SPRING UNDERGRADUATE RESEARCH
SYMPOSIUM

MISSISSIPPI STATE UNIVERSITY™
UNDERGRADUATE RESEARCH
AND CREATIVE DISCOVERY

COLVARD
STUDENT
UNION
APRIL 11–12, 2024

CONTENTS

Post a picture of your research on Instagram during the symposium with the hashtag #myMSUresearch and tag @shackoulshonors to enter a swag giveaway! The winner will be announced on Instagram by Wednesday, April 17th.

Welcome to the Undergraduate Research Symposium

The Office of Undergraduate Research and Creative Discovery is pleased to host the Spring 2024 Undergraduate Research Symposium and to be a part of Mississippi State University's Research Week. This symposium is a great way for undergraduate students to showcase their interest and dedication to research activities and for the MSU family to celebrate their engagement, curiosity, and hard work. Thank you for attending!

We believe the support of undergraduate research and creative endeavors for all students to be part of our core mission as an institution of higher learning. Participating in undergraduate research 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 each of them for their commitment to helping make the Spring Undergraduate Research Symposium an annual event. This includes: Shackouls Honors College, Office of Research and Economic Development, College of Arts & Sciences, Bagley College of Engineering, College of Agriculture and Life Sciences and Mississippi Agricultural and Forestry Experiment Station, College of Education, College of Forest Resources, Office of the Provost and Executive Vice President, Student Association, Honor Society of Phi Kappa Phi, and the Graduate School.

We are pleased that thirteen Special Area Competitions are affiliated with the symposium in an effort 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 Education; 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 Food Science, Nutrition, and Health Promotion; Department of Kinesiology; the Graduate School; Mississippi State Institute for the Humanities; Gulf Scholars Program, Theta Tau Professional Engineering Fraternity; and Mitchell Memorial Library.

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

Anastasia D. Elder, Ph.D.
Associate Dean, 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: Our State's Land-Grant Research Flagship

We are honored to welcome you to Mississippi State University's Spring 2024 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 Engagement Classification.

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

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

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

David R. Shaw, Ph.D.
Provost and Executive Vice President

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

March 7, 2024

Dear Undergraduate Research Symposium Participants:

On behalf of the faculty and staff of the Bagley College of Engineering (BCoE), congratulations on the submission and completion of your research projects as part of the Undergraduate Research Symposium. These submissions represent the hard work and dedication of our students and faculty to support the educational and research missions of MSU. These submissions and your participation in the UGRS will provide you with invaluable experience that will ultimately set you apart when you embark on your career journey.

The BCoE conducts fundamental and theoretical research in all areas of MSU research strategic strategy and others. This breadth of research endeavor allows students to pursue research endeavors in their field of interest. Undergraduates participating in the research mission of MSU and BCoE are experiencing a level of experiential learning that is unparalleled as it allows them to work side by side with world class researchers and graduate students and provides them to access with world class facilities.

As Dean of the BCoE, I commend you in your endeavors and hope that you will share your experiences with others. The BCoE is committed to supporting undergraduate student engagement in research and supporting student presentations at local, regional, national and international venues. Again, congratulations on your achievement and I look forward to seeing what you accomplish in the future.

Regards,

Jason M. Keith
Dean and Professor
Earnest W. and Mary Ann Deavenport Jr. Chair

MAKING AN
IMPACT

In Mississippi State University's College of Education, our faculty, staff and students are translating knowledge into impact. In FY23, our **research proposals totaled over $14 million** with **$7.9 million awarded.** And our FY24 research proposals have already surpassed **$40 million.** We're inspiring others to explore their passions through our 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.**

Mississippi Institute on Disabilities

The Mississippi Institute on Disabilities focuses on support and opportunity for people with disabilities in the Magnolia State. Bringing **MSU's T.K. Martin Center for Technology and Disability** and **MSU's Autism and Developmental Disabilities Clinic** under a unifying moniker, the new innovative institute creates a hub for research, training and cross-campus collaboration.

National Research and Training Center on Blindness and 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 ranging from direct-service practitioners to administrators of state agencies and federal programs.

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 VR applications in industry and design.

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 sponsor the Spring 2024 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
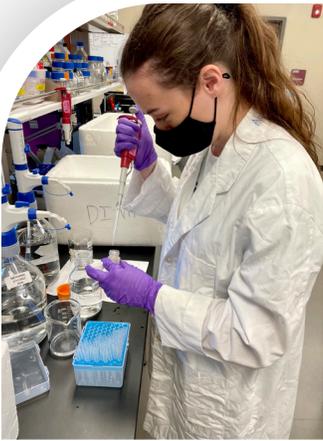Director of MAFES

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!

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,
Peter

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

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

THE HONOR SOCIETY OF
PHI KAPPA PHI

Chapter 060
Mississippi State University
Mississippi State, MS 39762

15th February, 2024

RE: The Undergraduate Research Symposium – Spring 2024

Peter Ryan
President
P.O. Box 9723
MS State, MS 39762

Josh Granger
Vice President
P.O. Box 9681
MS State, MS 39762

-
Student Vice Presidents:
Mary Walker
Jaymar Jackson
Caitlyn Guthrie

Krishna Poudel
Secretary
P.O. Box 9681
MS State, MS 39762

Jason Keith
Treasurer
P.O. Box 9595
MS State, MS 39762

Angela Hill
Administrative
Secretary

Chapter Address
P.O. Box 9690
MS State, MS 39762

662-325-3830
Fax: 662-325-4763
http://pkp.msstate.edu
pkp@org.msstate.edu

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. The MSU Chapter has received the higest Platinum recognition award for the past three years for its service and contribution to the academy and society.

Due to PKP's prestigious recognition and support of learning, the MSU Chapter is proud to also financially support the Spring 2024 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,

Peter L. Ryan

Peter Liam Ryan, PhD, MSU PKP Chapter President

UNDERGRADUATE RESESARCH SYMPOSIUM SCHEDULE
Spring 2024

Thursday, April 11ᵗʰ

Session 1 - Physical Sciences and Engineering		
TIME	**EVENT**	**LOCATION**
9:00 a.m. - 9:30 a.m.	Project Check-in and Student Viewing of Other Posters	Foster Ballroom, Colvard Student Union Second Floor
9:30 a.m. - 11:30 a.m.	Poster Session	

Session 2 – Arts, Music, & Design, Business & Economics, Social Sciences, Education, and Humanities (Posters)		
TIME	**EVENT**	**LOCATION**
1:30 p.m. - 2:00 p.m.	Project Check-in and Student Viewing of Other Posters	Foster Ballroom, Colvard Student Union Second Floor
2:00 p.m. - 4:00 p.m.	Poster Session	

Session 2 – Arts, Music, & Design and Humanities (Oral Presentations)		
TIME	**EVENT**	**LOCATION**
1:00 p.m.	Project Check-in	Fowlkes Auditorium, Colvard Student Union Third Floor
1:30 p.m.	Group I Presentations *See separate event schedule*	
2:30 p.m.	Group II Presentations *See separate event schedule*	

Friday, April 12ᵗʰ

Session 3 - Biological and Life Sciences		
TIME	**EVENT**	**LOCATION**
9:00 a.m. - 9:30 a.m.	Project Check-in and Student Viewing of Other Posters	Foster Ballroom, Colvard Student Union Second Floor
9:30 a.m. - 11:30 a.m.	Poster Session	

Session 4 – 3Minute Research Pitch		
1:30 p.m.	3Minute Research Pitch Competition, Hosted by The Graduate School *See separate event schedule*	Dawg House, Colvard Student Union First Floor

HUMANITIES and ARTS, MUSIC, & DESIGN ORAL PRESENTATIONS SCHEDULE

Fowlkes Auditorium, Colvard Student Union
Thursday, April 11th 1:30 p.m.

<table>
<tr><td style="background:green;color:white">Event Schedule</td></tr>
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1:00 p.m.   **Group I: Humanities Check In**
1:30p.m.   **Group I: Humanities Presentations**

Darrow Adderholt (53) The Consequences of Taken Stories
Annie Kirkpatrick (54) A "World Without Verona Walls": Why Juliet Makes Romeo her Bride in Shakespeare's *Romeo and Juliet*
Audrie Sifford (55) *Hamlet* Undone: A Loss of Doctrine
Alexandria Taylor (56) Humor In the Moment: The Change in Comedic Perception
Will White (57) Tamburlaine's Victims: The Other Side of Religious Violence

2:30 p.m.   **Group II: Arts, Music, & Design Check In**
2:45 p.m.   **Group II: Arts, Music, & Design Presentations**

Michael Herndon (60) Community Resilience: Disaster Relief Practices and Informing Better Built Environments
Saylor Kilpatrick (61) Phillip Noyce's Filmic Rendition of "Rabbit-Proof Fence" to Further the Juxtaposition Regarding Matriarchy vs Patriarchy as Pertains to Education
Kathryn McArthur (62) An Exploration of Gabriel Fauré's "Pavane, Op. 50" and its Evolution into Modern Chamber Music and Pop Culture Mediums
Dylan Hall (63) Poetry, Music, Collaboration, Inspiration: A Pairing of Poetic Lines of Sir William Blake with Dave Hall's "…Ascends the Sky" for Solo Marimba
Rocky Jacobs (64) *Brigade (EP)* - A Declaration of Gaiety, Isolation, and Rage

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3MINUTE RESESARCH PITCH

Dawg House, Colvard Student Union
Friday, April 12th 1:30 p.m.

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.

Hosted by The Graduate School at Mississippi State University.

STUDENT PRESENTERS

NAME	RESEARCH CATEGORY	PROJECT NUMBER
Aiden Baham	Engineering	001
Austen Breland	Engineering	002
James Chalmers	Engineering	003
Wen Xiang Chen	Engineering	004
Zijie Chen	Engineering	005
Minjae Cho	Engineering	006
Annemarie Coatney	Engineering	007
Gavin Denton	Engineering	008
Honor Elchos	Engineering	009
Daniel Ellis	Engineering	010
Madeline Frederick	Engineering	011
Jade Geiselman	Engineering	012
Naoufel Ghannami	Engineering	013
Niraj Ghimire	Engineering	014
Leonel Giacobbe	Engineering	015
Finnis Ginder	Engineering	016
Nick Gray	Engineering	017
Oliver Higginbotham	Engineering	018
Daniel Hogan	Engineering	019
Kyla Hunter	Engineering	020
Matison Hurt	Engineering	021
Jennefer Jones	Engineering	022
Tanner Jones	Engineering	023
Khaoula Kamal	Engineering	024
Jennifer Kemp	Engineering	025
Kennedy Keyes	Engineering	026
Theodore Lai	Engineering	027
Olivia Leatherman	Engineering	028
Ashwani Kumar Mishra	Engineering	029
Vincent Perkins	Engineering	030
Kyler Smith	Engineering	031
Charlotte Thompson	Engineering	032
Jade Thompson	Engineering	033
Addyson Wheat	Engineering	034
Katelyn Woodard	Engineering	035
Jordan Adams-Jackson	Physical Sciences	036
Caleb Bowman	Physical Sciences	037
Nicole Busby	Physical Sciences	038
Logan Carlson	Physical Sciences	039

NAME	RESEARCH CATEGORY	PROJECT NUMBER
Jocelyn Dieselberg	Physical Sciences	040
Jane Alice Dill	Physical Sciences	041
Caitlyn Guthrie	Physical Sciences	042
David Heson	Physical Sciences	043
Hannah Hyland	Physical Sciences	044
Bria Johnson	Physical Sciences	045
Jackson Koloc	Physical Sciences	046
Hannah Lawson	Physical Sciences	047
William Pope	Physical Sciences	048
Madeline Raynor	Physical Sciences	049
Allyson Trahan	Physical Sciences	050
Veer Vanmali	Physical Sciences	051
Chandler Woo	Physical Sciences	052
Darrow Adderholt	Humanities	053
Annie Kirkpatrick	Humanities	054
Audrie Sifford	Humanities	055
Alexandria Taylor	Humanities	056
Will White	Humanities	057
Kyndle Lee	Humanities	058
Alexandria Taylor	Humanities	059
Michael Herndon	Arts, Music, & Design	060
Saylor Kilpatrick	Arts, Music, & Design	061
Kathryn McArthur	Arts, Music, & Design	062
Dylan Hall	Arts, Music, & Design	063
Rocky Jacobs	Arts, Music, & Design	064
Sara Boyte	Arts, Music, & Design	065
Grace Delahoussaye	Arts, Music, & Design	066
Jacqueline Enriquez	Arts, Music, & Design	067
Breunna Manuel	Arts, Music, & Design	068
Lauren Odom	Arts, Music, & Design	069
Gabriela Patino	Arts, Music, & Design	070
Iliana Ramos	Arts, Music, & Design	071
Rachel Sampson	Arts, Music, & Design	072
Yin Wong	Arts, Music, & Design	073
Wynn Howell	Business and Economics	074
Morgan Oen	Business and Economics	075
Elena Palomino	Business and Economics	076
Todd Eubanks	Business and Economics	077
Sawyer Smith	Business and Economics	078
Raegan Adams	Education	079
Rosemary Boland	Education	080

NAME	RESEARCH CATEGORY	PROJECT NUMBER
Logan Brown	Education	081
Emma Conley	Education	082
Jordan Doherty	Education	083
Faith Hagan	Education	084
Shawn Mackey	Education	085
Hannah Magee	Education	086
Charles Nicholas	Education	087
Sarah Patterson	Education	088
Ella Sweeney	Education	089
Agatha Taquino	Education	090
Brooke Thompson	Education	091
Catherine Turner	Education	092
Hasini Yamagowni	Education	093
Adaline Rouse	Education	094
Anderson French	Education	095
Ethan Harriel	Education	096
Andy Jennings	Education	097
Rachel Adair	Social Sciences	098
Addison All	Social Sciences	099
Mallory Avary	Social Sciences	100
Kourtney Barfield	Social Sciences	101
Mikenlee Barlow	Social Sciences	102
Mary Barnes	Social Sciences	103
Adeline Barrett	Social Sciences	104
Chandleigh Barton	Social Sciences	105
Kristen Baxter	Social Sciences	106
Andrea Bickley	Social Sciences	107
Caroline Bowen	Social Sciences	108
Jadyn Bowen	Social Sciences	109
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Christa J Brewster	Social Sciences	111
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Luke Chaney	Social Sciences	113
Ann Chapman	Social Sciences	114
Madison Chenaille	Social Sciences	115
Abigail Counts	Social Sciences	116
Gregory Crotty	Social Sciences	117
Olivia Cuevas	Social Sciences	118
Landon Daniel	Social Sciences	119
Alexandria Davis	Social Sciences	120
Hannah Dean	Social Sciences	121

NAME	RESEARCH CATEGORY	PROJECT NUMBER
Whitney Duncan	Social Sciences	122
Michael Fernandez	Social Sciences	123
Kathleen Forman	Social Sciences	124
Hayden Fortinberry	Social Sciences	125
Margaret Freeman	Social Sciences	126
Katie Garcia	Social Sciences	127
Madelynn Green	Social Sciences	128
Angel Greer	Social Sciences	129
Shazina Hasan	Social Sciences	130
Mikayla Herndon	Social Sciences	131
Arielle Hooper	Social Sciences	132
Deja Howard	Social Sciences	133
Emma Huner	Social Sciences	134
Erin Jones	Social Sciences	135
Abigail Martin	Social Sciences	136
Grace May	Social Sciences	137
Cassidy McCullough	Social Sciences	138
Henry Miller	Social Sciences	139
Jordan Moore	Social Sciences	140
Tony Owens	Social Sciences	141
Owen Palocsik	Social Sciences	142
Zoe Parker	Social Sciences	143
Mia Patridge	Social Sciences	144
Billie Patterson	Social Sciences	145
Sarah Petersen	Social Sciences	146
K'Lee Pittman	Social Sciences	147
Michael Poe	Social Sciences	148
Abby Pulver	Social Sciences	149
Brooke Rayborn	Social Sciences	150
Yashwanth Rebala	Social Sciences	151
Carly Robinson	Social Sciences	152
Amya Sanders	Social Sciences	153
Haley Sells	Social Sciences	154
Maurico Smith	Social Sciences	155
Tyrus Smith	Social Sciences	156
Christian Stephens	Social Sciences	157
Julie Stepp	Social Sciences	158
Avery Tate	Social Sciences	159
Hunter Thompson	Social Sciences	160
Marlee Turner	Social Sciences	161
Cora Yielding	Social Sciences	162

NAME	RESEARCH CATEGORY	PROJECT NUMBER
Simranjeet Sekhon	Social Sciences	163
Tobias Adams	Biological and Life Sciences	164
Chaeyeong Ahn	Biological and Life Sciences	165
Fleming Archer	Biological and Life Sciences	166
Shisir Baral	Biological and Life Sciences	167
Katherine Barlow	Biological and Life Sciences	168
Tyler Barlow	Biological and Life Sciences	169
Nathan Baxter	Biological and Life Sciences	170
Mason Beard	Biological and Life Sciences	171
Grace Bellew	Biological and Life Sciences	172
Brandon Bernard	Biological and Life Sciences	173
Macie Bishop	Biological and Life Sciences	174
Jennifer Bittner	Biological and Life Sciences	175
Emily Jane Briggs	Biological and Life Sciences	176
Cole Browning	Biological and Life Sciences	177
Olivia Burdine	Biological and Life Sciences	178
Lillian Burke	Biological and Life Sciences	179
Jacob Carignan	Biological and Life Sciences	180
Shelby Carpenter	Biological and Life Sciences	181
Madalynn Clawson	Biological and Life Sciences	182
Curtis Coleman	Biological and Life Sciences	183
Emily Curran	Biological and Life Sciences	184
Sydney Davis	Biological and Life Sciences	185
Katherine Delaney	Biological and Life Sciences	186
William Dietz	Biological and Life Sciences	187
Catelyn Dill	Biological and Life Sciences	188
Lana Evans	Biological and Life Sciences	189
Ethan Favre	Biological and Life Sciences	190
James Feduccia	Biological and Life Sciences	191
Luke Ferguson	Biological and Life Sciences	192
Brayden Flanagan	Biological and Life Sciences	193
Ke'Daja Freelon	Biological and Life Sciences	194
Sarah Fullerton	Biological and Life Sciences	195
Jillian Gillum	Biological and Life Sciences	196
Seth Givens	Biological and Life Sciences	197
Zoie Graham	Biological and Life Sciences	198
Nicedriana Gray	Biological and Life Sciences	199
Daniel Grebner	Biological and Life Sciences	200
Claire Green	Biological and Life Sciences	201
Rachel Green	Biological and Life Sciences	202
Jennifer Greer	Biological and Life Sciences	203

NAME	RESEARCH CATEGORY	PROJECT NUMBER
Piper Guilliams	Biological and Life Sciences	204
April Guo-Yue	Biological and Life Sciences	205
Leah Hammons	Biological and Life Sciences	206
Trevor Haney	Biological and Life Sciences	207
Jekolby Harris	Biological and Life Sciences	208
Landon Hawk	Biological and Life Sciences	209
Dylan Hester	Biological and Life Sciences	210
Autumn Hilderbrand	Biological and Life Sciences	211
Joseph Hinton	Biological and Life Sciences	212
Madelyn Hunter	Biological and Life Sciences	213
John Jacobson	Biological and Life Sciences	214
Anna Jenkins	Biological and Life Sciences	215
Kristen Johnson	Biological and Life Sciences	216
Nyla Jones	Biological and Life Sciences	217
Kimberly Kaiser	Biological and Life Sciences	218
Catherine Kalmbach	Biological and Life Sciences	219
Caroline Kercheval	Biological and Life Sciences	220
P. Aaliyah Keys	Biological and Life Sciences	221
Hannah Knight	Biological and Life Sciences	222
Garrett Knotts	Biological and Life Sciences	223
Allie Koenig	Biological and Life Sciences	224
Tanner Laird	Biological and Life Sciences	225
Jacob Land	Biological and Life Sciences	226
Ryan Leach	Biological and Life Sciences	227
Sophie LeBlanc	Biological and Life Sciences	228
Seung Heon (Seth) Lee	Biological and Life Sciences	229
Renae Leighton	Biological and Life Sciences	230
Austin Lisowski	Biological and Life Sciences	231
Alyssia Little	Biological and Life Sciences	232
Aleese Loper	Biological and Life Sciences	233
Kailyn Lott	Biological and Life Sciences	234
Jariyah Lowe	Biological and Life Sciences	235
Bronwen Maddox	Biological and Life Sciences	236
Railey Mayatt	Biological and Life Sciences	237
Adriana Mays	Biological and Life Sciences	238
Emily McFatter	Biological and Life Sciences	239
Madeline McKnight	Biological and Life Sciences	240
Michael McPhail	Biological and Life Sciences	241
Audrey Miceli	Biological and Life Sciences	242
Monroe Moody	Biological and Life Sciences	243
Lydia Morphis	Biological and Life Sciences	244

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Morgan Mosby	Biological and Life Sciences	245
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Julia Null	Biological and Life Sciences	248
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Abby Pennington	Biological and Life Sciences	250
Grant Peterson	Biological and Life Sciences	251
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98
Name: Adair, Rachel
Major: Business Economics - Bachelor of Business Adm
Faculty Advisor: Holli Seitz, Communication
Funding: Shackouls Honors College Research Fellowship
Project Category: Social Sciences

Using Diffusion of Innovation Theory Attributes to Predict Intention to Click, Try, and Share HappyHealthy Physical Activity Posts on Facebook
The goal of this study is to understand how the Diffusion of Innovation (DOI) theory and the attributes of an innovation that predict adoption can be used to predict whether and how a person will engage with a HappyHealthy social media post from a Supplemental Nutrition Assistance Program-Education (SNAP-Ed) social marketing campaign. In a web-based survey designed using Qualtrics, 500 U.S. adults responded to questions about one randomly selected HappyHealthy physical activity post. Each participant was asked to rate their likelihood of clicking the link to view the entire physical activity demonstration, trying the physical activity demonstrated in the post, and sharing the physical activity with someone they know, with each behavior measured on a scale from 1 (*not at all likely*) to 10 (*extremely likely*). Participants were then asked to rate how much they agreed with 24 different measures assessing DOI attributes of relative advantage, compatibility, complexity, observability, and trialability on a scale from 1 (*strongly disagree*) to 5 (*strongly agree*). Linear regression analyses were used to examine the relation between the DOI attributes and each behavior. Relative advantage and compatibility were significant predictors of intention to click, try and share HappyHealthy physical activities. Observability was a significant predictor of intention to try and share HappyHealthy physical activities. Complexity and trialability were not significant predictors of intention to click, try, and share physical activity posts. The findings of this study provide important implications for engagement with social media campaigns that promote physical activity; promoting physical activities that are perceived as being higher in relative advantage (i.e., quicker and easier), compatibility (i.e., fitting the user's current way of being active), and observability (i.e., provide visible results) may lead to greater engagement from social media users.

79
Name: Adams, Raegan
Major: Kinesiology - Bachelor of Science
Faculty Advisor: Chih Chia Chen, Kinesiology
Co-Author(s): Hartleigh Schambeau
Project Category: Education

The Effects of Adapted Physical Activity Program on Balance and Quality of Life for Young Adults with Intellectual Disabilities
Limitations in mobility and quality of life are common in persons with intellectual disabilities (ID). The purpose of this study was to determine whether adults with ID could improve their balance and quality of life through adapted physical activity participation. Twenty-seven adults with ID (19 males and 8 females, aged 19-28 years) participated in an adapted physical activity program. Participants practiced soccer, basketball, and badminton activities with adults without ID for 2 hours each session, once a week for 6 weeks. Dynamic balance (e.g., Timed Up and Go Test), static balance (e.g., Sit-and-Stand Test), and Quality of Life (e.g., self-reported questionnaire) were measured before and after the program. A paired sample t-test 2 was used to explore the effect on their balance and quality of life. Participants significantly improved their performance in the Sit-and-Stand Test. They also improved their walking time in the Timed Up and Go test and reported more positive scores on their quality-of-life scale; however, both improvements did not achieve a statistically significant level. Participants practiced many fundamental motor skills (e.g., overhand throw, catch, kick, ball bounce, and run). Thus, this study concluded that young adults with ID could gain physical benefits (e.g., muscular strength) through participating in a six-week physical activity program. For dynamic balance, more emphasis needs to be placed on agility training, and for mental health benefits to be significant, more exercise sessions might be needed.

164
Name: Adams, Tobias
Major: Biochemistry - Bachelor of Science
Faculty Advisor: Richard Baird, Biochemistry, Molecular Biology, Entomology, & Plant Pathology
Co-Author(s): Hannah Purcha
Funding: ORED Undergraduate Research Program
Project Category: Biological and Life Sciences

Analysis of ROS Production in Soybean Subjected to Drought and *Macrophomina phaseolina* Challenges
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 elections, 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 grows and infects plants, especially during hot and dry conditions. Regardless of which hosts are infected, MP is believed to upregulate production of ROS, which leads to membrane damage and, ultimately, 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, and the tissue was assayed for key ROS-associated compounds. The results of these analyses are presented in the poster.

36
Name: Adams-Jackson, Jordan
Major: Biochemistry - Bachelor of Science
Faculty Advisor: Erika Womack, Mississippi State Chemical Lab
Co-Author(s): Madeline Raynor, Veronica Wigginton, Magan Green, Julie Toler, Christina Childers
Funding: ORED Undergraduate Research Program
Project Category: Physical Sciences

Evaluation of the Matrix Effect on the Quantitative Determination of Paraquat using LC-MS/MS
Paraquat is a popular herbicide used in agriculture to control weeds and grass. Modern agriculture is centered around the use of herbicides to increase production and quality of their products. However, paraquat is extremely toxic to mammals and humans, therefore it is important for laboratories to be able to properly detect paraquat in different matrices to avoid accidental poisoning. Increasingly, the high-performance liquid chromatography (HPLC) coupled with tandem mass spectrometry (MS/MS) are being used for the determination of herbicides in vegetation. However, co-eluting matrix components can alter the signal response, causing ion suppression or enhancement. The need for the assessment of matrix effect (ME) for the validation of a selective, analytical method for paraquat determination in vegetation is warranted.
The purpose of this experiment is to determine the ME by comparing the responses of a matrix-matched curve with standards in an organic solvent only calibration curve. To verify linearity, a calibration curve was used with a linear range of 1.56-200 ng/mL and a correlation coefficient (r^2) greater than 0.995. To evaluate ME, the expected results will be a comparison of peak response for the matrix-matched curve versus the standard curve. Difficult matrices can reduce the detector response due to ion suppression. Although ME cannot be completely avoided during LC–MS/MS analysis, it can be reduced by optimizing sample preparation procedures, and manipulating LC and MS conditions. Our results show more investigation is warranted. Future investigations will include the use of internal standards to assist in reducing ion suppression or enhancement.

53
Name: Adderholt, Darrow
Major: Secondary Education - Bachelor of Science
Faculty Advisor: Dhanashree Thorat, English
Funding: Shackouls Honors College Research Fellowship
Project Category: Humanities

The Consequences of Taken Stories
Stories and communities are often inseparable. This is especially true in communities and cultures that have a strong oral tradition. Within the context of American settler colonialism, the methodical and deliberate removal of stories led to consequences that are still felt to this day. Much of the research and thought that has been done in postcolonial academia looks at the means through which stories were taken as well as the importance of stories in general, but the consequences of the loss of these stories are equally fascinating and important. My research classifies these consequences from an individual perspective, but also a community perspective. This was accomplished through analysis of the literature and work of several Indigenous scholars and authors, taking their explanations of personal experiences and scholarship to form conclusions and a taxonomy to classify the consequences that are felt after the loss of crucial stories. This research concludes that the classification of these consequences falls into four categories: loss of self, loss of community, loss of history, and loss of knowledge. The removal and loss of stories, especially those that are so important to a community or people, directly leads to personal and community consequences.

165
Name: Ahn, Chaeyeong
School: Starkville High School
Faculty Advisor: Barbara Kaplan, Comparative Biomedical Sciences
Project Category: Biological and Life Sciences

The Potential for the Hemp Chemical Cannabidiol to Increase Oxytocin
The overall goal of this project is to understand how marijuana chemicals affect our immune system. Normally our immune system helps fight off infections but it can be compromised by some chemicals. Cannabidiol (CBD) is a chemical that comes from marijuana or hemp that has become very popular and is available as CBD oil. CBD has been reported to be "a wonder
drug", helping people with anxiety, sleep, or inflammation. A previous study showed that CBD suppressed neuroinflammation in mouse brains and that CBD also increased the oxytocin gene. Since oxytocin has also been shown to be protective for inflammation, we hypothesized that CBD will increase oxytocin gene and protein expressions and *Oxt* will bind to its receptor in immune cells. We conducted two experiments: 1) Determine if CBD increases the oxytocin gene in immune cells like it did in the brain; and 2) Determine if CBD increases oxytocin protein and causes it to bind to its receptor. We conducted PCR for oxytocin gene expression and we performed ELISA for IFN-y to see if CBD effects could be blocked with the oxytocin receptor
blocker. In mouse immune cells, CBD did not consistently increase *Oxt* gene expression. CBD's effect on IFN-y was not blocked with the oxytocin receptor blocker. In immune cells the mechanism for CBD's immune suppression does not involve oxytocin. Future studies could examine whether CBD induces oxytocin in immune cells in the brain.

