (**VAP**), straight-line velocity (**VSL**), and curvilinear velocity (**VCL**). Yearling Angus bulls (n = 21) were randomly allocated into two groups, either melatonin (**MEL**; n = 11) or control fed (; n = 10) for 60 days of treatment. MEL bulls were supplemented with 200 mg/kg of body weight of melatonin dissolved in ethanol, while CON bulls were supplemented with an equivalent ethanol vehicle control. Supplementation was top-dressed in a grain mix and fed daily via the CALAN gate feeding system from October 2024 to December 2024. Scrotal circumference (**SC**) and semen samples were collected on d 0, 28, and 56. Semen samples were obtained via electroejaculation and evaluated by computer-assisted sperm analysis for morphology and motility parameters. Data were analyzed using the MIXED procedure of SAS specific for repeated measures with treatment, time, and the interaction as fixed effects. Melatonin supplementation increased sperm motility in MEL compared to CON bulls on D28 ($P = 0.0390$; 84.7 ± 3.7, 73.4 ± 3.7) and D56 ($P = 0.0890$; 86.1 ± 4.3, 76.6 ± 3.6). Interestingly, VAP, VSL, and VCL were lower ($P < 0.5$) in MEL compared to CON bulls on D0 (VAP: 81.6 ± 5.3, 93.0 ± 5.0; VCL: 160.4 ± 11.5, 182.54 ± 11.4; VSL: 57.6 ± 4.3, 64.4 ± 4.1). However, there were no differences ($P > 0.1$) in these parameters between MEL and CON bulls by D28 or D56. These findings suggest that melatonin supplementation may enhance sperm motility and velocity over time, potentially benefiting reproductive performance in bulls.

140.
Name: Mazeres, Kelsey
Major: Animal and Dairy Science - Bachelor of Science
Faculty Research Mentor: Leyla Rios de Alvarez, Animal & Dairy Science
Co-Author(s): Caelin Hodges, Ke'Daja Freelon, Larry Leon, Maxwell Mkunga, Leyla Rios
Funding: College of Agriculture and Life Sciences URSP
Project Category: Biological and Life Sciences

Second Kiko Buck Performance Test in Mississippi
Kikos are a meat goat breed growing in popularity in the Southeast due to their hardiness and resistance to parasites. The objective of this test was to collect data on weaned Kiko bucks grazing under commercial farm conditions in Mississippi, from June 2024 to August 2024 (IACUC-24-232). Thirty-five farmers co-signed for 66 bucks from 13 different states. Measurements including body weight for average daily gain (ADG), body condition score (BCS), FAMACHA©, fecal egg count of nematodes (FEC) in eggs per gram of feces (EPG), and Coccidias (OPG, oocysts per gram of feces), were taken every two weeks. Loin eye area (LA) and USDA grading were measured via ultrasound at the beginning and end of the grazing period. The LA was used to calculate the ratio of LA/BW. The herd was rotated between three paddocks every two weeks, and forage samples were analyzed prior to the test. The average crude protein and fiber were 10.55% and 41.23% respectively. The bucks were dewormed with three classes of anthelmintics upon arrival at the testing site. The 10-week grazing period started after a two-week quarantine period. The data was analyzed using a Proc Mixed Analysis (SAS) The overall averages for the variables resulted: BW 24.7$\pm$ 4.6 kg; ADG 19.4 g/d; FAMACHA© 2.5; BCS 2.4; and nematodes 1291.2 EPG. FAMACHA© did not affect BW ($P=0.5651$); BCS affected BW ($P<0.0001$). FEC did not affect BW, ($P=0.8974$). The overall winning buck was from MS with an ADG of 52 g/day and an avg. FEC of 416.67 EPG. In 2024, MS experienced a very harsh summer with little rain and low grass availability, which restricted normal growth. In the future, commercial concentrate supplementation (approx. 250g/animal/day) will be used for the animal to express their growth potential better.

141.
Name: McBride, Abigail
Major: Biochemistry - Bachelor of Science
Faculty Research Mentor: Peixin Fan, Animal & Dairy Science
Co-Author(s): Himani Joshi, Caleb Lemley, Amelia Woolums, Jim Brett, Isaac Jumper
Funding: College of Agriculture and Life Sciences URSP
Project Category: Biological and Life Sciences

Effect of Fan and Sprinkler Cooling Strategy on Relieving Heat Stress in Dairy Cows

Dairy cows are highly susceptible to heat stress, which reduces milk production and reproductive efficiency. Previous studies reported that fans and sprinkler systems can mitigate heat stress to some extent by reducing the respiration rate. However, their effects on blood parameters, indicating systemic responses, are largely unexplored. In this study, 24 lactating Holstein cows were divided into heat stress (HS) group and heat stress abatement (HA) group, which had limited or full access to fan and sprinkler cooling system in the barn, respectively, during a 14-day period in summer (THI >70, indicating heat stress, was constant throughout the 14-day trial). Blood samples were collected on days 0 and 14 to assess the heat shock protein 70 (HSP70) and cortisol levels. Respiration rate was recorded regularly. Respiration rate showed no significant difference on day 0 but was significantly higher in the HS group on day 14 compared to the HA group (79.17±8.84 vs 52.5±9.80 breaths/min, $p<0.01$). However, no significant difference was observed in HSP70 and cortisol concentrations on both day 0 ($p=0.97$) and day 14 ($p=0.87$) between the two groups. Notably, at day 0, significant positive correlation between respiration rate and HSP70 was observed in both HS ($R_{Pearson} = 0.58$, $p = 0.05$) and HA groups ($R_{Pearson} = 0.62$, $p = 0.03$), but this positive correlation was only observed in HS group on day 14 ($R_{Pearson} = 0.57$, $p = 0.05$). Additionally, a significant positive correlation was also observed between HSP70 and cortisol concentration ($R_{Pearson} = 0.73$, $p = 0.007$) in the HS group on day 14 but not in the HA group. These findings suggest that short-term fan and sprinkler cooling strategies can reduce physiological heat stress and mitigate systemic stress responses in certain animals but not efficiently for the overall HA group.

240.

Name: McDaniel, Avery
Major: Biochemistry - Bachelor of Science
Faculty Research Mentor: Cliff McKinney, Psychology
Project Category: Social Sciences

Effects of Negative Affect on Psychological Problems Mediated by Sleep Hygiene

This study examined the relations between negative affect and emerging adult psychological problems, and how problems during sleep mediated this relationship. To extend findings to emerging adults, the current study examined these relations specifically in those aged 18 to 27. It was hypothesized that negative affect would have an indirect effect on psychological problems via difficulties during sleep. Participants included 559 emerging adults with an average age of 19.65 years old. The participants were 68.4% women and 31.3% men; 67.2% White, 27.6% Black, and 4.8% other. These participants completed the Insomnia Severity Index (ISI, Morin, 1993); the Adult Temperament Questionnaire (ATQ; Rothbart & Evans, 2007); and the Adult Self Report (ASR, Achenbach & Rescorla, 2003).
For the study, PROCESS model 4 was used to conduct a mediation analysis. The overall model predicting total psychological problems was significant, $R2= 0.12$, $F(2, 317) = 21.71$, $p < .001$. Negative affect was associated positively with Insomnia, $B = 1.63$, $SE = 0.41$, $p < .001$, and psychological issues, $B = 11.73$, $SE = 2.83$, $p < .001$. Insomnia was also associated positively with psychological issues, $B = 1.54$, $SE = 0.38$, $p < .001$. Using 5,000 bootstrap resamples, the confidence interval for the indirect effect of negative affect on psychological issues through insomnia was entirely above zero, $B = 2.51$, $SE = 0.96$, 95% CI [0.91, 4.61], suggesting a significant indirect effect. This study supports the necessity of further research into the correlation between sleep and mental health. Mental health is a serious issue around the globe, and perhaps with further research more solutions can be found for the prevention and treatment of serious psychological problems.

142.

Name: McGee, Jacob
Major: Wildlife, Fisheries & Aqua - Bachelor of Science
Faculty Research Mentor: Michael Sandel, FWRC-Wildlife,Fisheries&Aquaculture
Co-Author(s): Kayla Fast
Funding: College of Agriculture and Life Sciences URSP
Project Category: Biological and Life Sciences

The Evolution of Membrane-Bound Toll-Like Receptors within Cyprinodontiformes (Teleostei)

Members of the Toll-like receptor 1 (TLR1) subfamily are membrane-bound pattern recognition receptors that play a critical role in the human innate immune system. TLR1 and duplicates (paralogs) (e.g. TLR2, TLR6, TLR10, TLR18) have conserved structures and functions, dating back approximately 450 million years. Specifically, heterodimers of the TLR1 subfamily detect diacylated or triacylated lipopeptides, which are molecular signatures associated with Mycobacterium tuberculosis and related species. The evolutionary history of membrane-bound TLRs is complex, shaped by multiple gene duplications and losses. However, the net number of receptors within the TLR1 subfamily appears to be evolutionarily conserved across vertebrates, suggesting selective pressures on protein diversity and function. In this study, we conduct a phylogenetic analysis of TLRs in Cyprinodontiformes, a teleost order with a relatively high incidence of mycobacteriosis in both aquaculture and wild populations. Despite high diversity (>1,000 species), annotated TLR gene sequences are currently available in genomic browsers (e.g. Ensembl) for only nine species. To expand this dataset, we performed sequence similarity

searches using the Basic Local Alignment Search Tool (BLAST) to identify homologous sequences within the National Center for Biotechnology Information (NCBI) database. We conducted multiple sequence alignments using the MAFFT online server, and inferred phylogenetic relationships using the maximum likelihood method implemented in IQ-TREE. We then translated the nucleotide sequences into amino acid sequences, to identify structural variation among orthologous and paralogous proteins. Results of this study provide insights into the diversity and functional conservation of TLRs in Cyprinodontiformes. By characterizing the evolution of TLRs in Cyprinodontiformes, this study contributes to a deeper understanding of the evolution, diversification, and functional conservation of the innate immune system in vertebrates.

275.
Name: McOlgan, Connor
Major: English - Bachelor of Arts
Faculty Research Mentor: Dhanashree Thorat, English
Project Category: Humanities

The Spectacle of The War on Terror
The study of "spectacle" involves a wide range of subjects and mediums that involve the presentation of violence, and as Henry Giroux argues in promoting militaristic imperialism. This paper primarily focuses on the effects of "spectacle" in promoting American Imperialism during the invasion of Iraq. Comparing the events in Mohsin Hamid's The Reluctant Fundamentalist to the real-life news broadcasts of the bombings of Iraqi cities, we see how they instilled paranoia and support for the U.S. military. The ramifications of post-9/11 "spectacle" are still ever present in America and the global stage, and examining it in the context of narratives from the populace most affected will help fully showcase its effects. The main result of this campaign was that it dehumanized many of the indigenous populations within Iraq and the Islamic religion. Being aware of America's past use of "spectacle" can help us better analyze the continued use of it in contemporary media forms such as films, videogames, and social media.

143.
Name: Merry, Madeline
Major: Animal and Dairy Science - Bachelor of Science
Faculty Research Mentor: Kelsey Harvey, Prairie Research Unit
Co-Author(s): Jane Parish, Brooklyn Laubinger, Anna Beth McGehee, Jules Rimmer, Cole Miles, Allie Windham, Celeste Kenisky, Jaedyn Rawson
Funding: ORED Undergraduate Research Program
Project Category: Biological and Life Sciences

Analyzing Spring Versus Fall Calving in the Black Prairie Region of Mississippi
Most cow-calf producers in the United States that use a defined breeding and calving season choose to follow a spring (SP) calving season, as the abundant forage in the spring coincides with increasing cow nutrient requirements upon calving due to lactation. However, some producers choose to maintain a fall (FA) calving season. Hence, the objective of this study is to evaluate the impact of season and calving period on calf mortality, growth, and dam longevity using historical data obtained from the Prairie Research Unit **(**PRU)**.** Data from SP and FA calving crossbred cows and heifers were used over a 10-year period from 2013 to 2023, totaling 1,012 and 3,138 dams and calves, respectively. At calving, calf birth body weight (BW), gender, and dam body condition score (BCS) were recorded. Upon weaning, calf BW and dam BCS were recorded. Calves were backgrounded at the PRU before being shipped to a commercial feedlot where they were managed until harvest, when carcass characteristics were recorded. Data were analyzed using the MIXED or GLIMMIX procedure of SAS for quantitative data and binary data, respectively. At calving, FA cows tended ($P = 0.07$) to be older and BCS was greater ($P < 0.01$) for SP vs. FA cows, whereas no differences were detected ($P = 0.78$) for BCS at weaning. Calves from SP cows had greater ($P < 0.01$) birth BW, weaning BW, and 205-day adjusted weaning BW. Mortality at birth and weaning rate were similar ($P \geq 0.22$) between seasons. Calf value at weaning and upon harvest was greater ($P < 0.01$) for FA born calves, whereas hot carcass weight and backfat were greater ($P < 0.01$) for FA vs. SP born calves. Collectively, these results demonstrate calves born in the SP had increased growth performance, yet those born the FA generated greater income.

241.
Name: Middleton, Ashley
Major: Psychology - Bachelor of Science
Faculty Research Mentor: Jennifer Krafft, Psychology
Funding: ORED Undergraduate Research Program
Project Category: Social Sciences

The Role of Psychological Inflexibility in ADHD and Hoarding Symptoms
Hoarding disorder (HD) and attention-deficit/hyperactivity disorder (ADHD) are both associated with significant functional impairment and distress. These conditions commonly co-occur, with previous research suggesting that adults with ADHD experience hoarding symptoms at significantly higher rates than the general population (Morein-Zamir et al., 2022). Both disorders are linked to difficulties with attention, decision-making, and organization. One factor that may contribute to these difficulties is psychological inflexibility—a rigid pattern of responding in which individuals prioritize avoiding unwanted internal experiences (such as thoughts, emotions, and sensations) over engaging in behaviors that align with their values and goals (Hayes et al., 2006). This avoidance can contribute to difficulties in adaptive functioning and has been associated with various mental health conditions (Akbari et al., 2022). Psychological inflexibility could explain the relationship between ADHD and hoarding, but this has not yet been investigated. The present study examines the relationship between psychological inflexibility, ADHD symptoms, and hoarding symptoms. We hypothesize that psychological inflexibility will mediate the relationship between ADHD symptoms and hoarding symptoms. A general population sample of 600 adults will be recruited through the research platform Prolific. Participants will complete an online survey containing multiple self-report measures. Data collection is ongoing, and mediational analyses will test whether ADHD significantly impacts hoarding through the process of psychological inflexibility. Findings from this study could contribute to a deeper understanding of the underlying mechanisms of hoarding and ADHD. If psychological inflexibility mediates between ADHD and hoarding, this may provide a modifiable target for therapeutic interventions that can address hoarding and ADHD simultaneously, as reducing inflexible responses could improve functioning and quality of life.

144.
Name: Miller, Benjamin
Major: Biochemistry - Bachelor of Science
Faculty Research Mentor: Hasan Tekedar, Department of Comparative Bio Scien
Co-Author(s): Fenny Patel, Attila Karsi, Mark Lawrence, Larry Hanson
Funding: ORED Undergraduate Research Program
Project Category: Biological and Life Sciences

Deciphering the Evolutionary Trajectories of Florfenicol Resistance in *Edwardsiella piscicida*
Edwardsiella species are zoonotic pathogens that infect a diverse range of hosts, including reptiles, fish, and humans. One particular species, *Edwardsiella piscicida*, is an emerging intestinal pathogen that affects various fish species, including channel catfish. *E. piscicida* is responsible for enteric septicemia of catfish, causing significant economic losses and raising food safety concerns due to its high mortality rates. The most widely used methods to combat this pathogen are antibiotics, such as florfenicol. However, the overuse of antibiotics has raised concerns about developing and spreading antimicrobial resistance (AMR). Hence, to investigate the development of antibiotic resistance and its underlying mechanisms, we utilized Adaptive Laboratory Evolution (ALE). ALE is a controlled laboratory-based process investigating molecular evolution and adaptive changes accumulated in bacterial populations over specific selection pressure. Here, we used ALE to examine the adaptation of *E. piscicida* under Florfenicol stress. We identified the minimum inhibitory concentration (MIC) of florfenicol that inhibited 90% growth of *E. piscicida* C07-087. Based on the MIC, four independent biological replicas of *E. piscicida* were exposed to a gradual increase in Florfenicol antibiotics. Their respective four controls were exposed to BHI medium. Genome sequencing was performed on both the evolved replicates and controls to evaluate any genetic changes After completion of the ALE circuit, the exposed isolates were resistant to 549.88 ug/ml of Florfenicol, a 768-fold increase over the initial MIC. The growth rate and colony size of the exposed group reduced compared to the control groups. Genome sequencing revealed loss of a large DNA fragment in the genome of the exposed replicates. This study demonstrates how ALE can reveal the genetic mechanisms by which *E. piscicida* develops resistance to florfenicol. The findings provide crucial insights into combating AMR, offering potential strategies for more sustainable infection control in aquaculture.

145.
Name: Miller, Christie
Major: Animal and Dairy Science - Bachelor of Science
Faculty Research Mentor: Caleb Lemley, Animal & Dairy Science
Co-Author(s): Kasey Elder, Chayse Culbert, Marcus McGee
Funding: College of Agriculture and Life Sciences URSP
Project Category: Biological and Life Sciences

Behavioral Implications of Melatonin Supplementation in Late Gestational Angus Cows
Late gestation in cattle is a period of high metabolic demand for the dam, requiring physiological adaptations to support fetal development. Melatonin, a versatile hormone, can alleviate metabolic demand during this stage while also influencing neurotransmitters with potential behavioral effects. Our study evaluated the temperament and behavior of providing melatonin supplementation to late

gestational cattle. Angus cows (n = 30) in their third trimester were randomly assigned into melatonin (MEL) and control (CON) groups. Melatonin was dissolved in ethanol and provided to the MEL cattle individually top-dressed onto their feed at 200µg/kg of body weight. CON cows received the ethanol carrier alone. The cows were fed their designated diet through a Calan gate system, beginning at approximately day 209 of gestation. Eating duration was monitored weekly through video footage taken during feeding. Various temperament measurements were taken on days 14, 28, and 42 of treatment. Measurements included exit velocity (EV), exit velocity score (EVS), and chute score (CS). Mothering aptitude score (MOM) and maternal aggression (MA) were collected at calving. In dams, no differences (P>0.05) were observed between treatments in chute score and exit velocity score. There was no difference in exit velocity (m/s) of dams between treatments; however, exit velocity significantly varied (P<0.0001) as gestation proceeded. No differences (P>0.05) were found in MA and MOM scores between treatment groups. However, there was a lower variation for MA in MEL dams. There were no differences in eating duration (min) of dams between treatments; however, eating duration significantly increased (P<0.0001) as gestation progressed. These results indicate that melatonin, at the current dose and duration, did not alter the behavior or temperament of dams. However, the reduced variability in maternal aggression indicates neurophysiological effects. Further research should examine melatonin's impact on neurotransmitter production, metabolism, and hormonal regulation.

242.
Name: Miller, Henry
Major: Psychology - Bachelor of Science
Faculty Research Mentor: Mary Dozier, Psychology
Project Category: Social Sciences

Association between Person Attachment, Object Attachment, and Clutter
Evidence-based treatments for hoarding disorder remain lackluster in their efficacy. Approaching new mechanism may increase the effectiveness of our existing interventions. Childhood attachment can define and shape a person's life, including their psychopathology. Maladaptive attachment patterns with people may result in increased object attachment and subsequently increase clutter. The purpose of this study was to examine the associations between person attachment, object attachment, and impairment from clutter. Treatment-seeking older adults (N = 48) with hoarding disorder were given a baseline assessment that include the relationship between self and items scale (RSI), the inclusion of others in self scale (IOS), and the Saving Inventory-Revise clutter subscale (SI-R Clutter). Participants had a mean age of 70.0 (range 53-86) and were mostly women (71%). Scores on the SI-R Clutter were positively correlated with scores on the RSI (r = .28, p = .058) and negatively correlated with scores on the IOS (r = -.29, p = .052). As a person with hoarding disorder has a higher severity of impairment to clutter, their attachment to objects increases and their attachment to people decreases. Future research should examine the feasibility and efficacy for treatments that focus on underlying disordered attachments in hoarding disorder patients and self-sabotage related to attachment.

68.
Name: Mishra, Ashmit Kumar
Major: Computer Science - Bachelor of Science
Faculty Research Mentor: Prabhakar Pradhan, Physics & Astronomy
Co-Author(s): Mousa Alrubayan
Funding: ORED Undergraduate Research Program
Project Category: Physical Sciences

Automated Cancer Stage Prediction Using Deep Learning on Histopathological Imagery
The accurate cancer staging is critical for determining appropriate treatment strategies and predicting patient outcomes. However, traditional methods rely on manually examining histopathological slides, which can be time-consuming, subjective, and prone to inter-observer variability. This study introduces a robust deep learning framework for automated cancer stage prediction using high-resolution histopathological imagery. Our model leverages a modified ResNet-50 architecture trained on 11,245 annotated whole-slide images from diverse cancer types, each processed at a resolution of 224x224 pixels. The model incorporates transfer learning and data augmentation techniques to enhance generalization across different tissue types and staining protocols. Performance was evaluated using precision, recall, and F1-score metrics, with an intersection over union threshold of 0.5 for bounding box predictions. Testing on an independent cohort of 2,860 images demonstrated exceptional performance with a precision of 0.93, recall of 0.89, and F1-score of 0.91. The model successfully identified all five cancer stages with an overall accuracy of 87.6%. This automated system significantly advances manual assessment, offering standardized, rapid, and accurate cancer staging that can streamline clinical workflows and improve patient outcomes. This model's detection and classification capabilities present critical data for oncologists to develop personalized treatment plans and enhance cancer management strategies. While currently optimized for ovarian cancer, the modular architecture allows seamless integration of additional datasets (e.g., breast, lung, colorectal) through transfer learning. Future research will expand validation to multi-institutional cohorts and incorporate molecular data for multimodal analysis.

146.
Name: Mishra, Ashwani Kumar
Major: Computer Engineering - Bachelor of Science
Faculty Research Mentor: Vitor Souza Martins, Ag & Bio Engineering
Co-Author(s): Uilson Ricardo Venancio Aires
Funding: Award #58-6064-3-017, USDA Agricultural Research Service (USDA-ARS)
Project Category: Biological and Life Sciences

Automatic Cattle Feedlot Detection in Texas using YOLO and NAIP Imagery
Open Cattle feedlot is an outdoor facility where cattle are structurally organized for rapid growth, typically involving high-density stocking and controlled feeding practices. These locations can be particularly vulnerable to extreme weather conditions, as they can negatively impact animal health and productivity. However, official databases of these facilities are sparse, and methodologies for automatically detecting these areas are needed. This study aims introduces a robust method for automatically detecting open cattle feedlots using You Only Look Once (YOLO) object detection on high-resolution National Agriculture Imagery Program (NAIP) imagery (1-meter spatial resolution). The YOLO model was trained using 11,746 hand-annotated labels from Nebraska, Kansas, and Texas, with an NAIP patch size of 640x640 pixels. Detections by YOLO within a 100-meter buffer were aggregated and considered part of the same facility. To evaluate the model, we used precision, recall, and F1-score as performance metrics. These metrics were calculated based on a 25% intersection area threshold for correct predictions between the test labels and the predicted bounding boxes. Preliminary results from the Texas counties of Moore and Dallam, which were used for testing, demonstrate strong model performance with a precision of 0.95, recall of 0.88, and F1-score of 0.91. The model identified a total of 32 open cattle feedlot facilities in Dallam and Moore counties. The detection of these facilities provides critical data for policymakers to develop strategies aimed at mitigating the environmental, human health, and animal welfare, as these facilities are highly susceptible to extreme weather events.

147.
Name: Molloy, Zoe
Major: Food Sc Nutr. Health Prom (UG) - Bachelor of Science
Faculty Research Mentor: Wes Schilling, Biochemistry Nutrition Health Promo
Co-Author(s): Xue Zhang, Vada Lee Thacker, Emily Little
Funding: College of Agriculture and Life Sciences URSP
Project Category: Biological and Life Sciences

The impact of *Brochothrix thermosphacta* on volatile flavor compounds throughout the shelf-life of porcine *longissimus dorsii* muscle
Bacterial spoilage and oxidation are responsible for producing off-flavors and off-aromas in fresh meat, and *Brochothrix thermosphacta* is a common spoilage organism. This study utilized solid phase microextraction gas chromatography-mass spectrometry (SPME GC-MS) to determine how the volatile compounds in pork loin changed throughout shelf-life, and to identify if the volatile compounds present were different when the pork was inoculated with *B. thermosphacta*. A control and a *B. thermosphacta* inoculated treatment were evaluated over their five days of shelf-life. For the control group, 200 µL of 0.5% saline solution were applied to 30 g of pork. For the treatment, 3 logs of *B. thermosphacta* (suspended in 200 µL of 0.5 % saline) were applied to 30 g of pork. On each day, a random tray from each treatment was selected, and two 30 g pieces were snap-frozen in liquid nitrogen and stored at -80°C. Five grams of sample (ground in liquid nitrogen) were placed in an amber vial with 10 µL of 200 ppm chlorobenzene and 2.5 mL of 5% saline solution. The vial was heated at 60°C for 30 min with an SPME fiber to absorb the volatile compounds, which were injected into and analyzed in an Agilent 7890A GC and 5975C MS. On average, the peak areas of the volatile compounds increased over storage. Peak areas tended to be greater in the control samples at the end of shelf life in comparison to the treatment samples. This may indicate that *B. thermosphacta* outcompetes other spoilage bacteria that have a greater impact on volatile compound composition. Specifically, nonanal was present at higher levels in the fresh pork than the spoiled pork. Additionally, the peak area of 2-ethyl-1-hexanol increased in the samples over storage time, likely due to oxidation of compounds in the meat.

243.
Name: Montgomery, Emily
Major: Kinesiology - Bachelor of Science
Faculty Research Mentor: Megan Holmes, Department of Kinesiology
Co-Author(s): John Lamberth, Po-Lin Chen
Project Category: Social Sciences

Physical activity in older adults with regular Pickleball participation
Adequate physical activity (PA) participation is a critical element for healthy aging amongst older adults. According to the PA Guideline from the World Health Organization, older adults are strongly encouraged to engage in at least 150 minutes of moderate intensity aerobic PA per week as well as 2-3 days of muscle strengthening and multicomponent PAs in order to obtain health benefits and prevent falls. Pickleball (PB) is a fast-growing sport in the United States which has potential benefits for older adults' health. This study investigated the impact of regular PB participation on PA profiles in older adults. Thirteen males (age 68.07 ± 6.22 years) and 15 females (age 71.09 ± 7.99 years) who partook in regular PB participated in this study. GT3X+ accelerometers were used to collect PA data. Participants wore the accelerometer for 7 consecutive days (including when playing PB). Outcome variables include daily counts per minute, light-intensity PA, moderate-intensity PA, vigorous-intensity PA, moderate-to-vigorous-intensity PA (MVPA), and steps. Descriptive statistics were used to showcase the results. Main results found in this study were: 1) participants spent in average 165.36 ± 9.90 minutes MVPA on PB days and 101.17 ±8.74 on non-PB days, 2) participants accumulated 9639.35 ± 514.70 steps on PB days and 6630.72 ± 523.00 steps on non-PB days, and 3) male participants averaged 8158.01 ± 636.77 steps per week, while female participants averaged 8112.06 ± 591.73 steps per week. Regular PB participation can confer the opportunity for older adults to meet the World Health Organization PA guidelines. Even more notably, our participants achieved the recommended PA levels solely through their PB participation days. Incorporating PB into their routine may be an effective way for older adults to maintain a consistently active lifestyle to help them achieve healthy aging.

148.
Name: Montoya, Molly
Major: Biochemistry - Bachelor of Science
Faculty Research Mentor: Florencia Meyer, Biochemistry Nutrition Health Promo
Project Category: Biological and Life Sciences

Infection characteristics of Bovine Herpesvirus-1 and Bovine respiratory syncytial virus
Bovine respiratory disease is caused by multiple viral and bacterial agents. The importance of studying BRD lies in the economic loss each year through reduced production, morbidity, and mortality. The viruses observed in this study are bovine herpesvirus-1, a DNA virus, and bovine respiratory syncytial virus, an RNA virus. The viruses spread primarily through nasal secretions and bodily fluids. In addition, transporting and co-mingling induce stress, which increases the chances of infection and viral transmission. The study of these viruses in coinfection is relevant to the biology of BRD. We study both viruses in tissue culture to establish the effect they may have on each other. Viral replication can be quantified seen using a plaque assay to determine the number of infectious particles produced under different conditions. We were able to quantify BoHV-1 and BRSV and visualize their cytopathic effect under the microscope.

149.
Name: Moore, Evan
Major: Forestry - Bachelor of Science
Faculty Research Mentor: Ashley Schulz, FWRC - Forestry
Co-Author(s): Joshua Granger, Brady Self, Elizabeth Esser
Funding: College of Forest Resources
Project Category: Biological and Life Sciences

From forest to pasture: Implications of the spread of cogongrass (Imperata cylindrica) for biodiversity and land management in Mississippi
Cogongrass (Imperata cylindrica) is a non-native grass species that has many significant impacts, including threats to timber stands and pastures to its fire adaptation, high flammability, and rapid spread in disturbed areas via rhizome (i.e., underground stems that send out roots and shoots from its nodes) and/or seed. It was introduced to Alabama in 1912, then in Mississippi as a forage crop around 1921. Since then, cogongrass has spread aggressively through most of Alabama and Mississippi. Populations of the highly invasive grass species are well documented in southern Mississippi, where it is increasing wildfire risk, reducing native plant and animal biodiversity, and preventing longleaf pine (Pinus palustris) restoration efforts. In the northern part of Mississippi, cogongrass populations have been emerging along major roadways and in pastures, but distribution of cogongrass populations is largely unknown. This study aimed to: (1) identify locations of cogongrass populations in northern Mississippi, (2) measure the size of cogongrass populations, and (3) identify native species and ecosystems around the cogongrass populations that may be impacted. It is hoped that patterns of distributions can be determined to predict the future spread of the species. We conducted roadside surveys to identify locations of cogongrass populations and document the size and environmental impacts of the populations that are identified. Compared to southern populations, northern populations appear to be more distanced and smaller in size, sometimes with only a few individual cogongrass specimens. Populations are impacting forest edge habitat and pastureland for livestock grazing, and increasing risk of roadside wildfires. Additional roadside surveys will continue to identify cogongrass populations. Locations of populations will be shared with the Mississippi Forestry Commission for treatment and monitoring.

268.
Name: Morales, Jesus
Major: Architecture - Bachelor of Architecture
Faculty Research Mentor: Aaron White, School of Architecture
Co-Author(s): Tess Higginbotham
Funding: College of Architecture, Art, and Design Research Grants Program
Project Category: Arts, Music, & Design

AI's Potential Involvement Within Architectural History Courses
Artificial Intelligence could be utilized in academic courses of architectural history. A variety of prompts and strategies relating to architectural history were utilized with the AI chatbot, ChatGPT. This included information from academic essays submitted for architectural history courses that had also helped me to understand how effectively AI could involve itself in architectural history courses. The AI image generation feature was also utilized to see how successfully the program could translate historical architectural information. I utilized my time feeding it prompts that would give me substantial feedback on improving statements that lacked the quality of being a question, including interpreting historical texts, breaking down the full meaning of passages in a concise and understandable manner, and engaging in Socratic dialogues where the chatbot would impersonate a historical figure and attempt to replicate a specific type of intellectual dialogue, involving myself in these discussions. Upon the completion of research, findings showed that the current state of AI software such as chatbots have distinct advantages, such as in the breakdown and analysis of historical texts, and the improvement of certain aspects of essays including prompts, questions, and overall material within a particular section of a paper. There were indicators shown by the chatbot that showcased a continuous work in progress development in its communicative style when given prompts regarding Socratic dialogues, but there is still much more to improve upon with generative imaging regarding its analysis of historical inputs and prompts it was given.

69.
Name: Morgan, William
Major: Physics - Bachelor of Science
Faculty Research Mentor: Benjamin Crider, Physics & Astronomy
Funding: Department of Physics and Astronomy
Project Category: Physical Sciences

Monte Carlo Simulation of Neutron Beams Produced by the p(t,3He)n Reaction
Neutron scattering plays an important role in understanding the nuclear processes involved in much of nuclear physics, including nuclear energy production. The University of Kentucky Accelerator Laboratory (UKAL) performs neutron scattering experiments to study the neutron scattering probabilities of specific nuclei using beams of monoenergetic neutrons to carefully understand the scattering probability as a function of incident neutron energy. The monoenergetic neutron beam production process at UKAL involves producing neutrons by accelerating protons into a gas cell containing tritium, where a reaction occurs producing 3He and the beam of neutrons. However, the properties of this beam, such as the energy spread in the beam and the geometric properties of the outgoing beam, are difficult to measure yet important for extracting careful experimental results. To address these challenges, this work aims to perform Monte Carlo simulations using Geant4 that model the neutron production reaction along with the physical setup in which they are produced at UKAL, leading to a greater understanding of the spread of the beam, as well as the effects of changing temperature and pressure of the tritium gas. A description of the simulation process and preliminary results for modeling the properties of the neutron beam produced at UKAL will be presented.

276.
Name: Morman, Haylee
Major: English - Bachelor of Arts
Faculty Research Mentor: Dhanashree Thorat, English
Project Category: Humanities

"I'm Only White in America": Performing Ethnicity Post-9/11 and in Mohsin Hamid's The Reluctant Fundamentalist
There are stereotypes associated with all ethnicities, for better or for worse. Where some may be detrimental, others can be advantageous. In Mohsin Hamid's The Reluctant Fundamentalist, Changez, the narrator and protagonist, is a Pakistani man who attended Princeton University before moving to New York City to work for a company called Underwood Samson. While the novel is set

in the future, with Changez recounting the events of his life for an American stranger, the novel is primarily about what Changez learned from his time spent in America and with Americans pre- and post-9/11 and how that pivotal moment in American history permanently altered him. A key part of this transformation is the way in which Changez performs his ethnicity throughout the novel and how that changes during 9/11 and the events that followed, appealing to various stereotypes often as a means of either protection, advancement, or rebellion. Before engaging with Hamid's novel directly, it's important to first examine the way in which Islam and its followers have been racialized within recent American history. Islam does not denote a specific race, ethnicity, or phenotype. It is a major organized religion that does not include race limitations within its holy doctrine. The American connotation of Muslims, however, is centered around the Middle East, as the stereotypical Muslim would be Arab. This hasn't always been the case, however. This essay serves as an exploration of shifting American attitudes towards Muslims and Middle Easterners following the events of the attacks on the World Trade Center and the Pentagon on September 11, 2001. At the same time, the essay also analyzes Hamid's protagonist, Changez's, experiences with this cultural context, examining the intersections of race, religion, stereotypes, and identity performance.

150.
Name: Moroso, Jessica
Major: Wildlife, Fisheries & Aqua - Bachelor of Science
Faculty Research Mentor: Manuel Ruiz Aravena, FWRC-Wildlife,Fisheries&Aquaculture
Co-Author(s): Michael Sandel, Audrey Moehring
Funding: CFR Undergraduate Research Scholars Program
Project Category: Biological and Life Sciences

Understanding the Effects of Ecological Conditions on the Immune Response of Rodents in Mississippi
Rodents are important reservoirs for pathogens of public health concern and experience high infection rates while rarely displaying clinical signs. Understanding the relation between rodent immunology and infection is vital for determining the potential for pathogen shedding and disease spread. This ongoing study aims to establish baseline knowledge of immune condition and infection dynamics in wild rodent populations in Mississippi. Wild rodents native to northern Mississippi, including Sigmodon hispidus, Peromyscus sp., and Reithrodontomys sp., were captured, sampled, and released between June 2024 and April 2025. Whole blood samples were used to prepare blood smears for microscopic analysis of blood cell morphology. The proportions of leukocyte types were recorded to assess adaptive and innate immunity, with 100 white blood cells counted per slide for each individual's immune cell profile. We then estimated the ratio of lymphoid cells (B and T-cells) to myeloid lineage cells (neutrophils, eosinophils, basophils, and monocytes) to characterize a profile of the immune system activity in rodents at the time of blood collection. Leukocyte morphology and ratios were compared in the context of environmental and individual characteristics such as season, habitat, species, body size, and sex to assess immunity across and within a population. This baseline data for wild rodent immunology will support future studies investigating the immunology and physiology of these species within the context of the emergence of zoonotic diseases.

204.
Name: Morrow, Caitlin
Major: Interdisciplinary Studies - Bachelor of Science
Faculty Research Mentor: Zhujun Pan, Department of Kinesiology
Co-Author(s): John Lamberth, Caleb McAlpin, Kristy Gourley, Leo Chen
Funding: MSU Community Engaged Service Award
Project Category: Education

Utilizing Robots to Assist with Daily Activities and Independence of Older Adults
As the elderly population continues to rise, the demand for proper caregiving exceeds the availability of younger caretakers. This shortage of care compromises the elderly population's quality of life. Thus, it is of great importance to explore techniques to assist with daily activities and the independence of older adults. A proposed solution, that has been put into practice, involves the use of robots to support the elderly in their daily lives. Various companies and research institutions have developed robots to supplement human caregivers. Projects, such as the "Hobbit" robot, have been designed to enhance the quality of life of the elderly population by assisting them in maintaining greater independence. These robots assist with daily activities, such as bringing items to the user and providing feeding assistance. The elderly patients maintain some control over their daily activities, as they can manipulate the robots to assist them with tasks. These tasks include eating, dressing, personal hygiene, and household chores, which could otherwise be challenging for them to accomplish. For instance, the "self - feed robot" applies an advanced camera and a sensor system to assist the elderly user in feeding themselves. The elderly population can regain a sense of independence by performing the basic tasks in their lives without constant reliance on a caregiver. The utilization of robotic assistance in eldercare not only improves the independence of older adults but also reduces the burden on healthcare and caregivers.

41.
Name: Mulay, Aditya
Major: Computer Engineering - Bachelor of Science
Faculty Research Mentor: Christopher Hudson, CAVS Research
Co-Author(s): Daniel Carruth
Funding: BRIDGES
Project Category: Engineering

Deploying the NATURE Stack on a Clearpath Warthog
This project integrates the NATURE (Navigating All Terrains Using Robotic Exploration) autonomy stack onto a Clearpath Warthog robot equipped with an Ouster LiDAR, Sekonix camera, SwiftNav GPS, and IMU sensors. The Clearpath Warthog is a 610 lb remote-controlled amphibious robot designed specifically for operation in challenging terrains. The warthog's LiDAR is used for generating high-resolution point clouds, data points in a 3D space in a robot's perspective, which will enable it for obstacle detection, avoidance and environmental mapping. GPS provides accurate geolocation data, while IMU sensors offer information on the robot's orientation and movements. The NVIDIA Drive AGX Pegasus is the main computer on the robot where all the sensor data would be collected and processed with NATURE stack's algorithms to interpret the environment and make navigation decisions. The NATURE Stack, after processing the data from the sensors converts it into an occupancy grid, then the path planning algorithms uses the occupancy grid and commands the controllers on the robot.

70.
Name: Newton, Riley
Major: Geoscience - Bachelor of Science
Faculty Research Mentor: Boniface Fosu, Geosciences
Co-Author(s): Yeh-Heng Lin, Shrinidhi Ambinakudige, Brian Williams, Jamie Dyer
Funding: NSF EPSCOR
Project Category: Physical Sciences

Water Scarcity and Crop Yields in Underserved Communities
The Mississippi Delta is one of the biggest agricultural producers in the United States, producing major crops such as soybeans, cotton, and corn. The Delta is also one of the most poverty-stricken regions in the country, which makes it vulnerable to economic hardships with poor environmental conditions, like droughts. Extended periods of drought can lead to negative impacts on crop yields and broad socioeconomic impacts. With the increased intensity and frequency of droughts due to climate variability, it is crucial to understand the effects on agricultural productivity. This study aims to assess the impact and severity of droughts on the Mississippi Delta's agriculture through historical climate, crop yield, and socioeconomic data. Time-series and regression models will be incorporated to show the correlation of drought indices with crop yield trends and quantify the impact of drought severity on yield variations to provide insight into the relationship between water scarcity and the agricultural output. Vulnerability assessments will also be used to find areas most affected by water scarcity due to economic constraints. Through these assessments, this research will improve our understanding of the agricultural challenges caused by droughts in the region. The study will also explore potential strategies for mitigating the effects of drought on crop yields and rural economies, which will contribute to finding areas that are an easy target to agricultural losses due to water scarcity. This study's findings will contribute to the development of specific drought mitigation strategies, including improved water management practice and adaptive agricultural techniques. Furthermore, this study aims to support farmers during drought-related economic hardships and policymakers when making informed decisions to improve the durability of the Mississippi Delta's agricultural sector. This research will also help establish a foundation for sustainable agricultural practices and serve as a framework for future studies on climate-driven agricultural risks.

151.
Name: Nicholls, Sophia
Major: Animal and Dairy Science - Bachelor of Science
Faculty Research Mentor: Rhonda Vann, Animal & Dairy Science
Funding: College of Agriculture and Life Sciences URSP
Project Category: Biological and Life Sciences

Utilization of pain management devices for young sheep
Routine management practices in sheep and cattle include castration of young animals to control reproduction, reduce aggression, and improve meat quality. In addition, sheep tail docking (done mostly by banding) is important to reduce fly strike and to produce sheep utilized for 4H and FFA livestock judging competitions. A "banded" off tail can also be more sanitary, but is mostly just appealing in a livestock show ring. The American Association of Bovine Practitioners (AABP) recommends that "pain management be considered the

standard of care during all dehorning and disbudding procedures"; however, the language for castration is not prescribed (just encouraged). Unfortunately, many studies continue to show low stats related to pain mitigation for these and other procedures due to lack of accessibility of pain mitigation drugs. Lidoband® is a relatively new product patented to reduce castration pain and enhances animal comfort by delivering lidocaine over an extended period. There is limited information regarding the use of Lidobands® for tail docking and castration in sheep. Therefore, the objective of this research project was to utilize pain mitigation bands for tail docking in baby lambs and monitor for incidence and duration of pain and growth parameters. The data being recorded is the initial reaction of the lambs to the control vs Lidoband® banding methods, weight at birth, and how long it takes the tail to fall off from banding. Within 48 hours of birth, baby lambs were assigned to two treatment groups: Control (n=21) and Lidoband® (n=21). Lambs were monitored for 30 minutes for incidence and reactions to tail docking. Animals will be weighed every 30 days for monitoring growth parameters and average daily gains. All male lambs will be assigned to one of two treatment groups: control or Lidoband® after 4 weeks of age for banding for castration. Their pain reaction and average daily gains will be monitored every 30 days until weaning. The results of the Lidoband® tail docking and castration method will be compared to the control group for both aspects.

152.
Name: Null, Julia
Major: Wildlife, Fisheries & Aqua - Bachelor of Science
Faculty Research Mentor: Manuel Ruiz Aravena, FWRC-Wildlife,Fisheries&Aquaculture
Co-Author(s): Audrey Moehring, Michael W. Sandel, Fernando Arce
Funding: CFR-FWRC Undergraduate Research Program
Project Category: Biological and Life Sciences

Analysis of Seasonal and Sex-Based Variations in Endoparasitic Communities of Southeastern Rodent Populations
Parasites significantly influence host populations by affecting health, survival, and reproductive success. Parasitic susceptibility often increases during breeding seasons, likely due to heightened stress and energy demands. Rodents, characterized by short lifespans, large litter sizes, and high parasite diversity, experience notable variation in parasite prevalence between breeding and nonbreeding seasons. Parasite burden and diversity also differ between sexes, with males typically showing higher parasite loads but lower diversity compared to females. An extensive literature review was conducted, and fecal samples from wild rodents were analyzed through sedimentation, flotation, and microscopic identification techniques to characterize endoparasitic communities. Between June 2024 and April 2025, rodents were captured, sampled, and released across five field sites near Starkville, Mississippi, using Sherman traps. Differences in parasite communities are discussed in the context of host species, sex, seasonality, habitat quality, and host density. This research establishes baseline knowledge for understanding parasite ecology in wild rodent populations, ultimately informing disease dynamics within southeastern rodent populations.