99
Name: All, Addison
Major: Psychology - Bachelor of Science
Faculty Advisor: Cliff McKinney, Psychology
Project Category: Social Sciences

The Moderating Effects of Filial Piety on the Relationship Between Parents' Nurturance Levels and Social Status
Previous research has shown that individuals high in filial piety, specifically reciprocal filial piety, are likely to have better relationships with their parents (Jen et al., 2018). Filial piety is a Confucianist construct and has yet to be studied intensively outside of China and the surrounding area. Özmete & Pak (2022), researchers from Turkey, showed that filial piety was associated with reduced participant reported adverse childhood events (ACEs). One possible explanation for this finding is individuals with lower amounts of ACEs would report feeling higher filial piety. The circumstances underlying poverty could point to more tension in the household, socioeconomic status has also been shown to play a role in levels of filial piety and parent-adolescent conflict (Li et al., 2012). The current study aimed to see if this replicates in a multi-cultural sample. 3,773 participants were included that were recruited via Amazon's Mechanical Turk using self-report measures that were retroactively accessed. Participants completed measures of parent-child relationship quality, filial piety, and social status. It was hypothesized that 1a) social status would play a significant role in positively predicting both parents' nurturance levels and 1b) that fathers' nurturance levels would be especially associated with social status. Additionally, 2) filial piety would moderate the relation between social status and parents' nurturance levels such that filial piety would reduce the effect of social status on parents' levels of nurturance as seen in Chinese samples. Hypothesis 1 was partially supported; social status was a significant predictor of fathers' nurturance levels. Hypothesis 2 was partially supported, both pragmatic and compassion filial piety moderating the relation between social status and parental nurturance, but only in mothers. These results show that filial piety has a complex impact on the association between social status and parents' nurturance. Future research should strive to replicate this procedure within more cultures.

166
Name: Archer, Fleming
Major: Biochemistry - Bachelor of Science
Faculty Advisor: Galen Collins, Biochemistry, Molecular Biology, Entomology, and Plant Pathology
Funding: College of Agriculture and Life Sciences URSP
Project Category: Biological and Life Sciences

Does a Neurodevelopmental Mutation Predispose the Risk of Neurodegenerative Diseases
The purpose of the proteasome complex is to help remove damaged or unnecessary proteins by degradation. A proteasome mutation from a proline 320 to an arginine has been identified in three children with a rare neurodevelopmental disorder. This mutation, which is responsible for defective protein degradation rates in the proteasome, may also predispose these children with a neurodegenerative disease. Some diseases that have been linked to a defective protein degradation rate are Alzheimer's, Parkinson's, and Huntingtin's disease. This project involves linking the mutation in the proteasome to the increased potential of a neurodegenerative disease. BE(2)M17 neuroblast cells that have been engineered to have the P320R proteasome mutation were used in this experiment. These cells were transfected with plasmid DNA that is linked to neurological disorders. By using a cycloheximide chase to inhibit the translation of the RNA to a protein, the degradation rate of the proteins already synthesized are able to be measured using a western blot. Transfection of GFP in BE(2)M17 cells has been successful. The Tau mutation, which is linked to Alzheimer's and Temporal Dementia, is being tested for the mutation to the predisposition of a neurodegenerative disease.

100
Name: Avary, Mallory
Major: Anthropology - Bachelor of Arts
Faculty Advisor: Sydney Pullen, Anthropology and Middle Eastern Culture
Project Category: Social Sciences

Mississippi State University Student Motivations for Changing Their Major to Anthropology
This preliminary study investigates the multifaceted rationales underlying undergraduate students' decisions to change their major to anthropology. Research targeted senior anthropology majors who either changed their major to anthropology or added anthropology as a second major after entering the university with a different declared major. Data was gathered using a mixed-methods approach. Quantitative and qualitative data were gathered through 9 surveys, 4 interviews, and 12 hours of participant observation. Interviewees noted that the influence of anthropology professors, in the context of courses, played a pivotal role in shifting their academic trajectory toward anthropology. Furthermore, all surveyed and interviewed students, now seniors as of spring 2024, expressed optimism regarding their future educational and professional prospects following their transition to anthropology as a major field of study.

1
Name: Baham, Aiden
Major: Data Science - Bachelor of Science
Faculty Advisor: Jonathan Barlow, Data Science
Project Category: Engineering

SEC Football Predictive Model
The sport of college football has endless amounts of data points, from on-field player statistics to the number of players a college recruits each year. Each piece of data plays a factor in the winner of each game, in every game and every season trends can be found in the data to see why each team won or lost. These trends not only allow us to learn more about the sport, but it allows us to predict outcomes in the sport; and the goal of this project is to create a predictive model that can predict the outcome of any SEC (Southeastern Conference) football matchup. Using the *sklearn* libraries and data from pervious college football seasons, the model will use machine learning to train itself and find trends in the data. The data from previous seasons will be gathered from sports-reference.com; a few key data points that will be used are team names, winner points, loser points, total yards, turnovers, rushing yards, time of possession, etc. During the season, the model will produce a list of weekly predictions for every game in the upcoming week, taking in new data from the games played in the previous week.

167
Name: Baral, Shisir
Major: Computer Engineering - Bachelor of Science
Faculty Advisor: Vitor Martins, Agricultural & Biological Engineering
Funding: ORED Undergraduate Research Program
Project Category: Biological and Life Sciences

Semantic Segmentation of Satellite Imagery for Land Cover Classification Using an Unet model
 Accurate land cover mapping is crucial for various applications, including urban planning, environmental monitoring, and resource management. This study explores the application of deep learning techniques for semantic segmentation of satellite imagery to classify land cover types. The Unet model, a convolutional neural network architecture for semantic segmentation, was employed for this task. The dataset comprised RGB TIFF satellite images and corresponding ground truth labels. To enhance the data representation, four additional channels were incorporated: a Canny edge detection layer and entropy filters applied to the red, green, and blue channels. The resulting seven-channel images were used as input to the Unet model.
The model was trained on a high-performance computing cluster and the model's performance was evaluated using metrics such as loss, recall, and precision. The results demonstrated promising performance, with the model achieving a recall of around 0.8. Furthermore, the precision of the land cover classification reached approximately 0.75, indicating the model's ability to accurately identify various land cover types. This study highlights the potential of deep learning techniques, for semantic segmentation of satellite imagery and land cover classification. The approach of leveraging multi-channel data representations and a robust deep learning model, can potentially contribute to improved land cover mapping and monitoring efforts, with applications in urban planning, environmental management, and resource allocation.

101
Name: Barfield, Kourtney
Major: Psychology - Bachelor of Science
Faculty Advisor: Danielle Nadorff, Psychology
Co-Author(s): Maia McLin
Project Category: Social Sciences

Parenting Practices and Attachment Levels in Relation to Externalizing Behaviors in Children Raised by Nonparental Caregivers
Current literature supports the idea that parenting practices and level of child-caregiver attachment are correlated with externalizing behavior exhibited by children. However, these findings are mostly within samples of biological parents (often mothers) and their children. Studies show that parenting practices affect externalizing behaviors in adolescents through attachment using a mediation model. This relationship has been found among parental caregivers, but it is unknown if parenting practices, specifically supervision, predict attachment and externalizing behavior among children of nonparental caregivers. It was hypothesized that attachment level will moderate the relation between parenting practices and children's externalizing behavior who are raised by nonparental caregivers. Data was gathered from a previously collected dataset including 306 foster and grandparents raising children. Participants completed surveys assessing parenting practices, attachment, and child externalizing behaviors. To analyze the data, a moderation analysis using SPSS' Process Macro was used. A significant relation was found between attachment and externalizing behavior ($\beta= 4.04$, $p<.05$), with higher scores indicating lower levels of attachment and more externalizing behavior. No significant relation between supervision and externalizing behavior was found ($p=.20$). However, a significant moderation of attachment and poor supervision on externalizing behavior was found ($t=2.29$, $p<.05$). Supervision was not predictive of externalizing behaviors among children with high attachment ($p=.75$), but it was predictive among those who had low attachment ($p<.05$). These results support the idea that supervision practices (e.g., being unaware of where a child is located) are important to consider among those who have lower attachment to their caregivers and externalizing behaviors. Findings suggest it is important to consider attachment as a predictive factor when examining the relation between parenting practices and externalizing behavior in nonparental caregiver-child relationships.

168
Name: Barlow, Katherine
Major: Landscape Architecture - Bachelor of Landscape Arch
Faculty Advisor: Abbey Franovich, Landscape Architecture
Funding: College of Agriculture and Life Sciences URSP
Project Category: Biological and Life Sciences

What are the opportunities and constraints of designing and applying complex and organic shapes using 3D concrete printing technology compared to traditional concrete construction methods?
In architecture and engineering applications, 3D concrete printing (3DPC) technologies have demonstrated the marrying of individualized design and aesthetic goals with sustainability considerations and construction efficiencies. Since 3DPC allows for customized, complex geometry, structurally efficient designs can be fabricated quickly with minimal labor and materials. In contrast, conventional concrete construction methods are often restricted to simpler geometries due to labor and formwork limitations and frequently place a higher value on saving labor over reducing material use and subsequent environmental impacts. This research utilizes a case study methodology to explore and document 3DPC structures found in landscapes architecture projects where objects are complex and curvilinear. The selected case studies focus on three categories of application: recreational, structural, and ornamental. The study centers on the feasibility of organic and curvilinear shapes, time constraints on large and complex geometric structures, and the opportunities and constraints of 3DPC compared to traditional concrete practices as a new means of concrete construction.

102
Name: Barlow, Mikenlee
Major: Psychology - Bachelor of Science
Faculty Advisor: Mary Dozier, Psychology
Project Category: Social Sciences

A Review of Psychoeducation for Caregiver Burden
According to the World Health Organization (WHO), there are more than 55 million people (about twice the population of Texas) that report being diagnosed with any type of dementia, such as Alzheimer's disease or vascular dementia, with an increase in 10 million people per year. Caregivers play a vital role in preserving the quality of life and basic care needs for patients with dementia. Informal caregivers, such as family members, experience a drastic change in their way of living when becoming designated as a person's primary source of care. The term caregiver burden was developed to represent the negatively affected aspects of a caregiver's overall experience. While the term itself is considered multi-dimensional in its definition, we can conclude that caregivers may experience a

decrease in quality of physical, psychological, social, and financial aspects of their life while caregiving. The Centers for Disease Control and Prevention (CDC) notes that caregivers of individuals with a type of dementia are at higher risk for developing a mental illness such as anxiety and depression. Some common treatments for caregiver burden include general education, behavioral therapy, psychotherapy, group therapy, ectara. While all areas of treatments listed have shown effectiveness in reducing the risk of caregiver burden, psychoeducation has shown a significant positive effect. Psychoeducation aims to increase coping skills, understanding of the disorder being cared for, and validating the rigorous process of routine in caregiving. This type of education promotes the focus on the mental health of the caregiver along with the quality of care they provide to their designated friend or family member. This literature review determines the strength of psychoeducation as a form of treatment in reducing the prevalence of mental disorders in caregivers and caregiver burden.

169
Name: Barlow, Tyler
Major: Animal and Dairy Science - Bachelor of Science
Faculty Advisor: Brandi Karisch, Animal and Dairy Science
Co-Author(s): Shea Mackey, Reinaldo Cooke
Project Category: Biological and Life Sciences

Effect of arrival fecal egg count on growth and performance on stocker steers during a 90-d grazing period
Parasitism poses a significant concern in beef cattle due to its potential adverse effects on both health and productivity. The objective of this study was to investigate the impact of initial parasite load, specifically fecal egg count (FEC), on health and performance of growing beef cattle over a 90-day grazing period. Steers (n = 113) were obtained from a local auction barn, and delivered to the Leveck Animal Research Center. On d-1, shrunk body weight was recorded. On d 0, body weight was recorded and averaged with d -1 weights to obtain initial body weight, and all were dewormed and vaccinated. Overall ADG was calculated by linear regression. Fecal samples were obtained via rectal palpation and shipped to the Merck Lab located in Lawrence, Kansas for analysis. Steers were then randomly assigned to pastures 1 through 12 and arrival FEC classification based on 0.5 standard deviation above and below the mean. There were n=30 LOW, n=50 MED and n=20 HIGH. The cohort of steers utilized for the study were part of a larger study, focused on exploring the impacts of supplementing Bovacillus subtillus (TRT). Treatment effects on BRD and overall performance measures were tested using Poisson distribution, linear regression, using the MIXED procedure of SAS. TRT was included as a fixed effect. The mean FEC for each classification were LOW=128.8 EP3G, MED=185.1 EP3G and HIGH=222.7 EP3G (P<0.05). Overall morbidity was 72.57% with 2.7% mortality. Overall morbidity (LOW=44%, MED=30%, HIGH= 26%) did not differ (P=0.73) by arrival FEC class. There was no difference in ADG based on arrival FEC class however, there was an interaction (P<0.05) between TRT and class. Such that cattle that received Bovacillus subtillus and had a high arrival FEC had lower ADG. There was no difference in BW at any period during the trial (P>0.10).

103
Name: Barnes, Mary
Major: Agribusiness - Bachelor of Science
Faculty Advisor: Ayoung Kim, Agricultural Economics
Project Category: Social Sciences

A Comparison of the Teen Birth Rate among Urban and Rural Counties in Mississippi
The national teen birth rate published annually by the Centers for Disease Control and Prevention (CDC) shows the birthrate in the United States has been steadily declining for the past decade. However, there is little research into how teen pregnancy varies within each state across different community populations. The conclusion of a difference in the teen birth rate among rural and urban areas would allow for experimental research to determine the causal relationship between rurality and teen pregnancy. This research was conducted to address the teen birth rate in Mississippi, which is dependent on urban-rural status. Each county was placed on the USDA-ER's RUCC scale and was grouped into one of two categories dependent on its characteristics: rural and urban. This data was then merged with the teen birth rate data, estimated by the CDC, allowing definitive rural teen birth rate and urban teen birth rate calculations. The study showed a significant difference in the teen birth rate between urban and rural: the rural teen birth rate in Mississippi for the study year 2020 was 29.77 (per 1,000 females aged 15-19 years), and the urban teen birth rate was 22.58. This finding indicates that rural communities experience an elevated teen birth rate in comparison with the state average, whereas teen pregnancy is far less prevalent in urban areas. Also, this study presents the county-level distribution of teen birth rates through map visualization. To understand the cause and consequence of this urban/rural teen pregnancy gap, more research and experiments must be conducted on regional teen birth rates.

104
Name: Barrett, Adeline
Major: Criminology - Bachelor of Arts
Faculty Advisor: Stacy Haynes, Sociology
Co-Author(s): Catherine Authement
Funding: Bureau of Justice Statistics
Project Category: Social Sciences

Did *Thinking for a Change* really change my thinking: Results from a quasi-experimental evaluation of a cognitive behavioral intervention program in Mississippi
One of the most troubling yet well documented aspects of the criminal justice system is that most individuals leaving prison will eventually return. Over several decades, a wide range of interventions have been designed, implemented, and evaluated to try and stem the tide of recidivism. One of the most well-known cognitive behavioral intervention programs is *Thinking for a Change* (T4aC), created by researchers from the National Institute of Corrections. In this study, we use a quasi-experimental design to evaluate the effectiveness of the T4aC program delivered to a sample of incarcerated individuals at community work centers in Mississippi. Preliminary results suggest that, from the pre- to post-test, individuals who participated in the T4aC training exhibited significantly greater improvement in their thinking patterns than those in the control group. Implications for correctional programming, policy, and future research are also discussed.

105
Name: Barton, Chandleigh
Major: Criminology - Bachelor of Arts
Faculty Advisor: Angela Robertson, Social Science Research
Co-Author(s): Catherine Authement
Funding: Bureau of Justice Statistics
Project Category: Social Sciences

Evaluating the Effectiveness of a Substance Abuse Education Program Among Incarcerated Individuals in Mississippi
Alcohol and drug abuse has a significant influence on the criminal justice community. A substantial proportion, the National Institute on Drug Abuse estimates that 65% of incarcerated individuals in the U.S. have a substance use disorder, of individuals arrested and subsequently incarcerated for all types of crime were using alcohol and/or drugs at the time of their offense. Thus, reducing alcohol and drug abuse among individuals currently incarcerated should increase the likelihood of successful reentry upon release from incarceration. In this project, we modified a substance abuse education and prevention program and administered it to incarcerated individuals in four community work centers in Mississippi. Using pre- and post-test surveys, we examined the effectiveness of this program among individuals who participated in the program. Preliminary results suggest that the training may not have altered substance abuse intentions for the individuals upon release. Furthermore, post-test measures should be refined to more adequately measure the effectiveness of the program. Implication for policy, research, and substance abuse education and training are also discussed.

106
Name: Baxter, Kristen
Major: Psychology - Bachelor of Science
Faculty Advisor: Cliff McKinney, Psychology
Project Category: Social Sciences

Culture of Honor and Feminist Identity in Emerging Adults Moderated by Gender
Culture of honor (CH) refers to a culture's individual and social aspects regarding high emphasis on specific values. Classic examples are reputation, honesty, and moral integrity. Honor values reflect an association between reputation and self-worth. This is based on one's ability to maintain and uphold traditional gender norms, including that women be honest and faithful. Defying these norms in an honor culture renders physical and psychological violence. This study examined the relations between CH and emerging adults' feminist identity (FI), and how gender acts as a moderator for this relationship. To extend findings to emerging adults, the current study examined the relations of FI and CH in 875 emerging adults from a large southern United States university. The participants completed the Feminist Identity Composite to assess how closely the individual identifies with being a feminist. Participants also completed the Culture of Honor Scale to measure the individual's adherence to honor-related attitudes. Process 4.2 model 1 was used to conduct a moderation analysis. This study demonstrated how gender significantly affects how emerging adults respond to FI. A significant finding shows that women's FI remains constant whether they identify with a culture of honor or not, whereas men who report a high culture of honor report a lower feminist identity. A possible explanation for this finding could be that women identify stronger with their feminist

identity compared to their culture; also possible is that culture of honor is more salient for men who identify with facets of honor (i.e., protection, violence) as part of their masculine identity, which may be incongruent with feminist identity. This study supports the necessity of future research in the context of the relationship between gender and FI.

170
Name: Baxter, Nathan
Major: Culinology - Bachelor of Science
Faculty Advisor: Shecoya White, Food Science, Nutrition, and Health Promotion
Co-Author(s): Katie Allgaier, Himani Joshi, Kenisha Gordon, Dr. Pexin Fan
Funding: College of Agriculture and Life Sciences URSP
Project Category: Biological and Life Sciences

Validation of Sequencing Approach for Catfish Fecal Microbiome
Farm-raised catfish is an important agricultural product in Mississippi, accounting for 251.2 million dollars in revenue in 2023 for the state, a 53.2 percent increase since 2018. As the demand for farmed fish increases, it is imperative that we find new ways to both improve and monitor the quality of the fish we produce. To this end, we have begun investigating ways to quantify the bacterial species within the catfish gut microbiome. In this study, three market-sized catfish were harvested, and weight, length, intestinal weight, and intestinal length were all recorded. The intestines were divided into three regions: hindgut, midgut, and upper gut. Fecal matter from each section was collected separately and flash frozen immediately upon harvest. Using a DNA column-based extraction kit, potential changes to manufacturers protocols were tested to determine optimal extraction process for the fecal content. Once DNA extraction was optimized, PCR was performed, and samples were sequenced using Oxford Nanopore Technology. Results showed that standard manufacturer's protocols are not optimal for fish microbiome extraction, and that changes to standard protocols must be made to account for the low bacterial load within the catfish digestive system. Results also showed that DNA can only be consistently amplified from the hindgut region of the catfish. This is likely due to the lower bacterial load within the upper- and mid-gut regions. Sequencing confirmed that catfish bacterial diversity is low, with samples containing no more than 51 species while being dominated by 4 specific species. *Cetobacterium somerae* dominated in one sample and a combination of *Romboutsia timonensis*, *Terrisporobacter mayombei*, and *Clostridium saudiense* in the other two samples. Overall, these results demonstrate an optimized sequencing pipeline for amplifying catfish gut microbiome DNA and by providing understanding of the catfish gut microbiome composition.

171
Name: Beard, Mason
Major: Biochemistry - Bachelor of Science
Faculty Advisor: Galen Collins, Biochemistry, Molecular Biology, Entomology, and Plant Pathology
Project Category: Biological and Life Sciences

Exploring The Degradation Pathway Mediated by Ddi2 and In Cancer Cell Lines
Cancer is a disease that affects millions worldwide. Recent studies have shown promising results in treatment of multiple myeloma patients through the use of an HIV treatment called nelfinavir, or Viracept® (Besse et al., 2021). This could be due to the drug's ability to target a retroviral-like dimer in the endoprotease DDI2 (Collins et al., 2022) which activates two transcription factors, Nrf1/NFE2L1 and Nrf3/NFE2L3. These can create new proteosome units that break down other peptides (Op et al., 2022). Inhibition of Ddi2 leads to an increase in the number of MHC-I molecules that can make it to the surface. This leads to more presentation of cytosolic antigen and cancerous peptides that can activate cytotoxic cells. Ddi2 mediates the degradation of nearly 1/5th of the targets of the proteasome[GU1] (Collins et al., 2022). This experiment aims to determine the stability of surface proteins in cells with genetically inactive DDI2 compared to wild-type cell lines. Proteins of interest were selected from mass spectrometry data from an unpublished study that found proteins whose expression was significantly affected by DDI2 deactivation (Collins et al.). In this present study, cycloheximide treatment was used to inhibit translation, which facilitates the measuring protein stability. Western blotting was used to visualize the specific protein degradation within the cell lines at the different intervals of the cycloheximide treatment. These blots are then analyzed with software ImageJ to quantify protein concentration. This study hopes to give new insights into this pathway of protein degradation and create new avenues for cancer therapy research.

172
Name: Bellew, Grace
Major: Wildlife, Fisheries & Aqua - Bachelor of Science
Faculty Advisor: Melanie Boudreau, FWRC-Wildlife,Fisheries&Aquaculture
Funding: Undergraduate Research Scholars Program
Project Category: Biological and Life Sciences

Understanding the breadth and depth of long-term research in Canada and the United States
Long-term research in ecological and agricultural systems (i.e. LTER/LTAR) is characterized by the regular monitoring of variables in these systems over many years. While formal LTER/LTAR networks have been established in the U.S., projects can be perpetuated by a wide array of organizations, leaving little understanding on the scope of LTER/LTAR research being conducted across Canada and the United States. We aimed to compile information on LTER/LTAR to help add insight into the length and breadth of projects. Of the 266 studies identified, 68 and 196 were in Canada and the U.S., respectively. Most of the studies (94%) were ecological and 57% took a whole ecosystem approach. Of the 107 studies that were species specific, 51% focused on plants, 19% on avian fauna, and 14% on mammals, with the remainder investigating invertebrates, herpetofauna, or zooplankton. Ecological and agricultural studies were, on average, 24 (max = 157) and 33 (max = 84) years in length. Our research highlights that a large number of >10 year-long LTER sites are located across Canada and the U.S.

173
Name: Bernard, Brandon
Major: Biochemistry - Bachelor of Science
Faculty Advisor: Peixin Fan, Animal & Dairy Science
Co-Author(s): Mackenzie Woody, Himani Joshi, Derris Devost-Burnett, Chuan-Yu Hsu
Funding: ORED Undergraduate Research Program
Project Category: Biological and Life Sciences

High-Resolution Characterization of Champion Sheep and Goat Gastrointestinal Microbiota Using Full-Length 16S Sequencing
Small ruminants like goats and sheep are increasingly popular choices for livestock producers, particularly those with small farms or limited resources. They have a higher capacity to utilize lower-quality forages compared to large ruminants. The gastrointestinal tract of small ruminants harbors important microbes that contribute to digestion and pathogen prevention. However, gene amplicon sequencing of the partial regions of the 16S rRNA limit species-level characterization of the microbial community. In this study, we collected digesta samples from rumen and cecum, key fermentation sections, of 20 small ruminant animals at different locations in Mississippi State. The microbiota composition was analyzed using the full-length 16S amplicon sequencing with the Oxford Nanopore platform (R10.4.1 Flongle Flow Cells and GridION sequencer) and Emu bioinformatic pipeline. We identified 270 and 344 bacterial species that were present in at least 10% of rumen and cecum samples, respectively. There were 78 and 140 core bacterial species in 80% of rumen and cecum samples, respectively. The 5 most abundant bacterial species in rumen included Prevotella ruminicola (13.4%), Prevotella brevis (4.9%), Selenomonas ruminantium (3.9%), Bacteroidales bacterium CF (3.9%), and Succiniclasticum ruminis (3.6%); while the top 5 bacterial species in cecum were Bacteroidales bacterium CF (19.2%), Papillibacter cinnamivorans (4.6%), Dysosmobacter welbionis (3.8%), Lachnospiraceae bacterium GAM79 (3.3%), and Oscillibacter valericigenes (2.5%). The identity between sequences of detected species and those in Emu database was further confirmed. All identified bacterial species showed over 90% identity with sequences in the NCBI 16S RefSeq database, with the exception of Dysosmobacter welbionis (89.66%), indicating reliability of the full-length 16S sequencing and Emu pipeline for characterization of dominant gastrointestinal microbiota in small ruminants. In conclusion, this study achieves a detailed species-level resolution of the bacterial population in the rumen and cecum of small ruminants, which will enhance our understanding of the host-microbe interactions in small ruminants.

107
Name: Bickley, Andrea
Major: Psychology - Bachelor of Science
University: Louisiana State University
Faculty Advisor: Rebecca Brossoit, Psychology, Louisiana State University
Co-Author(s): Hannah Perkins Stark
Funding: Ronald E. McNair Research Scholars
Project Category: Social Sciences

Nature in the Workplace: Exploring Effects on Job Satisfaction, Turnover Intentions, and Workspace Satisfaction
The primary focus of the field of industrial-organizational psychology is on understanding employee experiences in the workplace. In contrast, environmental psychology focuses on the interaction between the environment and human experiences. This project integrates industrial-organizational psychology and environmental psychology theory and research. According to attention restoration theory (ART), it is essential for humans to replenish their mental resources after engaging in mentally taxing tasks, and exposure to natural elements serves as a source of attention restoration (Kaplan & Kaplan, 1989). Drawing from ART, this study aims to explore how nature exposure at work influences important employee outcomes. Specifically, we hypothesize that higher levels of nature exposure will be associated with increased satisfaction with physical workspace, lower turnover intentions, and increased overall job satisfaction. Data will be collected by surveying a diverse sample of 550 individuals. To be eligible, participants must be 18 years of age or older, living in the United States, employed either full- or part-time, and work more than 20 hours per week in a paid job. Participants who fail

attention checks will have their data excluded from the study to ensure optimal results are obtained. Linear regression analyses will be used to test the hypotheses. The results of this study will inform both research and practice of the potential benefits of integrating natural elements into the workplace. More specifically, these results might present a relatively simple way that organizations can improve employee outcomes by enhancing their exposure to natural elements during work hours.

174
Name: Bishop, Macie
Major: Food Sc Nutr. Health Prom (UG) - Bachelor of Science
Faculty Advisor: Xue Zhang, Food Sci Nutrition Health Promotion
Co-Author(s): Sawyer Smith, Morgan Mosby, Zoe Molloy, Emily Little, M. Wes Schilling
Funding: College of Agriculture and Life Sciences URSP
Project Category: Biological and Life Sciences

Efficacy of carboxymethylcellulose based films with glycerol and/or propylene glycol inclusion to control mite infestations on dry-cured ham.
Dry-cured hams are highly susceptible to ham mite infestations during the aging process. Methyl bromide (MB) was once a widely used fumigant to control mite infestations but is being phased out of use in accordance with the Montreal Protocol (1992) since it is an ozone depleting substance. Therefore, it is critical to develop MB alternatives to control mite infestations in the dry-cured ham industry. This study aimed to determine if carboxymethylcellulose (CMC) based films with various concentrations of glycerol and propylene glycol (PG) could prevent the growth and reproduction of mites on dry-cured hams.
The treatment films consist of 1% CMC-based films containing glycerol (0%, 0.5%, 1.0%, 1.5%, and 2.0%) and PG (0% and 10%). The films were prepared and wrapped around 2.54 cm^3 ham cubes (n = 5/treatment), with 20 large mixed-sex mites inoculated on each ham cube. A negative control (without film), a positive film control (1% CMC + 20% PG), and a positive net control (1% carrageenan + 1% propylene glycol alginate + 40% PG) were also included in the experiment. The ham cubes were placed in ventilated jars and incubated for 2 weeks, after which mobile mites were counted under a stereoscope. Results indicated that all treatments were effective (P < 0.0001) at controlling the mite population (0-10 mites) compared to the negative control (236 mites). The CMC-based glycerol and/or PG films were as effective (P > 0.05) as the positive film and net controls. The inclusion of glycerol or 10% PG did not (P > 0.05) improve the effectiveness of the CMC only film at controlling mites, suggesting that the mite controlling efficacy is primarily attributed to the physical barrier properties of the CMC-based films. In the future, the efficacy of films will be tested on whole hams in commercial aging rooms.

175
Name: Bittner, Jennifer
Major: Microbiology - Bachelor of Science
Faculty Advisor: Jerome Goddard, Biochemistry, Molecular Biology, Entomology, and Plant Pathology
Co-Author(s): Kendall Williford, Michael Caprio, Sam Ward
Project Category: Biological and Life Sciences

Laboratory Studies of Movement and Microenvironment Choices of Engorged Adult Female Gulf Coast Ticks, *Amblyomma maculatum*
Microenvironmental factors affect ovipositional choices and behavior in ticks. In this study, engorged female *Amblyomma maculatum* ticks were released in an observation arena covered with garden soil. The arena was evenly split into wet versus dry sides, each containing five different types of structures (totaling 10). Upon release, observations at particular time points were made over two days regarding speed, distance, actual paths traveled, and ultimate site selection, presumably for oviposition. In addition, time-lapse videography was utilized to record the track of each individual tick. This scenario was replicated three times with different cohorts of ticks (n = 5 per replicate). Of the total 15 ticks released in the arena, all attained a final site selection by 24 hr. These final sites were 7/15 (47%) edge of the arena; 2/15 (13%) under bark; 2/15 (13%) open soil; 2/15 (13%) at or near release point; 1/15 (7%) tunnel with animal fur; and 1/15 (7%) tunnel with chicken feathers. At final site selection, 11/15 (73%) subsequently burrowed into the soil, 3 of which completely were buried. Time-lapse videography revealed that most ticks (80%) explored the arena in a "looping back" fashion. Overall, engorged Gulf Coast ticks moved at an average speed of 0.09 mm/sec, and the total distance traversed by the ticks averaged 2.37 m.