244.
Name: Osborne, Olivia
Major: Kinesiology - Bachelor of Science
Faculty Research Mentor: Megan Holmes, Department of Kinesiology
Co-Author(s): Ian C. Macali, Po-Lin Chen, Sarah Catherine Childs, Travione Smith, Hunter Appleton
Project Category: Social Sciences

Aerobic Fitness in Collegiate Marching Band Members
High levels of aerobic fitness offer many health benefits. Collegiate marching band can be considered a nontraditional form of exercise that places high physical demands on participants. This study evaluates aerobic fitness levels of collegiate marching band members to better understand the impact of marching band participation on aerobic health. A total of 23 marching band members (11 males, age 19.45 ± 0.37 years, height 177.62 ± 2.23 cm, weight 77.22 ± 2.59 kg and 12 females, age 19.17 ± 0.27 years, height 165.26 ± 1.94 cm, weight 75.26 ± 4.67 kg) were tested using the Progressive Aerobic Cardiovascular Endurance Run (PACER) protocol, where participants ran back and forth between two markers set 20 meters apart. Numbers of completed laps were recorded and then compared to the FitnessGram norms. Descriptive statistics were used to calculate the means and standard deviations. The average PACER laps for males were 44.82 ± 6.06 laps, and females 19.58 ± 2.86 laps. According to the norms chart for the FitnessGram PACER test, 18-year-old males should achieve 54 laps while females should achieve 38 laps. Participants in the current study were lower than norms in both sexes. Based on the FitnessGram PACER norms, aerobic fitness may need additional attention in some members. Marching band members may benefit from activities that directly focus on improving aerobic fitness in addition to traditional band activities. Researchers should examine physical activity (PA) profiles of collegiate marching band members to better grasp the influence of their PA levels on their aerobic fitness. Given that practices and performances last for hours, one could assume that PA and subsequently, fitness levels would be higher. It may be that PA intensity of marching band activities is insufficient to achieve aerobic health benefits.

42.
Name: Palmer, Olivia
Major: Data Science - Bachelor of Science
Faculty Research Mentor: Jonathan Barlow, Data Science
Project Category: Engineering

A Health Monitoring App for Symptom Tracking and Predictive Analysis
Self-monitoring health applications have become an essential tool for individuals seeking to track their well-being, particularly in areas with limited access to healthcare. This project proposes a mobile health application that allows users to log daily symptoms, dietary intake, and emotional states, leveraging predictive modeling to provide health insights. By utilizing Intensive Longitudinal Methods (ILMs) and data collected from smartphones and wearable devices, the app aims to identify correlations between physical and emotional health indicators. Data analysis techniques such as descriptive statistics, correlation analysis, and predictive modeling will be employed to detect trends and forecast potential health concerns. The system will suggest potential remedies, such as dietary adjustments, or recommend seeking professional medical advice when necessary. Challenges include ensuring user engagement, maintaining data privacy, and integrating multimodal health data from various sources. Additionally, designing an intuitive interface for underserved populations, particularly in regions like Mississippi with limited healthcare access, is a key focus. By combining self-reported health data with machine learning techniques, this project aspires to create a practical and technically viable solution for individuals hesitant to seek traditional medical care.

153.
Name: Parish, Dakota
Major: Wildlife, Fisheries & Aqua - Bachelor of Science
Faculty Research Mentor: Ashley Schulz, FWRC - Forestry
Co-Author(s): Joshua Granger, David Evans
Funding: College of Forest Resources URSP
Project Category: Biological and Life Sciences

A vascular flora of prairie remnants and tupelo swamp along Hatchapaloo Creek in Simpson/Smith County, Mississippi
The Jackson Prairie is a disjunct ecoregion of the Blackland Prairie that contains small (<100 acre) prairie remnants with some rare and imperiled plant species. It extends from Jackson, MS, through the Bienville National Forest, to the Alabama border near Matherville, MS, and is composed of temperate grassland species. To the south of the Jackson Prairie is the Southern Hilly Gulf Coastal Plain ecoregion, which broadly consists of oaks, pines, and other Gulf Coastal Plain Species. Though these ecoregions are delineated by clear lines on maps, the transition in plant species composition may not be as abrupt. Sites bordering ecoregions may encompass native plant species from both ecoregions. The purpose of this floristic survey was to document the vascular plant species present on a 300+ acre site that contains prairie remnant, tupelo swamp, marsh land, and loblolly pine stands along Hatchapaloo Creek, which borders Simpson and Smith Counties in southern Mississippi. Specimens were collected during the summer of 2024, then identified and cataloged in the College of Forest Resources Herbarium at Mississippi State University in Fall 2024. Over 130 native and introduced vascular plant species have been identified to date, most of which have Southern Hilly Coastal Plain affinities. Results from this study have already started to shed light on unique ecosystems, species range extensions, and county records. Findings highlight the potential for human-altered landscapes to serve as refugia for native biodiversity and contribute to understanding species distributions within the state. Continued surveying throughout different times of year will be necessary to assess the role of these habitats in conservation and restoration efforts aimed at preserving native plant biodiversity in transitional areas.

269.
Name: Parker, Wade
Major: Music - Bachelor of Arts
Faculty Research Mentor: Matthew Haislip, Department of Music
Project Category: Arts, Music, & Design

The Spectrum of Musical Modality and its Emotional Affect
While the layman may be colloquially familiar with the musical concepts of “major” and “minor” keys, there exists a broader continuum of harmonic and melodic palettes that a composer may choose to write with. Canonized by European writers and theorists in the Middle Ages, these palettes are today referred to as the “Church modes”, for their application in liturgical settings, or “Diatonic modes.” Modality as a trend fell out of favor with the advent of the Common Practice Period (c. 1600) and functional harmony; though it has seen a resurgence since the end of the 19th century. This “neo-modal” revival often, though not exclusively, draws upon elements derived from folk music. Beyond pastoral or otherwise rural associations, modal music possesses an innate ability to elicit strong emotional and even cerebral effects in such ways that non-modal music perhaps could not emulate. By deviating from the “major-

minor" harmonic dichotomy that predominates European art music, composers gain access to a wider spectrum of colors with which to paint with. Modality and the applications of modal mixture, modal modulation, and tonal ambiguation are used extensively by composers such as Jean Sibelius, Claude Debussy, Bruce Broughton, Ruth Gipps, and others to evoke images of heroes, embarkations on grand journeys, intense instability, and fear of the unknown. The application of modality, though ancient in its origins, is still popular today for its unique semiotics.

245.
Name: Pathak, Siddhi
Major: Biological Sciences - Bachelor of Science
Faculty Research Mentor: Cliff McKinney, Psychology
Funding: Research on Emerging Adults and Parenting (REAP)
Project Category: Social Sciences

Negative Life Events and Depression: How Maternal Authoritarian Parenting Styles Influence Anxious/Depressive Problems
Negative life events have more importance in producing depressive symptoms among people vulnerable to cognitive and emotional factors (Lionetti et al., 2022). Parental practices early in life have long been established to play a significant role in mental health outcomes, especially in terms of stress modulation and well-being (Romm & Metzger, 2021). Life events have some negative effects on anxious/depressive problems while possible individual differences such as coping mechanisms and the influence of parents may lead to variations in mental health outcomes (Zhang et al., 2025). Thus, the current study examined if maternal authoritarian parenting moderated the association between negative life events and anxious/depressive problems in emerging adults. It was hypothesized that there might be a positive link between negative life experiences and anxious/depressive problems although in certain circumstances, mothers who practice an authoritarian style of parenting may be likely to amplify these negative experiences. Participants included 381 emerging adults (60.9% women; 74.9% White, 20.8% Black). Participants completed questionnaires online including the Adult Self Report (Achenbach & Rescorla, 2003), the Parental Authority Questionnaire (Buri, 1991), and the Life Events Questionnaire for Adolescents (Masten et al., 1994). PROCESS (Hayes, 2022) model 1 was used to conduct a moderation analysis. The model predicting anxious/depressive problems was significant, $R^2 = .13$, $F(3, 344) = 16.75$, $p < .001$. Negative life events positively associated with anxious/depressive problems ($B = 0.28$, $SE = 0.04$, $p < .001$). However, maternal authoritarian parenting did not have a main effect on anxious/depressive problems ($B = -0.04$, $SE = 0.05$, $p = .50$), nor was the interaction significant ($B = -0.01$, $SE = 0.01$, $p = .92$). These findings suggest that negative life events are key in the development of anxious/depressive problems for emerging adults, whereas maternal authoritarian parenting does not seem to be pivotal in this relation.

205.
Name: Paudel, Pranavi
Major: Biomedical Engineering - Bachelor of Science
Faculty Research Mentor: Zhujun Pan, Department of Kinesiology
Co-Author(s): John Lamberth, Aaron Griffith, Nate Conner
Project Category: Education

Assistive Robots for Mobility Support in Elderly Care: A Scoping Review
Mobility limitations affect a significant portion of the aging population, reducing independence and quality of life. In this demographic, assistive robots have a good potential in enhancing mobility and independence, supporting daily activities and addressing aging-related mobility challenges. This scoping review analyzed research on assistive robots, focusing on their functionality, control mechanisms, human-robot-interaction, and older adults' perspectives. It explores technical and user-related challenges including usability, adaptability, and acceptance of assistive robots among the elderly. A key focus of this study is the classification of robots based on their functions, intervention duration, and the technical and user interaction challenges. This review examined robots used for mobility support, including wheelchairs, exoskeletons, autonomous automobiles, and fetch-and-carry systems. Additionally, the study highlighted older adults' perceptions and barriers in adapting assistive robots. The findings provide a comprehensive analysis of the state of art of robotic systems in mobility assistance of aging populations. this review also provides recommendations for future development, emphasizing robots' usability and human-robot interaction by bridging the gap between robotic solutions and real-world implementation in elderly-care. The results of this scoping review serve as a foundation for suture research to develop more effective and user-friendly robotic systems for older adults.

71.
Name: Paugh, Zoie
Major: Physics - Bachelor of Science
Faculty Research Mentor: Benjamin Crider, Physics & Astronomy
Project Category: Physical Sciences

Simulating Neutron Interactions with Shielding Materials Using Monte Carlo Simulations
Neutron scattering plays a crucial role in nuclear physics, particularly in the advancement of nuclear energy production. Understanding neutron interactions with reactor shielding materials has become increasingly important as research intensifies to optimize next-generation nuclear reactors. At the University of Kentucky Accelerator Laboratory (UKAL), experiments utilizing monoenergetic neutron beams are conducted to study scattering probabilities as a function of incident neutron energy. A key aspect of these experiments is the use of neutron shielding to isolate the spectral effects of scattered neutrons from the target material, typically composed of a single nuclear species, from other laboratory scattering sources. While experimental data confirm the benefits of this shielding, detailed simulations are needed for a comprehensive understanding and future optimization. To address this, Monte Carlo simulations using Geant4 are being implemented to model neutron interactions with the shielding materials in the configuration matching their use at UKAL enabling the evaluation of their effectiveness. An overview of the simulation efforts and some initial simulated properties of the shielding will be presented.

246.
Name: Pettit, Tatum
Major: Psychology - Bachelor of Science
Faculty Research Mentor: Cliff McKinney, Psychology
Project Category: Social Sciences

The Relation Between Sociocultural Pressures and Body Image Moderated by Gender
Media has been noted to have a strong correlation with BMI and predicts disordered eating and body dissatisfaction (Singh & Gadiraju, 2020). A different study found that fathers' attitude towards their child's weight has been associated with more body shame in both girls and boys (Pecini et al., 2023). The current study examined sociocultural pressures on body image between men and women. Participants included 555 emerging adults (70.5% women, 70.7% White, 23.1% Black). They completed the Sociocultural Attitudes Towards Appearance Questionnaire (SATAQ; Thompson et al., 2004) to assess social pressures on body image. They also completed the Body-Esteem Scale for Adolescents and Adults (BESAA; Mendelson et al., 1997) to assess body image. PROCESS 4.2 (Hayes, 2022) model 1 was used to conduct a moderation analysis. The model predicting body image was significant, $R^2 = .34$, $F(3, 539) = 91.92$, $p < .001$. Sociocultural pressures on the body were associated negatively with positive body image, $B = -0.62$, $SE = 0.10$, $p < .001$. Gender was negatively associated with body image showing that women were more likely to have sociocultural pressures on the body than men, $B = -4.51$, $SE = 0.61$, $p < .001$. The interaction between gender and body image was not significant, $B = 0.12$, $SE = 0.08$, $p = .14$. The data suggest that sociocultural pressures are directly related to body image. It also shows that women were more likely to have sociocultural pressures on the body than men. The data suggests that further testing should be done to determine what kind of sociocultural pressures on the body impact women and men who have a negative body image because that data could lead to more effective support and treatment.

277.
Name: Phillips, Anne Louise
Major: English - Bachelor of Arts
Faculty Research Mentor: Matt Peaple, Shackouls Honors College
Project Category: Humanities

Unrest and Distraction: Fascism in *Cabaret* and *The Great Dictator*
In both Bob Fosse's 1972 film *Cabaret* and Charlie Chaplin's 1930 film *The Great Dictator,* Fascism, specifically German Nazism, is explored. Though the films are of different genres and periods, they both make use of narrative and film forms to depict the evils of a controlling government. Cabaret, a musical, uses juxtaposition and diegetic musical numbers to achieve this goal. The Great Dictator, a comedy, also employs juxtaposition, while using the characters' unrest and fear to further emphasize the message of the film. At the same time, however, the characters are kept distracted from the full onslaught of terror that is unfolding around them. Through these filmic choices, both films express the horrors of Fascism in Nazi Germany. This focus on unrest and distraction is particularly important for modern audiences to observe as division and unrest become ubiquitous in our culture.

154.
Name: Phillips, Colby
Major: Horticulture - Bachelor of Science
Faculty Research Mentor: Tongyin Li, Plant and Soil Sciences
Co-Author(s): Jacob Arthur, Abby Pennington, Ali Alsughayyir, Guihong Bi
Funding: College of Agriculture and Life Sciences URSP
Project Category: Biological and Life Sciences

Use of Grafted Tomatoes with Various Scion and Rootstock Combinations in High Tunnel Production
Tomatoes (Solanum lycopersicum) are of the most widely grown and consumed vegetable crops in the U.S. and worldwide. Per capita consumption of fresh and processed tomatoes were 20.3 pounds and 73.3 pounds in the US in 2017. Tomatoes are grown on over 400 acres in Mississippi, serving as an important part of vegetable production in the state. Grafting tomatoes onto vigorous and disease resistant rootstocks has become increasingly utilized in tomato production, offering benefits such as improved disease resistance, enhanced plant vigor, and greater yield potential. Tomato cultivars may also vary in their response to different rootstocks. The use of a high tunnel elevates temperatures and can potentially advance tomato production for 2 to 4 weeks, and further optimize production efficiency and improve fruit quality of grafted plants. This study examined plant vegetative growth, fruit yield, and quality characteristics including; soluble solids content, flesh firmness, and titratable acidity. There were five indeterminate specialty tomato cultivars including 'Aurea', 'Cubralibre', 'Darkmoon', 'Ducovery', and 'Ginfiz' grown in a high tunnel production system. Each cultivar was grafted onto three types of rootstocks including 'Estamino', 'Maxifort', and 'Multifort', or grown as non-grafted seedling. Results showed that tomato cultivars varied in their growth vigor, marketable fruit yield, and fruit quality, with 'Aurea' producing the highest marketable yield and fruits with the highest soluble solids content. The five selected tomato cultivars varied in their preference to rootstocks for vigorous growth and fruit yield.

43.
Name: Phillips, Jacob
Major: Computer Science - Bachelor of Science
Faculty Research Mentor: Jonathan Barlow, Data Science
Project Category: Engineering

Wheelie Good Parking: Live Data Regarding Parking Used to Transform Students' Ability to Effectively Find the Most Available and Convenient Parking In Real-Time
Planning travel and routes from home to class can be done with a constant rate in every aspect except one. Parking on campus is hard to plan around and predict. Live object detection regarding parking on campus can provide students and the campus with important, efficient and effective data. Real-time data can provide students with the most efficient parking spot in consideration with class locations and parking permit. With the data being live, it can change with the availability of the parking spot. With this data, students can effectively predict and plan for parking on campus. Peak hours and average availability, per spot or lot, will also be recorded and available to students and faculty. With this option, students and faculty can most accurately plan their travel. This data will also be helpful and effective for the campus. With this data, we can more accurately see which parking lots are most used, need more construction, focus, or care. We can also record how long cars are parked on campus, hours in which students are on or off campus. Eventually, we can even get peak days, weeks, or months. This research is relevant in many ways that benefit students, faculty, and the campus. This research and data can lead to many constructive ideas and solutions for parking and traffic on campus.

155.
Name: Potts, Claire
Major: Biological Sciences - Bachelor of Science
Faculty Research Mentor: Ling Li, Biological Sciences
Co-Author(s): Rezwan Tanvir, Caroline Kercheval
Project Category: Biological and Life Sciences

TRQA1: A Taxonomically Restricted Regulator of Protein and Starch Metabolism in Arabidopsis
The orphan gene Qua-Quine Starch (QQS) in Arabidopsis thaliana enhances leaf and seed protein levels, reduces starch content, and improves pest and pathogen resistance across plant species without affecting yield. Through microarray analysis, we identified Taxonomically Restricted QQS Associated 1 (TRQA1) as a gene significantly upregulated when QQS is suppressed. While TRQA1 has been previously linked to iron homeostasis, its role in plant metabolism remains largely unexplored. To investigate TRQA1's metabolic function, we analyzed Arabidopsis lines with altered TRQA1 expression—including overexpression, suppression, and knockout mutants, along with TRQA1 promoter-reporter fusions. Our findings reveal widespread TRQA1 expression across developmental stages, with particularly high activity in leaf cotyledons, radicles, vascular tissues, young leaves, shoot meristem, and root branching junctions.

Functionally, TRQA1 suppression led to increased total plant protein and reduced starch content without negatively impacting growth or yield, while overexpression had the opposite effect, decreasing protein levels and increasing starch accumulation. Further protein-protein interaction predictions using AlphaFold2-Multimer suggest TRQA1 interacts with the transcription factor MYB103, potentially modulating NF-YC4 (Nuclear Factor Y, Subunit C4) activity, a key regulator of carbon and nitrogen partitioning. These findings position TRQA1 as an important metabolic regulator with promising applications for enhancing plant protein content and improving crop nutritional value.

44.
Name: Prevette, Austin
Major: Aerospace Engineering - Bachelor of Science
Faculty Research Mentor: Eric Collins, HPC2
Co-Author(s): Shreyas Narsipur, Neil Sanipara, Kimberton Mai, Spencer Garrett
Project Category: Engineering

Applied Machine Learning-Based Metal Additive Manufacturing for Lightweight Aerospace Components
Metal additive manufacturing (AM) is an emerging paradigm in aerospace design; AM enables fabrication of structures that are impractical through traditional manufacturing methods. Additionally, these additive designs can utilize self-supporting Topology Optimization (TO) to drastically increase specific yield and specific 1st mode. The resulting mass-efficient designs reduce failure stress by up to three times compared to their subtractive counterparts. These AM and AM+TO designs are optimized using Kriging-based engineering surrogate modeling techniques and the resulting novel components are rigorously tested against various criteria—including yield failure testing, random vibration testing, and real-world flight tests. This paper validates the compressive strength and vibrational response of these parts at Mississippi State University's Advanced Composites Institute and NASA MSFC, respectively. Based on the results of the validation tests, the AM components exceed specified testing criteria and will thus be flown on a high-powered rocket for IREC 2025, pioneering the technology in applied student aerospace engineering.

247.
Name: Pulver, Abby
Major: Psychology - Bachelor of Science
Faculty Research Mentor: Hilary DeShong, Psychology
Co-Author(s): Chastity Mathis
Project Category: Social Sciences

Exploring the Relationship Between the Antagonistic Triad and Psychological Wellbeing
The antagonistic triad is comprised of psychopathy, narcissism, and Machiavellianism, three antagonistic personality constructs (Paulhus and Williams, 2002). Characteristics of psychopathy include antisocial behaviors, lower feelings of empathy and conscience, and a tendency towards impulsivity and thrill seeking. An individual who scores high in narcissism typically has an extreme need for interpersonal dominance and admiration, as well as an intense feeling of superiority and entitlement. Machiavellianism refers to the manipulative and planned exploitation of others with the intention of catering to the individual's self-interest. The Psychological Wellbeing Scale (PWB) is a theoretical model that measures distinct dimensions of wellness (Ryff and Keyes, 1995). According to Ryff (1989), autonomy involves self-determination and living by your own standards, rather than the collective. Environmental mastery is the ability to shape one's environment around an individual's psychological or physical needs. Purpose in life refers to a sense of direction that is produced from one's belief of meaning in the world. Personal growth is the continual development of one's potential. Self-acceptance involves maintaining positive attitudes directed towards oneself. This study aims to explore the connection between the individual antagonistic triad domains and their underlying facet traits with the five areas of psychological wellbeing. The current study required participants to complete the Psychological Wellbeing Scale (PWB; Ryff, & Keyes, 1995) and the Five-Factor Model Antagonistic Triad Measure (FFM ATM; Rose, Miller, & Lynam, 2022). The sample is comprised of 599 participants from an undergraduate student population. All individual antagonistic triad subscales from the FFM ATM were correlated with the PWB subscales autonomy, environmental mastery, personal growth, purpose in life, and self-acceptance. Regression analyses with part and partial correlations were conducted as well. Implications, key takeaways, and future directions will be discussed.

156.
Name: Raynor, Madeline
Major: Chemical Engineering - Bachelor of Science
Faculty Research Mentor: Erika Peoples, Mississippi State Chemical Lab
Co-Author(s): Piper Conrad, Christina Childers, Chiquita Price, Erika Womack
Funding: ORED Undergraduate Research Program, USDA-ARS
Project Category: Biological and Life Sciences

Surveillance of Chemical and Metal Contaminants in Catfish (Ictalurus) Using GC-MS/MS, LC-MS/MS, and ICP-MS
As of 2024, Mississippi has the largest inventory of catfish available to consumers. However, contamination from industrial waste or agricultural runoff can lead to harmful chemical and metal accumulation in aquatic ecosystems. Pesticides can be highly toxic to fish, including catfish, by impairing metabolic processes that can potentially lead to mortality. It is important to ensure safe consumption for the betterment of public health, regulatory compliance, and consumer trust. The purpose of this study was to determine chemical and metal contaminants in frozen and fresh catfish. Twenty-six samples of edible catfish samples, frozen fillets from local grocery stores and fresh catfish samples from local ponds, were collected and homogenized at the Mississippi State Chemical Laboratory. After samples were ground, both a QuEChERS extraction used for organic compounds and microwave digestion for metals were performed separately to extract target analytes. Subsequent analyses were performed on the GC-MS/MS, LC-MS/MS, and ICP-MS analysis. Results indicated detectable levels of pesticides for tribufos, bifenthrin, propiconazole, azoxystrobin, diuron (and its metabolites), and thiamethoxam were found in some catfish samples from fresh catfish sources. While most pesticides did not exceed their respective United States Code of Federal Regulations (CFR Part 180) tolerance levels (bifenthrin 5 ppb, propiconazole 100 ppb, azoxystrobin 200 ppb, diuron 200 ppb, thiamethoxam 20 ppb) and no tolerance is established for tribufos. However, thiamethoxam levels in catfish exceeded tolerance levels of 20 ppb (131 ppb thiamethoxam) in pond raised catfish. In addition, a panel of metals, in which there is no FDA-established actions levels for (Cr, As, Se, Ag, Cd, Ba, and Pb) was analyzed by ICP-MS. Additionally, Hg was analyzed but did exceed action levels (100 ppb). These results highlight the need for continued monitoring of catfish in fresh water sources to protect public health and sustain consumer trust.

45.
Name: Razafimino, Mino
Major: Aerospace Engineering - Bachelor of Science
Faculty Research Mentor: Shreyas Narsipur, Aerospace Engineering
Co-Author(s): Carmen Sescu, Melek Israel, Matthew White
Project Category: Engineering

Surface Modifications For Boundary Layer Control in Propellers
Propellers are widely used on small-scale aircraft. From recreational light aircraft to Unmanned Aerial Vehicles, they all rely on propellers to generate thrust due to their simplicity. As a result, increasing their efficiency holds a significant importance in general aviation. The present research investigates the effects of different surface geometries on propellers. It mainly focuses on answering the question of whether these aerodynamic devices would help reduce friction drag and would therefore enhance the performance of propellers to increase lift. Triangular riblets, trip devices, and vortex generators are modeled and placed on 12″x6″ propellers. The distances of each of these devices from the tip of the blade vary from model to model to test the extent of their effects. After testing the 3D-printed propellers in the wind tunnel, collection and interpretation of data such as torque, thrust and efficiency helps assess the effect of such devices on the propeller.

157.
Name: Rearden, Sailor
Major: Wildlife, Fisheries & Aqua - Bachelor of Science
Faculty Research Mentor: Melanie Boudreau, FWRC-Wildlife,Fisheries&Aquaculture
Funding: College of Agriculture and Life Sciences URSP
Project Category: Biological and Life Sciences

Beta-testing a new way of collecting GPS data for fawns
Global Positioning Systems (GPS) technology provides insight into the movement of white-tailed deer. Conventional GPS tracking techniques for fawns, such as expandable collars, can increase mortality, therefore, we beta-tested a new type of ear tag to collect these types of data on young deer. We paired location data, taken every 4 hours, to behavioral observations to see how the GPS unit performed. During observations, we approximated the deer's location using a compass and distance meter and recorded whether the

deer was bedded, standing, or moving, its head position—either down or up—and vegetation surrounding the deer– under a tree, in the grass, or in the open. We will show results related to the performance of the unit (battery life and locations recorded compared to those expected), accuracy (how good were the locations we received), and what deer behaviors were displayed during data collection.

158.
Name: Reid, Lillie
Major: Animal and Dairy Science - Bachelor of Science
Faculty Research Mentor: Cory Gallo, College of Ag & Life Sciences
Funding: College of Agriculture and Life Sciences URSP
Project Category: Biological and Life Sciences

Virtual reality (VR) interaction with horses and perceived improvements to mental health and wellness
Historically, animals have been used in therapeutic interventions with formal research beginning in the 1960s. Today, animal-assisted interventions, especially using dogs and horses, are common for treating mental health conditions. Equine-assisted therapy has demonstrated positive results for mental health and behavioral issues, but access is often restricted by physical, socioeconomic, and environmental factors. To address these barriers, virtual reality (VR) is being utilized to make equine-assisted therapy more accessible. VR offers mental health benefits without the financial and geographical constraints of horse ownership, thereby promoting animal agriculture to underserved populations. Therefore, the purpose of this study is to determine the physiological benefits on stress response, specifically heart rate, by viewing VR equine videos without physical interaction with horses. Participants (n=10) were recruited via campus bulletins and newsletters and completed pre- and post-surveys to assess daily stress levels and social and personal abilities in various areas as well as aspects of the VR setup and footage. A 360 GoPro camera recorded the VR video, and it was viewed with an Oculus VR headset. Heart rates were measured before and after the VR session using a Fitbit watch. The heart rates were analyzed, and the t-value showed significance in the pre- and post-values, indicating the VR significantly (n=0.038) reduced heart rate in participants. These results led to the assumption that the VR video lowered the effects of stress and anxiety in the body. The integration of virtual reality into equine-assisted therapy presents a promising solution to overcome barriers associated with traditional animal-assisted interventions. By making therapeutic experiences more accessible and affordable, VR has the potential to extend the benefits of equine-assisted therapy to a broader population, including those in underserved communities. This innovative approach not only enhances mental health outcomes but also promotes the value of animal agriculture in modern therapeutic practices.

46.
Name: Roberson, Cedric
Major: Artificial Intelligence - Bachelor of Science
Faculty Research Mentor: Maryam Mirabolghasemi, Chemical Engineering
Funding: ORED Undergraduate Research Program
Project Category: Engineering

Conversion of Subsurface-stored CO_2 via Gas Fermentation
Subsurface storage of CO_2 has been proposed as a solution to mitigate the adverse effects of greenhouse gas emissions on the climate. However, subsurface CO_2 storage is costly and there is minimal economic incentive for companies to develop such projects. Converting the stored CO_2 into commodity chemicals will provide such an economic incentive. CO_2 conversion into useful chemicals is possible through various processes, one of which is gas fermentation. In this study we explored natural and engineered processes for microbial conversion of CO_2. We selected two natural gas power plants in Mississippi as the source feed for CO_2 and identified a subsurface reservoir to be used as the bioreactor. We found that the CO_2 emitted from the selected sources in one year can be converted into 21.3 metric kilotons of methane through methanogenesis via naturally-occurring bacteria, or 0.4 metric kilotons of acetone through gas fermentation via engineered acetogens. The former reaction is estimated to take approximately 40 years. We need more data from batch reactor studies to estimate the duration of the latter reaction.

248.
Name: Robertson, Read
Major: Building Construction Science - Bachelor of Science
Faculty Research Mentor: Saeed Rokooei, Building Construction Science
Funding: ORED Undergraduate Research Program
Project Category: Social Sciences

A Gender-based Comparative Analysis of Motivations and Challenges in Construction Education
This research explores the gender-based differences in motivations, challenges and career expectations among students in construction education with a focus on students on Building Construction Science (BCS) program and Mississippi State University. Factors influencing male and female students' decisions to enroll, the barriers they are met with and their professional aspirations are looked into as well. A quantitative survey was distributed to students in the BCS program, collecting responses on topics such as demographics, motivators, obstacles, role models, work preferences, and career goals. The responses were then analyzed to identify trends and similarities between gender and various perceptive factors. The results revealed that job opportunities, high salaries and the challenges of the program were the primary motivating factors for both genders. Inversely, significant differences between the genders were found. Female students seemed to be influenced by their family more and faced greater social challenges like stereotypes and a lack of role models in their life. Male students reported their primary influence came from mentors and friends. Both male and female showed similar preferences for future work environments and working hours but male students expected a higher starting and long term salary compared to females. Both genders also showed comparable levels of confidence in their future success. This study concluded that addressing gender-specific barriers, such as stereotypes in society and the lack of female representation in construction could bring forth more diversity in construction education. Recommendations include targeted recruitment strategies, providing more female role models and educating students on the gender disparities in salary expectations can help promote equity in the construction industry.

249.
Name: Robertson, Read
Major: Building Construction Science - Bachelor of Science
Faculty Research Mentor: Saeed Rokooei, Building Construction Science
Funding: ORED Undergraduate Research Program
Project Category: Social Sciences

An Empirical Evaluation of Suicide in the Construction Industry
Suicide rates in the construction industry is an issue that has not gained the attention it deserves despite statistics indicating significantly higher rates in construction than in other industries. This study examines the perceptions of professionals in construction in relation to suicide, its causes and potential prevention measures. This study features a quantitative survey that was conducted among working professionals in the construction industry. This survey received 73 responses that revealed a widespread lack of knowledge when it comes to suicide in construction. The study also highlights many factors contributing to suicide. These factors include long work hours, job insecurity, the stigma around mental health and limited access to support resources. The results show a gap in awareness in the workplace and preventive initiatives, suggesting that the industry does not prioritize mental health as it should. Additionally, the study found multiple barriers to seeking help. These include the fear of being judged, job-related consequences and a lack of access to mental health resources. These findings show a need for industry wide reforms when it comes to mental health training, policies and support programs. If these challenges are addressed properly, construction companies can foster a more supportive environment that lowers suicide risk and strengthen worker well-being. The findings of this study are a steppingstone for more research into how to combat this crisis in the construction industry.

47.
Name: Rogers, Ethan
Major: Aerospace Engineering - Bachelor of Science
Faculty Research Mentor: Matthew Berk, Raspet
Co-Author(s): Chuangchuang Sun, Thomas James, Parker Liberatore
Funding: Department of Aerospace Engineering
Project Category: Engineering

Fusion-Based Utilization and Synthesis of Efficient Detections (Project F.U.S.E.D.)
This study aimed to develop hardware and software for an object detection fusion system, using three different sensors. The system's performance was compared to that of individual sensors deployed for the same task. The focus of the research was to prove the competence and benefits of a decision-level fusion method as it was applied to lightweight object detection architectures, and the driving motivators behind the study were simplicity in implementation and good computational performance. In short, the algorithm would use lightweight models to perform object detection on the sensors individually, and then the detection coordinates would be transformed into the same coordinate planes for correlation. The method exploited sensor calibration and depth images to create an efficient workflow. Once the algorithm was created, it was tested and compared both qualitatively and quantitatively to individual models deployed on the same sensors with no fusion framework. Qualitative results clearly indicated that the fusion algorithm outperformed individual models in more challenging scenarios. The quantitative results indicated the same trend, but it was also clear that inaccuracies in the fusion methodology resulted in a small percentage of the true detections being missed when they were otherwise caught by individual models. Future work should consider investigating the deployment of the fusion algorithm on small

devices, because the lightweight models were intended for mobile deployments. Other possible work should study the effect of improved extrinsic calibration, better-trained models, semantic segmentation models overlayed for improved depth resolution, and adding adaptability to the algorithm's decision-making process for different scenarios.

250.
Name: Roman, Katie
Major: Animal and Dairy Science - Bachelor of Science
Faculty Research Mentor: Kathleen Ragsdale, Social Science Research Center
Co-Author(s): Terezie Tolar-Peterson, Sylvia Banda, Netsayi Mudege, Madeline Burdine, Lizzy Muzungaire
Funding: College of Agriculture and Life Sciences URSP
Project Category: Social Sciences

Evaluating Acceptability of Four Flavors of Dried Fish Powder-Fortified ComFA+Fish Instant Porridge to Address Stunting Among At-Risk Children in Rural Zambia
Despite Zambia's progress in reducing infant and young child (IYC) malnutrition, stunting (35%) and wasting (4%) in children under 5 years remain high, particularly in rural areas [1]. To address nutrient gaps among vulnerable IYC, we conducted sensory panels of different flavors of Complementary Food for Africa+Dried Fish Powder (ComFA+Fish) Instant Porridge, fortified with dried fish powder (DFP) from whole pelagic small fish from Zambia's Lake Kariba and flavored with all-natural ingredients.Thirty-three caregivers and IYC (ages 6-23 months) participated in four sensory panels over two days to assess IYC's global liking of four ComFA+Fish Instant Porridges: 1) Plain, 2) Vanilla, 3) Vanilla+Extra DFP, 4) Strawberry. The protocol used was successfully implemented in three previous sets of panels [2-7]. Caregivers fed each porridge to their child during three consecutive tasting intervals (Time 1-3; T1–T3). The porridge was served in 50g (~8 oz) portions using identical infant spoons and BPA-free bowls. Caregivers assessed their child's global liking of each porridge at T1–T3 using 5 descriptors of positive/negative behaviors exhibited by their child that correlated with a five-point hedonic scale where 1=Extremely Disliked and 5=Extremely Liked. We collapsed the results into three categories: Disliked/Extremely Disliked, Neutral, Liked/Extremely Liked. Results: Liked/Extremely Liked. Plain: 81.8%, 81.8%, 71.9% (T1, T2, T3, respectively); Vanilla: 84.9%, 87.9%, 90.3% (T1, T2, T3, respectively); Vanilla+Extra DFP: 70%, 65.5%, 62.1% (T1, T2, T3, respectively); Strawberry: 96.5%, 96.5%, 96.2% (T1, T2, T3, respectively). Averaged Results (T1-T3): Strawberry: 96.4%; Vanilla: 87.7%; Plain: 78.5%; Vanilla+Extra DFP: 65.9%. We plan to 1) adjust the ComFA+Fish Instant Porridge formulation to meet dietary reference intake (DRI) values while maintaining acceptability, and 2) complete a shelf-life study of the reformulated product.

251.
Name: Rossi, Madeline
Major: Psychology - Bachelor of Science
Faculty Research Mentor: Cliff McKinney, Psychology
Project Category: Social Sciences

Effects of Adverse Childhood Experiences on Psychological Problems in Adulthood as Moderated by Negative Trauma Appraisals
A history of childhood trauma makes adults more susceptible to threat appraisal which negatively affect mental health consequences. Lower threat appraisals suppress depressive symptoms of adults with moderate childhood trauma. (Mayer et al., 2022). Similarly, adults who reported experiencing childhood abuse and symptoms of PTSD also reported negative trauma appraisals. (Barlow et al., 2017). Meanwhile the presence of self-righting appraisal promotes self-reliance and overcoming trauma caused by Adverse Childhood Experiences (ACEs) (Leung et al., 2022). This study examined the relations between ACEs and psychological problems in emerging adults, and how negative trauma appraisals moderated this relationship. It was hypothesized that adverse childhood experiences will have a main effect on psychological problems in adulthood and negative appraisals of trauma will enhance the severity of the psychological problems. Participants included 736 emerging adults (61.0% women; 77.9% White, 15.6% Black). Participants completed the Adverse Childhood Experience Questionnaire (Felitti et al., 1998), the Trauma Appraisal Questionnaire (TAQ; DePrince et al., 2010), and the Adult Self Report (ASR; Achenbach & Rescorla, 2003). PROCESS 4.2 (Hayes, 2022) model 1 was used to conduct a moderation analysis. The model predicting psychological problems was significant, $R^2 = F(3, 732) = 221.52$, $p < .001$. Adverse childhood experiences was positively associated with psychological problems, $B = 2.27$, $SE = 0.50$, $p < .001$. Negative trauma appraisal was also positively associated with psychological problems, $B = 0.44$, $SE = 0.02$, $p < .001$. The interaction between adverse childhood experiences and negative trauma appraisal was not significant, $B = 0.001$, $SE = 0.01$, $p = .95$. This study examined the effects of ACEs on psychological problems in adults moderated by negative trauma appraisals. Both ACEs and negative trauma appraisals significantly affect psychological problems in adulthood. However, negative trauma appraisals do not increase the severity of ACEs on psychological problems in adults.

252.
Name: Rutherford, Janiya
Major: Psychology - Bachelor of Science
Faculty Research Mentor: Kathleen Ragsdale, Social Science Research Center
Co-Author(s): Terezie Tolar-Peterson, Madeline Burdine, Samantha Rios, Harleen Kaur Maroak, Katie Roman
Funding: ORED Undergraduate Research Program
Project Category: Social Sciences

Food Safety and Water, Sanitation and Hygiene (WASH) Curriculum Targeting Low-Literate Fishers, Processors, and End-Consumers in Rural Zambia: Evaluation Results

Reduced nutrition, food waste, and foodborne illness linked to inadequate cold chains and unsanitary practices during fish processing pose serious health hazards in low- and middle-income countries (LMIC) throughout sub-Saharan Africa where some rely on fish as an attainable animal source food (ASF). In Zambia, >50% of the population can afford 1-2 meals per day and the most consumed ASF is homegrown fish **[1]**. Fish is perishable without proper cold chains, most are processed at point-of-catch using traditional methods (e.g., smoking, sun-drying), and low-literate women predominate this economic activity. Most fish processors lack adequate training in food safety and water, sanitation and hygiene (WASH), traditional methods can expose fish/fish-products to biological and environmental contaminants that reduce nutrition, increase spoilage, and/or generate foodborne illness. To address the knowledge gaps among low-literate processors in rural Zambia, we implemented a three-hour fish processing, food safety and WASH tailored curriculum for fishers and processors in Siavonga (N=53; n=33 women). We discuss how it successfully implements activities among low-literate fishers and processors during two separate USAID Feed the Future Fish Innovation Lab projects, *FishFirst! Zambia* (2020-2023) and *Nourishing Nations-Nigeria* (2020-2023) **[2-4]**. We review the ComFA+Fish Fish Processing/WASH Training modules, which enhance knowledge of safe fish processing, storage, WASH to improve food safety, increase the quality of fish/fish-products, reduce spoilage/post-harvest loss, and reduce pressure on fisheries. We present the pre-/post-test evaluation results and how they are used to inform the content of two leisurely open-access online courses we are developing for dissemination globally via mobile phones. The first course focuses on fish for human nutrition, early infant feeding, WASH, targets caregivers, nurses, nutritionists, extensionists, and community health workers. The second course focuses on fish processing, food safety, WASH, targets fishers, processors, nurses, nutritionists, extensionists, and community health workers.

159.
Name: Rutherford, Jessica
Major: Chemical Engineering - Bachelor of Science
Faculty Research Mentor: Jean-Francois Gout, Biological Sciences
Co-Author(s): Jean-Francois Gout
Project Category: Biological and Life Sciences

Investigating Mutation Spectrum of Amyloid & Other Diseases

Amyloid protein aggregations are directly linked to neurodegenerative diseases such as Alzheimer's and Parkinson's. Changes in the amino acid sequence can turn a normal protein into an amyloid peptide. Because a small number of amyloid peptides can convert the remaining wild-type proteins, even transient changes in the amino acid sequences can result in the formation of permanent amyloid aggregates. Interestingly, the most common type of mutation, C:G to T:A transitions, produces amino acid changes that tend to increase the probability of amyloid formation. Therefore, we hypothesize that C:G and T:A mutations will be over-represented among mutations related to amyloid diseases. To test this hypothesis, we compared the spectrum of mutations linked to amyloid and other types of well-studied diseases using the mutation dataset from the ClinVar database. In addition, we polarized all mutations relative to the direction of transcription to obtain a more precise view of the type of base substitutions that are over or under-represented in different diseases. We find that C:G to T:A mutations are slightly over-represented among mutations linked to amyloid diseases. Interestingly, we also observed an asymmetrical mutation spectrum for other diseases, revealing biases in the types of mutations associated with different diseases.

253.
Name: Sanders, Henry
Major: Psychology - Bachelor of Science
Faculty Research Mentor: Andrew Jarosz, Psychology
Project Category: Social Sciences

The Impact of Social Media Usage on Attentional Control

Today's information society has resulted in the rise of social media platforms designed to target users' attention span for an extended period. Dopamine systems within the brain respond to short form content, such as short videos, that can lead to addictive habits of

excessive social media 'scrolling' by creating feelings of a dopamine 'high' associated with acquiring novel and interesting information (Tereshchenko & Kasparov, 2023). Previous research has shown excessive digital media usage may negatively impact attention span and reduce individuals' ability to sustain attention, suggesting attentional resources may be overburdened for heavy social media users (Andreassen & Pallesen, 2014). Information related to the impact of individual social media apps is lacking and research involved in gathering screen time data often relies on subjective measures. Prior studies have also utilized the Sustained Attention to Response Task (SART) and Engle-Squared to evaluate attention. This study assesses social media usage and attentional control by gathering screen time data using built in smartphone features combined with evaluating performance on multiple attentional control tasks, including the Stroop Task (Stroop, 1935), the Flanker Task (Eriksen & Eriksen, 1974), the Simon Task (Simon & Rudell 1967) as well as the SART (Robertson et al., 1997). It is hypothesized that heavy social media users will perform worse on attentional control tasks, particularly for users who engage more in apps consisting substantially of short form content. Understanding social media behavior across individual apps may give insight into how specific apps influence attentional control. This research could improve future methodological approaches of gathering screen time data and guide effective strategies to reduce poor attention outcomes related to heavy social media use.

195.
Name: Sanderson, Spencer
Major: Agribusiness - Bachelor of Science
Faculty Research Mentor: Will Maples, Agricultural Economics
Funding: College of Agriculture and Life Sciences URSP
Project Category: Business and Economics

An Examination of the Profitability of Various Soybean Marketing Strategies for Mississippi Delta Producers
Per FarmDocDaily, only 11% of United States soybean producers use the futures market to manage their price risk. The futures market can be a vital tool in locking in acceptable prices during periods of market volatility. In this study, various marketing strategies for Mississippi soybean producers are examined. Using futures market and cash price data for the years 2008 to 2023, eleven strategies, including pre-harvest and post-harvest, were examined. For Greenwood and Greenville, MS., the most dominant pre-harvest strategy was a series of timed sales between March and May resulting in an average final received sale price of $11.03/bu for Greenville, and $10.76/bu for Greenwood. For post-harvest marketing in Greenville, the dominant strategy resulted in a final received price of $11.43/bu. For Greenwood, the dominant strategy resulted in a final received price of $11.16/bu. Across all strategies, the strategies that resulted in the lowest final price involved holding all the way until next harvest and selling 100% in that cash market. These results are significant for producers who are looking to make more careful and profitable marketing decisions with their grain, providing a template of historically successful strategies and showing the results of each.

48.
Name: Sao, Mohnish
Major: Computer Science - Bachelor of Science
Faculty Research Mentor: Prabhakar Pradhan, Physics & Astronomy
Co-Author(s): Mousa Alrubayan, Mohnish Sao
Funding: ORED Undergraduate Research Program
Project Category: Engineering

Evaluation and Optimization of Deep Learning Models for Enhanced Detection of Brain Cancer and Early Alzheimer's Disease in Medical Imaging
This research explores the power—and occasional stubbornness—of deep learning models in medical imaging, on brain cancer detection and the nascent efforts toward Alzheimer's disease detection. Initially, a ResNet-50 model was employed to distinguish between diseased and healthy brain states, but the results were not as exciting. Recognizing the need for a better approach, the study pivoted to DenseNet-121, whose densely connected architecture not only tackled the vanishing gradient problem but also delivered a robust performance boost. With fine-tuning through hyperparameter optimization and data augmentation, the refined model achieved an accuracy of 88.35%, an impressive F1 score of 0.9116, recall of 0.8667—numbers that speak louder than any textbook.
Building on this success, the research also lays the groundwork for applying similar techniques to the early detection of Alzheimer's disease, an area where early intervention is critical yet challenging. Despite facing hurdles like imbalanced datasets and the trial-and-error nature of model tuning, the journey has been a rich learning experience. Importantly, this is ongoing research—an evolving endeavor that continues to refine its methods and push the boundaries of medical imaging analysis. In sum, the study underscores the continuous pursuit of advancements in medical diagnostics.