80
Name: Boland, Rosemary
Major: Kinesiology - Bachelor of Science
Faculty Advisor: Harish Chander, Kinesiology
Co-Author(s): Hunter Derby, Nathan Conner, Adam Knight
Project Category: Education

The Impact of Different Sounds and Noises On Static And Dynamic Postural Stability

Postural stability can be impacted by sounds that cause disturbances to the vestibular and the visual systems. The purpose of the study was to assess the impact of different types of sounds and noises on both static and dynamic postural stability. A total of 20 participants (age: 21.35 ± 1.79 years; height: 170.7 ± 9.3 cm; mass: 66.725 ± 14.1 kg) were tested using the Limits of Stability (LOS) on the BTrackS™ balance plate and a Timed-Up-and-Go (TUG) tests, when exposed to four different sounds in a randomized order with a no sounds (NS) control performed initially [construction noise (CN), white noise (WN); sirens (SR), and nature sounds (NA)]. The sounds and noises were delivered through headphones (70-80 dB). Center of pressure (COP) total sway area (cm^2) from the LOS and time to completion of TUG (seconds) were analyzed using a one-way repeated measures ANOVA at an alpha level of 0.05. RESULTS: Significant differences between the sounds were observed for TUG [$F_{(4,76)} = 9.683$, $p<0.001$; $\eta_p^2=0.338$] but not for LOS [$F_{(4,76)} = 1.013$, $p=0.406$; $\eta_p^2=0.051$]. Pairwise comparisons for significant main effect for TUG revealed that NS demonstrated significantly slower time to completion compared to CN, WN, SR, but not NA. Findings suggest that the different sounds and noises did not impact static postural stability during LOS that involved voluntary excursion of COP, while maintaining the same base of support (BOS). However, during dynamic postural stability with changing BOS during TUG walking, exposure to noises of CN, SR, and WN, demonstrated a faster time to completion, compared to no sounds or nature sounds. This may be attributed to anxiety induced by the noise immersion and perception of sounds, compared to calm nature sounds, and no sounds. Findings can aid in better understanding the impact of different occupational noises on postural stability.

108

Name: Bowen, Caroline
Major: Fashion Design & Merchandising - Bachelor of Science
Faculty Advisor: JuYoung Lee, School of Human Sciences
Co-Author(s): Sydney Phillips, Kat Kwasny, Claire Billingsley, Mary Hollis Gee
Project Category: Social Sciences

Parenting Style Influences the Financial Responsibility of Their Children

There is a gap between parenting style and shopping behaviors of their children that this research intends to close. Therefore, this research seeks to answer how parenting styles affect the financial responsibility and spending patterns of their children, specifically in the 18 to 22-year-old range. The purpose of this research is to discover if the way that parents choose to raise their children (and the amount of involvement that they have with the children) influences the financial responsibility of their young adult's spending habits. This research's objective is to conduct surveys and collect data on the correlation between the parenting style that young adults receive and their positive or negative spending patterns. If a parenting style is directly linked to the spending habits of young adults, those who were raised with authoritative parents will be most likely to spend their money on something long-lasting- the empire builder. Those who were raised with permissive parents will be most likely to spend their money most irresponsibly- the pleasure seeker. Those who were raised with authoritarian parents will be most likely to see money as their achievement- the star. Those who were raised with uninvolved parents will be most likely to spend their money on necessities only- the saver. In this study, the authors utilized Qualtrics to conduct an online survey of 18- to 22-year-olds about their parents' parenting styles affecting their own spending patterns. The participants were recruited through MechanicalTurK

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Name: Bowen, Jadyn
Major: Food Sc Nutr. Health Prom (UG) - Bachelor of Science
Faculty Advisor: Amanda Conrad, Food Sci Nutrition Health Promotion
Co-Author(s): Abbey Wallace, Tongyin Li
Funding: College of Agriculture and Life Sciences URSP
Project Category: Social Sciences

C.O.N.N.E.C.T: Communities Overcoming Need through Nutrition Education, Collaboration and Training

Food insecurity is a public health concern impacting health outcomes and quality of life due to limited or uncertain availability of safe and nutritious foods. Federal nutrition programs exist to address food insecurity, but the needs, behaviors, and preferences of people impacted by the programs, as well as grassroots efforts to alleviate food insecurity at the county level, must be considered to ensure adequate resources and utilization. This project focuses on Oktibbeha County, MS., which has a 19 percent food insecurity rate and exceeds the national rate of 12.8 percent. Through nutrition education, collaboration, and training, the project is facilitating the development of knowledge and solutions to combat local food insecurity. An initial needs assessment was conducted with community partners. The assessment of resources and collaborative feedback provided by community partners identified a need for consistency in food resource events, improvement of informational gaps, and reduced redundancy of programs offered. Workshops with area residents and Mississippi State University (MSU) students provided more feedback related to needs. These workshops increased

awareness of local food resources, educated attendees on budget-friendly food options, and assessed knowledge and barriers of food resources offered in the community. A majority of individuals indicated that they know how to access food resources: 60.7 percent of MSU students know how to access campus resources, 53.6 percent know how to access resources off campus, and 71.4 percent of community residents know how to access local resources. However, barriers vary between MSU students and community residents. MSU students indicate that time, money, and knowledge of resources are limitations, while community residents indicate transportation as the biggest barrier. The systematic approach to develop a foundational understanding of the local food insecurity situation will be used to increase participation and utilization of food access resources in the community.

37
Name: Bowman, Caleb
Major: Geoscience - Bachelor of Science
Faculty Advisor: Boniface Fosu, Geosciences
Co-Author(s): Yen-Heng Lin, Jamie Dyer
Funding: NSF EPSCoR
Project Category: Physical Sciences

Quantifying the Climate Impact of Land Use and Land Cover Changes in the Southern US: Insights from CMIP-LUMIP
Land use and land cover changes (LULCC) significantly influence weather and climate across all scales by altering the exchange of energy and heat between the earth and the atmosphere. At a local level, differences in land surface characteristics, such as soil and vegetation, can lead to considerable variations in latent and sensible heat fluxes. These variations can, in turn, impact atmospheric convection and, consequently, weather patterns. On a broader scale, LULCC can affect regional and global climates by influencing hydrological and circulation patterns, altering the Earth's albedo, and modifying atmospheric carbon dioxide levels. Moreover, LULCC is a key anthropogenic driver of climate change. This study aims to explore the impact of LULCC on the surface energy budget in the Southern United States through the analysis of six climate models from the Coupled Model Intercomparison Project Land-Use Model Intercomparison Project (CMIP-LUMIP). We employ three specific model setups: Hist_noLU (historical forcings without land use changes), Land-Hist (land model with historical land use changes), and Land-noLu (land model without land use changes) - to help attribute the effects LULCC on regional energy budget and climate. This work will provide a foundational baseline for enhancing our understanding of potential future impacts and implications of LULCC on climate.

65
Name: Boyte, Sara
Major: Architecture - Bachelor of Architecture
Faculty Advisor: Alexis Gregory, School of Architecture
Project Category: Arts, Music, & Design

Male vs. Female stereotypes in Architecture and related fields.
This research aims to understand the differences in how women present themselves in the education and profession of architecture through literary review. Being a male dominated field, what are the differences of 'achievements' for women who present themselves through stereotypical 'male' social types and women who present themselves through stereotypical 'female' social types? With quality and sensibility of work being ignored, how are different women getting recognition? Does this make a difference in how women feel comfortable in architecture education, or what their future looks like? This research aims to understand women's mindset and their confidence within this field and comparable fields.

110
Name: Bradford, Aleah
Major: Kinesiology - Bachelor of Science
Faculty Advisor: Kathleen Ragsdale, SSRC
Co-Author(s): Lizzy Muzungaire, Netsayi Mudege, Keagan Kakwasha, Madeline Burdine, Deja Howard
Funding: ORED Undergraduate Research Program
Project Category: Social Sciences

Exploring ComFA+Fish Results: A Nutrient Analysis of Kapenta Dried Fish Powder and Taste-Test Results from Three ComFA+Fish Sensory Panels in Rural Zambia. Submitted Poster
Complementary feeding- which begins as infants from exclusive breastfeeding to eating solid foods- is associated with malnutrition among infants and young children (IYC) where extreme poverty forces families to rely on maize-based diets. Extensively to feed IYC in Zambia and across sub-Saharan Africa (SSA), carbohydrate-rich maize porridge is inexpensive and filling, yet low in the protein, fats, and essential micronutrients that IYC's rapidly developing brains and bodies need. To improve nutrition security among vulnerable IYC and

families, we developed a protein/micronutrient blend to fortify local dishes. The primary ingredient of Complementary Food for Africa+Dried Fish Powder (ComFA+Fish) is locally sourced dried fish powder (DFP) made from nutrient-dense small, dried fish such as Kapenta (Limnothrissa miodon; Stolothriss tanganicae). Even when consumed in small quantities, DFP provides essential protein, fats, micronutrients, and vitamins A, B12, C, D and E. We conducted a nutrient analysis of Kapenta DFP and three Sensory Panels of ComFA+Fish-fortified dishes. Panel I tested four ComFA+Fish-fortified dishes among mothers, Panel II tested ComFA+Fish Complementary Maize Porridge among their IYC, Panel III tested two ComFA+Fish Instant Porridges produced in collaboration with Sylva Food Solutions – a Zambian multi-sectoral enterprise that produces and exports foods for European and SSA markets. We present data from: 1) Nutrient analysis of 100g of Kapenta DFP from Lake Kariba, which confirmed its high nutritional content; 2) Panel I, which confirmed high acceptability of four ComFA+Fish-fortified traditional dishes among mothers (N=42); 3) Panel II, which confirmed high acceptability of ComFA+Fish Complementary Maize Porridge among IYC ages 6-23 months (N=42); and 4) Panel III, which confirmed high acceptability of ComFA+Fish Plain Instant Porridge (N=40) and ComFA+Fish Vanilla Instant Porridge (N=38) among adults. We discuss the implications that ComFA+Fish holds promise to improve nutrition security among vulnerable IYC and their families.

2
Name: Breland, Austen
Major: Biomedical Engineering - Bachelor of Science
Faculty Advisor: Steven Elder, Agricultural and Biological Engineering
Co-Author(s): Matthew Ross, Nicholas Fitzkee
Funding: Shackouls Honors College Research Fellowship
Project Category: Engineering

In Silico insights into the inhibition of ADAMTS-5 by Punicalagin and Ellagic Acid for the Treatment of Osteoarthritis
ADAMTS-5 (aggrecanase-2) is a major metalloprotease involved in the regulation of the cartilage extracellular matrix. Due to its role in the removal of aggrecan in the progression of osteoarthritis (OA), ADAMTS-5 is often regarded as a potential therapeutic target for OA. Punicalagin (PCG), a polyphenolic ellagitannin found in pomegranate (Punica grunatum L.), and ellagic acid (EA), a hydrolytic metabolite of PCG, have been widely investigated as potential disease-modifying osteoarthritis drugs (DMOADs) due to their potent antioxidant and anti-inflammatory properties, but their interaction with ADAMTS-5 has yet to be determined. Here, we describe the discovery of PCG (K_i = 183.3 μm) and EA (K_i = 1.13 μM) as potent inhibitors of ADAMTS-5 using molecular docking simulations to predict enzyme-inhibitor binding interactions. These results suggested that both compounds bind within the active site via the formation of H-bonds and interactions between ligand aromatic rings and enzymatic hydrophobic residue. Biochemical activity against rat ADAMTS-5 was assessed using a fluorescent-based sulfated glycosaminoglycan assay, where both PCG and EA significantly inhibited the enzymatic removal of aggrecan. The potential conversion of PCG to EA by enzyme-catalyzed hydrolysis activity was then investigated using liquid chromatography-mass spectroscopy to determine the potential for the use of PCG and EA as prodrug-proactive metabolite pair in the development of drug delivery systems to arthritic synovial joints.

111
Name: Brewster, Christa J
Major: Educational Psychology - Bachelor of Science
Faculty Advisor: Kasia Gallo, Counseling, Higher Education Leadership, Educational Psychology, and Foundations
Project Category: Social Sciences

Best Practices for Student-created Podcasts in Higher Education: A Guide to Implementing Student Generated Podcasts in the Classroom
Podcasts are digital media files including audio and, occasionally, video data that are uploaded online and available for download. These files feature an individual or a group discussing a specific topic. The literature describes three general styles of podcasts including 'The Quick Burst', 'The Narrative', and 'The Chat Show', The lengths of each podcast are less than 5 minutes, 40-80 minutes, and unspecified respectively. Universities and colleges around the globe have integrated the use of podcasts for learning into their curriculum. I conducted a literature review of fifteen empirical articles on the outcomes of using podcasts in higher education settings. Research suggests that students benefit from the use of podcasts in the classroom; however, most literature on podcasts focuses on the use of faculty generated podcasts as supplementary teaching material. Less research demonstrates the effectiveness of students creating podcasts on college and university campuses. The present guide outlines best practices recommended to implement student-generated podcasts into college and university courses, as well as summarizes the benefits and addresses the common struggles in podcasting assignments. These practices include suggestions on structuring the podcasting assignment, division of roles in group podcasts, successful use of technology, and others. The guide acknowledges common barriers that are encountered as students produce podcasts and suggests ways to overcome these difficulties. The main finding is that podcasting is an innovative practice that facilitates student learning, and it allows them to apply their knowledge in a creative way and may positively affect motivation for learning.

176
Name: Briggs, Emily Jane
Major: Biochemistry - Bachelor of Science
Faculty Advisor: Richard Baird, Biochemistry, Molecular Biology, Entomology, and Plant Pathology
Co-Author(s): Hannah Purcha
Funding: US Forest Service
Project Category: Biological and Life Sciences

The Importance of Phytophthora *cinnamomi* in the Oak Decline Disease Complex and White Oak Restoration.
  An essential hardwood in North America, white oak (*Quercus alba*) has seen a steady decline over recent decades, which has been dubbed the "oak decline disease complex". Despite extensive attempts at restoration and reforestation, white oak has struggled to reestablish itself due to extensive seedling loss. The genus *Phytophthora* encompasses a variety of species who can survive in the soil of forest ecosystems as well as being motile in water. These microbes are well known to attach members of Fagaceae such as American chestnut, but white oak susceptibility to *P. cinnamomi* infection has yet to be assessed. Furthermore, the source of *Phytophthora* contamination of white oak seedlings is still uncertain, as both the nurseries and eventual field plots where the seedlings are planted could harbor *Phytophthora* species. In this study, soil and white oak root samples from nurseries and field plots were collected and then cultured using specialized media to qualify and quantify the relevance of *P. cinnamomi* to white oak success under nursery and field conditions. Results and recommendations to improve white oak seedling viability are presented in the poster.

81
Name: Brown, Logan
Major: Educational Psychology - Bachelor of Science
Faculty Advisor: Dinetta Karriem, CounselHEdEdPsyFound (CHEF)
Project Category: Education

Extrinsic Rewards in Education: How do extrinsic rewards impact students' academic performance and their attitudes towards learning?
The purpose of this study was to examine the impact of extrinsic rewards on students' attitudes toward learning and academic achievement. Extrinsic rewards can take a variety of forms, such as money, tokens, tangible items like stickers and toys, or even verbal praise. Educators are implementing several of these extrinsic rewards in a variety of educational settings. Such rewards have the potential to significantly affect a student's general academic performance as well as their attitude toward learning. When implementing extrinsic rewards in an educational setting, there are a few factors to consider: the reward itself, how it is being delivered, and how it is being implemented. Students at Mississippi State University that were enrolled as undergraduate students participated in this study through an emailed survey link. Their current GPA and how often they were offered extrinsic rewards (candy, cash, verbal praise, or extra points) offered to them in both the fall semester of 2023 and the spring semester of 2024 were the two questions on the survey that were used to gather data for this study. According to the study's findings, students who received some form of extrinsic reward from their professor had higher GPAs than those who received little to no extrinsic reward. However, more research would be required in order to determine how the reward itself, its delivery framework, and its implementation all contribute to improved academic performance and attitudes.

177
Name: Browning, Cole
Major: Forestry - Bachelor of Science
Faculty Advisor: Joshua Granger, FWRC - Forestry
Co-Author(s): Courtney Siegert, Krishna Poudel, David Buckley
Funding: College of Agriculture and Life Sciences URSP
Project Category: Biological and Life Sciences

Silvicultural Treatments for Converting Loblolly Pine to Shortleaf Pine-Hardwood Dominance: Effects of Underplanting and Thinning
Guldin and Black (2018) estimated shortleaf pine and shortleaf pine-oak dominated stands covered roughly 70–80 million acres prior to European colonization. Today, shortleaf pine and shortleaf pine-oak stands are dominant on 6.1 million acres, a decline of more than 90 percent (Anderson et al. 2016). This decline has been attributed to the conversion to loblolly pine plantations, weak markets, and over utilization. With an increased interest and awareness for non-timber ecological services and the forest health risks associated with monocultures, stakeholders have begun to look towards more natural forest types. These natural forest types provide an array of benefits including increased ecological function, higher plant species diversity, and increased ecosystem stability and productivity. This project aims to evaluate the survival and growth of underplanted shortleaf pine and shortleaf pine-oak mixtures below a mature loblolly

pine stand. The seedlings of interest include shortleaf pine, sweetgum, post oak, northern red oak, southern red oak, and shingle oak which were established in March 2021. Planted seedlings were placed amongst canopy gaps facilitated by a commercial thinning operation in one 87-acre mid-rotation loblolly pine stand and group selection cuts within one 35-acre early rotation loblolly pine stand. Four-year survival and growth have varied significantly between planted species. Sweetgum has maintained the highest survival and growth compared to all other species. Southern red oak and shortleaf pine had the lowest survival rate when established together and post oak grew the least in height. The intention is to harvest these stands at maturity and release well-established, diverse shortleaf pine and shortleaf pine-oak stands.

112
Name: Browning, Travis
Major: Psychology - Bachelor of Science
Faculty Advisor: Jarrod Moss, Psychology
Co-Author(s): Emily Williamson
Project Category: Social Sciences

Examining Prioritization in Working Memory using Association Learning
Prioritization in working memory means preferentially keeping some information in our short-term working memory usually at the expense of information we choose not to maintain. The primary goal of this study was to further investigate the interaction between prioritization in working memory and the availability of that prioritized information later in long-term memory. In an association learning task, participants learned which key press was associated with different images in a set of images. Images with a blue border were to be prioritized and items with a red border were not to be prioritized. The image sets ranged from 3 to 6 items, and participants were asked to prioritize 1 to 3 items. After learning the associated key presses, participants completed a task to assess their working memory capacity that also served as a delay. Following this delay, there was a surprise testing phase where participants were asked to respond to the previously learned items again. Results indicated that participants responded to prioritized items faster within the learning phase, and participants with higher working memory capacity were more accurate. Within the testing phase, there was a significant drop in accuracy for prioritized items, particularly within the smaller set sizes and among participants with lower working memory capacity. These results replicate those of a prior study from our lab while also controlling for a potential confound in the prior study. Understanding how we prioritize items in working memory while learning would improve working memory theories and change how we engage in different tasks in day-to-day life. Our current findings show that prioritizing information in your working memory while studying, for example, decreases your retention of that information in your long-term memory. These strategies for controlling working memory have implications for learning concepts in the long-term.

178
Name: Burdine, Olivia
Major: Nat Res & Envir Conservation - Bachelor of Science
Faculty Advisor: Christine Fortuin, FWRC - Forestry
Co-Author(s): Esteban Galeano, Mary McTeague, Christine Fortuin
Funding: College of Forest Resources USRP
Project Category: Biological and Life Sciences

Investigating Plant-Pollinator Network Associations in Northeast Mississippi and Alabama
Increasing declines in beneficial pollinators produce minimally understood effects on Southern U.S. ecosystems. As a result, the frequency and quality of pollination in forests and agricultural systems have declined and caused negative functional changes for these ecosystems. Further, the relationship wild pollinators have with vegetation in the southeast is also minimally understood. Increasing this knowledge and understanding will allow for management practices to be transformed, prioritizing the well-being of pollinators. Additionally, species of concern will be identified and focused on for conservation and management. The goal of this research project is to examine how bees in Northern Mississippi and Northern Alabama utilize floral resources and to develop methods to extract pollen from wild bees for DNA analysis. Wild bees were collected via netting in Oktibbeha County Mississippi and Blount County Alabama. Data such as bee species, the species of plants visited by each pollinator, and environmental conditions at the time of capture will be used to build plant-pollinator network analyses. These analyses will elaborate upon plant-pollinator relationships and the demographic of native and invasive flora. The methods developed for pollen extraction will be utilized in future projects for assessing plant/pollinator networks in forest environments in the southeast. This information will help conservationists better preserve and manage forests, as well as pollinators, in Mississippi and Alabama. This project will feed into a larger, collaborative effort to better understand plant-pollinator relationships in southern forests for conservation.

179
Name: Burke, Lillian
Major: Wildlife, Fisheries & Aqua - Bachelor of Science
Faculty Advisor: Ashley Schulz, FWRC - Forestry
Funding: College of Agriculture and Life Sciences URSP
Project Category: Biological and Life Sciences

Comparison of the effects of phytophagous insect incidence and impact on leaves of native versus introduced woody plant species in the southeast.
From Chinese tallowtree (Triadica sebifera) to callery pear (Pyrus calleryana) and thorny olive (Elaeagnus pungens), the states of Alabama and Mississippi are inundated with introduced woody plant species. Researchers in invasion ecology have proposed many hypotheses for how introduced plant species are successful at establishing and spreading. One key hypothesis is the enemy release hypothesis, which indicates that introduced species are less impacted by natural enemies than native species due to their lack of coevolved relationships in the novel environment. Few studies have tested this hypothesis by comparing impacts of phytophagous insects on introduced versus native woody plant species, especially in areas of the southeastern United States where growing seasons are longer and some insect pests can produce more than one generation per year. This study assessed (1) how insect incidence and impact varies across three native [water oak (Quercus nigra), sweetgum (Liquidambar styraciflua), red maple (Acer rubrum)] and three introduced (Chinese tallowtree, callery pear, thorny olive) woody plant species, and (2) which types of arthropods (e.g., orders, feeding guilds) are primarily impacting native versus introduced woody plant species. We collected from one individual of each plant species from three sites in Alabama and three sites in Mississippi. Six, 0.5m long branches with the most (n = 3) and least (n = 3) herbivory were cut from each tree. Leaf damage was measured with LeafByte, and samples were weighed to calculate leaf area:weight. A sweep net was used to collect arthropods from each plant. Arthropods were identified taxonomically and categorized by feeding guild (e.g., predator, gall maker, skeletonizer, leaf miner, sap feeder). Results from this study will be discussed and help demonstrate impacts of introduced plant species in the southeastern United States, especially regarding their value as food for native insect species and ability to support higher trophic levels.

38
Name: Busby, Nicole
Major: Chemistry - Bachelor of Science
Faculty Advisor: Ericka Akins, Chemistry
Project Category: Physical Sciences

Cotton Seed Biochar for the Remediation of Cadmium Contaminated Water
Cadmium (Cd^{2+}) is a toxic metal found in the environment due to expanding industrial activities. Human exposure results in adverse conditions such as cancer, kidney, liver, and cardiovascular damage. Cotton is a major value-added product and 150 kg of cotton seed is generated as a byproduct for every 100 kg of fiber produced from cotton. Cotton seed biochar (CSBC) was obtained by the pyrolysis of cotton seed biomass at 400 ^{o}C for 1h and characterized by SEM, SEM-EDS, FTIR, BET, XRD, elemental analysis, and XPS. Batch adsorption experiments were done to optimize the adsorption of Cd^{2+} onto cotton seed biochar. CSBC has a point of zero charge of 7.96. Cd^{2+} adsorption capacity onto CSBC increased with the rise in pH due to increasing electrostatic attraction. Maximum Langmuir adsorption capacities of ~ 13.21, ~19.43, and ~21.69 mg/g were obtained for the sorption of Cd^{2+} onto CSBC at 5, 25 and 40 ^{o}C, respectively. The adsorption process gave fast kinetics and reached its maximum within 30 min at 0.2, 2, and 20 mg/L initial Cd^{2+} concentrations (pH 5). Dose optimization experiments were done in DI water, Noxubee Bluff lake water and Loakfoma lake water spiked with 5, 25, and 50 mg/L Cd^{2+} concentrations. CSBC demonstrated a robust performance with similar removal efficiency in all water samples. The optimum removal efficiency was obtained with a 1 g/L CSBC dosage in DI water and Noxubee Bluff Lake while Loakfoma Lake water required a 4 g/L CSBC dosage.

180
Name: Carignan, Jacob
Major: Biological Engineering - Bachelor of Science
University: Louisiana State University
Faculty Advisor: Juhee Haam, LSU Department of Biological Sciences
Co-Author(s): Atharva Dingankar
Project Category: Biological and Life Sciences

Effect of chronic stress on microglia in the entorhinal cortex.
Microglia are innate immune cells in the brain and play a critical role in defending against pathogens and removing harmful cellular products. However, the overactivation of microglia mediates a series of adverse changes, causing dysfunction and death of neurons, and

is a major contributor to neuroinflammation. The entorhinal cortex is responsible for mediating the consolidation of labile memories in the hippocampus into long-term memories in the neocortex and is the first brain region damaged in Alzheimer's disease, suggesting its vulnerability to environmental factors. Chronic stress is a significant risk factor for Alzheimer's disease. However, it is not known how chronic stress affects microglial cells in the entorhinal cortex. We propose to investigate the effect of chronic stress on the microglial number, coverage, and morphology. We will conduct immunohistochemical staining using the microglial markers TMEM119 and IBA-1, which will be followed by imaging and analysis. For the morphological analysis of microglial processes, we will use skeleton and fractal analyses to determine the relative levels of ramified and amoeboid morphologies present, which are indicative of inactive and active microglia, respectively. By investigating the changes in microglia in the entorhinal cortex, we expect to show a possible mechanism by which chronic stress impairs memory.

39
Name: Carlson, Logan
Major: Physics - Bachelor of Science
Faculty Advisor: Gombojav Ariunbold, Physics and Astronomy
Project Category: Physical Sciences

A Cost-Effective, At-Home Raman Spectroscopy Setup in Comparison with Commercial Alternatives
Raman Spectroscopy is an incredibly powerful, non-destructive method of molecular identification within materials. It operates by using the unique vibrational modes of molecules, and signal generated through Raman spectroscopy acts as spectral fingerprints of the substances. The technique is widely applicable in many fields ranging from pharmaceuticals to agriculture, but the cost can be a significant barrier to entry. An example of a commercial device is the 'BWTek BTR-111 Mini Raman Spectrometer' which costs about $15,000 USD. This is a significant purchase for small farming businesses or pharmaceutical companies, so a more cost effective setup was developed in the lab.
A smaller at-home setup was developed for a cost of about $10,000 USD. This is a significant decrease in cost to consumers, and it was shown that the cost can be optimized further at little to no cost to image quality. Calibration and characterization of the At-home setup was also completed based on Signal to Noise Ratio, Dark current, compactness, and more. Applications of this Spectroscopic setup have also been explored for biological and plastic samples.

181
Name: Carpenter, Shelby
Major: Biological Sciences - Bachelor of Science
Faculty Advisor: Peixin Fan, Animal & Dairy Science
Co-Author(s): Jalyn Hawkins, Colby Hardin, Chuan-yu Hsu
Funding: ORED Undergraduate Research Program
Project Category: Biological and Life Sciences

The colostrum microbiota of dairy cattle and its potential influence on calf gut microbiota development
Colostrum, the nutrient-rich first milk often fed to calves immediately after birth, contains many immunoglobulins and bacteria that are transferred to the calf to aid or potentially inhibit health and gut development. However, there are few studies on the potential direct transfer of microbiota from colostrum to calf gastrointestinal tract and the subsequent health effects. The purpose of this study was to analyze the bacterial composition of colostrum and investigate the potential of bacterial transmission from colostrum to neonatal dairy calves and its relationship with calf gut disorders. We collected colostrum samples from 25 primiparous Holstein cows and fecal samples from their neonatal calves 4, 7, 11, 14, and 30 days after birth, and characterized their microbiota by full-length 16S rRNA gene amplicon sequencing. The total bacterial concentration was determined using optimal single plate-serial dilution spotting. We identified 347 bacterial species from colostrum samples and an average bacterial concentration of 5.65 log (CFU/mL), ranging from 3.30 to 7.74. Two species had 100% prevalence and 77 had more than 50% prevalence (core bacteria in colostrum). The 3 most abundant species were *Streptococcus thermophilus*, *Lactococcus lactis*, and *Comamonas testosteroni*. There were 13 core bacterial species shared by colostrum and fecal samples collected from day 4 till day 30, indicating their great potential to persistently colonize in the neonatal calves. No strong relationship was observed between colostrum microbiota for healthy and diarrhea calves (alpha and beta diversity p-values of 0.55 and 0.785, respectively), but we identified 7 specific bacterial species that were enriched in colostrum for diarrhea calves, such as pathogenic bacteria *Acinetobacter bereziniae* and *Acinetobacter haemolyticus*. This study provides a high-resolution of colostrum microbiota and identified specific colostrum-derived bacteria in the gut microbial ecosystem of neonatal calves.