72.
Name: Sapkota, Saugat
Major: Electrical Engineering - Bachelor of Science
Faculty Research Mentor: Boniface Fosu, Geosciences
Co-Author(s): Yen-Heng Lin, Shrinidhi Ambinakudige, Jamie Dyer
Funding: NSF EPSCoR
Project Category: Physical Sciences

Sensitivity of Regional Hydroclimate Simulations to Land Use and Land Cover Changes
Land use and land cover (LULC) changes shape local and regional climates, yet their influence remains a major source of uncertainty in climate projections. This study explores how different LULC datasets influence simulated hydroclimate dynamics through high-resolution, downscaled simulations over the Mississippi Delta Region, a landscape marked by intensive agriculture, wetland loss, and human-driven land changes. By systematically varying physical and dynamic schemes within the WRF model, the study isolates how LULC modifications affect key climatic variables like temperature, precipitation, and boundary layer characteristics. To systematically evaluate the impact of LULC on climate projections, parameter sets from various peer-reviewed studies are employed to guide the selection of physical and dynamic schemes within WRF. The experimental design systematically tests combinations in microphysics, cumulus parameterization, radiation models, and planetary boundary layer schemes. Land surface models (LSMs) are also tested, incorporating vegetation dynamics, soil moisture feedback, and urban/lake influences. Beyond land-atmosphere interactions, the study accounts for broader climate drivers such as cloud microphysics, sea surface temperature adjustments, and data assimilation techniques like spectral and grid nudging. The simulated results are compared with observational datasets to assess model performance and determine which configurations yield the most reliable climate projections. These findings will enhance regional climate modeling by identifying the sensitivity of climatic variables to LULC datasets, improving forecasting, agricultural planning, and climate adaptation strategies in vulnerable regions like the Mississippi Delta.

160.
Name: Sartin, Jack
Major: Biochemistry - Bachelor of Science
Faculty Research Mentor: Galen Collins, Biochemistry Nutrition Health Promo
Project Category: Biological and Life Sciences

Expression and Purification of DDI2 Orthologs: NRIP2, NRIP3, ASPRV1, and SPRTN
DNA-damage inducible 1 homolog 2 (DDI2) is a protein that plays a role in protein degradation through its activity on the transcription factor NRF1. NRF1 is continuously made and degraded by the proteasome, however, when the proteasome is not functioning correctly, DDI2 will cleave NRF1 into its active form as a transcription enhancer to make more proteasomes. Thus, there is a negative feedback system that allows for the cell to regulate and maintain proteasome levels. Inhibition of the proteasome can lead to apoptosis in cancerous cells through the buildup of regulatory proteins that aren't being degraded, through drugs such as Nelfinavir. Unfortunately, these drugs have been shown to have quickly onset refractory periods through adaptations from the cancer cells like the following. DDI2 has been shown to upregulate in cancer cells to cleave more NRF1 and thus increase proteasome transcription to promote regulatory protein degradation to avoid detection and apoptosis. Interestingly, in cells where there is a targeted inhibition of DDI2 there is an upregulation of the proteins NRIP2 and NRIP3. These proteins are orthologs of DDI2 because of a shared retroviral protease, or RVP, region. Another protein, ASPRV1, shares this RVP region. The basis of my project is to isolate and purify these proteins, along with another protein called SPRTN, to develop an assay for biochemical testing on these proteins as this has not been developed yet. We are interested in finding out exactly what these proteins are doing when they are upregulated in response to DDI2 inhibition and if they can compensate for DDI2 inhibition, thus making them a drug target to further the time that drugs like Nelfinavir remain effective against certain cancers. More specifically, we want to determine if they cleave the same thing as DDI2 and if they function as dimers.

49.
Name: Seiler, Gavin
Major: Cyber Security & Operations - Bachelor of Science
Faculty Research Mentor: George Trawick, Computer Science and Engineering
Co-Author(s): Shelly Hollis, Devin Chen
Funding: Bagley College of Engineering AY 2024-2025 Undergraduate Research Award
Project Category: Engineering

An Evaluation of the Efficacy of Student-Led Cybersecurity Assessments for Mississippi K-12 School Districts
Hands-on experiences, in addition to a degree, is necessary for college graduates to find competitive employment nowadays, a fact

particularly evident in the field of cybersecurity. At the same time, K-12 school districts often have limited IT staff with little or no cyber expertise and the responsibility of safeguarding large quantities of personally identifiable information. Mississippi State University's Computer Science and Engineering Department, in conjunction with the VICEROY program, is beginning to fill these gaps by conducting student-led cybersecurity assessments for school districts using the U.S. Department of Homeland Security's (DHS) Cybersecurity Performance Goals (CPG). School IT teams are so understaffed and overworked that they do not make time to do the cyber reviews. The review process with a third party is often the first time anyone has systematically reviewed the cyber posture for vulnerabilities. Therefore, we propose a research team of students and faculty to act as facilitators of a K-12 security assessment program as begun through the VICEROY project. These facilitators would train and lead MSU students in conducting cybersecurity assessments, expand the assessment program to more districts, collect data from completed CPG assessments, build reports for school districts based on assessments, and follow up with school districts to determine what benefits the CPG assessments had on them. The research team's methods and findings would be published to share and, hopefully, scale the concept as a national effort of university students conducting cybersecurity assessments with K-12 schools to increase the security posture of our nations' K-12 schools.

50.
Name: Sewell, Reid
Major: Data Science - Bachelor of Science
Faculty Research Mentor: Andy Perkins, Computer Science and Engineering
Project Category: Engineering

GNNs for Network Classification in Single Cell RNA Sequencing Data
A common technique when investigating a disease is to profile gene expression, as this gives unique insights into the functions of a cell. Gene expression data gathered from single cell RNA sequencing can be encoded into a gene co-expression network, which is a graph of potential relationships between different genes. One method for interpreting data encoded as a graph is to use a graph neural network, or GNN. This project designs a pipeline for training a GNN to accomplish classification tasks on graph data. Then, given a dataset of gene co-expression networks made from multiple single cell RNA sequencing studies, the pipeline is used to train a GNN for classifying the health state a given gene co-expression network represents. The trained GNN model is used to judge the effectiveness of the pipeline across disciplines.

183.
Name: Shelton, Nathan
Major: Music - Bachelor of Arts
Faculty Research Mentor: Jenna Klein, Department of Music
Co-Author(s): Dylan Hall
Project Category: Arts, Music, & Design

A Sisterly Bond: The Life, Legacy, and Musical Influences of Nadia and Lili Boulanger
The sisterly bond between Nadia and Lili Boulanger profoundly influenced their lives and musical careers, through mental, physical, and philosophical aspects. Their connection is particularly evident in the realm of music, as highlighted in this presentation. Titled, "A Sisterly Bond: The Life, Legacy, and Musical Influences of Nadia and Lili Boulanger," this presentation sheds light on the compositional brilliance of both sisters and their mutual impact on each other's work. This presentation also explores specific aspects of the Boulanger sisters' compositional styles and repertoire. Lili Boulanger's style is characterized by ambitious harmonic structures that resonate throughout her works, whether composed for solo piano or orchestra. Lili Boulanger, in particular, infused her compositions with storytelling elements that mirrored her life and significant events around her. In contrast, Nadia composed a few pieces early in life, but is primarily remembered as a teacher, conductor, and soloist, which along with her many accomplished protégés earned her recognition as one of the greatest teachers of the 20th century. The Boulanger's enduring sisterly bond resulted in numerous similarities across their compositions, despite their stark difference. Following Lili's untimely passing, Nadia ceased composing and dedicated herself to teaching, honoring her sister's legacy by imparting her knowledge and influence to her students for decades to follow. Without Lili, we would not have Nadia, and without Nadia, we would not have Lili. Through this presentation attendees will not only gain a deeper knowledge of the Boulanger sisters' compositional output, but their lasting imprint on our musical landscape.

196.
Name: Sieja, Jimmy
Major: Business Economics - Bachelor of Business Adm
Faculty Research Mentor: Travis Wiseman, Finance & Economics
Co-Author(s): Josh Phillips
Funding: Shackouls Honors College Research Fellowship
Project Category: Business and Economics

Examining Reverse Brain Drain in the United States: The Impact of Remote Work Availability
This study examines the impact of remote work on domestic brain drain in the United States, particularly in the post COVID-19 pandemic era. Using a difference-in-differences methodology, we assess whether the increased flexibility of remote work has influenced the migration patterns of educated/skilled individuals, enabling them to remain in their home states or return after previously relocating. Our findings reveal a dual effect: a *preventative* effect, where individuals can access better-paying jobs without migrating, and a *reverse* effect, where remote work facilitates the return of previously relocated individuals to their home states. Leveraging data from the Integrated Public Use Microdata Series (IPUMS USA), we analyze trends before and after 2020, comparing remote workers with essential workers, who represent a "business-as-usual" scenario. Results indicate a statistically significant reduction in brain drain among remote workers post-COVID, suggesting that remote work contributes to a more geographically balanced distribution of talent. Our study highlights critical policy implications for regional economic development, emphasizing the need for strategies to maximize the benefits of remote work in mitigating brain drain, particularly for states suffering from massive brain drain. Future research will incorporate longitudinal data to further examine the long-term effects of remote work on migration patterns and geographic mobility.

51.
Name: Simmerman, Garrett
Major: Chemical Engineering - Bachelor of Science
Faculty Research Mentor: Julie Jessop, Chemical Engineering
Co-Author(s): Finnis Ginder
Funding: NSF REU: Grant Number 2054775
Project Category: Engineering

Beam Me Up: Electron-Beam Polymerization Behavior of Acrylate and Methacrylate Mixtures
Polymerization is the process where small molecules, called monomers, combine to form larger, repeating structures called polymers. Electron beam (EB) polymerization uses electrons to generate free radicals that initiate the reaction, often leading to cross-linking, where bonds form between polymer chains, enhancing thermal and physical properties. EB polymerization is more environmentally friendly and energy-efficient than traditional methods like thermal polymerization. It also does not require solvents or expensive initiators like UV polymerization. This makes EB a safer and industrially viable technique. In industrial settings, polymers are rarely made from pure monomers but rather from mixtures. Some commonly used monomers are acrylates and methacrylates. However, methacrylates are much less responsive to EB polymerization than their acrylate counterparts. This research focuses on how mixtures of acrylates and methacrylates behave under EB polymerization, particularly regarding conversion rates (the proportion of monomers forming polymers) and gel fraction (the amount of cross-linked polymer). Testing for conversion and gel fraction will reveal how mixture composition influences polymerization and the resulting polymer properties. Gas chromatography will analyze non-cross-linked polymers, providing a comprehensive view of polymerization outcomes. The primary goal is to determine how different monomer mixtures affect conversion and gel fraction, aiming to establish predictive models for these values in other mixtures. Understanding the relationship between conversion and gel fraction could improve applications like migration testing, which assesses the transfer of substances (e.g., dyes, inks, food materials) across polymer substrates, critical for food packaging and safety-sensitive industries. This research could optimize EB polymerization for mixed monomer systems, enhancing material performance and broadening industrial applicability. By mapping the behavior of acrylate and methacrylate mixtures, this study aims to provide valuable insights into improving polymerization processes and material design.

73.
Name: Singh, Guriqbal
Major: Computer Science - Bachelor of Science
Faculty Research Mentor: Jaspreet Randhawa, Physics & Astronomy
Project Category: Physical Sciences

Sensitivity of X-ray burst models to nuclear reaction rates
In X-ray binaries, a neutron star accretes material from its companion (Sun-like) star. Accreted material undergoes nuclear reactions on

the surface of neutron star, leading to type-I X-ray bursts. Extreme bursts happen in ultra-compact X-ray binaries (UCXRBs) where a neutron star accretes material form a white dwarf. This study investigates the impact of nuclear reaction rates on burts models for an UCXRB system. Using python-based one-zone X-ray burst models which features an extended reaction network, we analyzed the sensitivity of various burst properties to variation in reaction rates. Results indicate that the energy generation and nucleosynthesis are highly sensitive to change in some of the reaction rates. These finding highlight some of the important reaction rates to be constrained experimentally to improve the X-ray burst model observation comparison.

52.
Name: Singletary, Hayward
Major: Mechanical Engineering - Bachelor of Science
Faculty Research Mentor: Nayeon Lee, CAVS Research
Funding: ORED Undergraduate Research Program
Project Category: Engineering

Experimental investigation on developing nanotextures using anodization
In this study, nanotextures were developed on the surface of Ti-6Al-4Vo alloy using an electrochemical method in conjunction with a function generator. Nanotextures observed in biological samples, such as eggshells, flower petals, or insect cuticles, show properties of antibacterial, superhydrophobic, or water condensation. We used anodization techniques, in which a Ti-6Al-4Vo alloy, acting as the anode, was submerged in a solution of $0.5NH_4F + (CH_2OH)_2 + H_2O$ and connected to a voltage box, and graphite, acting as the cathode; then 20V power was applied for 30 minutes with and without the function generator. As a post-treatment, the samples were heat-treated at 450 °C and then examined using a Scanning Electron Microscope (SEM). The samples without a function generator showed various structures, chasms, cracks, and features with no visible pattern or order. When a sine frequency of 1 Hz was added to the anodization process, the structure of the nanotubes became more ordered. The higher the frequency induced by the sine generator, the more compact the nanostructures were; however, inducing a frequency into anodization caused the height of the nanostructures to reduce. With continued research and experiments, a correlation between how frequency, voltage, and anodization cause the creation of TiO_2 nanostructures on titanium can be found. The end goal of this study is to see if nanotextures developed on metals will exhibit properties similar to those seen in biological samples.

53.
Name: Slavick, Stephanie
Major: Biomedical Engineering - Bachelor of Science
Faculty Research Mentor: Lauren Priddy, Ag & Bio Engineering
Co-Author(s): Emma Roden, Nathaniel Bosque, Tanveer Shaikh, Thomas Werfel, Nicholas Fitzkee
Funding: Shackouls Honors College Research Fellowship, NIH R56AI139479
Project Category: Engineering

Cytocompatibility of functionalized gold nanoparticles as an antimicrobial therapeutic
Osteomyelitis is a bone infection most often caused by *Staphylococcus aureus*. Because antibiotics often cannot penetrate biofilm or deeply infected tissue, treatment typically involves surgical debridement followed by prolonged, high-dose, systemic antibiotics. These treatments can cause organ toxicity and increase the risk of antibiotic resistance. Thus, localized delivery of alternative antimicrobials is necessary to minimize systemic side effects and increase efficacy. Protein-coated gold nanoparticles (AuNPs) have been used in many biomedical applications due to their biocompatibility and high photothermal efficiency which allows for effective treatments even with low concentrations of AuNPs. Functionalized AuNPs, specifically elastin-like polypeptide (ELP)-coated AuNPs, cause agglomeration of AuNPs which enhances photothermal efficiency when irradiated with a near-infrared laser, making them prospective antimicrobial treatments for *S. aureus*, as the heat induced by the laser can kill the bacteria. Additionally, we are testing R2AB and ELP-R2AB coated AuNPs due to R2AB's ability to bind to biofilms. Prior to laser application, the objective of this research was to determine the cytotoxic effects of AuNPs functionalized with ELP, R2AB, and ELP+R2AB on human embryonic kidney (HEK-293) cells. Based on published data, we hypothesized that ELP-coated AuNPs would not have a cytotoxic effect on HEK-293 cells. In this study, 10, 20, or 40 nM AuNPs were applied onto cells for 24 hours. Initially, we used a Cell Titer-Glo assay to measure cytotoxic effects, but it gave inconsistent luminescence results. Therefore, we performed a Cell Counting Kit-8 (CCK-8) assay, an absorbance-based viability method. However, removing the AuNPs from the cells was difficult, and residual AuNPs affected the absorbance readings. Currently, we are troubleshooting the luminescence issues with the Cell Titer-Glo assay and exploring other viability assays, including MTT, which would allow us to determine cell number by measuring the absorbance of the supernatant (cell solution).

184.
Name: Sloane, Yuria
Major: Architecture - Bachelor of Architecture
Faculty Research Mentor: Silvina Lopez Barrera, Architecture
Funding: Aydelott Travel Award
Project Category: Arts, Music, & Design

Disruptive Architecture: The role of architecture in the liberation of Indigenous communities around the world
"Disruptive Architecture: The role of architecture in the liberation of Indigenous communities around the world" is a project focused on discussing the effects of colonial architecture on indigenous groups worldwide. The indigenous groups included in this research were the Aymara people of modern day Bolivia, the Māori people of modern day New Zealand, the Ryukyu people of modern day Okinawa, and the Sami people of modern day Norway. The research was aimed at finding and discussing elemental, spatial, and technological patterns in the architecture of colonial powers and how they were used to directly, negatively impact the indigenous communities in which they resided. In tandem, the research investigated traditional architecture of each indigenous community. These two paths of exploration were then combined to analyze contemporary examples of indigenous architecture. These examples ranged from multi-use residential to museums and bureaucratic buildings. With this research we are able to form a path to further the creation of effective, respectful architecture that serves chronically oppressed indigenous communities.

254.
Name: Smith, Madison
Major: Psychology - Bachelor of Science
Faculty Research Mentor: Cliff McKinney, Psychology
Project Category: Social Sciences

Religiosity Influencing Risky Sex Behavior Moderated by Sexual Knowledge
Research suggests religiosity delays the sexual debut of adolescent females and mixed findings for adolescent males (Rostosky et al., 2004). Growing research shows the importance of sexual knowledge on adolescents engaging in risky sexual behavior (Mori et al., 2023). This current study examined how private religiosity associated with risky sex behavior and how sexual knowledge moderated that relation. Participants included 946 emerging adults from a large southern United States university. Participants completed the Stearns-McKinney Assessment of Religious Traits (SMART; Stearns & McKinney, 2018), measuring the private religiosity of emerging adults, the Student Sexual Risk Scale (Dehart & Birkimer, 1997), measuring risky sex behavior, and the Sex Knowledge and Attitudes Test (SKAT-A; Fullaed et. al, 2005), measuring of the sexual knowledge of the emerging adults. It was hypothesized that sex knowledge would strengthen relations between private religiosity and risky sex behavior. Process 4.2 (Hayes,2022) model 1 was used to conduct a moderation analysis. The model predicting risky sex behavior was significant, $R^2 = .35$, $F(3, 942) = 11.22$, $p < .001$. Private religiosity was not associated with risky sex behavior, $B = -.03$, $SE = .04$, $p = .471$. Sexual knowledge associated negatively with risky sex behavior, $B = -.36$, $SE = .06$, $p < .001$. The interaction between private religiosity and sexual knowledge was not significant, $B = -.003$, $SE = .01$, $p = .60$. Results showed that sexual knowledge, but not private religiosity nor its interaction, had a significant effect on risky sex behavior. The results of the interaction involving sexual knowledge and private religiosity do not support the hypothesis that sex knowledge would strengthen the relation between private religiosity and risky sex behavior. Future studies can study the effect further to see what else may be a mediating or moderating effect or influence on risky sex behavior.

54.
Name: Smith, Owen
Major: Industrial Engineering - Bachelor of Science
Faculty Research Mentor: Wenmeng Tian, Industrial and Systems Engineering
Funding: Bagley College of Engineering Undergraduate Research Award
Project Category: Engineering

FFF Process Parameter Identification with Machine Learning Models
In recent years, additive manufacturing (AM) has seen increasing popularity, owing to its efficiency and high speeds. Fused Filament Fabrication (FFF) is a popular form of 3D printing, where a plastic filament is heated up and deposited layer by layer to construct a part. Input process parameters have large impacts on the final part quality. Data privacy and incomplete data providing incomplete process parameters can make replicating parts difficult, such as for research purposes. However, a machine learning model can be trained on *in-situ* layer-wise images collected during a print to combat this issue. With sufficient data, these models could be used to predict unknown parameters from other parts. Two parameters were tested, infill pattern orientation and extrusion width, with four parts across three factors printed for each for a total of twenty-four. Images of each layer for each of these parts were collected during the printing stage using a Raspberry Pi controlled camera. These sample prints have been used to train machine learning models as a proof of

concept at process parameter identification. The models being tested were random forest classification and neural networks, while additional image featuring techniques, such as principal component analysis, were applied to enhance performance. They were evaluated for their ability to predict unknown process parameters in a test set when provided an initial training set, providing a benchmark for the viability of machine learning models in process parameter identification.

161.
Name: Smithey, Maximus
Major: Biochemistry - Bachelor of Science
Faculty Research Mentor: Fred Musser, Agricultural Science & Plant Protec
Co-Author(s): Lauren Catchot
Funding: College of Agriculture and Life Sciences URSP
Project Category: Biological and Life Sciences

Effects of Rearing Methods on Soybean Looper Growth, Development, and Reproduction
The soybean looper (Chrysodeixis includens) is a moth species widely used in biochemical assays and entomological research. Its current rearing method involves placing larvae individually into disposable 1 oz cups filled with an artificial diet containing autoclaved agar. While effective in yielding high moth emergence, this method is resource-intensive in terms of labor, time, and materials. Originally designed for corn earworm (Helicoverpa zea), this approach may not be necessary for soybean loopers, as they exhibit minimal cannibalism when housed together. However, no alternative methods for streamlined soybean looper rearing have been published. This study aimed to identify modifications to the existing rearing protocol to reduce labor and material costs without compromising colony output. Two modifications were tested: (1) adding agar to the diet after autoclaving rather than before, simplifying preparation and broadening agar selection, and (2) mass rearing larvae in larger containers to reduce labor and materials. Results indicated that long-term mass rearing was ineffective for colony maintenance but was feasible for short-term rearing, such as insecticide bioassays. Additionally, the modified diet preparation method, where only water was autoclaved, proved equivalent to the standard approach. Future research should explore reducing the amount of diet per cup, as soybean loopers feed on the diet surface rather than burrowing, unlike corn earworm larvae. These findings provide valuable insights for optimizing soybean looper rearing protocols to improve efficiency in laboratory and industry settings.

162.
Name: Snider, Jadyn
Major: Animal and Dairy Science - Bachelor of Science
Faculty Research Mentor: Caleb Lemley, Animal & Dairy Science
Co-Author(s): Megan Mills, Jayla Hawkins, Marcus McGee
Project Category: Biological and Life Sciences

Impact of oral melatonin supplementation on behavior in the bull
Bull behavior affects libido, aggression, and activity and thus, may have impacts on reproductive efficiency. The objective of this study was to examine bull behavior during oral melatonin supplementation. Yearling Angus bulls (n = 21) were allocated into two groups, melatonin fed (MEL; n = 11) or control fed (CON; n = 10) for 90 days of treatment. MEL bulls were supplemented with 200 mg/kg of body weight of melatonin dissolved in ethanol, while CON bulls were supplemented with an equivalent ethanol vehicle control. Supplementation was top-dressed in grain, fed daily via the CALAN gate system from October 2024 to January 2025. Weights were measured and melatonin supplementation was adjusted weekly. Chute exit velocity (m/s), pen scores and chute scores were collected bi-weekly. In addition, feeding duration, bunk visits, and displacement events were recorded via video and visual assessment of group behaviors when bulls were mingled in a paddock were done twice weekly. Group behavior was analyzed using the MIXED procedure of SAS and individual behaviors were analyzed using both the GLIMMIX and MIXED procedures of SAS. There were no differences ($P > 0.05$) in exit velocity, pen scores, or chute scores between treatments. However, on a group level, MEL had a higher ($P = 0.0237$) frequency of active behaviors compared to the CON (37.0 ± 2.2, 29.8 ± 2.2). MEL tended to have a lower frequency of mounting events compared to CON (1.06 ± 0.43, 2.04 ± 0.42) however, MEL received more ($P = 0.0413$) mounts than CON (1.5 ± 0.25, 0.81 ± 0.25). Additionally, during individual feeding events, MEL tended ($P = 0.0899$) to receive more displacements at the feed bunk compared to CON bulls (0.89 ± 0.07, 0.70 ± 0.08). MEL bulls may be more active but less aggressive and dominant compared to CON bulls.

255.
Name: Spradling, Emma Claire
School: Starkville High School
Faculty Research Mentor: Jonathan Barlow, Data Science
Funding: Shackouls Honors College Research Fellowship
Project Category: Social Sciences

Measuring Personality Coherence in LLMs: Stability of Directed Personification Across Standardized Assessments
As large language models (LLMs) advance and artificial intelligence is used increasingly in healthcare, psychological research has the capability to expand through lower costs and a lower demand for volunteers. If LLMs prove to take on the persona of people with psychological conditions accurately, researchers can evaluate the models and their behaviors in the same manner they would humans. This would allow psychologists to use LLMs in place of volunteers and to alter their assessments and treatments based on responses from the LLMs. The reliability of the LLMs to mimic humans with psychological conditions is being assessed through the use of psychological tests that have proven to be valid in human trials. Thus far, when given to OpenAI's GPT-4 that has been prompted to personify a particular patient, Goldberg's (1992) Big-Five Factors Markers personality assessment has yielded similar results as would be expected from the patient themself. The same test will also be given to Anthropic's Claude. This research aims to discover what type of persona different foundation models have, the extent to which they can embody any personality, and if psychological conditions attributed to humans can be modeled using artificial intelligence.

163.
Name: Stafford, Bradley
Major: Biochemistry - Bachelor of Science
Faculty Research Mentor: Galen Collins, Biochemistry Nutrition Health Promo
Funding: College of Agriculture and Life Sciences URSP
Project Category: Biological and Life Sciences

Influence of a Proteasome Mutation on Cell Viability in Response to Protein Misfolding Toxins
Based on National Health Interview Survey data, around 8.5% of children aged 3 to 17 have some type of neurodevelopmental disability, such as autism spectrum disorder, attention-deficit/hyperactivity disorder (ADHD), or learning disability. These disabilities can include a mutation in the gene that encodes one of the proteasomes 26S subunits ATPase 5, PSMC5. The 26S proteasome is a highly ordered, multicatalytic protease complex composed of 2 complexes, a 20S core and a 19S regulatory subcomplex. In animal models, mutations of regulatory particle subunits eventually manifest as mental incapacity or lack of muscle function, resulting in total mental/physical degeneration. In humans, this would be characterized by Alzheimer's, Lou Gehrig's (ALS), and Parkinson's Diseases. Six unrelated children have a mutation of Proline 320 to Arginine (P320R) in PSMC5 and share neurodevelopmental delay and autism-like behaviors. A neuroblastoma line has been used with this mutation to examine the effects of protein misfolding stresses on cell viability. Protein misfolding stress is hypothesized to increase the load on proteasomes. Therefore, if this mutation compromises protein degradation, it is expected that this could serve as a good screening model for compounds that restore proteasome function and as a model of what might go awry in the development of neurons. A proteostatic stressor was selected: thapsigargin, which is an endoplasmic reticulum Ca2+-ATPase (SERCA) that increases cytosolic calcium levels by releasing calcium from intracellular stores. Upon treatment with thapsigargin, there were conflicting results. In order to better understand the roles of inhibitors in this cellular process, more testing with other stressors will be necessary.

55.
Name: Stewart, Jada
Major: Software Engineering - Bachelor of Science
Faculty Research Mentor: Nayeon Lee, CAVS Research
Co-Author(s): Sungkwang Mun, SaMin Han
Funding: BRIDGES Undergraduate Research Program
Project Category: Engineering

Analyzing Perceived Disaster and Crime Risk in Biloxi, MS using Python
The purpose of this research is to compare public perception to historical data of danger regarding environmental hazard and crime to find consistencies or discrepancies. It will also integrate socioeconomic data to answer the question of why or why not the data is consistent with each other. We are integrating computer science, social science, geospatial analysis, landscaping to shed a light on how social and historical factors shape public perception. This research aims to eventually provide an understanding of risk awareness, and its implications for community resilience and policymaking. From a computer science perspective, this project uses python libraries to visualize data. Python is a programming language, but it sometimes needs to import pre-written code that extends its capabilities in the

form of libraries. Matplotlib and Contextily work together to overlay maps and points of data. Contextily is a library used to add base maps to visualization, so it lays a foundation while matplotlib is used to customize scatter plots of geographical data. The different points of public perception are plotted then added as a point on a bigger map. The library NumPy handles numerical data within datasets. For example, machine learning techniques and statistical models are used to visualize data in a heat density form using the Kernal Density Estimation (KDE). NumPy helps to create arrays that represent a grid for spatial analysis. By creating these maps in Python, they can be viewed side by side to easily identify patterns that impact community safety. These findings can contribute to more data-driven decision making in urban planning, law enforcement, and emergency response strategies. The research highlights the value of combining public surveys with spatial data analysis that can help foster safer, more resilient neighborhoods.

256.
Name: Stewart, Savanah
Major: Secondary Education - Bachelor of Science
Faculty Research Mentor: Lourdes Cardozo Gaibisso, English
Co-Author(s): Haylee Morman, Daniela Coral
Funding: ORED Undergraduate Research Program
Project Category: Social Sciences

Establishing New Territorializations in a Community-Engaged TESOL Program: Insights from College Student Experiences
Recently, there has been a surge of interest in community-engaged learning (CEL) programs within academic institutions. CEL initiatives within Teaching English to Speakers of Other Languages (TESOL) have become increasingly prevalent, particularly in the post-COVID era. Practitioners recognize the significance of these initiatives in TESOL teacher education programs and their promising role in identifying and addressing the needs of multilingual learners (MLs). A TESOL professor and three of their students explore the lived experiences of providing TESOL tutoring to immigrant children in semi-rural Mississippi, continuing growing research and adding new perspectives. Using Deleuze and Guattari's theoretical framework of territorialization-deterritorialization, the authors were able to further reflect on their experiences, describing the dual processes of establishing and transcending educational boundaries within the structured tutoring program. These experiences in CEL in TESOL emphasize the importance of reflective practices in pedagogical practices, ongoing supports for all participants involved, and partnerships with local communities, advocating for a nuanced and context-specific approach to community-engaged TESOL.

164.
Name: Sullivan, Anne Marie
Major: Biological Sciences - Bachelor of Science
Faculty Research Mentor: Matthew Brown, Biological Sciences
Co-Author(s): Felicity Kleitz-Singleton, Felicity Kleitz-Singleton, Alexander K. Tice, Matthew W. Brown
Funding: NSF PurSUiT
Project Category: Biological and Life Sciences

It's not a phase - It's a lifestyle! Investigating the evolutionary history and transcriptional dynamics separating sporocarp and cyst formation in protosteloid amoebae.
The microbial world is exceedingly diverse, and many eukaryotic microbes (protists) exhibit an incredible diversity in morphology, lifecycle, and even behavior. Protosteloid amoebae are a group of amoebae that undergo sporocarpic fruiting, a process in which a single cell produces one-to-many walled spores on top a noncellular stalk. Sporocarpy is a life history that is entirely unique to Amoebozoa and the species that undergo sporocarpic fruiting are astoundingly diverse. Scientists have been observing and studying sporocarpic amoebae for many decades, but we still lack an understanding of the genes involved in sporocarp development, its evolutionary origins in Amoebozoa, or how it differs from other life history strategies like encystment. Vannellid amoebae are a group of flat, fan-shaped or lamellipodial amoebozoans that belong to the family Vannellidae. Most vannellids exist simply as trophic cells that consume bacteria and divide, with no other developmental or life history innovations. Vannella fimicola is one of four described terrestrial vannellid species and the only vannellid observed to exhibit a sporocarpic life cycle. Here, we propose methods to examine sporocarp development in V. fimicola and encystment in a closely related vannellid. We will utilize methods such as culture synchronization, Transmission Electron Microscopy, single-cell and whole-culture transcriptome sequencing, and differential gene expression analyses. We expect this experiment to help us understand the transcriptional dynamics and identify genes critical to sporocarp development and encystment in vannellids.

165.
Name: Sullivan, Chelsea
Major: Poultry Science - Bachelor of Science
Faculty Research Mentor: Pratima Acharya Adhikari, Poultry Science
Co-Author(s): Ruth Wallace
Funding: College of Agriculture and Life Sciences URSP
Project Category: Biological and Life Sciences

The effect of replacing inorganic with organic trace minerals on pullet performance (0 to 6 weeks of age)
The objective of this study was to determine the effects of replacing inorganic with organic trace minerals in young pullets on feed intake, body weight, and body weight gain from 0-6 weeks of age. A totals of 750 day-old LSL lite pullets were placed in the stacked pullet cage at the Poultry Research farm of Mississippi State University. There was a total of 10 blocks that contained 10 replicates of each dietary treatment (Trt). Each contained 15 pullets. A total of 5 diets were formulated. Trt 1: Control inorganic trace minerals (ITM) Program diet that was formulated based on industry standard, Trt 2: 25 Mintrex: 75 ITM Program, Trt 3: 50:50 Mintrex: ITM Programs, Trt 4: 75:25 Mintrex: ITM Program, and Trt 5: 100 Mintrex Program. Data was analyzed by running one-way ANOVA with PROC GLM SAS 9.4. Differences were considered significant at $P \leq 0.05$. The daily body weight gain was significantly lower in Trt 1 compared to Trt 2, 3 and 5. However, Trt 1 and Trt 4 were similar. There was not any significant difference between the Trts in regards to weekly weight gain. There was no difference between the trt with regards to daily feed intake. There was no difference in Trts in regards to feed intake that was measured in lbs 100 birds. In conclusion, Trt that was in 50:50 Mintrex: ITM Programs had the highest body weight gain, but there was no difference in the feed intake. The future research should include extending these Trts for a longer grow out period for pullets to see the benefits of trace minerals feeding.

257.
Name: Tate, Avery
Major: Psychology - Bachelor of Science
Faculty Research Mentor: Holli Seitz, Communication
Funding: ORED Undergraduate Research Program
Project Category: Social Sciences

From Image to Influence: Examining the Impact of Image Type, Source, and Disease on Social Media Vaccine Messages
The U.S. Centers for Disease Control and Prevention (CDC) serves as a major source for vaccine information, but public trust in the CDC declined during and after the COVID-19 pandemic. Additionally, CDC often uses cartoon-style images for public health messaging in social media. In formative research for a vaccine education campaign, Mississippians were less receptive to cartoon-style social media advertisements, deeming them "childish" and less serious. This experiment assesses the impact of image type (cartoon vs. photo), source (CDC vs. Mississippi State University Extension), and disease (COVID-19 vs. flu) on audience perceptions of message effectiveness and source credibility. This online survey-based experiment utilizes a between-subjects factorial design (Image: Cartoon vs. Photo x Source: CDC vs. MSU Extension x Disease: COVID-19 vs Flu). 801 U.S. adults were randomly assigned to one of eight conditions. Within each condition, participants saw one of four social media posts corresponding to their assigned condition. After viewing the post, they responded to two measures of perceived message effectiveness, a source trustworthiness scale, and a source expertise scale—all rated from 1 to 5. There were no significant effects of source or image type on perceived message effectiveness. However, disease type influenced ratings. Flu messages were rated as more effective ($M = 3.73$, $SD = 1.00$) than COVID-19 messages ($M = 3.28$, $SD = 1.16$). Flu messages were also seen as more trustworthy ($M = 3.91$, $SD = 0.95$) and higher in expertise ($M = 3.95$, $SD = 0.94$) than COVID-19 messages ($M = 3.57$, $SD = 1.13$ and $M = 3.58$, $SD = 1.11$, respectively). Discussing COVID-19 appears to reduce perceived effectiveness and credibility, regardless of image type or source. Future research should focus on disease-specific messaging strategies.

74.
Name: Taylor, Kayla
Major: Physics - Bachelor of Science
Faculty Research Mentor: Bill Li, Physics & Astronomy
Funding: ORED Undergraduate Research Program, ORAU Ralph E. Powe Junior Faculty Enhancement Award
Project Category: Physical Sciences

Exploring AI-Based Data Reduction and Clustering Method for Future Detector Readout System
The Electron Ion Collider (EIC) is the large scale development of a particle accelerator to be constructed over the next decade. With the combined efforts of over 1500 scientists around the world, the future of advancements in our understanding of the subatomic particles that make up protons, and various other ions looks more promising than ever, paving the way for groundbreaking discoveries in particle physics. A lot of moving parts go into not only the construction of the EIC, but also the planning. Over the next few months I will be contributing to the efforts of developing the Large/Longitudinally-Segmented Forward Hadronic Calorimeter, (LFHCal)—a key

component of the EIC. The LFHCal is designed to precisely measure the energy of the particles created after the collision of electron beams with heavy ion beams. The shower of energy will be measured using a 1600 m² plastic scintillator wall; the wall will be made up of 30 mm x 30 mm x 3 mm scintillator tiles. Once the energetic particles pass through the tiles, energy in the form of photons is detected by the photon sensors (embedded in the tiles). One challenge is that beam collisions will produce a vast number of particles, leading to numerous detector hits. These hits generate terabytes of data, requiring advanced technology and significant processing time for analysis. To address this challenge, my research will focus on developing an AI-assisted data filtering and clustering method. This approach will identify the energy center among scintillator tiles with the highest concentration of electric signals while effectively rejecting unwanted background hits. A Monte Carlo simulation tool will then be used to train AI to create an algorithm streamlining the process of data reduction and clustering methodology. Using AI to filter vast amounts of data will streamline analysis, save time, and significantly reduce our carbon footprint.

166.
Name: Thacker, Vada Lee
Major: Food Sc Nutr. Health Prom (UG) - Bachelor of Science
Faculty Research Mentor: Xue Zhang, Animal & Dairy Science
Co-Author(s): Wes Schilling, Zoe Molloy, Emily Little
Funding: College of Agriculture and Life Sciences URSP
Project Category: Biological and Life Sciences

The impact of *Brochothrix thermosphacta* inoculation on the shelf-life and spoilage potential of porcine *longissimus dorsii* muscle
Brochothrix thermosphacta is a common spoilage bacterium in pork. However, minimal research has been reported on its spoilage potential. Therefore, the objective of this study was to elucidate the impact of inoculating pork loin with *B. thermosphacta* on spoilage, sensory aroma and appearance, and shelf-life. *B. thermosphacta* was cultured at 30°C for 20 h. The treatment (3 logs of *B. thermosphacta* in 0.5% saline) and control (200 µL of 0.5% saline) were applied to five 30-gram pork loin samples per treatment for each storage time. Pork samples were stored on meat trays in a meat case under approximately 1000 lux at 40°C until randomly chosen for observation over 5 days. On each day of observation, samples were assigned 3-digit blind codes, and panelists (n=3) evaluated both the treatment and control for aroma, appearance, and overall acceptability using a 7-point categorical scale. For microbiological analysis, pork samples were swabbed with sterile sponges soaked with buffered peptone water, homogenized in a stomacher for 2 min at maximum speed, and plated on brain heart infusion (BHI) agar plates. Plates were incubated at 30℃ for 48 h and then counted for colonies. No differences ($P>0.05$) existed between the treatment and control with respect to pH and microbial counts. As storage time increased, samples became more spoiled based on increased oxidation aroma, spoilage aroma, and slimy appearance ($P<0.05$). However, inoculating fresh pork loin with 3 logs of *B. thermosphacta* did not impact spoilage when compared to the control as indicated by lack of differences in pH, aroma and appearance attributes, and microbiological counts on each day of storage. Future research will include analyzing the pork microbiome to determine if native or inoculated bacteria have a greater impact on pork spoilage.

167.
Name: Thames, Mia
Major: Horticulture - Bachelor of Science
Faculty Research Mentor: Tongyin Li, Plant and Soil Sciences
Co-Author(s): Jacob Arthur, Shecoya White, Guihong Bi
Funding: College of Agriculture and Life Sciences URSP
Project Category: Biological and Life Sciences

Evaluating Asian green cultivars for winter production in high tunnels
Leafy greens are vegetable crops that are grown and sold for their edible leaves. They are a common part of the American diet and make up a high percentage of the ingredients used in salads. They are an important crop due to their contribution to a healthy diet because they are high in vitamins and minerals, antioxidants, and fibers. Leafy green vegetables are a high-value specialty crop for farmers and are in high demand at farmers' markets, roadside stands, on-farm stands, Community Supported Agriculture (CSA) programs, and local restaurants. Due to their high market value, an extended growing season for leafy greens gives farmers more profitability due to increased productivity and off-season marketing. Selling crops in off-seasons allows farmers to make a premium profit on their produce. There lacks recommendations in cultivar choice, harvest size, fertilization management, and planting time for leafy green production in protected environments. This study evaluated plant growth, yield, cold tolerance, and leaf mineral nutrients of five bok choy cultivars including 'Win Win Choi', 'Carlton', 'Nabai Spring', 'QD-2 Express', and 'Chun Mei' as affected by the application of three types of biostimulants. Results showed that 'Carlton' produced the highest plants of 38.11 cm and 'Win Win Choi' produced the highest marketable yield among the five tested cultivars. The application of biostimulants did not affect marketable yield of tested bok choy cultivars but altered plant leaf temperature.

168.
Name: Thapa, Sulav
Major: Aerospace Engineering - Bachelor of Science
Faculty Research Mentor: Li Zhang, Poultry Science
Co-Author(s): Meng Zhang, Xiang Li
Funding: United States Department of Agriculture (USDA)- ARS
Project Category: Biological and Life Sciences

Slope Matrix Graph(SMG): An Analytical Method for Bacteria Sample Comparison and Analysis
Analyzing genomic sequences to find correlations between bacterial samples often faces significant computational challenges, particularly with large datasets. Existing methods either require extensive hardware upgrades to handle the computational load or rely on both time and resource-intensive simulations. Moreover, many software solutions prioritizing efficiency lack in providing accurate and meaningful correlations between bacterial samples. This study introduces a novel computational approach, Slope Matrix Graph (SMG), which leverages mathematical graph theory and optimized parallel processing techniques to analyze large bacterial datasets efficiently. SMG utilizes both CPU and GPU parallel processing to handle matrix operations, allowing it to find correlations across multiple bacterial samples with reduced runtime and lower computational cost. The method performs matrix multiplications at various levels, followed by applying graph theory to cluster the results, enabling clear visual interpretations of the relationships between samples. The performance of SMG was tested on datasets ranging from small matrices (10x10) to large matrices (100,000x10,000), with runtimes varying from 0.7 seconds to 73.4 seconds, demonstrating significant improvement over existing techniques. Furthermore, SMG consistently achieved high accuracy in detecting correlations, making it both a faster and more reliable alternative for bacterial sample analysis than existing analysis programs such as SparCC, ZicoSeq and Bray-Curtis. This research presents SMG as an efficient and scalable method, offering both speed and precision through its innovative use of mathematical graph theory and parallel computing.

169.
Name: Thompson, Annamarie
Major: Biomedical Engineering - Bachelor of Science
Faculty Research Mentor: Trey Howell, Department of Comparative Bio Scien
Co-Author(s): Aliaa Ismail, Eryn Whitaker, Marianna Sellers, Matthew Ross
Funding: Shackouls Honors College Research Fellowship, NIEHS grant# 1R15ES035527-01
Project Category: Biological and Life Sciences

Roles of the Pregnane X Receptor and Gender in the Immunometabolic Profile of Murine Bone Marrow-Derived Macrophages
Diabetic foot ulcers are a common complication experienced by diabetics, affecting approximately 25% of patients. *Diabetes mellitus* patients have been shown to have elevated levels of prevalent organochlorine pesticide metabolites. These metabolites can bind to a variety of receptors in the body to have unforeseen consequences. The pregnane x receptor (PXR) is a xenobiotic sensing receptor that regulates the expression of genes encoding drug-metabolizing enzymes, drug transporters, and cellular metabolism. Study of PXR is useful for defining the effect of the receptor on pharmacokinetics, drug toxicity, and efficacy. However, the role of PXR in wound healing remains largely unstudied. The present study was designed to investigate PXR in macrophage function and metabolomics of bone marrow-derived macrophages (BMDM). To this end, femoral and tibial bone marrow was harvested from male and female C57BL/6J mice. Monocytes were isolated from bone marrow and cultured *in vitro* to facilitate conversion to the macrophage phenotype. Macrophages were treated with vehicle, pregnenolone 16α-carbonitrile (PCN; PXR agonist), vehicle + lipopolysaccharide (LPS), or PCN + LPS for 24 hours. Following treatment, cell extracts and media were utilized for targeted metabolomic analysis to identify differences in cellular immunometabolism with and without activation of PXR. Preliminary findings indicate significant differences in analyte levels between male- and female-derived BMDMs. In select treatment groups, citrate and itaconate levels in female BMDM media are significantly higher than male levels. The same relationship was observed in pyruvate levels from female BMDM cell extracts. Itaconate levels in cell extracts did not vary significantly between sexes; however, stimulation with LPS resulted in significant increases in itaconate levels within sexes. Interestingly, succinic acid was the only analyte that was significantly decreased in female BMDM cell extracts as compared to males. Differences in immunometabolism between male and female mice may offer insights into sex-dependent inflammatory profiles and wound resolution rates, warranting further study into the causes and origins of these differences.