3
Name: Chalmers, James
Major: Mechanical Engineering - Bachelor of Science
Faculty Advisor: Reuben Burch, Industrial and Systems Engineering

Co-Author(s): Cameron Fowler
Funding: ORED Undergraduate Research Program
Project Category: Engineering

Mitigating Workplace-related Musculoskeletal Disorders Using Smart Sleeve Wearable Technology

Despite technological advancements, manufacturing plant operators still face a significant risk of workplace injuries. In 2018, the United States Bureau of Labor Statistics reported over 2.8 million nonfatal workplace injuries and illnesses, with workplace-related musculoskeletal disorders (WMSDs) constituting approximately 30 percent of these cases. WMSDs, or "ergonomic injuries," are soft-tissue injuries caused by awkward positions, overexertion, or repetitive motion. Per the Centers for Disease Control and Prevention, WMSDs annually prompt almost 70 million physician visits and an economic burden of around $50 billion. Using Liquid Wire™ smart elbow sleeves, we can measure and record an operator's upper-limb motion. This wearable technology utilizes strain sensors and inertial measurement units (IMUs) to collect motion data from user movements. A custom Python script analyzes this data, pinpointing movements in riskier ranges of motion (as defined by the Rapid Upper Limb Assessment, or RULA) and risky movement durations. These insights are visualized using Microsoft PowerBI, presenting a concise dashboard designed for easy interpretation by someone with limited ergonomic experience. To validate the effectiveness of these tools, we compare the kinematic data from the Liquid Wire™ smart sleeve with that of a gold-standard 3D motion capture system. These systems simultaneously record specific operator test movements, and the resulting data points are analyzed using the Python script and compared to validate the data and insights recorded by the Liquid Wire™ smart sleeve. Once validated, a local industry partner will implement this technology to analyze operator motions. This increased awareness will allow for better ergonomic patterns to be created and potentially mitigate WMSDs, safeguarding operator health.

113
Name: Chaney, Luke
Major: Political Science - Bachelor of Arts
Faculty Advisor: Benjamin Tkach, Political Science and Public Adm
Project Category: Social Sciences

Force For Hire: PMSCs and Human Rights Abuses

Since the end of the Cold War, states have increased their reliance on contractors to augment military and security services. Private military and security companies, which are commercial, benefit-oriented companies which provide military and security services (Branović 2011), are utilized by employers to pursue their policy objectives. Popular media will often portray PMSCs as amoral mercenaries willing to dirty their hands in blood for the sake of generating a profit, but this image doesn't always line up with theory or evidence on PMSCs. Despite high profile incidents such as Nisour Square Massacre in Iraq in 2007, how often do PMSCs actually commit abuses? In this study, I expect to find relationships between the type of PMSC and human rights abuses and the employer of the PMSC and human rights abuses. Principal-agent dynamics, profit incentives, and employer motivations may all be theoretical reasons as to why PMSCs are either incentivized or disincentivized to commit abuses. I expect armed PMSCs to commit more human rights abuses than unarmed or support PMSCs due to the nature of their duties involving the actual dispersal of kinetic force. I expect employer motivations to have a strong impact on PMSC behavior due to influences from the principal in the principal-agent relationship, national or local norms being enforced or not enforced on PMSCs, and the desire for immediate or future profit. This article investigates which factors influence PMSCs to commit or avoid committing human rights abuses, and to what degree. I will be using data from the Private Security Events Database, which will be referred to as the PSED (Avant and Neu 2019).

114
Name: Chapman, Ann
Major: Psychology - Bachelor of Science
Faculty Advisor: Danielle Nadorff, Psychology
Co-Author(s): Alexandria Davis, K'lee Pittman
Project Category: Social Sciences

Understanding Technology Usage Patterns in Adolescents: The Interplay of Household Type, Sense of Belonging, and Gender

The United States Census Bureau found that in 2020, roughly 56,642 children in Mississippi lived in grandparent-headed household or "grandfamilies". Children are often placed in grandfamilies as a result of their biological parents being unwilling or unable to care for them, which often overlaps with traumatic experiences and could lead to an increased risk of developing disrupted attachment due to this separation. Increased exposure to traumatic events and disrupted attachment are linked to poor emotional development outcomes in adolescents, including lacking a sense of belonging. Previous literature shows sense of belonging could be a predictor of internalizing and externalizing problems for all adolescents. Previous studies also indicate that interacting online may satisfy the need for belonging for adolescents. Gender also has a major influence on adolescents' sense of belonging as well as the way in which they interact online.

This study investigates how household type moderates the relation between children's sense of belonging and their technology usage, with gender as a covariate. Data from the fifth wave of the Future of Families and Child Wellbeing Study (FFCWS; YEAR), was used to investigate the relation between sense of belonging and technology usage among adolescents in grandfamilies (N= 4,898; 1.8% grandchildren; 52.2% male; M age = 15.00). While the overall model was significant (p < .001), moderation analysis revealed non-significance for household type moderation. The relation between sense of belonging and adolescent's grandfamily status, as well as adolescent's gender as a covariate, were not significant. However, sense of belonging emerged as a significant predictor of technology usage (p < .00). These findings indicate that while household type and gender do not significantly moderate the relation between sense of belonging and technology usage, children's sense of belonging itself plays a significant role in predicting their patterns of technology use.

4
Name: Chen, Wen Xiang
Major: Software Engineering - Bachelor of Science
Faculty Advisor: Vuk Marojevic, Electrical and Computer Engineering
Co-Author(s): Oliver Higginbotham, Ashwani Mishra
Funding: NSF REU: NSF Award #2120442, ONR Award N00014-23-1-2808
Project Category: Engineering

Identification of Resource Allocation in Virtualized O-RAN Systems for Enhanced 5G Research Workflows
The Open Artificial Intelligences Cellular (OAIC) research platform developed at MSU establishes a community research platform, which is software that runs on a software radio research testbed using powerful commodity servers and workstations. One significant challenge in advanced wireless and networking research is the limited hardware resources that can negatively affect the software's overall performance. The problem of hardware resource limitation stemming from sharing the testbed among multiple users simultaneously can be tackled through the implementation of a hypervisor on a very powerful computing system to enhance the testbed experience for researchers. By using a hypervisor, the researchers can remotely access their designated virtual machines for critical testing and software demonstrations. This research focuses on identifying the bottlenecks of such systems when they are being run for computationally intensive workloads by multiple researchers. The program used to gather data is HWiNFO64 allowing for direct sensor recording. The primary sensors that could reveal resource bottlenecks include cache, DRAM read/write bandwidth, per core usage, power usage vs thermal design power, and disk usage. Therefore, our research includes the comprehensive analysis of such parameters for supporting cutting edge wireless communications and networking research on Edge computing platforms. This research involves a system with at least four configurations: barebone hypervisor, a single VM, five VMs, and 10 VMs. By analyzing these parameters using the different configurations and comparing the recorded values with what the system has available, we can examine what improved parameters each VM will need for scalability. Additionally, we will analyze what the critical resources and minimal configurations of the system should be so that we can compensate for those in future system configurations. In the end, this research will determine exactly what specific resources are used the most on a virtualized O-RAN system for enabling research and development.

5
Name: Chen, Zijie
Major: Computer Science - Bachelor of Science
Faculty Advisor: Sungkwang Mun, Ctr for Advanced Vehicular Systems
Project Category: Engineering

Autoencoder-based Data Denoising and Temperature Conversion for Infrared Camera Images in Additive Manufacturing
In the field of additive manufacturing, infrared (IR) cameras play a crucial role in monitoring the thermal behavior of the printing process. However, the acquired IR images often suffer from noise and other artifacts, hindering accurate analysis. This research project aims to develop a data denoising approach using autoencoders, a type of neural network architecture, to enhance the quality of IR camera images. In order to train the autoencoder, we preprocessed the IR camera images by splitting them into smaller 32x32 sub-images. These sub-images serve as input to an autoencoder, then a neural network that learns to encode the input data into a compressed representation and then decodes it back to its original form. By training the autoencoder on a large dataset of IR sub-images, it learns to capture the underlying patterns and structures, effectively removing noise and preserving the essential thermal information. Once the autoencoder is trained, it can be applied to new IR camera images from additive manufacturing processes. The denoised sub-images are then reassembled to form the full IR camera image, providing a cleaner and more accurate representation of the thermal behavior during the additive manufacturing process. This enhanced data can be utilized for various applications, such as process monitoring, defect detection, and quality control, ultimately leading to improved productivity and reliability in additive manufacturing.

115
Name: Chenaille, Madison
Major: Psychology - Bachelor of Science
Faculty Advisor: Allison Jaeger, Psychology
Co-Author(s): Katelyn Simmons, Michael Poe, Skylar Kline, Christopher Jolivette, Rachel Apperson
Funding: NSF #2307285
Project Category: Social Sciences

The effect of self-generated diagrams on science text comprehension and metacomprehension
Comprehending new science topics tends to be challenging for many students. In this experiment, different modes of diagram presentation were implemented to investigate how self-generated or provided diagrams influenced comprehension and judgment accuracy for complex topics in chemistry. Across two timepoints (T1 and T2), a sample of 189 psychology students were randomly assigned to one of four conditions. Two conditions required participants to draw their own diagrams while reading through four chemistry texts and the other two conditions provided the diagrams. After reading each text, participants were asked to complete a test judgement asking how well they believed they would perform if tested on the information. After reading and judging all 4 texts, participants completed a 7-item multiple choice test for each topic. Participants returned a week later and made another set of test judgements for each topic and completed the same multiple-choice tests. Importantly, students were not allowed to reread any of the texts. Results indicated that judgements were higher at T1 than at T2, but there was no effect of self-generated versus provided diagrams on judgement magnitude. There was also no effect of time-point or generate condition on multiple-choice test scores. To assess the accuracy of students' judgments (i.e., how closely their judgments aligned with their test scores), we computed a measure called relative metacomprehension accuracy. We found an interaction such that in the generate conditions, relative accuracy was higher at T1 than at T2, but there was no difference in relative accuracy at T1 and T2 in the no-generate conditions. Overall, these results suggest that generating diagrams while reading can support better relative accuracy immediately after reading, but this benefit may fade after a delay.

6
Name: Cho, Minjae
Major: Mechanical Engineering - Bachelor of Science
Faculty Advisor: Chuangchuang Sun, Aerospace Engineering
Project Category: Engineering

Constrained Meta-Reinforcement Learning for Adaptable Safety Guarantee with Differentiable Convex Programming
Despite remarkable achievements in artificial intelligence, the deployability of learning-enabled systems in high-stakes realworld environments still faces persistent challenges. For example, in safety-critical domains like autonomous driving, robotic manipulation, and healthcare, it is crucial not only to achieve high performance but also to comply with given constraints. Furthermore, adaptability becomes paramount in non-stationary domains, where environmental parameters are subject to change. While safety and adaptability are recognized as key qualities for the new generation of AI, current approaches have not demonstrated effective adaptable performance in constrained settings. Hence, this paper breaks new ground by studying the unique challenges of ensuring safety in non-stationary environments by solving constrained problems through the lens of the meta-learning approach (learning-to-learn). While unconstrained meta-learning already encounters complexities in end-to-end differentiation of the loss due to the bi-level nature, its constrained counterpart introduces an additional layer of difficulty, since the constraints imposed on task-level updates complicate the differentiation process. To address the issue, we first employ successive convex-constrained policy updates across multiple tasks with differentiable convex programming, which allows meta-learning in constrained scenarios by enabling end to-end differentiation. This approach empowers the agent to rapidly adapt to new tasks under non-stationarity while ensuring compliance with safety constraints. We also provide a theoretical analysis demonstrating guaranteed monotonic improvement of our approach, justifying our algorithmic designs. Extensive simulations across diverse environments provide empirical validation with significant improvement over established benchmarks.

182
Name: Clawson, Madalynn
Major: Biochemistry - Bachelor of Science
Faculty Advisor: Florencia Meyer, Biochemistry, Molecular Biology, Entomology, and Plant Pathology
Co-Author(s): Brendan Morrow
Funding: College of Agriculture and Life Sciences URSP
Project Category: Biological and Life Sciences

Biofilm formation by microbes of the Bovine Respiratory Disease

Mannheimia haemolytica is a bacterium that naturally occurs in cattle's upper respiratory tract. It is also associated with clinical presentations of the Bovine Respiratory Disease (BRD) in healthy cattle. *M. haemolytica's* adherence and proliferation can lead to infection of the lungs through inhalation for cattle. In addition, it produces leukotoxins that kill white blood cells leading to severe lung damage in cattle with BRD. When some bacteria congregate together under favorable conditions, they can form complex film structures known as biofilms that allow them protection and proliferation under hostile conditions. This additionally provides resistance against antibiotics for the bacteria. Finding ways to reduce biofilm formation could help combat the persistence of infection and help reduce antibiotic resistance. In our work, we investigated methods of developing biofilm-like materials originating from the bacteria *M. haemolytica*. Overnight cultures of *M. haemolytica* were prepared in BHI for 24 hours under standard culture conditions. Then, 24-well plastic plates were seeded with the overnight culture diluted in fresh BHI and incubated for 3 days (72 hours). *M. haemolytica* biofilm formation was tested and observed under two different temperatures (34°C and 37°C) to understand if *M. haemolytica* specifically thrives under slighter cooler conditions than the core body temperature due to its natural inhabitation within the upper respiratory tract. Additionally, several substrates, such as extracellular matrix components, were seeded onto the surface of the plastic plates before bacteria to determine if they would enhance the bacteria's ability to generate biofilm. A cooler temperature than the core body temperature did not show an enhancement of biofilm-like formation. In addition, various substrates such as collagen and fibrinogen, did not significantly affect biofilm formation, either. Furthermore, a procedure to disrupt the generated biofilm was explored. We tested different concentrations of Copper-EDTA, Zinc-EDTA, and Magnesium-EDTA because previous work in our lab showed that these metals can inhibit *M. haemolytica* growth. These metals were added in different concentrations to investigate the factors that can affect the formation of biofilm. Various metal concentrations are currently being tested; however, Magnesium-EDTA appears to have the potential to disrupt biofilm formation slightly more than the other metals tested thus far. Future studies will focus on examining the structure of the biofilms and the extent to which we are able to disrupt them.

7
Name: Coatney, Annemarie
Major: Biomedical Engineering - Bachelor of Science
Faculty Advisor: Lauren Priddy, Agricultural and Biological Engineering
Co-Author(s): Emma Van Epps, Honor Echols, Mahathir Bappy
Project Category: Engineering

Enhancing the Fabrication Process for 3D Printed Polymer-Ceramic Composite Scaffolds

Critically sized bone defects resulting from trauma or tumor resection extend beyond native bone's capacity to self-heal, requiring additional regenerative measures. The current gold standard for such procedures is autografting, which can pose risks, including infection and donor site morbidity. 3D-printed biodegradable bone scaffolds have arisen as a feasible alternative to autografting due to their ability to integrate into and mimic the biological and mechanical properties of native bone. The functional complexity of this tissue necessitates composite materials which promote osteoconductivity, such as the materials used in this experiment: poly(lactic-co-glycolic acid) (PLGA), an FDA-approved biodegradable thermoplastic with tailorable mechanical and chemical properties, and nanohydroxyapatite (nHA), a calcium-based ceramic that closely mimics the mineral component of bone. The composite material preparation process, however, introduces variability which compromises the reproducibility, homogeneity, and biocompatibility of the product. Thus, improvement and refinement of the fabrication method is necessary. The composite is currently made by dissolving PLGA and nHA in acetone, which is then removed via passive evaporation. Not only is this process time consuming; it also introduces bubbles and fails to completely remove the biologically incompatible acetone. The final product is then heated and manually scraped from its container to be used in printing, resulting in material loss when tacky residual thermoplastic remains in the beaker. By use of a silicon mold, vacuum oven, and updated printing procedure, the aim of the updated method is to ensure the complete removal of acetone, minimize bubble occurrence, increase printing accuracy, and reduce material loss during the fabrication process. Preliminary testing has confirmed the ability of the vacuum oven to reduce bubble occurrence in printed scaffolds and remove acetone with greater efficiency.

183
Name: Coleman, Curtis
Major: Wildlife, Fisheries & Aqua - Bachelor of Science
Faculty Advisor: Garrett Street, FWRC-Wildlife,Fisheries&Aquaculture
Co-Author(s): Jane Dentinger, Bronson Strickland, Renae Leighton
Funding: College of Agriculture and Life Sciences URSP
Project Category: Biological and Life Sciences

Characterization of Body Acceleration Data Signals for Remote Sensing of Complex Animal Behaviors

Traditionally, animal behavior research is hindered by our inability to directly observe wild animals. New animal-borne biologging

technologies may amend this by recording information about the animal in situ. Accelerometer/magnetometer (AM) dataloggers record body acceleration and geomagnetic orientation of tagged animals, enabling reconstruction of animal behavior and movement patterns at sub-second intervals. Applications of this technology commonly describe only behaviors with distinct and predictable patterns of body acceleration (e.g. walking and resting), using "black box" approaches trained on captive animal data to identify behavior from datalogger signals. Conversely, there has been little research on rare or complex behaviors such as socially affiliative or aggressive behaviors, which are likely characterized by less readily identifiable data signatures. If so, we may ask: what are the salient characteristics of behaviors that make them suitable for biologging studies? We will analyze AM datasets and observed behavior for 20 behaviors collected from captive wild pigs (Sus scrofa) and construct AI/ML-based classification models to calculate probability profiles for animal behaviors given common data signal structures (i.e. the true behavioral composition of each classification group, per Dentinger et al. 2021). Distinctive characteristics as identified by the AI/ML algorithms will be used to identify the key features of the data signals, and thus the body movements, needed to make them distinctive. This research will serve as an important reference for those interested in remote sending of animal behaviors and whether AM dataloggers are useful for ecological research and management activities.

82
Name: Conley, Emma
Major: Biomedical Engineering - Bachelor of Science
Faculty Advisor: Harish Chander, Kinesiology
Co-Author(s): Jordan Doherty, Hunter Derby, Adam Knight, Harish Chander
Project Category: Education

The Effects Of Nike Hypervenom X Indoor Soccer Shoes On Limits Of Stability
The limits of stability (LOS) test is commonly used to assess spatial and temporal postural control measures. Although various footwear have been developed to improve ankle stability via localized compression of the ankle joint, ankle mobility may be limited and negatively affect one's LOS. Therefore, the purpose of this study was to evaluate the effects of two types of athletic footwear on healthy individuals' LOS. Twenty healthy participants [12 males, 8 females; age: 20.95 $\pm$ 0.96 years] completed the LOS test on the BTrackS™ balance platform that involved leaning in four directions [front left (FL), back left (BL), back right (BR), front right (FR)] in each footwear condition: barefoot (BF), Nike Hypervenom X indoor soccer shoe with a built in compression sock (S), and Nike Hypervenom X indoor soccer shoe without a built in compression sock (NS). Footwear condition was assigned in a counterbalance order. Center of pressure (COP) area was used to assess participants' LOS, with greater COP area indicating better LOS and postural control. A 3 (shod condition: BF, NS, S) x 4 (direction: FL, BL, BR, FR) repeated measures ANOVA was used to assess COP area at an alpha level of 0.05 using JASP open-source statistical program. Results revealed significant main effects between footwear ($p = 0.013$) and direction ($p < 0.001$). Post hoc comparisons revealed significantly greater LOS area in the FL and FR direction compared to BL ($p < 0.001$) and BR ($p < 0.001$). In addition, greater LOS were observed in BF ($p = 0.023$) and NS ($p = 0.035$) when compared to S conditions. The current study revealed significantly greater LOS in footwear conditions that did not involve localized compression around the ankle, suggesting that although localized compression may improve ankle stability, it may negatively impact healthy individuals' LOS.

116
Name: Counts, Abigail
Major: Anthropology - Bachelor of Arts
Faculty Advisor: Anna Osterholtz, Anthropology and Middle Eastern Cultures
Project Category: Social Sciences

The Cultural Significance of Interpersonal Violence and Accidental Trauma Found in Remains From Đurđevac-Sošice
The analysis of traumatic lesions in bioarchaeology can be a lens into social structure and activity in the past. This study is meant to provide insight into medieval ways of life in Đurđevac-Sošice via bone fractures and their causes. Accidental trauma leaves different scars than those caused by interpersonal violence, but both can explain a lot about social interaction. This poster will detail two fractures excavated from below church floors (potentially indicating that these were persons of relatively higher societal status) at the Medieval site of Đurđevac-Sošice (Croatia, ca. 11-17th century): one fracture to the ulna likely accidental in nature and the other a cranial depression fracture more likely the result of interpersonal violence. The fractures were analyzed macroscopically and contextualized through a literature search. The two fractures are described and compared with clinical literature to determine the most likely cause of the fracture (e.g., accidental versus interpersonal violence). Treatments for traumatic fractures were then explored for the Medieval world. Both fractures were fully healed at the time of death. In particular, the healed ulnar fracture provides evidence of advanced medical practices, as the callus is well-integrated and shows no signs of infection. Contextualized analysis of trauma allows us to begin to understand the social role of violence through the analysis of cranial depression fractures, while accidental fractures allow us a glimpse into treatment strategies and activities that put the population at risk for fractures, including potential activity patterns related to subsistence.

117
Name: Crotty, Gregory
Major: Psychology - Bachelor of Science
Faculty Advisor: Jarrod Moss, Psychology
Co-Author(s): Emily Williamson Creel
Project Category: Social Sciences

An Analysis of the Effect of Cognitive Reflection on Insight Problem-Solving Behavior
Cognitive reflection (CR) is described as the ability to override intuitive but incorrect solutions when first solving a problem or puzzle and further reflecting on the information to find the true solution. The current experiment consisted of the Cognitive Reflection Test (CRT), followed by three insight problems (Nine Dot Problem, Cheap Necklace Problem, and Inverted Triangle Problem). In order to evaluate the hypothesis that people reflect on their unsuccessful attempts when they become stuck while solving, participants were randomly assigned to one of three conditions. Participants in the Control condition simply solved the problem, Common Attempts condition had access to three common experimenter-generated attempts while solving, and Own Attempts condition had access to their own six most recent unsuccessful problem attempts. Each attempt taken during the problem-solving phase was displayed to the left of the problem-solving area, giving the participant a direct view of their previous incorrect solutions. We hypothesized that participants with higher CR would have longer attempt times than those with lower CR because they were spending more time reflecting on potential strategies, and participants with access to unsuccessful attempts would spend more time reflecting. Time spent solving and individual attempt times were used to determine the proportion of each participant's total solution time that was spent on their longest attempt. We found that higher CRT scores were associated with a larger proportion of total solve time spent on the longest attempt, but there was no evidence to support the hypothesis that access to unsuccessful attempts was associated with longer attempt times. These findings suggest that people with higher CR tend to spend more time reflecting on problem elements and previous attempts than people with lower scores. This difference leads to lower attempt numbers, higher solution rates, and overall faster problem-solving times for those with higher CR scores.

118
Name: Cuevas, Olivia
Major: Building Construction Science - Bachelor of Science
Faculty Advisor: Saeed Rokooei, Building Construction Science
Co-Author(s): Haley Rocks
Funding: ORED Undergraduate Research Program
Project Category: Social Sciences

Cultivating Environmental Justice and Community Resilience Education for Female and Underrepresented College Students
The main research question in this study was "what is the role of churches in the greater Birmingham area in response to tornados?" This study used multiple ways to learn more about the role of churches in the aftermath of tornados in Birmingham. Firstly, free resources online such as reputable websites were used. After gathering general information on the severity of tornadoes in Birmingham, basic knowledge that the community is equipped with was explored. Then interviews with churches around the greater Birmingham area helped to specify the main functions of churches in community resilience. Lastly, an analysis was performed to compare the information online to the information given by the churches. This also included comparing different churches' responses and determining if there was a given pattern. Through research and communication with local churches, it was shown that they would partner with other organizations that focus on community outreach and resources. The churches may encounter people who require shelter and would send them to other organizations. Ministries would also do food drives throughout the year to be able to stockpile goods for natural hazard events. Oftentimes, the churches will take the food that has been donated to food banks for the citizens who are not in their immediate area. Churches will also encourage their members to be volunteers with disaster relief teams and other community resource organizations. Analysis of data indicated that churches in the greater Birmingham area are heavily involved through volunteer work and donations. While they do not usually help distraught citizens directly, they are some of the main resources that aid in the function of the organizations that do. Churches are a safe place to go to find the proper help for each person's specific situation and needs in natural hazards.

184
Name: Curran, Emily
Major: Animal and Dairy Science - Bachelor of Science
Faculty Advisor: Clay Cavinder, Animal & Dairy Science
Funding: College of Agriculture and Life Sciences URSP
Project Category: Biological and Life Sciences

Application of technology to promote mental health and facilitate animal agriculture education to underserved populations

Wellness programs are incorporating horses for therapeutic use on the assumption that horses do generally yield positive benefits in mental health through equine interaction. Equine interactive programs, such as 4-H, have reported boosts in qualities associated with emotional safety including self-esteem and confidence as a result of participation. In a study concerning psychotherapy incorporating equine interaction for children who experienced intra-family violence, it was suggested that equine interaction contributed to greater Global Assessment of Functioning scores, including improvements in youth who were diagnosed with post-traumatic stress disorder and attention-deficit hyperactivity disorder. Unique from other therapeutic interventions, equine interaction provides a multi-faceted benefit potential, ranging from mental to physical health. It is recommended that horses be considered as a means of providing psychological and physical benefits, however, many people are unable to experience these benefits because of physical or socioeconomic limitations. Those who may be unable to participate are people who have physical impairments, health limitations due to age, economic hardships restricting horse ownership, or environmental restrictions due to living in an urbanized area with limited agriculture exposure.

Therefore, our study will explore using technology to bring horses to those who are unable to experience known benefits. Virtual reality may be able to provide users with mental health benefits through experiencing horse related activities without the added costs and geographical limitations that are associated with equine ownership. This, in turn, will promote animal agriculture to a wider spectrum of individuals, particularly targeting underserved populations.

119
Name: Daniel, Landon
Major: Psychology - Bachelor of Science
Faculty Advisor: Cliff McKinney, Psychology
Project Category: Social Sciences

Indirect Effect of Parental Psychological Maltreatment on Interpersonal Competency via Post-Traumatic Stress Disorder Symptoms

This study examined the relationship between parental maltreatment and post-traumatic stress disorder and their relation with interpersonal competence. Empathy deficits are related to parental maltreatment, and early exposure to maltreatment is associated with later impairments in social and interpersonal skills, possibly as the result of specific deficits in cognitive and emotional empathy (Meidan & Uzefovsky, 2020). Maltreatment is extremely detrimental to development in many of the areas for childhood development. Post-traumatic stress disorder (PTSD) can occur when an individual is exposed to a highly stressful or frightening event. Examples of posttraumatic stress symptoms include emotion dysregulation, negative posttraumatic cognitions, dissociation, and depression, and children who develop PTSD-related symptomology are also at an increased risk of developing comorbid psychiatric disorders, including substance abuse, eating disorders, and borderline personality disorder (Patterson et al., 2022). Interpersonal competency is being able to connect and interact with other people. Research has indicated that individuals with high interpersonal competency also tend to have positive outcomes, such as academic success, positive relationships, and better mental health (Szkody et al., 2022). This study consisted of 735 participants from Mississippi State. Participants completed tests like the Interpersonal Competence Scales (ICQ; Buhrmaster et al., 1998), the Adverse Childhood Experiences Scale (ACES; Felitti et al.,1998) and the PTSD Checklist (PCL-5; Weathers et al., 2013). It was hypothesized that current parental maltreatment and PTSD symptoms would correlate negatively with interpersonal competency and that parental maltreatment would correlate positively with PTSD symptoms. The overall model predicting interpersonal competence was significant, $R^2 = .05$, $F(3, 732) = 12.86$, $p < .001$. The first hypothesis of maltreatment being correlated with low interpersonal competence was not supported. The second hypothesis of PTSD predicting interpersonal competence was supported, and the third hypothesis of parental maltreatment being significantly correlated with PTSD was also supported.

120
Name: Davis, Alexandria
Major: Psychology - Bachelor of Science
Faculty Advisor: Danielle Nadorff, Psychology
Co-Author(s): Laura Ann Chapman, K'lee Pittman, Acacia Lopez
Project Category: Social Sciences

Constructing a model of attainment for those raised by grandparents: financial status, engagement in wellbeing scale, and caregiver education level.

Grandfamilies are formed when parents are unable or unwilling to care for their children. The formation of grandfamilies often results from traumatic experiences, such as parental abandonment, abuse, or death. Despite previous literature stating this population is at a higher risk for poor mental health factors, there is still little research into the predictors of outcomes for this population. One important outcome yet to be fully evaluated in this population is that of educational attainment. This study aimed to evaluate how grandparent

financial status, grandchild engagement measured on a wellbeing scale, and grandparent education level differentially predict educational attainment of children raised in grandparent-headed households. A sample of children raised by their grandparents from the Future of Families and Child Wellbeing Study (2021 wave) was utilized to attain data of reported household income, grandchild's self-reported engagement, and grandparent education level (N = 88). A multiple regression was run to predict educational attainment of children raised in grandparent-headed households from financial status, engagement, and grandparent education level. These variables were not found to be significant in predicting educational attainment, only predicting 4% of the variance $F(3,78)$ = 1.01, ns, R^2 = 0.04. These results contrast with previous studies finding a significant effect of these variables on educational attainment. To evaluate the discrepancy between these results and previous literature, an independent samples t-test was conducted to evaluate for group differences between those raised by grandparents versus those who were not. The only variable found to have a significant effect was household income, $t(3489)$ = -3.29, p < .05. While this study did not find financial status, grandchild engagement, and grandparent education level to be significant in predicting variance in participants' educational attainment, further research is necessary to identify additional factors for inclusion in a model predicting grandchildren's educational attainment.