170.
Name: Thompson, Charles
Major: Biochemistry - Bachelor of Science
Faculty Research Mentor: Seung-Joon Ahn, Biochemistry Nutrition Health Promo
Co-Author(s): Sujin Lee
Project Category: Biological and Life Sciences

Effect of Gossypol on Diamide Insecticide Tolerance
The corn earworm (*Helicoverpa zea*) and fall armyworm (*Spodoptera frugiperda*) are common polyphagous agricultural pests that have caused significant economic damage to the cotton industry in the southern U.S. The cotton plant produces gossypol as a defense compound to fend off herbivorous insects. Although chlorantraniliprole is a diamide-class insecticide that is widely used to control both insect pests, its effect of gossypol ingestion is poorly understood in terms of insecticide efficacy. Here, we evaluated the effect of gossypol on the insecticide tolerance using bioassay in both cotton pests. *H. zea* and *S. frugiperda* that were pre-exposed to gossypol showed increased LD_{50} to chlorantraniliprole compared to the control that had not ingested gossypol. Specifically, the LD_{50} value of *H. zea* larvae increased from 0.0068 to 0.0161 ppm and, the LD_{50} value of *S. frugiperda* larvae increased from 0.0048 to 0.0087 ppm. The pre-gossypol treatment enhanced LD_{50} values by 2.37-fold and 1.81-fold in *H. zea* and *S. frugiperda*, respectively, compared to controls. The data suggests that the detoxification enzymes enhanced by gossypol exposure may play a role in the detoxification of diamide insecticides probably by inducing a suite of detoxification enzymes. The regulatory mechanisms triggered by gossypol are currently being investigated. This research will provide a foundation for understanding insecticide resistance mechanisms and insect adaptation strategies to plant defense compounds.

56.
Name: Thompson, Jade
Major: Software Engineering - Bachelor of Science
Faculty Research Mentor: Cindy Bethel, Computer Science and Engineering
Funding: NSF REU: Award #1900883
Project Category: Engineering

Exploring the Impacts of an Adaptive Haptic Heartbeat within a Socially Assistive Robot
This research investigates the therapeutic effects of an adaptive haptic heartbeat within Therabot, a socially assistive robot that takes the form of a soft, plush lap dog. A simulated haptic heartbeat that adjusts its own speed based on user heart rate was developed for integration within the Therabot robot. A user study evaluated the effects of various heartbeat behaviors on user experiences with Therabot. Participants in the study experienced one of three conditions; Therabot either exhibited no simulated heartbeat, a simulated heartbeat with a static heart rate, or a simulated heartbeat with an adaptive heart rate. This research explores the differences between these experimental conditions, with respect to self-reported improvements in state anxiety, improvements in physiological state, and improved robot perceptions. The findings contribute to a broader understanding of haptic heartbeats and other aliveness behaviors in socially assistive robots.

57.
Name: Thompson, Jameson
Major: Mechanical Engineering - Bachelor of Science
Faculty Research Mentor: Lesley Strawderman, Industrial and Systems Engineering
Co-Author(s): Naima Bradley, Kenyan Buckner
Funding: ORED Undergraduate Research Program
Project Category: Engineering

Developing a Prototype of a Portable Hydration and Cooling Station for Industrial, Outdoor, and Sporting Applications
Heat-related illnesses pose a significant risk in industrial workspaces, outdoor events, and athletic competitions, making efficient hydration and cooling solutions essential. Developing a portable, user-friendly system requires multiple design phases, including needs assessment, material selection, prototype development and field testing. While research has explored various hydration and cooling technologies, further investigation is needed to integrate these components into a practical, mobile solution. This study focuses on designing and prototyping a modular hydration and cooling station optimized for portability, durability, and usability. The current phase involves evaluating design feasibility, cooling efficiency, and user accessibility to refine the prototype for diverse environments. Future iterations will incorporate user feedback and environmental testing to enhance performance and scalability for real-world applications.

58.
Name: Travis, Jayla
Major: Software Engineering - Bachelor of Science
Faculty Research Mentor: Christopher Hudson, CAVS Research
Co-Author(s): Tyler Hannis, Daniel Carruth
Funding: B.R.I.D.G.E.S Undergraduate Research
Project Category: Engineering

Decoding Mobility: CAN Bus Data Interpretation for Vehicle Control
Standing over 6 feet tall, the MuddTrax MTX-C is a high-performance, all-terrain utility vehicle equipped with 18-inch tracks featuring 1.5-inch paddles for enhanced maneuverability. This project focuses on decoding and interpreting the vehicle's two CAN Bus networks to enable control using a Logitech controller. Initially, comprehensive research was conducted to understand CAN Bus protocols and interpret individual data bits. Subsequently, a Python script was developed in Visual Studio Code to integrate the Logitech controller with the vehicle's CAN communication system. To achieve accurate vehicle control, systematic data collection was performed, mapping specific CAN messages to distinct forward-backward and left-right movements. These CAN Bus messages were captured and graphed to identify patterns correlating vehicle movements with data trends. The Python script was then refined to interpret real-time CAN Bus signals effectively.

75.
Name: Traywick, Justin
Major: Physics - Bachelor of Science
Faculty Research Mentor: Benjamin Crider, Physics & Astronomy
Project Category: Physical Sciences

Deriving Nuclear Level Schemes From Gamma Ray Spectroscopy Data With Machine Learning
While most atomic nuclei exist in nature in their lowest energy state, known as a ground state, a great deal of experimental evidence shows that nuclei are comprised of a shell structure with a number of discrete states of energy known as quantum energy levels that lie above the ground state. When a nucleus exists in an energy level above the ground state and transitions down through these levels, it often emits gamma radiation that can be detected in experiment using specialized detectors. Through the careful analysis of this data via gamma-ray spectroscopy, along with knowledge of quantum mechanics, the data can be used to construct a graph of the known quantum levels and their decay probabilities to other levels, known as a nuclear level scheme. This project aims to apply machine learning to the task of identifying level schemes based on spectroscopic data by using an experimentally validated simulation to generate gamma ray spectroscopy data from an artificial nuclear level scheme and use this data to train a machine learning model that can generate nuclear level schemes from new gamma ray spectroscopy data. The simulated training data and machine learning model for this project are complete, leaving the training of the model along with further analysis and adjustments of this process to be done. The presentation of this research will cover the theory and experimental process behind gamma ray spectroscopy and nuclear level scheme generation, as well as information regarding functionality of the machine learning model used. Furthermore, the steps taken to create this data and steps necessary to complete the project will be outlined.

258.
Name: Treloar, Avery
Major: Criminology - Bachelor of Arts
Faculty Research Mentor: David May, Sociology
Funding: ORED Undergraduate Research Program
Project Category: Social Sciences

If I Could Have Been Helped When I Was a Kid, I Might Not Be in Prison Now
Most quantitative research about mental health issues in the correctional system tends to examine the prevalence of mental health diagnoses and their relationship with violence. No research that we are aware of looks at the childhood mental health diagnoses and treatment of incarcerated people and the impact of childhood mental health on an individual's correctional experiences as adults. Using a sample of approximately 450 currently incarcerated people in a large southern state, I compare the respondents' length of prison sentence and their childhood mental health diagnoses. Preliminary findings suggest that one in four incarcerated persons had at least one childhood mental health diagnosis. Additionally, those with a childhood mental health diagnosis were significantly more likely to have been incarcerated before their current sentence and to have served more time incarcerated in their life span than their counterparts without a childhood mental health diagnosis. The findings from this exploratory study should help provide more nuance around research about mental health challenges in correctional settings. Implications for policy and future research are also discussed.

259.
Name: Trotter, Olivia
Major: Psychology - Bachelor of Science
Faculty Research Mentor: Mary Dozier, Psychology
Project Category: Social Sciences

The Effects of Equine-Assisted Therapy on PTSD and Anxiety Symptoms
The treatment of post-traumatic stress disorder (PTSD) and generalized anxiety disorder (GAD) can present distinctive challenges due to the individualized nature of the disorders. Treatments often consist of various forms of therapies and medications that don't always suit the very personal and complex symptoms that arise from PTSD and GAD. Incorporating horses into therapy practices may increase the efficacy of certain treatment skills (e.g., mindfulness). We conducted a literature review to determine the effect of equine-assisted therapy as an approach to treating symptoms of PTSD and GAD. One study was conducted where 16 participants who had experienced a Criterion A traumatic event and reported current PTSD symptoms engaged in various tasks involving horses for 6 weeks with 2 hour sessions (Earles et al., 2015). Following the last session, the participants reported significantly less posttraumatic stress symptoms, less severe emotional responses to trauma, less generalized anxiety, as well as fewer symptoms of depression. In addition, participants increased use of mindfulness strategies, and reported a decreased use of alcohol. However, no significant effects were found on physical health, proactive coping, self-efficacy, social support, or life satisfaction. This study provides valuable information on how to potentially treat individuals with PTSD and GAD in the future. Equine-assisted therapy is a unique approach that can reduce stress and anxiety symptoms while promoting positive mindsets that can help in coping and processing trauma.

260.
Name: Umar, Muneebah
Major: Biological Sciences - Bachelor of Science
Faculty Research Mentor: Molly Zuckerman, Anthropology/Middle Eastern Culture
Co-Author(s): Lydia Bailey, Kerri Widrick, Sharon DeWitte, Fabian Crespo, Amanda Wissler
Funding: Shackouls Honors College Research Fellowship, ORED Undergraduate Research Program, NSF #1946203
Project Category: Social Sciences

Examining frailty and tuberculosis relative to persistent late-stage acquired syphilis infection in individuals within a historical documented collection.
The many complexities of clinical and microbiological research on acquired syphilis mean that scientific understandings of its pathogenesis, especially heterogeneity in frailty, comorbidities, or susceptibility to persistent, tertiary (late) stage infection relative to human host characteristics, has lagged behind that of other common bacterial infections. In order to quantify frailty to persistent syphilis and build on previous research, an 11-biomarker Skeletal Frailty Index (SFI) (porotic hyperostosis, cribra orbitalia, rickets/osteomalacia, osteoporosis, linear enamel hypoplasia, periodontal disease, neoplasms, osteoarthritis, intervertebral disc disease, rotator cuff disease, fracture) measured chronic physiological stress and nutrition. The presence or absence of tuberculosis was also recorded using skeletal lesions and documented disease cases. The sample contained individuals from the pre-antibiotic era, early 20th century Robert J. Terry Anatomical Collection and the Hamann-Todd Osteological Collection (N=55) with antemortem syphilis diagnosis. The group was split into those with early-stage (n=17) and late-stage (n=38) infection. Results show that the mean between-group SFI varied between early-stage (3.71) and late-stage (4.37) individuals. The difference may not be statistically significant due to the small early-stage group size (ANOVA ($p = 0.128$)) but could indicate an association between early and later-life stress and undernutrition and vulnerability toward persistent infection. Results from a chi-square test yielded a chi-square statistic of 4.159 and found that the distribution of TB between the early and late-stage samples was significant ($p = 0.041$). Future work will focus on increasing the group of early-stage individuals to detect whether this association is meaningful. A deeper understanding of frailty and co-morbidities relative to destructive and debilitating late-stage syphilis may improve reconstructions of syphilis's past disease burden but also, via translational science, contribute to refined prognostic, diagnostic, and screening criteria in public health and clinical settings.

171.
Name: Vandiver, Madison
Major: Animal and Dairy Science - Bachelor of Science
Faculty Research Mentor: Molly Nicodemus, Animal & Dairy Science
Co-Author(s): Julius Culwell, Ed North, Toree Williams
Funding: ORED Undergraduate Research Program
Project Category: Biological and Life Sciences

Tracing coat color phenotype over time within the Mountain Pleasure Horse Association
The Mountain Pleasure Horse (MPH) is an American gaited horse breed that has a limited population of under 3,000 horses. Due to limited size, there's a misunderstanding of the breed with it often confused for the Rocky Mountain Horse (RMH), another American gaited breed. Besides gaits, a distinction between the breeds is the coat color phenotype as the MPH is typically known to have a palomino coat color compared to RMH's chocolate coat color. However, registration guidelines have become less restrictive in recent years to expand MPH population. This change in registration may impact phenotypical characteristics such as coat color; thus, to evaluate changes within the registry concerning coat color phenotype, the objective of this study was to utilize pedigree tracing to identify coat color variations over time for purebred horses registered within the MPH Association (MPHA). A total of 2,255 pedigrees were sampled from MPHA database. Only purebred horse records with coat color assignments and date of birth were utilized. For comparisons, records were divided between the first two decades of registrations within the database (1960-1980, n=98) and the last two decades (1990-2010, n=708). While the two most common coat colors within the first two decades were either palomino (26.5%) or chestnut (26.5%), the last two decades the two most common coat colors were either chestnut (30.2%) or chocolate (20.9%). Palomino registrations had the largest decrease with a drop of 10.4%. The black, brown, and roan coat colors similarly decreased in registrations by 1.0%, 0.9%, and 1.1%, respectively. Champagne, dun, and cremello were not coat colors found within the first two decades, but each were present within the last two decades (increase by 0.1%, 0.1%, and 0.4%, respectively). Understanding trends within registrations can assist in determining knowledgeable breeding practices that can assist in preserving desired breed phenotypical characteristics.

172.
Name: Vanga, Vineel
Major: Biochemistry - Bachelor of Science
Faculty Research Mentor: Galen Collins, Biochemistry Nutrition Health Promo
Co-Author(s): Cole Beard
Project Category: Biological and Life Sciences

Purification of Ddi2 to Study its Regulatory Mechanisms
Shuttling factors are proteins that are responsible for transporting ubiquitinated (ub) substrates to the proteasomes for degradation. DNA damage inducible 1 homolog 2 (Ddi2) can bind to ub conjugates through its ub-like domain (UBL). Additionally, Ddi2 has a retroviral protease domain that is similar in structure to HIV's. This protease domain is a potential target for promoting the effectiveness of immunotherapies against cancer. For example, the HIV protease inhibitor – nelfinavir – has shown to upregulate certain immune system proteins. Ddi2 may be responsible for degrading key regulatory proteins in oncogenic signaling pathways. If so, Ddi2 could prevent the immune system from responding to cellular abnormalities. This study aims to generate the tools and materials to study the activity and inhibition of Ddi2 using purified proteins. To accomplish this, Ddi2 and proteins involved in the ub proteosome pathway (UPP) must be isolated. This can be accomplished by protein purification, where a specific protein can be isolated from a complex mixture via techniques like chromatography. Affinity chromatography was used as it separates proteins based on specific interactions between the proteins and ligand-associated stationary phase. This ensures higher purity of the isolated proteins. Expected results indicate high concentrations of purified proteins that can later be used in enzymatic assays to test Ddi2 activity.

59.
Name: Vazeii, Shaheen
Major: Computer Engineering - Bachelor of Science
Faculty Research Mentor: George Trawick, Computer Science and Engineering
Co-Author(s): Wilson Patterson
Funding: VICEROY Scholars Program
Project Category: Engineering

Enhancing Mississippi K-12 Cybersecurity Education Through Cyber Competitions
Mississippi State University (MSU) is launching its first Cybersecurity Capture the Flag (CTF) competition. The annual event, titled Cowbell CTF, will engage K-12 students from Mississippi high schools. The primary goal of Cowbell CTF is to provide a competitive environment for K-12 students to learn and apply cybersecurity skills and concepts. In collaboration with the Mississippi Cyber Initiative (MCI), Center for Cyber Education (CCE), and MSU's VICEROY, Cyber Club, and WiCyS, this initiative aims to enhance Mississippi's cybersecurity education and inspire the next generation of cybersecurity professionals, which strengthens Mississippi's position as a leader in cybersecurity education.

173.
Name: Walker, Kaylynn
Major: Biochemistry - Bachelor of Science
Faculty Research Mentor: Seung-Joon Ahn, Biochemistry Nutrition Health Promo
Co-Author(s): Courtney Wynn
Funding: College of Agriculture and Life Sciences URSP
Project Category: Biological and Life Sciences

Is it hot or not: CRISPR-Cas9 knockout of target genes for capsaicin detoxification in *Helicoverpa zea*
Insects and plants have been in a constant evolutionary battle since the beginning of time. Insects developed numerous methods for feeding on the plant's leaves, stems, roots, and fruits. In order to combat these voracious insects, plants developed secondary metabolites as a form of chemical defense against insect feeding. The secondary metabolites, also known as allelochemicals, can be toxic to the insect or act as deterrents to prevent the insect from continuing their feeding behavior. Over time, these plant allelochemicals influenced the evolution of detoxification mechanisms in insects. Our study focuses on this evolutionary relationship between the allelochemical, capsaicin, produced by hot pepper plants and the highly resistant corn earworm, *Helicoverpa zea*. Previous research on this topic has identified a gene family, uridine diphosphate (UDP) glycosyltransferase (UGT), responsible for the detoxification of capsaicin and has narrowed it down to a handful of candidate genes. This project will utilize the CRISPR-Cas9 site-directed mutagenesis gene editing technique to knock out the candidate genes: UGT40c, UGT40d, UGT40e, and UGT33t. Mutated larvae will be fed capsaicin incorporated diet to determine the detoxification efficiency of the target genes. The results from this study will be very useful in understanding the underlying molecular aspects of UGT facilitated capsaicin detoxification in the corn earworm and provide direction for future insect pest management strategies against this polyphagous pest.

261.
Name: Walters, Gracie
Major: Psychology - Bachelor of Science
Faculty Research Mentor: Hilary DeShong, Psychology
Co-Author(s): Ashleigh Westbrook, Bennett Porter
Funding: NIMH R-15 Grant MH122937-01A1
Project Category: Social Sciences

Investigating Potential Shared Childhood Risk Factors for BPD and PTSD
Borderline Personality Disorder (BPD) is distinguished by symptoms of instability in behavior, emotions, and interpersonal relationships. Linehan's biosocial model explains these symptoms develop as a result of two childhood risk factors: childhood emotional vulnerability and consistent parental invalidation. A child's emotional vulnerability includes an increased sensitivity to emotional stimuli, especially to negative events and the inability to quickly return to an emotional baseline. Parental invalidation happens when a child's emotions are constantly criticized, punished, or minimized. Post-Traumatic Stress Disorder (PTSD) is recognized by certain diagnostic characteristics that are met following a traumatic event, including intense emotional symptoms, re-experiencing the event, and avoiding stimuli associated with the trauma. PTSD-BPD comorbidity seems to be connected with repeated childhood traumatic events and their likelihood and severity, indicating that the two disorders may share childhood risk factors. Given the comorbidity and potential overlap, the current study sought to investigate these shared childhood risk factors in a sample of community adults. As such, it was hypothesized that childhood emotional vulnerability, parental invalidation, and their interaction will all significantly positively predict a BPD diagnosis. Additionally, it was hypothesized that childhood emotional vulnerability, parental invalidation, and their interaction will positively predict a PTSD diagnosis. The study includes 185 people (61.3% women, 67.2% White, mean age = 21.39) who completed an in-lab study that included self-report questionnaires and clinical interviews. BPD and PTSD diagnoses were assessed using the SCID-5 Clinical Interviews. Childhood emotional vulnerability and parent invalidation were assessed retrospectively via the self-reported measures the Emotional Vulnerability in Childhood Socialization of Emotion Scale, respectively. Two separate logistic regression analyses will be conducted to test the hypotheses. The poster will include a discussion on the potential overlap in childhood risk factors for BPD and PTSD, and how this inform potential prevention and intervention recommendations.

262.
Name: Washington, Arisa
Major: Psychology - Bachelor of Science
Faculty Research Mentor: Brittany Lancaster, Psychology
Co-Author(s): Ann Davis
Funding: National Institutes of Health R01NR016255
Project Category: Social Sciences

Does parental education affect BMI change in a pediatric obesity treatment?
Higher parental education is often associated with greater health literacy, improved access to resources, and more effective health-related decision-making, which may influence a child's ability to engage in and benefit from obesity treatment. The iAmHealthy program, a family-based pediatric obesity intervention delivered via televideo, provides an opportunity to examine whether parental education affects a youth's response to pediatric obesity treatment. Youth (n=148, ages 6-10, 56.8% female, 87.1% White) in rural areas were randomly assigned to iAmHealthy intervention (n=64) or Newsletter Control (n=84). Parents reported their highest degree obtained at baseline. Parent and child anthropometrics were measured at baseline and post-treatment (8 months)**.** Change in child BMI z-scores and parent BMI were calculated to assess treatment response. Multiple linear regression was utilized to examine whether parental education differentially impacts changes in child BMIz/parent BMI across two treatment groups. At baseline, parent education was not significantly correlated with child BMIz (B=-.12, p=.141), but was significantly correlated with parent BMI (B=-.22, p=.011). A multiple regression evaluating child BMIz change scores, F(3,129)=1.38, p=.251, R^2=.03, found that the main effect of treatment group and the interaction were not significant. The main effect of parental education was significant, β=.03, p=.04. A multiple regression evaluating parent BMI change scores, F(3,123)=.74, p=.530, R^2=.02, found that the main effect of treatment group, education, and the interaction effect were not significant. While parental education was associated with changes in child BMIz, it accounted for minimal variance overall and did not predict changes in parent BMI. This suggests that the effectiveness of iAmHealthy and newsletter control were not dependent on parental education. Future studies may examine whether other socioeconomic factors impact BMI changes throughout treatment.