185
Name: Davis, Sydney
Major: Biochemistry - Bachelor of Science
Faculty Advisor: Natraj Krishnan, Biochemistry, Molecular Biology, Entomology, and Plant Pathology
Co-Author(s): Emma Palmer
Funding: College of Agriculture and Life Sciences URSP
Project Category: Biological and Life Sciences

A balancing act: Pan-neuronal over-expression of ataxin1 in Drosophila melanogaster leads to decreased life span and subtle behavioral deficits.
Spinocerebellar ataxia type 1 (SCA1) is a neurodegenerative disease caused by the expansion of a translated CAG repeat encoding glutamine in the ataxin-1 (Atx-1) protein. Interestingly, while overexpression of mutant Atx-1 with an expanded polyQ tract causes neurodegeneration in mice and flies, even human Atx-1 with a nonpathogenic repeat of (CAG)14CAT-CAG-CAT(CAG)15, such as hAtx-1[30Q], causes neuronal degeneration if expressed at sufficiently high levels in either mice or Drosophila. To understand the physiological consequences of overexpression of Atx-1 in flies, the yeast two hybrid system
was employed where wild-type ataxin-1 under UAS was driven pan-neuronally in nervous tissue of Drosophila melanogaster using the elav-GAL4 driver (elav-GAL4/UAS-Atx-1). Parallel controls were UAS ATX-1/+ and elav-GAL4/+. The lifespan of flies overexpressing Atx-1 was significantly reduced compared to controls. While daily locomotor activity rhythms were not markedly affected, the negative geotaxis response was significantly impacted in flies overexpressing Atx-1. The expression of armadillo which is required for both for cell–cell adhesion and for regulating gene expression during development was markedly reduced. Moreover, Drosophila Nemo (nmo) a member of a conserved family of protein kinases that have roles in diverse signaling processes during development was also affected. Taken together, our results point to a specific level of ataxin necessary for proper development and enhanced levels can have physiologically detrimental effects.

121
Name: Dean, Hannah
Major: Psychology - Bachelor of Arts
Faculty Advisor: Danielle Nadorff, Psychology Department
Co-Author(s): Laura Shillingsburg
Project Category: Social Sciences

Exploring the Influence of Primary Caregivers on Adolescent Well-being: A Moderated Correlation Analysis
Positive functioning in adolescents is a vital aspect of development, with influences such as family environment playing a significant role (Fredrickson, 2001). According to Morris et. al. (2007), examining positive functioning within the family context is vital to help one understand adolescent development. This study looks at the correlation between Adolescent Engagement Perseverance Optimism Connectedness and Happiness (EPOCH) scores and 3-year-old Child behavior checklist (CBCL) scores, focusing on the moderating effect of primary caregivers, whether biological parents or other kinfolk. This is important because investigating kinship care families is essential due to their unique dynamics and potential impact on adolescent well-being (Winokur, et. al., 2015). Data from 2641 caregiver-child dyads were analyzed using moderation analysis. The predictor variables were CBCL scores and primary caregiver type (biological or kinfolk), while the outcome variable was Adolescent EPOCH scores. The correlation between CBCL scores and EPOCH scores was significant (β = 0.053, p < 0.001). However, the interaction between CBCL scores and the type of primary caregiver was insignificant (p = 0.394), suggesting that the relationship between earlier behavioral characteristics and adolescent emotional regulation is not significantly moderated by the type of primary caregiver. Although these findings may not have been originally expected, they emphasize the importance of understanding longitudinal influences on adolescent's overall well-being.

66
Name: Delahoussaye, Grace
Major: Architecture - Bachelor of Architecture
Faculty Advisor: Alexis Gregory, School of Architecture
Project Category: Arts, Music, & Design

Impacts and Causes of Imposter Syndrome in Architectural Studies
Imposter syndrome, the build-up of anxiety and self-doubt in one's skills and achievements, has become a prominent issue within academic and professional spheres. This research aims to explore within the realm of architectural studies, a program that demands critical thinking, artistic visualization, and technical proficiency. This study seeks to uncover the specific factors contributing to imposter syndrome within this context. Seeds for imposter syndrome are sure to manifest with such a widespread demand for creativity, technical prowess, and interdisciplinary collaboration. This research will delve into the experiences of students, educators, and practitioners to clarify the subtle ways imposter syndrome shapes perceptions, aspirations, and career trajectories within the architectural domain. Especially those who belong to the demographic minorities. The research utilizes literature reviews that will gather quantitative and qualitative insight into this topic. By reviewing literary works surveys and interviews, this research will identify common triggers, coping mechanisms, and potential factors associated with imposter syndrome in architectural contexts. By the end, this research hopes to contribute to the development initiatives within architecture for educational and professional spheres. By fostering awareness and understanding of imposter syndrome, educators and similar institutions can implement interventions to support students and professionals in navigating feelings of anxiety and self-doubt. Shedding light on the often-unspoken challenges inherent in the architectural journey fosters a more inclusive and supportive environment where individuals can thrive authentically, unfazed by the shadows of imposter syndrome. Through collaborative efforts and shared insights, this endeavor unveils self-doubt, empowering individuals to embrace their unique talents and contributions within architecture.

186
Name: Delaney, Katherine
Major: Biochemistry - Bachelor of Science
Faculty Advisor: Natraj Krishnan, Biochemistry, Molecular Biology, Entomology & Plant Pathology
Co-Author(s): Emma Palmer, Sydney Davis
Funding: College of Agriculture and Life Sciences URSP
Project Category: Biological and Life Sciences

Bringing order to translation: Physiological consequences of disruption of genes encoding tRNA-guanine transglycosylase and the Queuosine salvage protein in Drosophila melanogaster
Queuosine which is a hypermodified 7-deaza-guanosine that occurs at the wobble anticodon position 34 of four tRNA (Tyr, Asn, Asp, His) species for amino acids His, Asn, Tyr, and Asp with 5'GUN anticodons. Although the Q-modification occurs in most organisms, its precise role remains unclear in eukaryotes. The enzyme that substitutes Q for G34 in the Q-tRNAs is tRNA-guanine transglycosylase (TGTase), encoded by the Tgt gene. Eukaryotic TGTases consist of a catalytic subunit (QTRT1) and a homologous accessory subunit (QTRTD1), forming a functional complex. Unlike eubacteria, eukaryotes are unable to synthesize the Q-nucleoside or its precursors de novo. Animals must therefore salvage the nucleobase of queuosine, known as queuine, using salvage proteins such as DUF2419. Drosophila melanogaster has a single Tgt gene (CG4947) encoding the QTRT1 protein (NP_608585.1) and the accessory subunit gene (CG3434) encoding the protein QTRTD1 (NP_6483201.1) necessary for Q-tRNA formation. There is also a single gene (CG9752) encoding the potential Q-salvage protein family DUF2419 (NP_611573.1). It is hypothesized that lack of Q-tRNA modifications would impact an organisms physiology. To understand the physiological consequences of lack of such modification, disruption of the Tgt gene and its accessory subunit gene was achieved by ubiquitously driving the expression of an RNAi transgene targeting these genes using the powerful GAL4/UAS system. The lifespan, accumulation of protein carbonyls, dopamine levels and neuronal degeneration was documented in flies which lacked Q-tRNA compared to control flies. The obtained data lend strong support to the hypothesis that lack of Q-incorporation affects tRNA species such as tRNA-Asn, tRNA-Tyr and tRNA-His, which ultimately leads to neurodegenerative symptoms.

8
Name: Denton, Gavin
Major: Industrial Engineering - Bachelor of Science
Faculty Advisor: Seunghan Lee, Industrial and Systems Engineering
Funding: ORED Undergraduate Research Program
Project Category: Engineering

Integrating Discrete-Event and Physics-Based Simulations for Enhanced VR Training in Manufacturing
Discrete-Event Simulation (DES) has been widely used to analyze the system performance in manufacturing. However, its application at the component level has been constrained due to high abstraction and low fidelity. This project aims to enhance manufacturing system efficiency by integrating DES models with Physics-Based Simulation (PBS) 3D training models. Specifically, we developed DES models of Milwaukee Tools' manufacturing process in Greenwood, MS, using the software FlexSim. This model will then be incorporated into our PBS model using a game engine software - Unreal Engine, facilitating the creation of Virtual Reality (VR)-based training. The objective is to provide employees with a more accurate and immersive training experience based on the real data collected from the Milwaukee plant, which serves as the input data for the simulation. Our integration improves the effectiveness of the training model, addressing the current challenges of maximizing the user-friendly level. Throughout this integration, employees can now identify process bottlenecks and assess system performance within an immersive environment. Upon successful implementation, our model can be used for training related to the manufacturing processes. Thus, the project will quantify the impact of VR training on employee effectiveness by comparing it with traditional training methods. This research is committed to ongoing training data generation and analysis to ascertain the VR training's efficiency.

40
Name: Dieselberg, Jocelyn
Major: Mathematics - Bachelor of Science
Faculty Advisor: Amanda Diegel, Mathematics and Statistics
Funding: NSF grant: DMS 2110768
Project Category: Physical Sciences

An Efficient Solver for a Numerical Method Modeling Grain Growth via the Phase Field Crystal Equation
The phase field crystal equation is a popular method for modeling many materials science phenomena, such as grain growth, solidification, and more. We develop a robust solver for an established numerical scheme utilizing a finite element method for the phase field crystal equation. The key ingredient of the solver is a preconditioned minimal residual algorithm (with a multigrid preconditioner) whose performance is independent of the spatial mesh size and model parameters and mildly dependent on the time step size. We present results for a few numerical experiments.

187
Name: Dietz, William
Major: Animal and Dairy Science - Bachelor of Science
Faculty Advisor: Trent Smith, Animal & Dairy Science
Project Category: Biological and Life Sciences

Evaluation of the relationship between maternal aggression and mothering ability on calf performance
The objective of this study was to determine the association between mothering ability (MOM) and maternal aggression (MA) on Angus (n=49), Hereford (n=12), and Crossbred (n=44) calf birth weight and adjusted 205-day weight. Data were collected on 3- to 13-year-old Angus, Hereford, and Crossbred females and their calves from August to November 2023. Two separate scoring systems were developed to evaluate MA and MOM based on a scale of 1 to 5 with a MA of 1 being a non-aggressive (flees without calf) dam and 5 being an aggressive (displays fight response) dam, and a MOM score of 1 being an uninterested (no signs of nurturing) dam and 5 being an interested (nurtures calf) dam. Mothering ability and MA scores were taken at calving by two trained technicians, and the average of the two scores was recorded under the respective category. Data were analyzed using SAS with significance declared at $P \leq 0.05$. The model included birth weight and 205-day weight as the response variables with levels of MA and MOM as fixed variables with sire of the calf as a random variable. Maternal aggression was shown to significantly affect calf birth weight ($P < 0.0015$). Calves born to dams that scored a 4 had larger birth weights compared to calves born to dams with a score of 3. Birth weights for MA were similar for all other comparisons ($P > 0.05$). There was no effect of maternal aggression on 205-day weight ($P > 0.05$) or mothering ability on birth weight or 205-day weight ($P > 0.05$). Results indicate that a maternal aggression could have an impact on calf performance.

188
Name: Dill, Catelyn
Major: Biological Sciences - Bachelor of Science
Faculty Advisor: Priyadarshini Basu, Biochemistry, Molecular Biology, Entomology, and Plant Pathology
Co-Author(s): Lauren Jennings, Ramesh Sagili
Funding: ORED Undergraduate Research Program, USDA (AFRI)
Project Category: Biological and Life Sciences

Creating a Pollen Nutritional Database for North America

Bees are essential pollinators for a majority of the commercial produce and native angiosperms. There are a variety of stressors affecting bee populations, such as pesticide use, pathogenic infection, and climate change; however, a stressor that is often overlooked is poor nutrition. Having a nutritious diet for bee populations is crucial in terms of proper immune function, larvae development, and overall colony health. Therefore, it is essential that melittologists and agriculturists have an understanding of pollen nutritional quality from angiosperms and crops in which bees pollinate, seeing as pollen is the source of protein, lipids, vitamins, minerals, phytochemicals, and phytosterols for bee populations. Creating a nutritional database that is accessible to researchers, farmers, and the general public will be beneficial in strengthening bee populations across the country. This poster describes the methods used to quantify the macromolecule content in pollen and how the results may appear in the foundational database.

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Name: Dill, Jane Alice
Major: Wildlife, Fisheries & Aqua - Bachelor of Science
Faculty Advisor: Todd Mlsna, Chemistry
Co-Author(s): Prashan M. Rodrigo, Charles U. Pittman Jr.
Funding: NSF REU: #1852527
Project Category: Physical Sciences

Removal of As(V)- Contaminated Wastewater Using Magnetite-laden Biochar

Magnetite nanoparticles were synthesized on biochar (Fe_3O_4/BC) using chemical co-precipitation. Fe_3O_4/DFBC was used here to remediate As(V) contaminated water. pH 5 was selected as the optimized pH due to low iron leaching and closeness to groundwater pH. Sorption equilibriums were reached after 3h, 2h, and 1h for 0.5, 5, and 50 mg/L initial As(V) concentrations, respectively. Sorption was exothermic, and Langmuir capacity was 6.33 mg/g at 25°C. The effect of ionic strength, the impact of Fe_3O_4/BC particle size, and the effect of competitive ions/molecules were studied on As(V) sorption. The key concept was to study the simultaneous adsorption and transformation of highly toxic As(III) to As(V) from pH 1-13, and the optimum pH obtained was 3. Continuous-flow fixed-bed column breakthrough study was carried out at 0.5, 5, and 50 mg/L and maximum capacities were 3.47, 3.49, and 3.72 mg/g, respectively. Potassium phosphate was used for the column regeneration study. Fe_3O_4/BC was characterized by scanning electron microscopy (SEM), transmission electron microscopy (TEM), and Mössbauer spectroscopy after and before laden with As. In addition, a pH-dependent (pH 1-13) surface sorption mechanism was studied by X-ray photoelectron spectroscopy (XPS).

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Name: Doherty, Jordan
Major: Kinesiology - Bachelor of Science
Faculty Advisor: Harish Chander, Kinesiology
Co-Author(s): Emma Conley, Hunter Derby, Adam Knight
Project Category: Education

The Impact of Athletic Footwear With Localized Compression On Postural Stability

Lateral ankle sprains are a common occurrence in sports and recreational activities. Resulting in damage to both active and passive tissues within the ankle joint, lateral ankle sprains have the potential to negatively affect postural stability via reductions in proprioceptive feedback. Athletic shoes that include a compression sock has been developed to provide localized compression around the ankle joint to enhance proprioception and improve postural stability. Therefore, the purpose of this study was to investigate the effects an athletic shoe with a built-in compression sock on postural stability. Twenty healthy participants [12 males, 8 females; age: 20.95 ± 0.96 years] completed the modified clinical test of sensory integration in balance (mCTSIB) in barefoot (BF), Nike Hypervenom X indoor soccer shoe with a built-in compression sock (S), and Nike Hypervenom X indoor soccer shoe without a built-in compression sock (NS). Footwear condition was assigned in a counterbalance order. Center of pressure (COP) path length (cm) was analyzed using a 3 (footwear condition: BF, NS, S) x 4 (balance conditions: eyes open (EO), eyes closed (EC), eyes open foam surface (EOF), and eyes closed foam surface (ECF) with an alpha level set at 0.05. Results from the current study revealed significant differences in balance performance between balance conditions ($p < 0.001$). In addition, a significant interaction was observed between footwear condition and balance condition ($p < 0.001$). Post hoc comparisons revealed that during ECF trials, NS ($p = 0.04$) and S ($p < 0.001$) elicited significantly greater postural stability compared to BF conditions. No significant main effects were observed between footwear. The current findings indicate that when other sensory systems are manipulated, athletic footwear may aid to improve postural control regardless of the application of localized compression of the ankle joint.

122

Name: Duncan, Whitney
Major: Civil Engineering - Bachelor of Science

Faculty Advisor: Saeed Rokooei, Building Construction Science
Co-Author(s): Kylan Welford
Project Category: Social Sciences

Cultivating Environmental Justice and Community Resilience Education for Female Underrepresented College Students
The state of Louisiana has historically been prone to devastating winds, storm surges, and flooding from hurricanes and, in recent decades, has seen the imminent threat and effects of rising sea levels. Louisiana's large population is at risk due to the natural disasters as well as marshes that contain numerous species and communities. Factors such as poverty, deep dependence on the natural resources, and high vulnerability to natural hazards are often associated with Louisiana's coastal communities; however, time has shown the adaptability and resilience of the inhabitants of the areas. This research examined the economical, sociological, and infrastructural ability to prepare, respond, and recover from natural disasters in the wake of inevident coastal sea level rises, particularly along the Louisiana coastline. The focus of this research was to assess the combative efforts of Louisiana's government and local communities to build lasting and adaptive structures. Research was conducted using news sources, professional journals, and local experiences to understand and analyze the constructive methods that are being implemented across the state. Billions have been spent to construct levees and other restorative measures such as sediment diversion to combat the effect of rising levels of sea waters and increased natural disasters. One such initiative known as the Louisiana Fortify Homes Program has incentivized homeowners with grants of up to $10,000 to implement roofs that can withstand 150 mph winds and prevent water leakage. In addition, this research examines smaller scale projects such as Glass Half Full Nola which is using recycled glass to create eco-constructive sand and gravel used for disaster relief and restoration. It is apparent that the people of Louisiana have not let destructive environmental phenomena diminish the pride and connections they have to the land and will continue to advocate for the place they call home.

9
Name: Elchos, Honor
Major: Biomedical Engineering - Bachelor of Science
Faculty Advisor: Lauren Priddy, Agricultural and Biological Engineering
Co-Author(s): Jaydon Gibson, Brooke Kouba, April Gyo-Yue
Project Category: Engineering

Custom Chamber for Cell Seeding of Scaffolds for Tissue Engineering
Seeding of cells onto biomaterial scaffolds is crucial in tissue engineering to initiate tissue growth. Cell seeding methods include two categories: static seeding, where cells are suspended in a medium and passively adhere to the scaffold over time, and dynamic seeding, which incorporates fluid flow through the scaffold to enhance cell adhesion. Static seeding techniques often yield insufficient attachment and inhomogeneous distribution of cells on scaffolds. Thus, the aim of our current study was to improve cell attachment on poly(lactic-co-glycolic acid) (PLGA) scaffolds using a dynamic method known as oscillation seeding. PLGA scaffolds are biocompatible and easily fabricated via 3D printing. This study uses MC3T3 pre-osteoblast cells because they adhere well, proliferate quickly, are genetically stable, and can be cultured in standard cell culturing media. A custom seeding chamber was designed to accommodate dynamic forces of oscillation seeding, via a peristaltic pump that utilizes rollers to mechanically move the cell suspension through the chamber system in one direction. The chamber comprises two sections: an outer casing, designed as a cube with adapters on both sides for unidirectional media flow, and an inner circular core which will be rotated 180° at various intervals during the seeding process, allowing for flow in the opposite direction (relative to the scaffolds). The core is divided into three hallways, each accommodating two scaffolds, featuring individual adapters to hold the scaffolds in place and promote perfusion through the scaffolds. Ultimately, this custom chamber is designed to facilitate uniform distribution of cells throughout all six scaffolds in a repeatable manner. A test was conducted perfusing methylene blue dye (as a surrogate for cells) through the chamber to evaluate the distribution of flow throughout the scaffolds.

10
Name: Ellis, Daniel
Major: Mechanical Engineering - Bachelor of Science
Faculty Advisor: Alta Knizley, Institute for Clean Energy Technology
Co-Author(s): Russell Thompson
Funding: Department of Energy Office of Environmental Management
Project Category: Engineering

Investigation into Electrospun Polymer Nanofibers as a Filtration Media
Filters and filtration systems are widely used to ensure environmental protection from air contaminants. The Department of Energy uses high-efficiency particulate absorbing (HEPA) filter requirements, which requires 99.97% aerosol removal efficiency, as a standard which many industries follow. One major flaw of standard HEPA filters is their susceptivity to water. A manufactured material called

electrospun polymer nanofibers, characterized by its ultrathin fibrous makeup, is being used in the biomedical and environmental engineering field for its waterproof capabilities. Typically, the material is created using a liquid polymer solution which has an electrostatic charge applied to it. This solution is released from a spinneret onto an oppositely charged plate, usually spinning in a certain direction, where layers of polymer fibers are deposited. As the droplets of solution leave the nozzle, they are stretched by electrostatic forces then the polymer dries in air as the fibers are settled onto the plate. Factors in the electrospinning process such as the solution's chemical make-up, mass flow rate, voltage drop, and length across the nozzle and plate can change the materials fibrous qualities. This study's purpose is to investigate electro spun material and its potential as a filter media. By adjusting these several factors on a laboratory electro spinner, the microscopic fibrous makeup is expected to change. With use of a scanning electron microscope (SEM) the microscopic fiber characteristics of the electro spun media can be imaged. The fiber characteristics such as size, shape, and overall makeup will be measured in ImageJ software and compared to each other and the standard HEPA filter to note the differences in the porous makeup of the materials. Results and conclusions are discussed, and future research is suggested.

67
Name: Enriquez, Jacqueline
Major: Architecture - Bachelor of Architecture
Faculty Advisor: Silvina Lopez Barrera, School of Architecture
Project Category: Arts, Music, & Design

Indigenous Technologies in Modern Architecture
The existence of vernacular architecture has remained around for countless centuries and can be described in many types of structures and forms all around the world that still stand today. This paper will further focus on vernacular technologies and their applications and impact in developing countries in modern architecture. Vernacular buildings are made of natural materials and traditional techniques that can be sustainable, resilient, and harmonious to the environment. The use of indigenous techniques has provided people with a home that is an affordable, natural, and comfortable environment. Although vernacular architecture makes up a high percentage of the world's existing buildings it is still being inadequately researched, which gives great concern and displays major challenges to keep these techniques alive. There are many different vernacular methods used in several parts of the world and this paper will study the methods corresponding to earth-building construction, troglodyte techniques, and bamboo techniques. These will look at how these techniques accommodate the needs of local people responding to the specific conditions of the environment, climate, and availability of local resources. Using case studies, it will investigate how indigenous architecture will use the natural landscape, local material, and vernacular techniques to achieve natural passive heating-cooling in a home to keep thermal comfort. For many people, these structures have been a comfortable shelter in various types of climates and regions. It has been passed on from generation to generation to accommodate the community and the resources available. Each of the case studies is located in a different region where there are similarities but also differences that include climate, materials, and culture. Finally, this research will discuss the discoveries investigated to support the connection between the indigenous technologies developing countries have and how they can be applied to modern architecture.

77
Name: Eubanks, Todd
Major: Ag Eng Tech & Bus - Bachelor of Science
Faculty Advisor: Seong Yun, Agricultural Economics
Co-Author(s): Chad Dacus, Will Maples
Project Category: Business & Economics

Bioeconomic Analysis of Agricultural Damage, Population, and Harvest: A Case Study of White-tailed Deer Management in Mississippi
In recent years, the State of Mississippi has been recorded to have one of the largest white-tailed deer (Odocoileus virginianus) populations in the US. This rapid reproduction and population influx has damaged the state's agricultural industry, as white-tailed deer feed on leading crops of Mississippi, such as soybeans, corn, and cotton, in addition to concerns about disease diffusion to livestock. The Risk Management Agency of the US Department of Agriculture reports that crop insurance indemnities for wildlife damage in Mississippi were $6.87 million from 2008 – 2022. Current wildlife management practices are taking place in Mississippi to lower the population of white-tailed deer, including hunting seasons (generally, Oct. to Jan.) and "depredation permits". A farmer can be issued a depredation permit to hunt outside of the season if the farmland presents significant indications of damage caused by white-tailed deer. This study evaluates the effectiveness of these current management practices by comparing yearly white-tailed deer population estimates and harvest rates. The results support the hypothesis that suppression efforts by the permit system in Mississippi are lower than the increase in population, explaining the recent population increase. Considering the recently lowered number of hunters, enhancing the harvest rate per hunting effort, i.e., hunting effectiveness, would be considered in policy instead of increasing the number of permits sold.

189
Name: Evans, Lana
Major: Biological Sciences - Bachelor of Science
Faculty Advisor: Dr. Jan Williams, Department of Pharmacology & Toxicology, University of Mississippi Medical Center
Co-Author(s): Jonita Cooper, Ubong Ekperikpe, Sautan Mandal, Anukool Bhopatkar
Funding: NSF REU: University of Mississippi Medical Center
Project Category: Biological and Life Sciences

Time restricted feeding reduces progressive proteinuria in obese Dahl salt-sensitive rats prior to puberty
Prepubertal obesity (PPO) is a major public health concern in the US and has been associated with early signs of renal injury. Sedentary lifestyle and improper eating behavior are two leading causes of PPO. Time restricted feeding (TRF) has been shown to improve cardiometabolic parameters in obese patients without reducing body weight. However, the effects of TRF on renal injury during PPO have not been investigated. Therefore, the current study examined whether TRF reduces renal injury in obese Dahl salt-sensitive leptin receptor mutant (SS^{LepR}mutant) rats before puberty. Four-week-old SS and SS^{LepR}mutant rats were given either ad libitum access to food for 24 hours (control group) or 8 hours during their active phase (TRF group) for 4 weeks. Body weight and food intake were significantly higher in SS^{LepR}mutant rats versus SS rats throughout the study. While TRF tended to decrease body weight and food intake during the first 2 weeks in SS^{LepR}mutant rats, TRF did not have an impact on both parameters by the end of the study. Fasting blood glucose levels were similar and within normal physiological range in all groups. Fasting plasma insulin levels were significantly higher in SS^{LepR}mutant rats versus SS rats, and TRF reduced fasting plasma insulin by 50% in SS^{LepR}mutant rats. Moreover, TRF markedly improved glucose tolerance and insulin sensitivity observed in SS^{LepR}mutant rats. At the end of the study, we did not observe any differences in MAP (via carotid catheter) among the groups. At baseline, proteinuria was significantly higher in SS^{LepR}mutant vs SS rats, and it remained higher throughout the study. TRF only reduced proteinuria in SS^{LepR}mutant rats. Glomerular injury and renal fibrosis were markedly greater in SS^{LepR}mutant vs SS rats, and TRF improved these histological changes. Interestingly, renal SGLT2 expression markedly elevated in SS^{LepR}mutant rats compared to SS rats, and TRF significantly normalized SGLT2 expression. Overall, these data suggest that TRF prevents the early progression of proteinuria by reducing insulin resistance during PPO independent of lowering arterial pressure.

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Name: Favre, Ethan
Major: Wildlife, Fisheries & Aqua - Bachelor of Science
Faculty Advisor: Michael Sandel, FWRC-Wildlife,Fisheries&Aquaculture
Funding: College of Agriculture and Life Sciences URSP
Project Category: Biological and Life Sciences

Microplastics in Cambarus Crayfishes
With the amount of debris and litter that is in wildlife, microplastics are beginning to be more commonly found throughout organisms. A microplastic is a particle less than 5mm in diameter that is the beginning process of making plastic objects. Microplastics inside of organisms over time will begin to release toxins that will ultimately kill them. If there are plastics inside of something like crayfish, an organism that many people enjoy eating, it should be documented that the possible threat of eating plastics. My goal for my undergraduate research is to identify if there are any forms of microplastics in crayfish. Collecting samples all across Starkville, Mississippi and the Noxubee Wildlife Refuge is the intended goal, followed by blending up my samples to see how much plastic is truly inside crayfish. After blending the samples, the microplastics will float to the top of the solution, where I will identify the amount of plastic by looking under a microscope and seeing on graphing disc paper. The different habitats around Starkville also impact how crayfish are affected or have microplastics in them. I think that regardless of the areas of habitat, there are going to be microplastics found in some manner. For example, in areas of the Refuge that you would not think to find plastics, there were pieces of trash found. My research will show the importance in keeping wildlife clean of plastic or any other waste. If we do not keep nature clean, we will start to affect ourselves starting with the food that nature provides for us. Acknowledgments: David Pounders

191
Name: Feduccia, James
Major: Biochemistry - Bachelor of Science
Faculty Advisor: Galen Collins, Biochemistry, Molecular Biology, Entomology, and Plant Pathology
Funding: Shackouls Honors College Research Fellowship
Project Category: Biological and Life Sciences

Detecting Neuroinflammatory Signals from a Mutation in PSMC5

The Ubiquitin-Proteasome Pathway helps maintain cellular health by removing misfolded or damaged proteins. It does this by first marking proteins for degradation with ubiquitin and then by breaking down these proteins through the 26S proteasome. Besides general proteostasis, it also participates in immune function by producing antigens for binding to MHC I class molecules. Recently, a mutation in one of the 26S proteasome genes, PSMC5, has found in multiple individuals and linked to their exhibition of Autism Spectrum Disorder-like symptoms. PSMC5 uses ATP hydrolysis to unfold substrates for efficient degradation, therefore a deleterious mutation in this subunit interferes with the proteasome's ability to function properly. The breakdown of the proteasome's activity can induce cell death and neurodegeneration through accelerated aggregation of misfolded proteins. We hypothesize that not only does the PSMC5 mutation disrupts regular proteasome function, but it also causes neuroinflammation that leads to ASD-like symptoms. To determine this, I am measuring changes in the transcriptional activity of genes associated with inflammation and the immune response using quantitative PCR from a neuroblastoma cell line with CRISPR-induced mutation of PSMC5. We thus hope to determine if an inherent inflammatory signal exists in cells with this PSMC5 mutation, which would be an important basis for understanding this disease.

192
Name: Ferguson, Luke
Major: Nat Res & Envir Conservation - Bachelor of Science
Faculty Advisor: Krishna Poudel, FWRC - Forestry
Funding: Forest and Wildlife Research Center and the CFR/FWRC Undergraduate Research Scholars Program
Project Category: Biological and Life Sciences

Quantifying carbon sequestration by trees on Mississippi State University Campus

The issues of climate change have become especially exacerbated due to the exponential increase in the earth's population, and as the earth's population increases, more and more people are moving into urban areas. As a result, anthropogenic activities cause urban areas to become a major source of greenhouse gas emissions contributing to climate change. One of the many ecosystem services that forests provide is reducing greenhouse gas emissions through sequestering and storing carbon. Because of this, urban forests can be a helpful tool in reducing carbon emissions from urban areas. The aim of this study was to show how useful urban forests can be in mitigating carbon emissions, and how they can be a solution for climate change. To show this, trees from Mississippi State University's campus were inventoried and the carbon sequestering/storing potential was computed. Dendrometric data such as diameter at breast height (1.3m above ground), total height, canopy top height, canopy height, crown base height, crown width both n/s and e/w, and condition were collected for each individual tree using a 100% urban forestry cruise on Mississippi State University's campus. Allometric equations developed by Jenkins et al. (2003) was used to calculate above-ground biomass for each tree. Then, by using a series of conversions, total carbon dioxide weight was estimated for each tree. Together, the top five oxygen-producing species on campus sequestered a gross carbon total of 1420.31 kg/year. Total carbon dioxide weight for all trees on campus was 1,083,069.6 $kgCO_2$ equivalent. The study shows that urban forests have great potential for combating climate change. Due to a host of other benefits urban forests provide, development of proper management plans for them should be a key aspect in urban planning.

123
Name: Fernandez, Michael
Major: Psychology - Bachelor of Science
Faculty Advisor: Mary Dozier, Psychology
Project Category: Social Sciences

Hoarding Severity and Levels of Clutter as it Relates to the Five-factor Model of Personality within Older Adults with Hoarding Disorder

Hoarding disorder is outlined by intense difficulty parting with and/or discarding personal belongings resulting in an abnormal and sometimes dangerous amount of clutter (Mathes et al., 2020). The Five-factor Model of Personality outlines elements of personality within an individual by measuring their levels of openness, conscientiousness, extraversion, agreeableness, and neuroticism (Baranczuk, 2019). There is an identifiable relationship between mental disorders and the five-factor model, including aspects like high levels of neuroticism and low levels of agreeableness in individuals with clinical disorders (Malouff, 2005). The goal of this study was to identify how these different personality aspects present themselves in older adults with hoarding disorder. Forty-four older adults (mean age 50; SD=9.4) completed a comprehensive baseline assessment in their homes as part of a treatment study. Hoarding severity was assessed using the Saving Inventory-Revised (Frost et al., 2004) and the Clutter Image Rating (Frost et al., 2008). Personality was assessed using the IPIP-60-NEO (Maples-Keller et al., 2019). Pearson correlations were used to assess the association between hoarding severity and the five-factor model of personality. Hoarding severity on the SI-R Total was significantly correlated with Conscientiousness (r=-.35, p=.03) and Neuroticism (r=.36, p=.02). Clutter level on the CIR was not significantly correlated with any of the personality factors. The ability to highlight certain personality traits that may be present in older adults with hoarding disorder helps further define the elements that may give rise to the development of hoarding disorder. Hoarding severity in older adults was significantly correlated with levels of

conscientiousness and neuroticism, however, clutter level was not correlated with any of the personality factors. This highlights an important idea that hoarding is not just excessive clutter, but there are personal and psychological factors that play into its severity in older individuals.

193
Name: Flanagan, Brayden
Major: Civil Engineering - Bachelor of Science
Faculty Advisor: Prashan Rodrigo, Chemistry
Co-Author(s): Charles U. Pittman Jr., Todd E. Mlsna
Funding: USDA
Project Category: Biological and Life Sciences

Urea-coated Manganese Ferrite Nanoparticles Dispersed on Biochar as a slow-release Fertilizer
The food demand is constantly increasing with the world's population growth, and agricultural sustainability is an inevitable requirement needed to fulfill this demand. The use of fertilizers is essential to improve crop yield and maintain soil fertility; however, most fertilizers like Urea are highly water soluble, resulting in contamination of stormwater runoff and eutrophication in ground and surface water. Urea fertilizer is one of the most common nitrogen fertilizers in the world. Nitrogen is an essential macronutrient for plant growth and plant reproduction. Rice husk is one of the major byproducts worldwide. In this project, rice husks were converted to rice husk biochar (BC) under reduced oxygen conditions at 430°C. Then, $MnFe_2O_4$ nanoparticles were synthesized on rice husk biochar by adding a 1:2 molar ratio of $MnCl_2$ and $FeCl_3$ followed by raising the pH to 9.40 by adding NH_4OH. Urea was adsorbed on $MnFe_2O_4$ nanoparticles dispersed in rice husk biochar to synthesize our desired controlled-release urea fertilizer ($Urea/MnFe_2O_4/BC$). A greenhouse experiment was performed to check the suitability of $Urea/MnFe_2O_4/BC$. Treatments included 1) control, 2) urea powder as reference fertilizer-1X, 3) untreated BC with urea powder-1X, 4) Urea absorbed BC-1X, 5) Urea absorbed BC-2X, 6) $MnFe_2O_4/BC$ with urea powder-1X, 7) $Urea/MnFe_2O_4/BC$-1X, and 8) $Urea/MnFe_2O_4/BC$-2X. Here the N, P_2O_5, K_2O, lime, and Mg rates were maintained as 100 kg N ha^{-1}, 60 kg P_2O_5 ha^{-1}, 50 kg K_2O ha^{-1}, 500 kg lime ha^{-1}, 20 kg Mg ha^{-1} and 22.42 kg ha^{-1}, respectively. Rice husk biochar (BC), Urea/BC, $MnFe_2O_4/BC$, and $Urea/MnFe_2O_4/BC$ materials were characterized by scanning electron microscopy, x-ray photoelectron microscopy, x-ray diffraction, and elemental analysis. Further, Urea leaching studies were performed at different pH values for Urea/BC and $Urea/MnFe_2O_4/BC$ materials.

124
Name: Forman, Kathleen
Major: Ag Educ., Leadership & Comm - Bachelor of Science
Faculty Advisor: Carley Morrison, School of Human Sciences
Co-Author(s): OP McCubbins, Jesse Morrison
Funding: College of Agriculture and Life Sciences URSP
Project Category: Social Sciences

Identifying Stress Factors in Informally Trained Educators
With rising workplace expectations and changes to the traditional postsecondary classroom, higher levels of stress have been reported for university educators. In the wake of COVID-19 and the growing use of online and hybrid classes, educators are faced with many challenges in balancing their workload. Previous research investigated different stressors for educators, but there is a lack of current research reflecting the stressors that informally trained educators face as compared to instructors and professors with a background in education. The Faculty Stress Index (FSI) was adapted to meet the needs of a more technologically advanced educational environment. The survey instrument was sent out to faculty teaching courses within the College of Agriculture and Life Sciences at Mississippi State University. The results of this research indicated high levels of stress for postsecondary educators, further justifying previous literature, and an overall higher level of stress in informally trained educators as compared to formally trained. We recommend administrators implement more training and support for educators to combat workplace stress. Increased support from administrators and opportunities for professional development can alleviate stress for faculty creating a more positive teaching and learning environment for teachers and students alike.

125
Name: Fortinberry, Hayden
Major: Social Work - Bachelor of Social Work
Faculty Advisor: Laura Boltz, Sociology
Project Category: Social Sciences

Mental Health and Greek Life at MSU
This study aims to address the gap in literature surrounding mental health and Greek life. After receiving a survey, chapter presidents at Mississippi State University were asked to disperse the survey to their members. After two weeks, the survey was closed, and the results were analyzed. The survey results showed that 27% of Greek-affiliated students had been previously diagnosed with a mental health issue with anxiety being the most common. Most students also reported that being a member of Greek life had a positive impact on their mental health which is synonymous with previously studies claiming that extra-curricular activities improve mental health.

11
Name: Frederick, Madeline
Major: Computer Science - Bachelor of Science
Faculty Advisor: Christopher Hudson, Center for Advanced Vehicular Systems
Project Category: Engineering

Testing the Accuracy of LIDAR-based Mapping and Localization on an Unmanned Ground Vehicle
As autonomous navigation becomes more relevant, ensuring the accuracy and precision of LIDAR-generated maps and localization becomes crucial. Using hdl_graph_slam, an open-source Robot Operating System (ROS) package based on 3D Graph SLAM with Normal Distributions Transform (NDT) matching-based odometry and loop detection, my research aims to increase understanding and optimization of LIDAR-based mapping and localization methods. These techniques play a crucial role in achieving highly accurate maps and precise localization estimates, thereby contributing to the reliability and accuracy of autonomous navigation systems. In pursuit of this goal, I will design and execute a series of field tests designed to examine the accuracy of these maps and localization outputs. The utilization of a LIDAR sensor for map creation presents a significant challenge – we need to know the LIDAR's location before mapping can occur. SLAM resolves this issue by simultaneously generating a map of the unknown environment and handling localization. In addition to field tests, I will record rosbag data at multiple speeds and process it in the lab to calculate various metrics, including overlap displacement error (ODE), absolute trajectory error (ATE), and relative trajectory error (RTE) for both linear and angular motion. These metrics will provide comprehensive insights into the efficiency and accuracy of the SLAM-generated maps. Ultimately, this research contributes to the bettering of LIDAR-based mapping and localization, advancing the navigational capabilities of unmanned ground vehicles in diverse terrains with better precision. Through methodical testing and rigorous analysis, I aim to boost confidence in the application of LIDAR technology within autonomous systems, paving the way for more reliable navigation solutions.

194
Name: Freelon, Ke'Daja
Major: Wildlife, Fisheries & Aqua - Bachelor of Science
Faculty Advisor: Sandra Correa, FWRC-Wildlife,Fisheries&Aquaculture
Co-Author(s): Julia Null, Grant Peterson
Funding: CFR-FWRC Undergraduate Research Program
Project Category: Biological and Life Sciences

Using a Genetic Approach for the Identification and Phylogenic Study of Larval Fish Species in the Seasonally Flooded Forests Alongside the Pascagoula River
While research has shown that floodplain forests serve as critical habitat for adult freshwater fish, little is known about fish in their early life stages. Thus, determining the species composition of larval and juvenile fish communities in Southeastern flooded forests has important implications for further wetland and critical fish habitat conservation measures. Larval and juvenile fish species can be difficult to morphologically differentiate due to their underdeveloped pigmentation and lack of distinguishable characteristics. Molecular tools and techniques are emerging resources capable of identifying organisms at the species level. Our aim is to elucidate the identity of larval and juvenile fish species through DNA extraction and PCR amplification of mitochondrial DNA, which will illustrate the relationship between fish phylogeny, age class, and their geospatial patterns of habitat use and selection. The samples with less species identification confidence were categorized and ranked into three main priority groups, priority 1 being the least identifiable and priority 3 being the most identifiable by species. The 266 samples that were separated into priority groups 1 and 2 were then put through the DNA extraction process. The extracted DNA samples were tested for purity and PCR viability to ensure successful downstream PCR amplification of the mitochondrial DNA. 85 percent of our extracted samples proved adequate for the next steps in the PCR process, which will enable us to verify and analyze the varying identities of Southeastern fish species and their geospatial distributions in association with varying age classes in the seasonally flooded forests. This data will provide further implications for the conservation of vital larval and juvenile fish habitat and emphasize the importance of maintaining river ecosystem connectivity.

126
Name: Freeman, Margaret
Major: Psychology - Bachelor of Science

Faculty Advisor: Cliff McKinney, Psychology
Project Category: Social Sciences

Relation Between Parental Physical Abuse and Psychological Problems Moderated by Conservative Religiosity

The current study examined the relation between parental physical abuse and emerging adults' psychological problems moderated by the level of conservative religiosity of participants. Previous studies have found a uniquely strong correlation between physical abuse in childhood and high levels of anger and depressed mood (Sigurvindottir et al., 2021). Studies have also found that religiosity is a significant safeguard against psychological problems caused by childhood abuse (Jung, 2018). There is significant research showing that using religion as a coping strategy in adulthood can combat the residual negative psychological effects of physical abuse in childhood (Upenieks, 2021). 574 emerging adults completed the Adult Self-Report (ASR; Achenbach & Rescorla, 2003) to assess overall psychological issues, the Conflict Tactics Scale – Parent Child (CTSPC; Straus et al., 1998) to measure physical maltreatment of participants by mothers and fathers over the past year, and the Stearns-McKinney Assessment of Religious Traits (SMART; Stearns & McKinney, 2019) to measure conservative religiosity of participants. Mother's physical abuse was associated positively with psychological problems, $B = 0.20$, $SE = 0.03$, $p < .001$. Conservative religiosity was associated negatively with psychological problems, $B = -0.38$, $SE = 0.15$, $p = .01$. The interaction between mother's physical abuse and conservative religiosity was significant, $B = 0.01$, $SE = 0.003$, $p = .009$. Father's physical abuse was associated positively with psychological problems, $B = 0.30$, $SE = 0.06$, $p < .001$. Conservative religiosity was negatively associated with psychological problems, $B = -0.42$, $SE = 0.16$, $p = .009$. The interaction between father's physical abuse and conservative religiosity was not significant, $B = -0.001$, $SE = 0.006$, $p = .82$. Results indicate that religiosity is significantly associated with psychological problems related to physical abuse by mothers only. At high conservative religiosity, maternal physical abuse in the past year was more highly related to psychological problems than at moderate or low conservative religiosity.

95
Name: French, Anderson
Major: Kinesiology - Bachelor of Science
Faculty Advisor: Chen Chih-Chia, Kinesiology
Co-Author(s): Anderson French
Project Category: Education

The Associations between Sleep Quality and Skill-related Physical Fitness in College Students: A Preliminary Study

College students often cut short their sleep time to deal with the overwhelming challenges of transitioning from high school to college. Thus, a high prevalence of poor sleep quality is an area of inquiry that requires closer scrutiny. This study examined the relationship between sleep quality and physical fitness. Twenty-seven students participated in the 100-yard dash test, quadrant jump test, and standing long jump test to assess speed, agility, and power abilities. The Pittsburgh Sleep Quality Index (PSQI) was used to measure sleep problems. Results indicated participants with poor sleep quality had significantly higher scores in sleep latency, daytime sleepiness, and global PSQI index. The preliminary results had a significantly positive association between the performance of standing long jump test and the use of sleep medication ($p = .044$). Individuals who used sleep medication more frequently performed better in standing long jump test. A significantly adverse association between the performance of the 100-yard dash test and sleep latency was also evident ($p = .045$). Although participants had longer sleep latency, they had shorter completed times in the 100-yard dash test due to the use of sleep medications. These results suggest some associations between sleep quality and physical performance in young adults.

195
Name: Fullerton, Sarah
Major: Nat Res & Envir Conservation - Bachelor of Science
Faculty Advisor: Courtney Siegert, FWRC - Forestry
Co-Author(s): Waqar Shafqat, Austin Himes, Heidi Renninger
Project Category: Biological and Life Sciences

Populus Genotype Diversity Improves Nutrient Uptake from Agricultural Runoff

Populus species and their hybrids represent ideal short rotation woody crops (SRWC) with high biomass productivity. As a consequence of high growth rates, these trees may require higher nutrient inputs. However, careful location of SRWC plantations to capture agricultural nutrient runoff may improve water quality. Furthermore, the diversity of genotypes in a SRWC production system may impact nutrient uptake. To explore these relationships, we established two field trials evaluating nitrogen and phosphorus uptake from shallow groundwater as a function of taxonomic and functional diversity using three Populus taxa (P. deltoides × P. deltoides (D×D), P. deltoides × P. tricocarpa (D×T), and P. deltoides × P. maximowizcii (D×M)) each with genotypes exhibiting high and low nitrogen use efficiency (NUE). Following two growing seasons, we observed higher uptake of nitrate and ammonium by high NUE genotypes compared to low NUE genotypes in single-genotype plots. We also observed an increase in nitrate uptake due to taxonomic diversity in

multi-genotype plots of high NUE. Results from the third growing season are still pending. Our findings provide preliminary evidence that functional and taxonomic diversity could be leveraged in SRWC cultural practices and improve environmental services, specifically water quality.

127
Name: Garcia, Katie
Major: Fashion Design & Merchandising - Bachelor of Science
Faculty Advisor: Iva Ballard, College of Business
Co-Author(s): Stephen Trest
Project Category: Social Sciences

Rugby and American Football Injuries and Their Impact on Student Academic Achievement and Wellbeing
The purpose of this research is to investigate the impact participation in collegiate American football and rugby and their injuries have on student academic achievement and wellbeing. Prior literature reviews on the topic have primarily focused on the physical aspects of the sports and have failed to relate these effects to academic abilities. To complete this research, we selected studies that focus on academic success as it relates to sports participation at the professional, college, club, and intramural level as well as team sports participation and its effect on student wellbeing. Additionally, we selected studies specific to sports-related injuries, primarily concussions, to further investigate ideal recovery times and lasting academic effects, which may directly or indirectly impact academic achievement. Furthermore, we evaluated the long-term effects of concussions that were diagnosed earlier in life. This presentation provides a summary of what each study investigates, its methodology, and results as provided by the authors. In addition, we present conclusions, comparisons and contrasts of the results and findings, limitations, and further recommendations for future studies. We found there are benefits and risks associated with these high impact sports. Although there is evidence to indicate that injuries related to these sports can negatively impact athletes' academic performance and long-term health, evidence also supports that participation in such sports can improve students' health and academic lives. Through this literature review, we hope that students will be able to assess risks and benefits associated with rugby and American football and be better equipped in making the decision of whether they should participate in these sports.

12
Name: Geiselman, Jade
Major: Electrical Engineering - Bachelor of Science
Faculty Advisor: Jean Mohammadi-Aragh, Electrical and Computer Engineering
Project Category: Engineering

Developing and Testing a Virtual Reality Training Simulation for Power Wheelchair Operation
While driving a power wheelchair may appear to be a simple task, the reality is that it takes specific motor, visual, and cognitive skills in order for an individual to be able to proficiently operate one of these machines. This thesis introduces and tests the efficiency of a self-developed virtual reality (VR) wheelchair training simulation experienced through an Oculus Quest 2 headset. Ten participants, with no prior power wheelchair experience, undergo real-world obstacle course trials and five sessions of the VR simulation. This study aims to assess the transferability of skills developed in the VR environment to real-world scenarios. The research aims to explore the feasibility of developing engaging, cost-effective, and accessible training systems in the field of rehabilitation and assistive technology.

13
Name: Ghannami, Naoufel
Major: Mechanical Engineering - Bachelor of Science
Faculty Advisor: Mohsen Azimi, Mechanical Engineering
Co-Author(s): Olivia Leatherman, Abel Nettles, Ethan Vallegra, Matthew Templeton, Dalila Belaidi
Project Category: Engineering

Resilience Quantification of Space Habitats through Virtual Testing
Resilience, the ability of a system to absorb disturbances while maintaining its core functions and adapting to changing conditions, stands as a cornerstone in the design and operation of complex systems such as space habitats. Therefore, quantifying the resilience of a system assumes paramount importance, particularly in domain of space habitats where the transition between states is susceptible to disturbance events. The ability to withstand and recover from such disruptions is not merely a theoretical consideration but a practical necessity. Various methodologies have been employed to quantify the resilience of systems in response to disruptions. While they offer valuable insights into assessing and prioritizing vulnerabilities in various network systems, including transportation and infrastructure, there appears to be a gap in research pertaining to resilience in the context of extraterrestrial habitats. This is due to the distinct challenges and considerations that differ significantly from terrestrial networks. With the aim of quantifying the resilience of a space

habitat, the Modular Coupled Virtual Testbed, developed by Resilient Extra-Terrestrial Habitats Institute, offers a valuable tool for simulating disturbance scenarios within space habitats' systems. By harnessing the datasets generated, a set of metrics can be computed. Integrating two methodologies—temporal performance analysis and network-centric approaches—allows for a comprehensive evaluation of the habitat's resilience across diverse conditions. This evaluation aids in developing a robust decision-making framework to address potential failures effectively and facilitate a seamless decommissioning of the habitat when necessary.

14
Name: Ghimire, Niraj
Major: Computer Science - Bachelor of Science
Faculty Advisor: Haifeng Wang, Industrial and Systems Engineering
Funding: ORED Undergraduate Research Program
Project Category: Engineering

Comparative Analysis of Sleep Patterns in ADHD and Non-ADHD
Sleep patterns play a crucial role in overall health and well-being, yet they are often disrupted in individuals with Attention Deficit Hyperactivity Disorder (ADHD). This research aims to investigate the differences in sleep patterns between ADHD and Non-ADHD groups, shedding light on potential implications for diagnosis and treatment.
Using a comparative approach, we analyzed sleep data collected from participants belonging to both ADHD and Non-ADHD groups. Various parameters, such as brain activity in different stages during sleep, were examined using polysomnography and self-report measures.
The study utilized real clinical data. A series of data preprocessing and cleaning approaches has been used. Statistical analyses were employed to identify significant differences in sleep patterns between the two groups.
Understanding the unique sleep patterns linked to ADHD can have a significant impact on early detection and intervention strategies. Individuals with ADHD often experience difficulties with falling sleep, staying sleep, and having good quality sleep in general. These disruptions can exacerbate symptoms of ADHD, such as impulsivity, inattention, and hyperactivity, leading to impaired daytime functioning and decreased quality of life.
By interpreting these differences, this research aims to contribute to the development of specific measures aimed at improving sleep quality and overall well-being in individuals with ADHD. Additionally, insights gained from this study may inform early detection strategies and personalized treatment approaches for individuals with ADHD, ultimately enhancing their overall health and functioning.

15
Name: Giacobbe, Leonel
Major: Computer Science - Bachelor of Science
Faculty Advisor: Christopher Hudson, Center for Advanced Vehicular Systems
Co-Author(s): I'Jerius Brown
Funding: ORED Undergraduate Research Program
Project Category: Engineering

Deploying the Robot Operating System 2 (ROS2) and the Navigation2 stack to a 1/10 scale RC Vehicle
This project integrates the Robot Operating System 2 (ROS2) and the Navigation2 stack on a 1/10th scale RC vehicle equipped with an OAK-D short range stereo camera and a Aceinna OpenRTK GPS/IMU unit. The stereo camera generates Point Cloud data, a set of discrete data points organized in space to provide 3D modeling and visualization from the robot's perspective. The IMU is used to determine the geographical position and orientation of the robot in space. Using this data, the vehicle can conduct Simultaneous Localization and Mapping (SLAM), a popular method used in autonomous navigation where a robot can generate a map and localize itself within that map at the same time. An NVIDIA Jetson AGX is used as the computing unit where the data received from the sensors gets processed and converted into an occupancy grid. This occupancy grid is then provided to a path planning algorithm, which communicates with the vehicle's motor controller to execute the necessary commands to follow the planned path. An additional layer of complexity is also added to this project: while most autonomous vehicles navigate a flat 2D plane, the dirt track in which this vehicle was trained has numerous bumps, ditches and irregularities. The importance of this research lies in the fact that much of the software and methods used in the autonomy of a 1/10 scale RC vehicle can be scaled up and utilized in medium scale autonomous vehicles. This provides a more economically feasible way of testing new autonomy software and is also a simpler way of introducing students to the world of robotics.

196
Name: Gillum, Jillian
Major: Animal and Dairy Science - Bachelor of Science
Faculty Advisor: Pratima Acharya Adhikari, Poultry Science

Co-Author(s): ElsiAnna Rodewald, Xixi Chen
Funding: College of Agriculture and Life Sciences URSP
Project Category: Biological and Life Sciences

The effects of replacing inorganic and organic trace minerals with a micro-coated mineral complex in late-lay laying hen diets on performance, bone health, mineral excretion, and digestibility

The objective of this study was to evaluate the effects of a micro-coated mineral complex (MinCo) when compared with organic (OTM) and inorganic trace minerals (ITM) on performance and egg quality in laying hens. A total of 192 71-week-old Dekalb White laying hens were placed in 48 cages, with four hens per cage and 16 replications per treatment in the caged-layer facility at the Poultry Research Center of Mississippi State University. The three dietary treatments were fed for 12 weeks and included a corn-soybean mash basal diet with 1) 0.25% OTM, 2) 0.125% ITM, and 3) 0.035% MinCo. Data was analyzed by one-way ANOVA with PROC GLM SAS 9.4. Differences were considered significant at $P \leq 0.05$ and a trend at $P < 0.1$.

Trace mineral intake values for Fe, Mn, Cu, and Zn were significantly different across treatments ($P < 0.001$), where the ITM group had the highest intake of Fe (293 mg/d) and Zn (107 mg/d), the OTM group had the highest intake of Mn (147 mg/d) and Cu (38 mg/d) while the MinCo group had the lowest intake of Mn (81 mg/d), Cu (18 mg/d), and Zn (77 mg/d). There was a trend ($P = 0.0605$) in hen day egg production (HDEP) where the OTM group was lower than ITM, but was not different than the MinCo group. No significant differences were observed between treatments for average egg weight and egg quality metrics, including Haugh Unit, Yolk Weight, Shell Weight, Albumen Weight, Shell Thickness, and Egg Breaking Strength. In summary, feeding the MinCo micro-coated mineral complex in laying hens can support comparable egg production and egg quality when compared to birds fed OTM and ITM, with a significantly reduced mineral inclusion rate and intake; this feeding strategy shows potential benefits for supporting sustainable animal agriculture.

16
Name: Ginder, Finnis
Major: Chemical Engineering - Bachelor of Science
Faculty Advisor: Julie Jessop, Swalm School of Chemical Engineering
Co-Author(s): Sage Schissel
Funding: NSF Research Grant 1264622
Project Category: Engineering

X-ray vision: Peering into the effects of monomer and initiator choices on conversion outcomes of X-ray polymerizations

X-rays are a form of high-energy electromagnetic and ionizing radiation that can be used to break molecular bonds and create radicals and ions. Thus, X-ray irradiation can be used to initiate certain chemical reactions. This research focuses on using X-ray irradiation to initiate polymerization in a variety of (meth)acrylates and to activate photoacid generators for epoxide polymerization. (Meth)acrylate systems are prevalent in commercial formulations, in which X-ray polymerization can provide a distinct advantage since the ionizing nature means that no initiator molecules are required for polymerization to occur. In addition, X-ray polymerization occurs at room temperature and does not require solvents to control the reaction temperature. The effect of (meth)acrylate chemistry was explored by measuring monomer conversion as a function of irradiation time using Raman spectroscopy. Methacrylates polymerized more slowly than acrylates; however, all monomers reached similar final conversions. The effect of photoacid generator (PAG) chemistry, as well as compatibility with X-ray irradiation, was also tested. Epoxide samples were prepared using one of three common PAG, and conversion was measured at three different irradiation doses. Higher doses resulted in higher initial conversion of the epoxide monomer. The conversion was also affected by the PAG counterion, possibly due to the relative strength of the acid produced. The conversion of these epoxide samples continues to be monitored after the initial polymerization to observe any dark-cure effects; however, preliminary results show that dark cure effects after X-ray initiation are very limited compared to other forms of initiation. Understanding how monomer and initiator chemistry impact conversion will allow for successful implementation of X-ray polymerization in future industrial applications.

197
Name: Givens, Seth
Major: Ag Eng Tech & Bus - Bachelor of Science
Faculty Advisor: Mary Love Tagert, Agricultural and Biological Engineering
Co-Author(s): Katelin Waldrep
Funding: Mississippi Soybean Promotion Board
Project Category: Biological and Life Sciences

Effect of Cropping System and Soil Moisture on Iron Deficiency Chlorosis (IDC) in Soybean: 2023 Results

Iron deficiency chlorosis, or IDC, is a problem that affects soybeans grown in different regions of the United States. Past research has found that $CaCO_3$ content, pH, temperature, and moisture in the soil can all be related to the severity of IDC in soybeans. IDC has

become a common problem in soybeans grown in the Blackland Prairie region of Mississippi. Most of the research done in Mississippi has historically focused on variety selection for IDC tolerance. Variety selection should remain the first line of defense, but as varieties are added or removed each growing system, this process has become more complex for producers. Various management strategies have shown promise in helping reduce the effects of IDC in soybean. This study combines several management strategies to evaluate the effect of seven different cropping systems on IDC symptoms and yield. The study was conducted during the 2023 growing season using a split plot design, with the cropping systems as the main plots and six different soybean varieties as subplots. Three susceptible and three higher tolerant varieties were evaluated, and plots were planted on 96.5 cm raised beds. There were 42 total treatments replicated four times. Each cropping system was evaluated by recording visual ratings, plant height, and leaf area index (LAI) weekly (weather permitting). Cropping systems with a corn rotation and planted at a higher seeding rate of 395,368 seeds/ha yielded higher than the other cropping systems; and of the six varieties evaluated, Pioneer 53A67X yielded the highest. This poster presents year one results, and the study will be repeated during the 2024 growing season. Future work also includes the development of management zones to address IDC in production fields in the Blackland Prairie regions of Mississippi.

198
Name: Graham, Zoie
Major: Biochemistry - Bachelor of Science
Faculty Advisor: Shien Lu, Biochemistry, Molecular Biology, Entomology, and Plant Pathology
Co-Author(s): Emma Willis, Westin Phillips
Funding: College of Agriculture and Life Sciences URSP
Project Category: Biological and Life Sciences

Isolation and Identification of Soybean Seed Endophytic Bacteria
Plant diseases greatly impact crop yields, and research is seeking out ways to sustainably promote crop production. Plant endophytes can naturally confer protection against plant diseases and promote growth. Antimicrobial endophytes can be used as a sustainable biological control agent. The research objective was to isolate, identify, and characterize bacterial endophytes from soybean seeds for development of biological control. Thirty bacteria were isolated from six different soybean seed varieties. 16S rDNAs of sixteen isolates were PCR amplified and sequenced. The genera of eight isolates were determined. Sequence analysis showed that three isolates belong to the genus *Niallia*, four belong to *Brevibacillus*, and one belongs to *Bacillus*. Some isolates have significantly lower 16S rDNA similarity (<95%) to the known bacterial species, indicating these isolates may represent novel species of bacteria. Antimicrobial activities and plant growth functions of the isolates are under investigation. This research will provide insights regarding soybean seed endophytes and their functions.