263.
Name: Weatherford, Katherine
Major: Psychology - Bachelor of Science
Faculty Research Mentor: Cliff McKinney, Psychology
Project Category: Social Sciences

Effects of Maternal Maltreatment on Psychological Problems Moderated by Private Religiosity
Mahoney (2010) found that religion and spirituality shape, support, and alter family dynamics. Although church attendance did not effect psychological problems, religious coping had positive effects (Upenieks, 2021). Studies continuously show there are many layers to spirituality and family relationships that remain uncovered (Stearns & McKinney, 2018). The current study examined the relationship between maternal maltreatment and psychological problems and how private religiosity may moderate the relation. It was hypothesized that higher private religiosity would weaken the relation between maternal maltreatment and psychological problems.
Participants included 585 emerging adults (65.5% women, 35.5% men; 69.3% White, 25.0% Black, 2.4% other). They completed the Adult Self-Report (ASR; Achenbach & Rescorla, 2003), the Conflicts Tactics Scale: Parent-Child Version (CTSP; Straus et. al.,1998), Stearns-McKinney Assessment of Religious Traits (Stearns & McKinney, 2018). PROCESS 4.2 (Hayes, 2022) model 1 was used to conduct a moderation analysis. The model predicting psychological problems was significant, R^2 = .12, F(3, 406) = 18.22, p < .001.Maternal maltreatment was positively correlated with psychological problems, B = .15, SE = .02, p < .001. Private religiosity was negatively associated with psychological problems, B = -.62, SE = .18, p < .001. The interaction between maternal maltreatment and private religiosity was significant, B = .006, SE = .003, p = .036. This study examined the effects of maternal maltreatment and total psychological problems moderated by private religiosity. Maternal maltreatment and psychological problems were positively associated with one another. High private religiosity indicated a decrease in the relation between maternal maltreatment and psychological problems. This study supports the idea of future research in exploring other genders, specific religions, and coping skills through religious practices.

264.
Name: Weaver, Sara Anne
Major: Human Development & Family Sci - Bachelor of Science
Faculty Research Mentor: Tommy Phillips, School of Human Sciences
Co-Author(s): JuYoung Lee, Abbey Harper, Sydney Blackwell, Bryce Roby
Project Category: Social Sciences

The Relationship Between Stress Levels in Emerging Adults and Their Likelihood to Engage in Retail Therapy
The purpose of this study is to examine the relationship between stress levels in emerging adults (ages 18-25) and their likelihood of engaging in retail therapy. As stress remains a prevalent factor in young adulthood, this research seeks to determine whether individuals experiencing higher stress levels are more inclined to use shopping as a coping mechanism. The study employs a quantitative approach, utilizing an online survey conducted via Qualtrics to collect self-reported data from participants. Stress levels are measured using the Perceived Stress Scale (PSS-10), with answer choices ranging from 1 (strongly disagree) to 7 (strongly agree). While engagement in retail therapy is assessed through the Retail Therapy Scale developed by Kang and Johnson (2011). This scale has participants rank questions based on a scale of 0 (never) to 4 (very often). A correlation analysis is used to determine the strength and direction of the relationship

between these variables. Preliminary findings suggest a positive correlation between elevated stress levels and increased engagement in retail therapy, supporting the hypothesis that individuals under higher stress are more likely to shop as a means of emotional regulation. These findings contribute to a broader understanding of consumer behavior, particularly how psychological stress influences purchasing decisions. The study in progress highlights the importance of addressing stress management among emerging adults and raises awareness of the potential implications of retail therapy as a coping strategy. Future research may explore additional factors such as financial literacy, impulsivity, and long-term psychological effects associated with stress-induced shopping behaviors.

174.
Name: Weinstein, Nina
School: The Mississippi School for Math and Science
Faculty Research Mentor: David Van Den Heever, Ag & Bio Engineering
Funding: ORED Undergraduate Research Program
Project Category: Biological and Life Sciences

Neural Correlates of Episodic and Working Memory in Visual Recall
Memory and the richness of conscious experience illuminate an understanding of human cognition. This study is intended to offer an analysis of the neural mechanisms that underlie the active recall of visual memory, whereas it also examines the competition between two distinct memory systems: working memory and episodic memory. After delivering a very brief visual stimulus of four distinguishable shapes, each bearing a unique color, the participant is asked to rate how vividly they remembered that stimulus. They will then be asked to recall the shapes and colors presented to them. Here, both the phenomenological and the objective accuracy of memory retrieval are brought into play for analysis. The neural encoding and retrieval processes will be reconstructed by analyzing behavioral patterns in memory accuracy and subjective ratings about vividness. The study explores how the difference in richness of memory correlates with the ability to remember and recognize either shapes or colors. Additionally, the research estimates some possible effects across attentional controls and synaptic strengths onto stability in visual representations. By directly linking subjective reports of vividness against recall accuracy, this experiment seeks to characterize the relationship between the perceived memory and real memory fidelity. The results may contribute to gaining further insight on consciousness concerning visual working memory and episodic recall, also highlighting the neurophysiological underpinning of mnemonic representation. In addition, this study would cater for insights into cognitive neuroscience because of dysfunctional neurological disorders characterized by memory disturbances. Through this research, we intend to open new paths for work on conscious perception and memory systems, bridging the gap between phenomenology and neurophysiology in human cognition.

175.
Name: Welch, Tori
Major: Nat Res & Envir Conservation - Bachelor of Science
Faculty Research Mentor: Christine Fortuin, FWRC-Forestry
Funding: College of Forest Resources Undergraduate Research Scholars Program
Project Category: Biological and Life Sciences

Investigating the Effects of Prescribed Fires on Wild Bee Populations and Communities
Pollinators play a vital role in sustaining the health of our forests, gardens, parks, and agricultural systems. Native pollinator communities often rely on forest resources for nesting and foraging. Previous studies have revealed notable bee diversity in planted loblolly pine forests, yet significant gaps remain in our understanding how forest management practices, including prescribed burns, affect pollinator communities. This project focused on examining how bee communities were affected by prescribed burns that happened within the past year (2024) compared to sites that were burned two years ago (2022) in pine forests. There was a total of six collection sites, three sites burned in 2024 and three sites burned in 2022. Each site contained four types of pollinator traps: blue vein, yellow pan, white pan, and blue pan traps. For each of the bee collections, the traps were set out at each site for three days and then collected and brought back to the lab to pin and analyze each bee down to species. The preliminary results suggest little significance between the bee communities in recently burned forests versus the forests burned a few years ago. Further analysis will clarify the impact of prescribed burns on bee communities.

60.
Name: Wheat, Addyson
Major: Aerospace Engineering - Bachelor of Science
Faculty Research Mentor: Rani Sullivan, Aerospace Engineering
Co-Author(s): Shuvam Saha
Project Category: Engineering

Mode I Fracture Behavior of Stitched Composites in a Cryogenic Environment
Composite structures have been increasingly explored for applications in lightweight cryogenic pressure vessels because of their high strength to weight ratios and relatively low coefficients of thermal expansion. However, previous experiments with cryogenic composite applications have demonstrated increased gas permeability through the composite structure due to microcracking, decreasing the effectiveness of their pressure vessel capabilities. Mode I fracture testing has been conducted to analyze the stiffness of stitched composite structures and to measure the maximum loads obtained, both under cryogenic and room temperatures. Effects of cryogenic temperature on the stitching and the resin-carbon fiber interface were assessed using optical microscopy. Failure modes of the stitches were analyzed to determine the impact of stitching on the strength of a composite body under cryogenic loads.

197.
Name: Whitehead, Joshua
Major: Finance (Undergraduate) - Bachelor of Business Adm
Faculty Research Mentor: Brandon Cline, Finance & Economics
Funding: Finance & Economics Department
Project Category: Business and Economics

Measuring Market Sentiment Towards CEO Incentives
One of the primary purposes of a firm is to increase the shareholders' wealth. One of the primary directors of a firm is the CEO. In an environment with no agency problems, the CEO will act in the shareholder's best interest, behaving in an optimal way to increase the firm's and shareholder's wealth. Existing literature observes the individual agency of CEOs and how firms incentivize CEOs to act in the best interest of shareholders. However, some of the incentives provided to CEOs and, consequently, the behavior of the firm is not optimal to all stakeholders. Using existing data on CEO compensation and employment, my research is targeted to illuminate market perception of these CEO incentives through analysis of stock price returns around announcement of CEO incentive plans. In addition, I study the differences between candidate origin and corresponding incentive structure. Accounting for the individual profiles of candidates and corresponding skills requires careful consideration to adequately compensate CEOs and maximize alignment to the firm's goals. I hypothesize that CEO profile influences compensation design to address candidate skills and agency costs, impacting firm value and market perception of CEO future value.

265.
Name: Williams, Nena
Major: Psychology - Bachelor of Science
Faculty Research Mentor: Cliff McKinney, Psychology
Co-Author(s): Tram Nguyen
Project Category: Social Sciences

Family Functioning and Trauma Appraisal: Predictors of Psychological Resilience in Emerging Adults
Trauma appraisal, the subjective interpretation and cognitive evaluation of traumatic events, significantly influence psychological outcomes in trauma-exposed individuals. Previous research has highlighted the pivotal role of family functioning in shaping responses to trauma, with dimensions such as communication, roles, and problem-solving being critical in modulating these appraisals. The family systems theory posits that healthier family interactions can buffer the adverse effects of trauma, potentially leading to more adaptive trauma appraisals. While the effects of family dynamics on trauma response have been studied, there remains a gap in understanding the specific roles of on-going family functioning in shaping trauma appraisals, particularly in emerging adults. This study examined how different family functioning dimensions (communication, roles, problem-solving, affective responsiveness, and behavior control) might predict trauma appraisal scores. Utilizing a cross-sectional design, data were collected from 736 participants who completed the Family Functioning Assessment Device and the Trauma Appraisal Questionnaire. Multiple regression analysis revealed that the family's difficulty solving problems ($\beta = .24$, $p < .001$), poor communication ($\beta = .18$, $p < .001$), affective overinvolvement ($\beta = .16$, $p < .001$), and the chaotic pattern of family responsibilities predicted higher levels of negative trauma appraisals ($\beta = -.11$, $p = .017$). The extent to which family members experienced appropriate affect and the way families maintain standards did not predict negative trauma appraisals. These results highlight the importance of targeting specific aspects of family functioning in therapeutic settings to aid trauma survivors. Interventions that enhance family problem-solving, communication, and involvement may be particularly effective in promoting adaptive trauma appraisals and better overall psychological resilience.

176.
Name: Willingham, Carlie
Major: Biomedical Engineering - Bachelor of Science
Faculty Research Mentor: Shecoya White, Biochemistry Nutrition Health Promo
Co-Author(s): Devin Chen, Kallie Bosarge, Ajay Yenduri, Ella Kate Boothe, Carrie Ruth Jackson
Funding: MSU Pipetting Team
Project Category: Biological and Life Sciences

Efficacy of Essential Oils Versus Household Products for Strawberry Preservation
The short shelf life of strawberries has caused significant strain on the agricultural industry, resulting in the loss of hundreds of millions of dollars each year. Past research has estimated that 64% of strawberries are lost before they are ever eaten. This waste is mainly due to the shelf life of strawberries being a mere 2-7 days. Through this research, the Pipetting Team at Mississippi State University attempts to elongate the shelf life of strawberries through analyzing the efficacy of dip applications of various essential oils compared to household products. Strawberries were dipped into one of six antifungal treatments: 1% essential oils (carvacrol, lime, limonene) and 1% household products (bleach, vinegar, and Tsunami 100™) and water solution (control) for 1 minute. Post-dipping the strawberries were allowed to dry overnight at room temperature. Fungal growth and moisture loss were observed intermittently over a 5-day period. The 1% carvacrol and 1% lime oil treatments were the only treatments where no fungal growth was visually detected over the entire 5-day storage period compared to the control and the other treatment applications. Carvacrol and lime oil did however experience significant moisture by day 5 in comparison to the alternate treatments and control. The use of essential oils at 1% overall proved to be more effective at controlling fungal growth compared to the household products. As consumers seek more natural antifungals for preservation, carvacrol and lime oil treatments may present realistic solutions. However, moisture loss and possible organoleptic volatiles from the essential oils may prevent marketability in the industry. Experimenting with various concentrations of these treatments could offer a cost-effective and efficient way to enhance the shelf life of strawberries by inhibiting fungal growth and reducing food waste.

198.
Name: Yelvington, Taylor
Major: Fashion Design & Merchandising - Bachelor of Science
Faculty Research Mentor: JuYoung Lee, School of Human Sciences
Funding: College of Agriculture and Life Sciences URSP
Project Category: Business and Economics

The Resilience, Capacity, and Capability of U.S. Cotton Supply Chains
Blockchain technology, a decentralized digital ledger, is increasingly being adopted across various industries to enhance transparency, efficiency, and security. Within the cotton textile and apparel supply chains, blockchain has gained traction as a tool for improving traceability, sustainability, and ethical sourcing. Major fashion brands, including Stella McCartney, Levi Strauss, and H&M, have implemented blockchain to verify product origins and uphold ethical labor standards. However, despite its benefits, blockchain adoption among small businesses remains limited due to high implementation costs, technical challenges, and resource constraints. This study investigates the key factors influencing blockchain adoption in small businesses within the cotton supply chain, utilizing the Technology Acceptance Model (TAM) as a framework. Specifically, it examines how perceived ease of use and perceived usefulness impact blockchain implementation. The research explores the relationship between these factors and the intention to use blockchain technology, explaining the barriers for widespread adoption. Findings from this study will provide valuable insight for industry stakeholders, helping to develop targeted strategies and training programs to facilitate blockchain adoption among small businesses. By addressing the technological gap, this research contributes to improving supply chain transparency, sustainability, and overall efficiency in the fashion and textile industries.

177.
Name: Young, Kayla
Major: Biochemistry - Bachelor of Science
Faculty Research Mentor: Richard Baird, Agricultural Science & Plant Protec
Co-Author(s): Hannah Purcha
Funding: Shackouls Honors College Research Fellowship
Project Category: Biological and Life Sciences

Assessing the Impact of Drought and *Macrophomina phaseolina* Infection on the Soybean Microbiome
Charcoal rot, caused by the fungus *Macrophomina phaseolina (MP)*, is a major threat to agriculture given its wide host range and potentially devastating virulence. MP is a significant threat to soybean production, especially under drought conditions that are projected to become more common in soybean-growing regions in upcoming years. Though MP can cause significant losses to an entire field of soybean, it is often the case that a relatively healthy plant is found beside a severely diseased plant. Therefore, we hypothesize that the endophytic community of a plant impacts its ability to survive MP and/or drought stress. This research project investigates this hypothesis by comparing the metagenomic DNA extracted from soybean plants subjected to four treatments (MP, drought, MP and drought, and a control) to evaluate how these stressors alter the microbial community. The results of these analyses are presented in the poster.

266.
Name: Zhou, Kallen
Major: Economics - A&S - Bachelor of Arts
Faculty Research Mentor: Chris Snyder, Shackouls Honors College
Project Category: Social Sciences

A Statistical Analysis of Southern Land Grants in Addressing Declining College Enrollment
With declining enrollment of higher education, it is crucial to analyze current mechanics in order to maintain higher education's benefits to society. Currently, research is aware that land grants serve an important historical role in promoting enrollment, yet additional research is required on their contemporary impact on enrollment and institutional aid. Specifically, this study evaluates land grants universities - institutions established under the Morrill Act of 1862 - and data collected from their respective Common Data Sets on historical enrollment and institutional aid from 2013 to 2023. A two sample t-test is used to understand the statistical significance of land grant status. This study concludes that land grants status is not statistically significant in percent change for enrollment and institutional aid. However, the land grants studied exhibit significance in the proportion of students applying for aid and students who received it. The findings of this study highlights the need for further analysis of the contemporary role of land grants in addressing higher education enrollment trends.

278.
Name: Clawson, Madalynn
Major: Biochemistry – Bachelor of Science
Faculty Research Mentor: Florencia Meyer, Biochemistry Nutrition Health Promo
Funding: CALS URSP
Project Category: Biological and Life Sciences

Analysis of Biofilm Imaging by *Mannheimia haemolytica*
M. haemolytica is a bacterium naturally found in the upper respiratory tract of cattle, and it is associated with clinical cases of Bovine Respiratory Disease (BRD). Given its natural presence in the upper respiratory tract, *M. haemolytica* can, through inhalation, reach the lungs and proliferate. Bacteria adhere and can develop complex, protective structures known as biofilms, which shield bacteria from environmental stressors and antibiotics, making infections more persistent and difficult to treat. Understanding and reducing biofilm formation could provide valuable insights into combating bacterial persistence and antibiotic resistance. Our research focuses on developing and characterizing biofilm-like structures formed by *M. haemolytica*. We have compared different trains of *M. haemolytica* in the capacity to produce biofilms and have imaged the biofilm-like structures. Building upon biofilm formation, we investigated methods to disrupt these bacterial structures. We wish to test the effects of different metal-EDTA complexes on biofilm degradation. Results suggest that Copper-EDTA shows a slight advantage in disrupting biofilm formation compared to the other tested metals. Further studies will refine the concentration of each metal to determine the most effective combination for eliminating *M. haemolytica* biofilms. We would also like to further characterize the biofilm using scanning electron microscopy (SEM). Our findings may contribute to mitigate BRD-related infections.

279.

Name: McNew, Nicholas
Major: Wildlife, Fisheries, and Aquaculture – Bachelor of Science
Faculty Research Mentor: Peter Allen, FWRC-Wildlife,Fisheries&Aquaculture
Co-Author(s): Melanie R. Boudreau
Funding: CFR USRP
Category: Biological and Life Sciences

Effects of different accelerometer shapes on retention, and survival in Channel Catfish (*Ictalurus punctatus*)

Accelerometers are useful for quantifying spatial movements and activity, and hold promise for understanding energy use of fish in turbid waters, such as in commercial catfish production. In order to use accelerometers, they must be surgically implanted, however, catfish in the family Ictaluridae can expel foreign objects from their body in approximately 2-4 weeks. To explore materials that might have longer retention times, different accelerometer tag materials and external coatings were evaluated in Channel Catfish (*Ictalurus punctatus*) over 12 weeks following surgical implantation. There were four tag types: polyactide (PLA), resin, resin with surgical mesh, and resin with surgical mesh and beeswax. Retention rate was low for all tag types. The surgical mesh tag had the highest retention rate, (<40% by 4 weeks) and the resin tag had the lowest retention rate (0% by 4 weeks). Fish survival differed among tag types, with only 35% of the fish with the surgical mesh tag surviving until 12 weeks compared to 50% survival at 12 weeks in fish with PLA tags. Differences in retention and survival may be due to material type and tag size. Results in this study indicate tag covering can influence retention duration, but experiments using accelerometer tags should occur 2-4 weeks following implantation for maximum data collection. Results also indicate while the surgical mesh tag does provide a longer retention time, because of the high mortality rate, this method is not recommended.

280.

Name: Grebner, Daniel
Major: Forestry – Bachelor of Science
Faculty Research Mentor: Adam Polinko, FWRC - Forestry
Co-Author(s): John Willis
Funding: CFR URSP
Project Category: Biological and Life Sciences

Evaluating Drought Resistance of Loblolly, Longleaf and Longleaf-Loblolly Pine Hybrid Seedlings

Sonderegger pine, a naturally occurring hybrid of longleaf pine (Pinus palustris) and loblolly pine (Pinus taeda), remains largely understudied, particularly regarding its functional traits. While its growth patterns and crown morphology have been documented, questions persist about whether it inherits the drought tolerance of longleaf pine, which typically thrives in drier environments compared to loblolly pine. To explore this, we examined the drought response of Sonderegger pine, longleaf pine, and loblolly pine under controlled conditions designed to assess resistance, resilience, and the heritability of functional traits. Seedlings were subjected to two drought treatments: (1) an extreme drought period and (2) prolonged drought with intermittent supplemental moisture. During the initial 25-day extreme drought phase, seedlings received no water and were weighed every 3–4 days. After this period, all seedlings were watered, and one-third were returned to normal watering conditions. In the next 25-day phase, drought-treated seedlings were given supplemental moisture only when soil moisture levels dropped to 2%. The final 25-day period focused on estimating transpiration rates by recording pot weights every two days in comparison to a well-watered control group. To evaluate the effects of drought on each species, we measured survival rates and photosynthetic activity following each month of treatment. Additionally, we separated the needles, roots, and stems, removed any non-structural carbohydrates, and weighed each component individually to determine biomass partitioning. This study will provide valuable insights into the functional traits of Sonderegger pine, particularly its drought tolerance, and clarify whether this hybrid inherits drought-resistant characteristics from its parent species.

281.

Name: Trepagnier, Andrew
Major: Mechanical Engineering – Bachelor of Science
Faculty Research Mentor: Christopher Barrett, Mechanical Engineering
Funding: NSF
Project Category: Engineering

Machine-Learned Interatomic Potentials of Pure Crystalline Yttrium

Pure crystalline Yttrium (Y) has been a material of great interest for solid-solution hardening of Magnesium (Mg) alloys due to its enhancement of Mg's high strength-to-weight ratio. Molecular dynamics simulations have been a cornerstone of material science

research for systems like Mg-Y for characterizing the behavior of various configurations on the atomic level. However, one challenge of modern molecular dynamics is the inflexibility of conventional interatomic potential formulations such as Modified Embedded Atom Methods (MEAM) and Embedded Atom Methods (EAM) due to their limited number of characterizing parameters. The use of neural network architectures for interatomic potential fitting has recently become a computation strategy of great interest in material science due to its superior abilities to train over large, memory-intensive datasets in reasonable time and to tailor the number of characterizing parameters to the needs of the dataset. In this study, an interatomic potential of pure Y was trained using a machine-learned rapid artificial neural network (RANN). The performance of the RANN model was characterized by testing the machine-learned interatomic potential (MLIP) with the Large-scale Atomic/Molecular Massively Parallel Simulator (LAMMPS). The model was validated based on two metrics of the potential – energy-volume relation, and elastic constants. For the energy-volume relation, the model achieved accuracies on the order of meV/atom compared to Density Functional Theory (DFT) energies. However, the predicted elastic constants showed significant deviations of up to 50% difference from both DFT and MEAM-based calculations, suggesting the need for further refinement in training datasets and metaparameters.

MISSISSIPPI STATE UNIVERSITY

UNDERGRADUATE RESEARCH AND CREATIVE DISCOVERY

The Office of Undergraduate Research and Creative Discovery at Mississippi State University works to support undergraduate research and creativity by connecting students with opportunities aligned with their intellectual interests and guiding them through the process of completing successful undergraduate projects. Our website offers resources for both students and faculty mentors: *urcd.msstate.edu*.

THANK YOU

For supporting undergraduate research

Special thanks to Morgan Elmore, Cameron Everson, Kierstynn Hunter, and the Judy and Bobby Shackouls Honors College student workers for contributing to the success of this event.