199
Name: Gray, Nicedriana
Major: Biochemistry - Bachelor of Science
Faculty Advisor: Galen Collins, Biochemistry, Molecular Biology, Entomology, and Plant Pathology
Funding: Harvard Medical School
Project Category: Biological and Life Sciences

Assay Development for DDi2 Protease
Immunotherapy has been used to help patients infected with cancer. However, the disease resists this therapy in some patients, in part cause by cancer cells decreasing antigen presentation. Recently, inhibiting the protein DDI2 (DNA Damage Inducible 1 Homolog 2 was found to increase antigen presentation in cancer cells.DDi2 is a ubiquitin-dependent endoprotease. To aid in identifying improved inhibitors of DDI2, we need a better assay for DDI2 function. We hypothesize that that ubiquitin is an allosteric modulator. The materials being used are the proteins DDI2, sfGFP, SUMO protease, S. cerevisiae Ubiquitin, Uba1, Ubc2, Ubr1, 3C protease, E6-AP, unanchored ubiquitin chains. These proteins will be expressed in E. coli or S. cerevisae and purified using column chromatography methods. The hope of this project is to develop a drug that shows antigen presentation, therefore decreasing the number of patients that are infected with primary cancer or cancer that has acquired resistance to cancer therapy.

17
Name: Gray, Nick
Major: Electrical Engineering - Bachelor of Science
Faculty Advisor: Sathishkumar Samiappan, Geosystems Research Institute
Co-Author(s): Ruchitha Yadav Prakash
Funding: US Army Corp, Engineering Research And Development Center
Project Category: Engineering

Analyzing Energy Usage and Carbon Emissions From Training A Deep Neural Network On High-Resolution Imagery
Invasive Aquatic Species (IAS) disrupt ecosystems by negatively impacting biodiversity and altering habitats, which is why timely detection and mapping is important for implementing effective management. A popular strategy for detecting and mapping IAS is by utilizing aerial mapping. An effective way to create these maps is by training deep learning neural networks using high-resolution imagery collected from Uncrewed Aerial Systems (UAS). However, high-resolution imagery requires critical resources, such as time and electricity. When the source of electricity is non-renewable, training large models for ecological mapping can negatively impact the environment through greenhouse gas emissions. Previous studies have shown that even training a deep neural network on a small dataset can lead to significant carbon emissions. In this research, we aim to train a Convolutional Neural Network (CNN) on high-resolution imagery from UAS to classify 4 different IAS. In this process, we study major factors, such as time to train and size of imagery, to estimate the energy cost and environmental impact of this model in terms of watts consumed and grams of carbon produced. These factors play a vital role in assessing the ecological sustainability of AI training with the substantial increase in AI based technology.

200
Name: Grebner, Daniel
Major: Forestry - Bachelor of Science
Faculty Advisor: Adam Polinko, FWRC - Forestry
Co-Author(s): John Willis
Funding: ORED Undergraduate Research Program
Project Category: Biological and Life Sciences

Recording the ability of multiple different species of seedlings to resist and recover from several different disturbances
In the Southeast, stand structure has undergone significant changes associated with land use practices and changes in disturbance regimes. Historically, this region experienced frequent, low-intensity fire that maintained open, savannah-like stand structures. However, fire suppression has resulted in denser stands with increasing proportions of fire-intolerant hardwood species. As the climate changes, disturbances such as drought and fire are expected to become more frequent and severe. Thus, it is critical to understand how species will respond to changing disturbance regimes, particularly in novel stand structures and species compositions associated with fire suppression. To understand this question, I established two separate studies that will evaluate response to disturbance. The first study investigates the interacting effects of drought and fire on hybrid longleaf pine (Pinus palustris x taeda) to understand the heritability of disturbance response. The experiment will consist of three different durations of drought stress followed by a controlled burn. The second study will examine the effects of drought, defoliation, and frost stress on containerized shortleaf pine (Pinus echinata), red maple (Acer rubrum), loblolly pine (Pinus taeda) and longleaf pine (Pinus palustris). Specifically, we are interested in understanding stress response and adaptation to repeated disturbance. In the greenhouse, each seedling will be subjected to a disturbance, allowed to recover, and then exposed to either the same or a different disturbance. Disturbance response will be measured by the rate of photosynthesis, water use efficiency and morphological traits like root collar diameter. Ultimately, managers will be able to use our results to make management decisions that consider increasingly severe disturbances.

201
Name: Green, Claire
Major: Biochemistry - Bachelor of Science
Faculty Advisor: Priyadarshini Basu, Biochemistry, Molecular Biology, Entomology and Plant Pathology
Co-Author(s): Josh Fawley, Ethan Eaton, Blake U'ren, Pierre Lau
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 honeybee 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.

128
Name: Green, Madelynn
Major: Anthropology - Bachelor of Arts
Faculty Advisor: James Hardin, Anthropology
Project Category: Social Sciences

Reading Between the Houses: A Reconstruction of I7, I8, J7, and J8 at Tell Halif

Mississippi State University's Lahav Research Project excavated several Iron Age II (ca. 700 BCE) houses at Tell Halif in southern Israel during its 1992 and 1993 seasons. Several houses were preserved well in a fiery destruction stratum and treated synthetically. However, remains of less well-preserved houses from units I7, I8, J7, and J8 have yet to be studied, reconstructed, and published. By analyzing the artifacts found primarily on the partially preserved floors of the units relating to Strata VIA and VIB and comparing them to the locations of artifacts found in more complete structures, I am attempting to determine the architecture that once stood there and its relation to the houses around it such as the K8 house and F7 house through a detailed spatial analysis. By comparing the assemblages of units I7, I8, J7, and J8 to those in H7, H8, K7, and K8 I can craft a plausible reconstruction of the building(s) that once stood there. Through my research, I have also been accessing the dating of Strata VIA and VIB and their associated artifacts. Through this project, I aim to reconstruct the missing architecture of Stratum IVB in these units.

202
Name: Green, Rachel
Major: Wildlife, Fisheries & Aqua - Bachelor of Science
Faculty Advisor: Priyadarshini Basu, Biochemistry, Molecular Biology, Entomology, and Plant Pathology
Co-Author(s): Lauren Jennings, Raju Rangappa
Funding: College of Agriculture and Life Sciences URSP, USDA AFRI, Project Apis m.
Project Category: Biological and Life Sciences

The Impacts of Climate Change on the Nutritional Quality of Bee Forage

Climate Change has become an increasing problem in the last few years. This has had a significant impact on pollen and nectar of flowers. Heat and drought stress can impact pollen nutritional quality and viability and can affect the nectar's nutritional quality and quantity. Overall, they can also impact the plant growth. This in turns has cascading impacts on the availability of forage for all bee pollinators. This research project focuses on understanding the effects on climate change on bee forage using sunflowers and soybeans as experimental plants in greenhouses. The first greenhouse was set to the ideal heat at 32°C during the day and 22°C. The second greenhouse has its temperature raised to 38°C during the day and 22°C at night to simulate heat stress. Inside both the greenhouses, there were four rows of 100 plants. Each row was split in half. One half was undergoing drought stress at 30% irrigation, and the other half was set to 100% irrigation. This was done to simulate control plants, drought stress plants, heat stress plants, and drought and heat stress plants. Once the flowers had grown, the pollen and nectar within the flower were harvested. They were then analyzed for their protein and lipid contents and checked for other measurements.

129
Name: Greer, Angel
Major: Psychology - Bachelor of Science
Faculty Advisor: Jennifer Krafft, Psychology
Project Category: Social Sciences

Exploring Gender Differences in Psychological Flexibility and Emotional Daily Affect

Psychological inflexibility, defined as the inability to sustain values-consistent behavior in the face of psychological distress due to overly rigid responses to thoughts and emotions, plays a crucial role in emotional well-being (Akbari et al., 2022).
While there is evidence of gender differences in symptoms of mental illness and adaptation to stressful situations (e.g., Graves et al., 2021; Kelly, 2017), there is a lack of direct exploration of potential gender differences in components of psychological inflexibility or psychological flexibility—the ability to adaptively respond to psychological distress while maintaining values-driven actions—thus warranting further investigation. This study utilizes Ecological Momentary Assessment (EMA) in a college student sample (n = 127) to investigate the hypothesis that females would demonstrate higher levels of experiential avoidance and cognitive fusion, and lower levels of acceptance and cognitive defusion compared to males during periods of heightened negative affect, while both genders would exhibit similar day-to-day positive affect. Females showed higher levels of general distress at baseline ($\beta = 0.078$, $p = 0.049$), while there were no significant differences between men and women in momentary positive affect ($\beta = 0.038$, $p = 0.85$) or negative affect ($\beta = -0.188$, $p = 0.12$). During times of heightened negative affect, there were no significant differences between men and women in levels of experiential avoidance ($\beta = -0.142$, $p = 0.44$), cognitive fusion ($\beta = 0.0604$, $p = 0.76$), acceptance ($\beta = -0.00532$, $p = 0.98$), or cognitive defusion ($\beta = -0.033$, $p = 0.85$). Our study reveals that regardless of gender, individuals exhibit similar levels of experiential avoidance, acceptance, cognitive defusion, and cognitive fusion when experiencing heightened negative affect. Future research could investigate whether variables such as cultural factors or socioeconomic status interact with gender to influence psychological flexibility.

203
Name: Greer, Jennifer
Major: Chemistry - Bachelor of Science
Faculty Advisor: Sidney Creutz, Chemistry
Co-Author(s): Mu Ge, Fernanda Maria Garcia
Funding: Shackouls Honors College Research Fellowship, NIH R15
Project Category: Biological and Life Sciences

Synthesis of bipyridine-containing bio-inspired ligands to support manganese and iron for oxidative catalysis
Iron is essential to life and, along with manganese, has been known to cleave alkenes in the body. Very harsh reagents or conditions are often used to replicate this process, such as KMNO4 and ozonolysis. Few synthetic systems have been able to replicate this process under mild conditions. Works have tried and failed to replicate the process of using enzymes to assist in the oxidative cleavage of alkenes, however, since nature is able to accomplish this process effectively and efficiently, it may be possible to do it synthetically. To determine the effectiveness of manganese and iron complexes, ligands are synthesized to give a manganese complex that hopefully gives a good turnover of catalyzing alkene cleavage to generate aldehydes or ketones selectively. We targeted a ligand based on a bipyridine scaffold with pyridine groups to assist in positioning to coordinate with manganese and iron. The pyridine groups have a 2-pyridone structure to assist in positioning the complex.

204
Name: Guilliams, Piper
Major: Biomedical Engineering - Bachelor of Science
Faculty Advisor: Sungkwang Mun, Center for Advanced Vehicular Systems
Co-Author(s): Vincent Perkins, Adriana Mays
Funding: ORED Undergraduate Research Program
Project Category: Biological and Life Sciences

Anodizing Titanium Alloy to Form Antibacterial Nanostructures
In this research, anodization was used to create antibacterial nanotexture surfaces on titanium alloy samples. Titanium is widely used in biomedical applications because it is biocompatible and strong, yet light weight. The titanium alloy was chosen for this research because alloys allow an oxide layer to form when anodized. These oxide layers form the antibacterial nanotexture surface. Antibacterial nanotexture refers to the surface structure that causes destruction or repellence of bacterial cells by the contact material's surface characteristics. This research can contribute to a problem associated with antibiotic resistance and biofilm formation, with the intention to implement nanotextures on implantable devices. The titanium alloy samples underwent a six-step polishing procedure followed by cleansing in a solution of acetone and deionized water for 15 minutes in an ultrasonic cleaner. After the samples were cleansed, they were anodized in a 1:7 volumetric ratio of pure acetic acid to 0.5% w/v hydrofluoric acid in water (48% w/v) (a 1000mL solution consisted of 125mL acetic acid, 4.375mL hydrofluoric acid in water, and 870.625mL deionized water). A titanium alloy sample (anode) was connected to the positive terminal of the power supply with the polished face facing the platinum mesh (cathode) that was connected to the negative terminal of the power supply and the positive leg of a capacitor. A function generator was connected to both the negative leg of the capacitor and the titanium alloy sample. The power supply was set to 10V, and the function generator was set to 10 KHz. The procedure ran for one hour with the 200mL of solution being continuously stirred using a stir bar and magnetic stirrer. After the procedure was completed, SEM and AFM were performed to observe the nanostructures and measure the surface roughness, respectively.

205
Name: Guo-Yue, April
Major: Biomedical Engineering - Bachelor of Science
Faculty Advisor: Juan Mendoza, Biochemistry & Molecular Biology, U of Chicago Pritzker School of Molecular Engineering
Co-Author(s): Rebecca Nusbaum
Funding: NSF REU: University of Chicago Pritzker School of Molecular Engineering (PME) REU
Project Category: Biological and Life Sciences

Exploring a Novel Immune Modulation Approach for Monomeric Interferon Gamma (IFNγ) Design
Interferon gamma (IFNγ), a key immune regulator, holds promise for therapeutic applications. However, its complex effects have hindered clinical success. Previous research has shown that mutating a dimeric structure can simplify immune responses. This simplification can be achieved by designing a monomeric form of IFNγ to reduce complexity for more predictable and reproducible outcomes in therapeutic settings. Utilizing a rational structure design approach, we reengineered the genetic sequence, unlocking partial agonist potential without dual polypeptide chains. Based on Mendoza et al.'s (2019) findings, we used rational structural design

to develop a monomeric IFNy variant. Helical rearrangements were employed to modulate the expression profile as a monomer, enhancing precision in therapeutic targeting. To experimentally validate this design, we utilized a two-pronged approach. First, we amplified the modified IFNγ gene using polymerase chain reaction (PCR). Then, Gibson assembly, a technique for efficient DNA fragment integration, was used to insert the designed sequence into a plasmid vector suitable for cellular uptake. This construct was transfected (introduced) into yeast and insect cells. Yeast cells, single-celled organisms known for their ability to express complex proteins in a controlled environment, allowed for initial confirmation of successful protein production and facilitated analysis of expression levels. Transfection of High Five (Hi5) insect cells utilized mammalian-like folding machinery and post-translational modification capabilities, thereby enhancing the potential of the engineered variant for therapeutic applications. The successful expression of the engineered monomeric IFNγ variant and its receptors in yeast and Hi5 insect cells, demonstrates its feasibility for production in diverse cellular environments. With implications spanning cancer therapy, autoimmune diseases, and infections, this work paves the way for personalized treatments. Future studies will assess its ability to modulate immune responses, promising tailored treatments with enhanced precision and efficacy. Additionally, translation into mouse studies will provide crucial preclinical insights for clinical development.

42
Name: Guthrie, Caitlyn
Major: Biological Sciences - Bachelor of Science
Faculty Advisor: Todd Mlsna, Chemistry
Co-Author(s): Chathuri Peiris, Dr. R.M. Oshani Nayanathara, Dr. Charles U. Pittman Jr., Dr. Xuefeng Zhang
Funding: Department of Energy
Project Category: Physical Sciences

Surface Engineering of Lignin-Enriched Wood Fibers through Metal-Ion Modification: A Pathway to Controlled Hydrophobic-to-Hydrophilic Conversion
An increasing demand for eco-friendly and biodegradable food packaging skyrockets due to continuous environmental concerns. These concerns have led to the decline in the utilization of plastic tableware and an increase in the search for an environmentally friendly alternative. Here we venture to create tableware with water resistance properties and heightened wet tensile strength by utilizing a hydrophobic hybrid fiber approach that merges different percent (2% and 6%) of lignin-containing fibers. An innovative metal cation-induced surface nanoengineering technique (M^{x+}-SNE) is incorporated to augment the hydrophobicity of the fibers, by immersing the fibers in aqueous metal ion solutions followed by drying, without the addition of extra hydrophobic sizing chemicals. Metal cations (MX^+) such as Fe^{3+} and Zr^{4+}, are capable of interacting with fiber polar groups (i.e., -OH and COOH), causing the surface "hairy" cellulose nanofibrils to self-assemble into a compact structure resulting in a decreased presence of hydroxyl (OH) groups, leading to a reduced surface energy and a notable enhancement in hydrophobicity and water resistance. The wettability transition of the fibers was analyzed by measuring water absorption capacity and water contact angle (WCA). The WCA of a raw 2% and 6% lignin containing fiber was observed as 0° indicating its hydrophilic nature, which was increased up to ~130° and 135° respectively with an immersion period of 4h in a Zr^{4+} solution (0.002 M). The higher the WCA, the higher the hydrophobicity. However, WCA increased only up to 125° after immersing the 2% lignin containing fiber in a 0.002 M Fe^{3+} solution for 4h and the 6% lignin containing fibers immersion in higher Fe^{3+} concentration was unable to make the fibers hydrophobic. As an alternative route for developing sustainable and biodegradable bio-based tableware, M^{x+}-SNE can be considered.

84
Name: Hagan, Faith
Major: Kinesiology - Bachelor of Science
Faculty Advisor: Harish Chander, Kinesiology
Co-Author(s): Hunter Derby, Nathan Conner, J. Adam Jones, Adam Knight
Project Category: Education

Comparing Lead Leg Joint Kinematics During Obstacle Negotiation in Real And Virtual Reality Environments
Successful locomotion is dependent on an individual's ability to modulate and adapt gait characteristics to effectively maneuver the environment. Realistic immersion in virtual environments provides an opportunity to expose individuals to fall risk hazards with minimal risk of injury when compared to real-world exposure. Therefore, the purpose of this study was to compare lower extremity joint kinematics during obstacle negotiation when exposed to real and virtually generated trip obstacles. Fourteen healthy participants [7 males, 7 females; age: 23.46 ± 3.31 years; height: 173.85 ± 8.48 cm; mass: 82.19 ± 11.41 kg; shoe size (men's): 9.03 ± 2.71] were recruited for this study. Participants' lower extremity joint kinematics about the knee and ankle of the lead leg were compared during obstacle negotiation in both REAL and VR environments. Knee and ankle joint kinematics were analyzed independently using a 2 x 3 repeated measures ANOVA to compare environments as well as gait types at an alpha level of 0.05. The current study revealed significant differences in maximal knee joint flexion ($p < 0.001$) and dorsiflexion angle ($p < 0.001$) between gait types. Post hoc

comparisons revealed significantly greater knee flexion during unexpected trip (UT) trials ($p < 0.001$) and expected trip (ET) trials ($p < 0.001$) when compared to normal gait (NG) trials. Additionally, significantly greater dorsiflexion angles were observed during UT ($p = 0.005$) and ET ($p = 0.002$) trials when compared to NG trials. Post hoc comparisons revealed no significant differences in plantarflexion angles between gait types. No significant differences were observed in knee or ankle joint kinematics between environmental conditions. The current findings revealed similar lower extremity joint kinematics of the lead leg during obstacle negotiation in both REAL and VR environments, suggesting potential effectiveness of acute VR exposure and skill transferability of locomotor adaptations.

63
Name: Hall, Dylan
Major: Music Education - Bachelor of Music Education
Faculty Advisor: Jason Baker, Music
Co-Author(s): Taylor Sims
Project Category: Arts, Music, & Design

Poetry, Music, Collaboration, Inspiration: A Pairing of Poetic Lines of Sir William Blake with Dave Hall's "...Ascends the Sky" for Solo Marimba
In our world, two of the greatest paths to artistic expression primarily stand on their own. These two art forms, Poetry, and Classical Music are now being collaborated through a self adaptation of Professor Dave Hall's (University of North Texas) composition for solo marimba entitled "...Ascends the Sky" with the spiritually poetic words of Sir William Blake to tell a new story enhanced through expression. This new adaptation tells the story of a man who battles his inner spirits as well as the evilness in the world around him. Throughout his life, he continues to battle these spirits and as he draws closer to the end of his life, he reflects on the journey he has taken and realizes that he will Ascend into the Sky.

206
Name: Hammons, Leah
Major: Biochemistry - Bachelor of Science
Faculty Advisor: Joby Czarnecki, Geosystems Research Institute
Co-Author(s): Jing Hu, Ardeshir Adeli, Frances Podrebarac, Renotta Smith, Zihan Li
Funding: College of Agriculture and Life Sciences URSP, ORED Undergraduate Research Program
Project Category: Biological and Life Sciences

Cover Crop Biomass influence on Cotton Soil Moisture and CO_2 Emissions
Agriculture in the United States is attributed approximately 10% of greenhouse gas emissions affecting climate change. To combat climate change, scientists have been exploring cover crops as a solution. In the southern U.S. adoption of cover crops, however, has been limited due to lack of region-specific research and proven results. At Mississippi State's Plant Science Research Center, previous research measured soil carbon dioxide (CO_2) flux using a LI-COR CO_2 smart chamber system and illustrated that out of Austrian Winter Field Peas, Elbon Rye, and a Mix of Peas, Rye, and Daikon Radish, Peas were the most effective cover crop for holding soil moisture and Rye emitted the least CO_2 while no cash crops were present in fall/winter (August 2022 to January 2023). To better analyze the effect of cover crops in cotton, gravimetric soil moisture and the mean cover crop biomass were collected. Biomass of Rye and Mixed cover crops were similar (2161 and 2031 lb/acre) and was roughly twice that of No Cover Crop (NCC, indigenous weeds) and Peas (1037 and 1124 lb/acre), respectively. This was expected since the Peas and Radish species were winter killed. Soil moisture was most in Rye plots during May and June but appeared least July-September. In contrast, NCC plots had the least moisture in May and June but appear like Peas and Mixed plots July-September. Peas had the highest CO_2 flux in May and June which corresponded to the median soil moisture. Rye emitted the most CO_2 in August and September with the least soil moisture. These results show that the interaction of CO_2 flux, cover crop biomass, and soil moisture during a cotton crop is complex. Comprehensive analyses of multiyear data with the addition of crop yields are needed to recommend cover crop treatments for farmers.

207
Name: Haney, Trevor
Major: Ag Educ., Leadership & Comm - Bachelor of Science
Faculty Advisor: Brandi Karisch, Animal and Dairy Sciences
Co-Author(s): Reinaldo Cook, Shea Mackey, Tyler Barlow
Project Category: Biological and Life Sciences

Gastrointestinal Parasite Reinfection in Dewormed Beef Steers Over a 90-d Grazing Period
Internal parasites negatively affect the health and efficiency of cattle grazing forage. The objective of this study was to determine the effect of arrival parasite load in beef cattle, as measured by fecal egg count (FEC), on reinfection rate over a 90-day grazing period. One

hundred twenty recently weaned beef steers were obtained from local auction markets and transported 150 km to a research facility. Animals with inadequate fecal samples upon arrival or who died during the trial were removed from this analysis (n=113). This experiment was part of a larger study examining the effect of Bovacillus focused on evaluating the performance, health, and physiological responses received over a 90-day period. On d 0 cattle were vaccinated for clostridial and respiratory diseases, dewormed with fenbendazole, and classified into low, medium, and high arrival FEC based on 0.5 standard deviation above and below the mean. They were randomly allotted to 1 of 12 pastures with access to stockpiled forage. Fecal samples were collected via rectal palpation on d 0, 14, 28, 56, and 90, and sent to the Merk Animal Health Laboratory in Lawerence, Kansas for analysis. Fecal egg counts plus 1, to account for 0 counts, were log transformed for analysis. Data was analyzed using the MIXED procedure of SAS with a fixed effect of Bovacillus treatment, with the repeated effect of day. Results indicated Bovacillus did not affect FEC at any time point (P=0.14). There were no interactions between Bovacillus treatment and arrival fecal egg count classification. Overall, fecal egg count decreased from d 0 to d 14, increased slightly from d 14 to d 28, increased from d 28 to d 56, and decreased slightly from d 56 to d 90 (P <0.01). Steers classified with high parasite load at arrival remained highest through the trial.

96
Name: Harriel, Ethan
Major: Kinesiology - Bachelor of Science
Faculty Advisor: Zack Gillen, Kinesiology
Project Category: Education

The Relationships Between Bat Speed and Stride Foot Ground Reaction Forces During Baseball Swings
This study aimed to examine the relationships between BS and GRFs of the stride foot during baseball swings. All data were collected and published freely online by The OpenBiomechanics Project performed by Driveline Baseball. Eighty-seven male participants (mean ± standard deviation, age 19.98 ± 2.11 years) of varying skill levels (12 high school, 66 college, 4 independent league, 5 minor league) performed four to nine swings, totaling 607 swings across all participants. During each swing, a Blast Baseball Swing Analyzer was attached to the knob of the bat and recorded BS, while two force plates recorded the GRFs produced by each leg in the x-, y-, and z-axes. The positive x-axis was defined as the direction towards the pitcher, the positive y-axis as the anterior direction of the hitter, and the positive z-axis as the superior direction of the hitter. The Pythagorean Theorem was applied in three dimensions using the GRF values along each axis to calculate the magnitude of total GRFs produced. Stride foot landing was defined as the instant the stride foot experienced 10% of the batter's bodyweight, foot plant as the instant GRF equaled 100% BW, and contact as the instant of collision between the bat and ball. Maximum GRFs in each axis, as well as combined, GRFs at stride foot landing and foot plant, and differences in time for the among stride foot landing, stride foot plant, maximum GRFs, and bat contact with the ball were quantified. Pearson product moment correlation coefficients assessed the relationships between BS, GRFs, and times of each phase. Maximum GRFs for each axis and combined exhibited significant negligible to low relationships with BS (r≥0.239, p<0.001). The difference in time between landing and contact and foot plant and contact exhibited negligible significant negative relationships with BS (r≥-0.109, p≤0.007). The time difference between stride foot landing and total maximum GRF as well as maximum GRFs for each axis exhibited negligible significant negative relationships with BS (r≥-0.254, p<0.001. The difference in time between stride foot plant and maximum GRF along each axis exhibited negligible significant negative relationships with BS (r≥-0.082, p≤0.044). The difference in time between stride foot landing and stride foot plant exhibited a negligible significant negative relationship with BS (r=-0.258, p<0.001). Although several statistically significant relationships existed, the magnitude of these relationships was low at best. These results suggest that the magnitude of GRFs in the x-, y-, and z-axes of the stride foot, and the timing with which they are generated, likely play at least small role in enhancing the BS of a swing. Future research should consider examining other aspects of GRFs during baseball swings to determine if any other relationships exist with BS that may aid in hitting performance.

208
Name: Harris, Jekolby
Major: Culinology - Bachelor of Science
Faculty Advisor: Shecoya White, Food Science, Nutrition, and Health Promotion
Co-Author(s): Courtlone Glaspie, Kala Morris, Kenisha Gordon
Funding: College of Agriculture and Life Sciences URSP
Project Category: Biological and Life Sciences

Effect of Air Fryer Technology on Predicted Microbial Inactivation in Chocolate Chip Cookie Baking
Microbial contamination of chocolate chips cookies can be introduced through ingredients such as flour and eggs causing foodborne illness. As the influence and application of air fryers increases with busy college students, it is crucial that these cooking technologies are validated for specific food applications. The objective of the study was to compare the difference between cookies being baked at 330°F and 350°F in the conventional oven versus air fryer by measuring water activity and various temperatures to predict microbial inactivation. The chocolate chip cookie dough followed a standard recipe. The tests were performed in duplicate. Thermocouples were

inserted into the cookies. These samples were placed in an air fryer and oven, observed in 5-minute intervals (Air fryer: 0, 5, 10, 15 and Oven: 0, 5, 10, 15, 20, 25), cooled and intermittently analyzed for temperature and Aw profiles. The average temperatures for air fryer cooking were 16.4, 39.2, 81.8, and 103.9 °C at 330°F and 17.7, 30, 58.6, 85.4, 97.7, and 103 °C in the oven at 330°F. At 350°F, the average temperatures were 17.9, 43.6, 85.1, and 105.7 °C for air fryer and 18.4, 46.2, 69.6, 93, 104.1, and 108.6 °C for oven. Overall, the cookies baked faster using air fryer technology and had higher thermal penetration over a shorter period compared to using a conventional oven at both temperatures. The oven samples exhibited higher overall Aw (Avg: 0.6277 Aw) compared to the air fryer (Avg: 0.5975 Aw), creating risk for illness. It is important to make sure that technologies have been validated to ensure food. The air fryer proved to be suitable for baking chocolate chip cookies at various temperatures. Future studies should examine validating the technology Salmonella and E. coli.

130
Name: Hasan, Shazina
Major: Psychology - Bachelor of Science
Faculty Advisor: Mary Dozier, Psychology
Project Category: Social Sciences

Enhancing Cultural Competency in Diagnosis: Key Considerations for Equitable Mental Healthcare
The growing diversity of clientele in mental health clinics necessitates a critical look at cultural competency in diagnosis. This narrative review analyzes six peer-reviewed articles to explore how cultural background can influence the presentation of mental health symptoms, potentially leading to misdiagnosis. Three key challenges were highlighted during this literature review. First, cultural expression of symptoms varies. Anxiety might manifest as somatic complaints in some cultures, while depression presents as social withdrawal in others. This variation risks misdiagnosis for clients encountering clinicians unfamiliar with cultural manifestations of symptoms. Second, standardized diagnostic criteria may not capture culturally specific expressions of distress. Standardized diagnostic tools, like the DSM-5, while offering clear criteria for classifying mental health disorders, may struggle to fully capture the nuances of distress expressed in different cultures. Finally, language barriers can hinder accurate assessment, hindering communication and understanding of the client's experience. Language barriers can make it difficult to accurately assess disorders and weaken therapeutic relationships with clients. These highlight the importance of cultural competency in accurate diagnoses and effective treatment. Cultural misunderstandings during mental health screening and assessment can lead to inaccurate diagnoses, the implementation of ineffective treatment plans, and a subsequent decline in mental well-being. The review underscores the need for increased clinician training in cultural factors influencing mental health presentations, development of culturally sensitive diagnostic tools, and improved language accessibility services to bridge the cultural gap and provide equitable mental healthcare.

209
Name: Hawk, Landon
Major: Interdisciplinary Studies - Bachelor of Science
Faculty Advisor: Bashira Chowdhury, Biochemistry, Molecular Biology, Entomology, & Plant Pathology
Co-Author(s): Bradly Brazzeal
Funding: College of Agriculture and Life Sciences URSP
Project Category: Biological and Life Sciences

Systematic Map of Herbivores on Carnivorous Plants
Carnivorous plants (CPs) are a group of plants across several taxonomic families that are capable of capturing and digesting prey.   Several insects have escaped being eaten and in turn consume the plant itself, however, there is not a lot of data on these unique insects. We created a systematic map with the question in mind of, "What arthropods herbivorize carnivorous plants and how do they escape being eaten by the plant?", to understand more about these insects and find where gaps in the research lie. Systematic maps take large data sets from searching literature and transform it into statistical maps to visualize what researchers have done in relation to this particular question.

60
Name: Herndon, Michael
Major: Architecture - Bachelor of Architecture
Faculty Advisor: Silvina Lopez Barrera, Architecture
Project Category: Arts, Music, & Design

Community Resilience: Disaster Relief Practices and Informing Better Built Environments
In the face of climate change and increasing severity of weather events, disaster relief and building practices play a critical role in recovery efforts and post disaster functioning. This study investigates these practices through interviewing community leaders in

different towns and conditions in Mississippi and the Gulf Coast region, exploring impacts at both urban and rural scales. The goal is to examine the process and provide potential solutions and criticism to the current practices of relief efforts, with the considerations focusing on ideas to increase sustainability and resilience to these events. In working on improving these factors, this research will highlight architecture's role in recovery along with the subtexts of infrastructure, economy, and socioeconomic development. Architectural documentation and thinking will establish goals with the ends of creating positive recovery and redevelopment for people and communities. Research methods will also frame the study, providing solutions in the built environment that evoke or provide new concepts of what buildings function as, how buildings perform long-term, and how buildings can reframe subtexts of infrastructure, economy, and socioeconomic development.

131
Name: Herndon, Mikayla
Major: Psychology - Bachelor of Science
Faculty Advisor: Cliff McKinney, Psychology
Project Category: Social Sciences

Parental Psychopathology and Interpersonal Competence: Moderation by Emotion Dysregulation Across Gender
The current study examined the effects of parental psychological problems on emerging adult interpersonal competence. Emotion dysregulation was also factored into this association as a potential moderator due to its implications of importance in the literature. Participants were predominantly White college-educated emerging adult women. They completed an online survey to assess their emotion regulation abilities, their interpersonal competence, and their perception of their parents' psychological problems. Results of regression analyses indicated that perceived paternal psychological problems were not significantly related to any facets of interpersonal competence in neither men nor women ($p > .05$). Perceived maternal psychological problems were only significantly associated with the emotional support ($\beta = -.33$, $p < .001$) and conflict management facets ($\beta = -.16$, $p < .001$) of interpersonal competence in women. Emotion dysregulation was significantly associated with all facets of interpersonal competence in both men and women (β ranging from -.16 to -.29, all $p < .01$ or $.001$). There was only a significant interaction between perceived maternal psychological problems and emotion dysregulation for the emotional support facet of interpersonal competence in women ($\beta = -.09$, $p < .05$). The results indicate that there is a complex interaction between parental psychological problems and other factors related to parenting. Future research should expand on this study by controlling for these external factors.

43
Name: Heson, David
Major: Physics - Bachelor of Science
Faculty Advisor: Shannon Starr, University of Alabama at Birmingham Mathemathics Department
Project Category: Physical Sciences

Numerics for the Energy of Heisenberg Ferromagnet 1-D Spin Rings
We investigate the change of the total system energy of 1-dimensional Heisenberg spin rings with increased system size, using the ferromagnetic model. As per Sutherland's analysis of the Bethe ansatz (Phys. Rev. Lett., 1995), the behavior of the Heisenberg spin rings under the antiferromagnet model is well-understood, with an analytical solution showing that the net energy decreases monotonically with increasing total spin. It is currently assumed that the ferromagnet behaves similarly, but we suspect the existence of a spin singlet divergence from this trend where a non-initial local maxima would exist, which might be due to weak paramagnetism in the singlet. We have currently numerically investigated systems of up to 20 site interactions using the University of Alabama at Birmingham Cheaha supercomputer. We also provide an extensive theoretical overview of the problem in our preprint available on Arxiv, which is currently under review for the Journal of Mathematical Physics. While we are not the first to investigate 20 site systems, 20 site systems are the largest investigated in literature up to this date for the Heisenberg Ferromagnet 1-D spin rings. Our numerics show a total decrease in energy with total system spin, however, we are witnessing increasingly small differentials between the system energies for increased system sizes, signaling that a turn-around is possible for larger systems. In this presentation we show the theory and computational methods behind obtaining these numerics, and possible future solutions for investigating systems larger than 20. The current limitation for the system size is the amount of memory required to create the Hamiltonians representing these systems, the space complexity of our current algorithm being $O(10^L)$, where L is the number of sites. We are currently investigating matrix decomposition and statistical techniques such as Monte Carlo to combat this.

210
Name: Hester, Dylan
Major: Forestry - Bachelor of Science
Faculty Advisor: Esteban Galeano, FWRC - Forestry

Co-Author(s): Getrude Aturu, Abigail Allison, Adam Polinko
Project Category: Biological and Life Sciences

Effect of Fertilization on Growth and Physiology in Longleaf Pine Seedlings in Mississippi, USA.
Longleaf pine (Pinus palustris) is a conifer with extensive geographical distribution, adapted primarily to Coastal Plain sites from southeastern Virginia to east Texas. Producers and greenhouse managers have observed that the environment, planting density, and genetics may all affect this species' early grass stage, but the impact of fertilization and hormone application is unknown. This study aimed to assess the effect of different fertilization concentrations and hormone applications on the growth, biomass, and physiology of 1-year-old longleaf pine seedlings. Therefore, we grew 144 seedlings at the greenhouse using Miracle-Gro potting soil mix during March-May 2023 (12 weeks) with four different treatments: C= control (no application of fertilizer or hormone), T1= Fertilization with 14-4-8 NPK (1 tsp/gal) + chelated iron (1 tsp/gal), ~100 ml per plant, T2= gibberellic acid 3 (GA3), sprayed at 10 µg/µl (1%), ~4 ml per plant, and T3= Fertilizer + hormone (14-4-8 NPK + chelated iron + 1% GA3). All treatments were applied weekly, with 12 applications in total. We established a randomized complete block design, with six blocks, each with 24 seedlings (4 treatments, each with six seedlings). Height, root collar diameter, needle length, root length, above-ground biomass, root biomass, photosynthesis, transpiration, stomatal conductance, and intrinsic water use efficiency were measured on the last day of the experiment. We performed ANOVAs and mean comparisons for each trait using the Duncan test at a 95% confidence level. As result, we found statistically significant differences among means for height, above and below-ground biomass, and photosynthesis. In conclusion, further research is necessary to completely understand the roles and interactions of the environment, silvicultural treatments (density and fertilization), and genetics on this species' growth and threshold for grass stages. This project can help improve greenhouse protocols and understand the synergistic effect of nutrients and hormones in producing longleaf pine seedlings.

18
Name: Higginbotham, Oliver
Major: Computer Engineering - Bachelor of Science
Faculty Advisor: Vuk Marojevic, Electrical and Computer Engineering
Co-Author(s): Wen Chen, Ashwani Mishra
Funding: NSF REU: NSF Award 2120442, ONR Award N00014-23-1-2808
Project Category: Engineering

Identification of Resource Allocation in Virtualized O-RAN Systems for Enhanced 5G Research Workflows
The Open Artificial Intelligences Cellular (OAIC) research platform developed at MSU establishes a community research platform, which is software that runs on a software radio research testbed using powerful commodity servers and workstations. One significant challenge in advanced wireless and networking research is the limited hardware resources that can negatively affect the software's overall performance. The problem of hardware resource limitation stemming from sharing the testbed among multiple users simultaneously can be tackled through the implementation of a hypervisor on a very powerful computing system to enhance the testbed experience for researchers. By using a hypervisor, the researchers can remotely access their designated virtual machines for critical testing and software demonstrations. This research focuses on identifying the bottlenecks of such systems when they are being run for computationally intensive workloads by multiple researchers. The program used to gather data is HWiNFO64 allowing for direct sensor recording. The primary sensors that could reveal resource bottlenecks include cache, DRAM read/write bandwidth, per core usage, power usage vs thermal design power, and disk usage. Therefore, our research includes a comprehensive analysis of such parameters for supporting cutting-edge wireless communications and networking research on Edge computing platforms. This research involves a system with at least four configurations: barebone hypervisor, a single VM, five VMs, and 10 VMs. By analyzing these parameters using the different configurations and comparing the recorded values with what the system has available, we can examine what improved parameters each VM will need for scalability. Additionally, we will analyze what the critical resources and minimal configurations of the system should be so that we can compensate for those in future system configurations. In the end, this research will determine exactly what specific resources are used the most on a virtualized O-RAN system for enabling research and development.

211
Name: Hilderbrand, Autumn
Major: Applied Science - Bachelor of Applied Science
Faculty Advisor: Mary Love Tagert, Agricultural and Biological Engineering
Project Category: Biological and Life Sciences

Investigation of Per and Polyfluoroalkyl substances (PFAS) in Landfills
Per and polyfluoroalkyl substances (PFAS) refers to a group synthetic, fluorinated chemicals known as 'forever chemicals' because they are persistent in the environment. PFAS chemicals are found to have toxins causing carcinogenic, mutagenic, or teratogenic effects on humans and other life forms. These chemicals are used to make products water, heat, and oil resistant. Over the past decade, there has

been an increasing number of peer-reviewed papers published on PFAS chemicals and the exposure of humans to these chemicals. More recently, research has been conducted and is ongoing to identify successful remediation methods for removing PFAS chemicals from water. Studies conducted on animals exposed to PFAS chemicals in the environment showed the negative effects of PFAS on the liver and immune system. Because the ultimate disposal of many PFAS is in landfills, EPA has developed effluent guidelines and pretreatment standards for landfills that discharge their leachate to surface waters or wastewater treatment facilities. EPA's priority is to hold the manufacturers of PFAS products accountable, but as of August 2023 the agency has also legally enforced levels for six PFAS chemicals to protect public drinking water. The main objective of this study is to review the literature to help landfills prioritize sustainable solutions for eliminating PFAS chemicals on site without transporting leachate to wastewater treatment facilities. Samples are being taken at a Mississippi landfill during a ten-week trial to measure PFAS levels in the landfill leachate, and these levels are being compared to landfill leachate levels reported in the literature.

212
Name: Hinton, Joseph
Major: Biochemistry - Bachelor of Science
Faculty Advisor: Florencia Meyer, Biochemistry, Molecular Biology, Entomology & Plant Pathology
Co-Author(s): Hunter Walt, Federico Hoffmann
Project Category: Biological and Life Sciences

Evolution of Hematophagy in Arthropods
Hematophagous arthropods, including mosquitoes, ticks, and fleas, have evolved mechanisms to allow for the consumption of blood. Despite this, not all hematophagous arthropods share a common hematophagous ancestor, thus this trait must have independently evolved several times. Along with this, not all hematophagous insects rely solely on blood for their nutrients. Some arthropods like ticks and bed bugs are obligate blood feeders, while others like mosquitoes only require blood in specific scenarios. Although many hematophagous arthropods are widely studied as vectors of disease, the genomic basis for hematophagy remains largely unknown. In this study, we used comparative genomics to investigate the evolution of gene families in various hematophagous and non-hematophagous arthropod lineages. To do this, we downloaded 25 genomes from NCBI's genome database, consisting of various hematophagous and non-hematophagous arthropods. We identified patterns of gene duplication, gene gain, and gene loss, and measured the rates of gene family evolution across all lineages in our study. We performed functional enrichment on these gene subsets. Our results shed light on the genomic origins of hematophagy in arthropods and identify gene families that may be important for the transition from non-hematophagy to hematophagy, and even from hematophagy back to non-hematophagy.

19
Name: Hogan, Daniel
Major: Biomedical Engineering - Bachelor of Science
Faculty Advisor: David Van Den Heever, Agricultural and Biological Engineering
Co-Author(s): Gabriella Moody, Jennifer Kemp
Project Category: Engineering

Redesign Omnipod Insulin Delivery
Type one diabetes is an autoimmune disorder that affects many Americans and is treated by frequent insulin injections. Currently, one of the most advanced technologies in treating type one diabetes is the Omnipod automated insulin delivery device. Although the Omnipod overcomes many of the limitations seen in previous models, problems such as the device falling off, the device causing a lack of self-confidence, and the device causing skin-related issues still exist. My senior design group and I propose that a smaller Omnipod model may remedy the problems that the current model possesses. By utilizing the Solidworks application, we were able to replicate a model of the current Omnipod and compare it to a designed model of a smaller Omnipod. We determined that, with minor modifications, a smaller model of the Omnipod is possible of remedying the problems that the current Omnipod model possesses. This smaller model will help consumers of the Omnipod be able to better treat their diabetes to accommodate their specific needs.

132
Name: Hooper, Arielle
Major: Psychology - Bachelor of Science
Faculty Advisor: Bennett Porter, Psychology
Co-Author(s): Greyson Bogle
Project Category: Social Sciences

Sex Differences in Emotional Expression: A Comparative Analysis of Anger, Anxiety, and Sadness in Suicide Notes
Suicide is a devastating phenomenon with significant societal implications, and understanding the complex emotional underpinnings of

suicide is crucial for effective prevention and intervention strategies. With but one exception world-wide, males complete suicide at rates exceeding those of females; the male to female suicide ratio in the United States is greater than 4:1 (Berman, 2003). In the instance of one's contemplation of ending their own life, they may leave behind a written or typed message expressing their thoughts, feelings, and reasons behind their decision. This message is widely known as a suicide note. Suicide notes are rare in occurrence in relation to the rates of suicide in the Unites States annually due to most victims feeling that communication through a note is meaningless (Ballur et al, 2014). Despite this fact, suicide notes can provide insight regarding reasons for individual suicide cases, identify common themes or risk factors associated with suicide, and display a glimpse into the emotional turmoil experienced by individuals who contemplate performing the act. Moreover, by examining suicide notes, researchers and mental health professionals can gain a more comprehensive understanding of the factors that underlie and contribute to suicidal ideation. This in turn has the potential to aid nation wide efforts in shaping more effective suicide prevention approaches. This study used a text analysis approach to study the emotional content of a collection of suicide notes. Specifically, we were interested in looking at differences in emotional content between notes written by men and notes written by women. For this study, we used a collection of suicide notes from the appendix of Leenaars' (1988) book, Suicide Notes. This archive of notes presents 33 suicide notes written by men and 20 notes written by women (n = 53). Notes were copied from the archive into a dataset and separated by biological sex. To analyze these notes, we used Linguistic Inquiry and Word Count 22 (LIWC-22) (www.liwc.app/). LIWC-22 is a natural language processing (NLP) tool that allows the user to retrieve values of various psychometric variables present within a given text. NLP is a field of artificial intelligence and computational linguistics that aims to pinpoint and understand written or spoken text. NLP was originally distinct from text information retrieval (IR), which employs highly scalable statistics-based techniques to index and search large volumes of text efficiently (Nadkarni et al, 2011). LIWC-22 values are summed based on the presence of words from a given "dictionary." For this study, we were interested in examining emotional content of suicide notes. Specifically, we were looking at emotions of anger, anxiety, and sadness. LIWC-22 provides built-in dictionaries for each of these three emotional variables. Example target words for anger include "hate", "mad", "angry", and "frustrated". Example target words for anxiety include "worry", "fear", "afraid", and "nervous". Example target words for sadness include "sad", "disappointed", and "cry". A series of T-tests will be performed to compare mean scores of anger, anxiety, and sadness between suicide notes written by men and suicide notes written by women. For this study, we have three hypotheses, based on previous research of emotional expression of biological sex. For anger, we predict that male suicide notes entail higher levels compared to female suicide notes based on anger being a socially appropriate and acceptable outlet for men to dispense general distress; men and women rely upon socialized sex-role stereotypes when responding to anger (Nunn, 1999). For anxiety, we predict that female suicide notes display higher levels in comparison to male suicide notes based on anxious thoughts accumulatively affecting women more than men; they have more metacognitive beliefs about uncontrollability of worry and believe that worry must be avoided (Bahrami, 2011). For sadness, we predict that female suicide notes exhibit higher levels than male notes due to previous research stating that women have significantly higher rates of psychological distress than men (Kessler, 1984) in addition to female expression of overt feelings of sadness and helplessness being more societally acceptable. Data collection has concluded and analyses will be completed.

133
Name: Howard, Deja
Major: Psychology - Bachelor of Science
Faculty Advisor: Kathleen Ragsdale, Social Science Research Center
Co-Author(s): Netsayi Mudege, Lizzy Muzungaire, Keagan Kakwasha, Madeline Burdine, Aleah Bradford
Funding: ORED Undergraduate Research Program, Feed the Future Innovation Lab for Fish through the United States Agency for International Development (USAID) award no. 7200AA18CA00030 and sub-award no. 322554-012200-027000
Project Category: Social Sciences

ComFA+Fish: A *FishFirst*! *Zambia* Innovation to Address Childhood Malnutrition in Zambia and Beyond
Background: Stunting among infants and young children (IYC) is a significant challenge in Zambia and other low- and middle-income countries (LMIC). In response, FishFirst! Zambia developed ComFA+Fish (Complementary Food for Africa+Dried Fish Powder), a novel protein/micronutrient blend that leverages locally sourced, nutrient-dense dried fish powder to combat IYC malnutrition. In 2022, Sensory Panel I confirmed high acceptability among mothers (N=42) for four ComFA+Fish-fortified dishes for household consumption; Sensory Panel II confirmed high acceptability among IYC (N=42) for ComFA+Fish Complementary Maize
Porridge. **Innovation/Technology:** Utilizing the USAID/SIL Innovation to Impact (i2i) Platform, we identified Zambia-based partners for collaboration on scaling ComFA+Fish: 1st Tier partners (e.g., national-level Sylva Food Solutions, Ministry of Health); 2nd Tier partners (e.g., district-level health officers, entrepreneurs); and 3rd Tier partners (village-level Community Health Workers/CHWs). During Phase III, we collaborated with Sylva Food Solutions to produce two ComFA+Fish Instant Porridges, high acceptability of ComFA+Fish Plain Instant Porridge (N=40) and ComFA+Fish Vanilla Instant Porridge (N=38) during Panel III, and conducted a Scaling Readiness Exercise among Tier 2 and Tier 3 stakeholders to determine strategic 'next steps' towards scaling ComFA+Fish in Zambia. **Discussion:** Stunting among IYC remains a significant concern in Zambia and other LMIC. FishFirst! Zambia's response to this challenge is to develop and scale ComFA+Fish to address persistent malnutrition among at-risk IYC. Phase II 'ground-proofing' activities in 2022 confirmed high acceptability of ComFA+Fish-fortified dishes among mothers and IYC. Designation in 2023 as a USAID/SIL i2i innovation and active

participation in key i2i learning events/activities underscored its potential for scaling. Phase III saw collaboration with a key Zambia-based partner to produce two instant porridges with confirmed high acceptability. In 2024, our goal to ground-proofing acceptability ComFA+Fish among 3rd Tier partners (e.g., traditional healers, CHWs) is a strategic "next step" to ensure a seamless adoption of ComFA+Fish.

74
Name: Howell, Wynn
Major: Fashion Design & Merchandising - Bachelor of Science
Faculty Advisor: Caroline Kobia, School of Human Sciences
Funding: College of Agriculture and Life Sciences URSP
Project Category: Business and Economics

Exploring Global Market Access Challenges Faced by Entrepreneurial Artisans: A Case Study of Kenya
From maker to market, the goal of this study is to break generational poverty and propel the future of entrepreneurial artisans. Behind agriculture, the entrepreneurial artisan sector in developing countries such as Kenya is the second-largest source of income with many artisans still in poverty (Wilson, 2022). Challenges faced by Kenyan artisans include income instability, poor infrastructure, inadequate access to markets, poor health and safety, and more (Keino & McCreath, 2020).
Highly skilled artisans globally lack access to a stable market and remain entrenched in intergenerational poverty. The United Nations Sustainable Development Goals (SDGs) are actively addressing this issue by implementing 17 goals aimed at improving various aspects of global development. These SDGs have a profound impact on artisanal life and communities. This study will specifically examine four of these SDGs as focal points: #1 No Poverty, #8 Decent Work and Economic Growth, #10 Reduced Inequalities, and #12 Responsible Consumption and Production. The specific objectives are 1) to evaluate current entrepreneurial artisan business models, 2) to explore value addition through artisan voices, and 3) to examine possible market access for artisans. The study will use the Human Centered Design (HCD) approach grounded on three phases Inspiration, Ideation, and Implementation (www.designkit.org, n.d.). The inspiration phase will evaluate current entrepreneurial artisan business models and explore value addition through artisan voices. In the ideation phase, the research will visualize, brainstorm, and discuss potential solutions based on the findings of the inspirations phase. In the implementation phase, researchers will examine possible market access for artisans and provide recommendations. Artisanal work carries culture to generations, stimulates money flow in the economy, teaches skill and craftsmanship, creates community, and gives artisans a sense of identity and dignity. The flexibility of entrepreneurial artisan work is a way forward for individuals in unstable living situations (Munro & O'Kane, 2022).

134
Name: Huner, Emma
Major: Criminology - Bachelor of Arts
Faculty Advisor: Braden Leap, Sociology
Funding: ORED Undergraduate Research Program
Project Category: Social Sciences

Making Country Cool: A Comparative Study of Peloton Instructors' Use of Country and Hip-Hop Music
There is considerable research on country and hip-hop music lyrics and musicians. However, there is a relative lack of focus on how people other than musicians engage with country and hip-hop music. This study analyzes how Peloton instructors utilized country and hip-hop music while teaching stationary bike exercise classes. A sample size of twelve exercise classes taught by six different instructors were analyzed. For each instructor, one country class and one hip-hop class were transcribed and coded in MAXQDA to identify how instructors engaged with the music. In contrast to hip-hop rides, in which all instructors stressed that the instrumental features of the music elevated the riders' moods and workout performance, instructors framed country music as suitable workout music in two distinct manners. Two of the six instructors played songs from the 1990s or older while reflecting on nostalgic memories prompted by these songs. According to these instructors, country music was suitable workout music because of its association with positive memories of the past. Conversely, the other four instructors played country songs released in the past decade while stressing that country infused with hip-hop, specifically, helps create a cool, upbeat environment for exercising. For these instructors, the suitability of country was contingent on infusions of hip-hop. These results indicate that the country and hip-hop music literatures should be better integrated. Not only is hip-hop being integrated into country by musicians, but individuals using and consuming these genres place them into conversation with each other.

20
Name: Hunter, Kyla
Major: Aerospace Engineering - Bachelor of Science
Faculty Advisor: Brady Swann, Raspet
Project Category: Engineering

Expanding Horizons: Exploring Sparrowhawk Marine Radar's Potential in UAS Operations
According to the Federal Aviation Administration (FAA), uncrewed aircraft systems (UAS) must remain within visual line of sight (VLOS) for operational purposes. This constraint presents significant challenges for missions requiring UAS to operate beyond visual line of sight (BVLOS). However, by implementing appropriate safety measures, the FAA can provide a BVLOS waiver. One promising technology under investigation to mitigate safety risks associated with BVLOS operations is the Sparrowhawk Marine Radar. The manufacturer states that this radar has a remarkable range of up to 8 nautical miles, an altitude coverage of 6000 ft above ground level, and an accuracy that is roughly 90%. The objective of this study is to test if these claims are proven to be true. The research being conducted will observe the Marine Radar's capability and reliability in detecting intruding aircraft, testing detection validation. The objective is to determine whether this technology can enable UAS to operate safely and accurately beyond visual line of sight. These advancements could revolutionize disaster response, search and rescue efforts, surveying activities, and even facilitate the transportation of vital organs. By pushing the boundaries of UAS operations, society stands to benefit from enhanced UAS efficiency and effectiveness in various critical tasks.

213
Name: Hunter, Madelyn
Major: Biochemistry - Bachelor of Science
Faculty Advisor: Natraj Krishnan, Biochemistry, Molecular Biology, Entomology, and Plant Pathology
Co-Author(s): Emma Palmer
Funding: ORED Undergraduate Research Program
Project Category: Biological and Life Sciences

Circadian locomotory activity patterns exhibit sexual dimorphism in a Drosophila model of Spinocerebellar ataxia Type 1
Brain dimorphism is a complex process, with multiple contributing mechanisms and pathways resulting in differences. Sex-based differences with regard to clinical features have been identified in a range of neurological diseases, including Alzheimer's disease (AD), Parkinson's disease (PD), Huntington's disease (HD), amyotrophic lateral sclerosis (ALS), multiple sclerosis (MS), and ischemic injury. In this study, a Drosophila model of Spinocerebellar ataxia type 1 (SCA1) a polyglutamine disease causing neurodegeneration was developed using the yeast two hybrid system. P{UAS-Hsap\ATX1.82Q}M6 which expresses humanAtaxin1 (ATX1 or SCA1) with a long PolyQ repeat of 82 amino acids under control of UAS was crossed to elav-GAL4, a pan-neuronal driver (elav-GAL4/UAS-ATX1.82Q) for driving gene expression throughout the nervous system. The circadian clock in Drosophila modulates a broad spectrum of physiological and behavioral processes including locomotor activity, sleep patterns, courtship, learning and memory, feeding behavior, chemosensation, and immune responses. Circadian locomotor activity was monitored in male and female SCA1 flies with parallel controls (UAS-ATX1.82Q/+ and elav-GAL4/+). Additionally, the expression of core clock genes – per, tim, clk and cyc was monitored over a 24 hr period (ZT0 – ZT 24). A distinct sexual dimorphism was recorded in the locomotor activity patterns as well as expression of core clock genes in the fly model of SCA1. Taken together, our results emphasize the role of sex-dependent effects on circadian locomotor activity pattern during SCA1 pathogenesis.

21
Name: Hurt, Matison
Major: Biomedical Engineering - Bachelor of Science
Faculty Advisor: Jessica Drewry, Agricultural and Biological Engineering
Co-Author(s): Jonathan Moon
Funding: ORED Undergraduate Research Program
Project Category: Engineering

Investigating the Effects of Cooling Methods on Environmental Conditions and Bird Performance in Commercial Poultry Houses
Commercial poultry production is highly sensitive to environmental conditions which can impact bird health, welfare, and productivity. This study aims to evaluate the effect of cooling methods employed in commercial poultry houses on litter moisture, air temperature and relative humidity, and bird core body temperature and weight. The study was conducted in two commercial houses, over two flocks, with the treatment and control houses crossing over between flocks. The control house used standard evaporative cooling practices and the treatment house used sprinklers in addition to evaporative cooling. Each house in the study was divided into 18 sections in which litter moisture and air temperature and relative humidity were measured. Additionally, core body temperature of 40 birds (20 per

treatment) were measured during the last four days of the first flock. Finally, 100 birds from each house were weighed within the last 5 days of the flock. Litter moisture levels were found to vary significantly across different sections of the poultry house but not by treatment. At the fan end of the house, the average litter moisture content was measured at 27.2% (± 0.01), which was statistically lower compared to the pad end and the middle section, where the average litter moisture content was recorded at 29.5% (± 0.01) and 29.8% (± 0.01), respectively. Air temperatures were significantly higher in the treatment house both during cooling and non-cooling periods, yet relative humidity levels were lower and more uniform within the house. No difference in bird core body temperature or weight was seen between treatments. The data suggests that incorporating sprinklers alongside standard cooling methods in commercial poultry houses may help in regulating and maintaining more consistent environmental conditions within the poultry house, potentially benefiting bird health and welfare. However, further research is needed to fully understand its impact on bird performance.

44
Name: Hyland, Hannah
Major: Geoscience - Bachelor of Science
Faculty Advisor: Todd Mlsna, Chemistry
Co-Author(s): Prashan Rodrigo, Nicole Busby, Frank Brigano, Bryan Eagle, Jagman Dhillon
Funding: NSF REU: Food, Energy and Water Security Summer Research Program
Project Category: Physical Sciences

Phosphate-enriched $MgFe_2O_4$, $MnFe_2O_4$, Fe_3O_4, and $BaFe_2O_4$ Nanoparticles Dispersed Rice Husk Biochar as Controlled-Release Fertilizers
Fertilizers remain a crucial part of the agricultural process worldwide. Each year, more fertilizers are needed to keep up with global demand as the population grows. Regrettably, commercial fertilizers contribute to eutrophication due to the water-soluble characteristics of their chemical structure. When these organic compounds accumulate in bodies of water due to agricultural runoff, the oxygen content is depleted and harms marine life. To combat this issue, a low-cost sustainable solution that will provide plants with the necessary soil nutrients at a controlled release rate is needed. Rice husks, a major agricultural waste product, have various environmentally relevant uses. Rice husk biochar, rich in silica, can hold more moisture than other biomaterial alternatives. In addition, it allows for better chemical retention when treated due to its large surface area and porosity. In our investigation, four samples of rice husk biochar were obtained from Glanris which were pyrolyzed at 400C in a low oxygen environment for 10-15 minutes residence time. The biochar samples were modified with deposition of a) $MgFe_2O_4$, b) Fe_3O_4, c) $MnFe_2O_4$, and d) $BaFe_2O_4$ nanoparticles onto the surface which increased the amount of phosphate uptake. Column leaching experiments (2.54 cm dia x 9.31 cm height) were carried out by passing 10 L of deionized water through phosphate-adsorbed engineered biochar-loaded sandy loam soil mixture (100 kg of P_2O_5/hectare) and compared with a triple super phosphate loaded soil matrix (100 kg of P_2O_5/hectare). These modifications decreased the phosphate leaching rate compared to the common commercial fertilizer: triple superphosphate. Finally, the original rice husk biochar samples were characterized and compared to the engineered rice husk biochar alternatives. The characterization studies included: Fourier transform infrared spectroscopy, X-ray photoelectron spectroscopy, point of zero charge, X-ray diffraction, and elemental ash analysis.

64
Name: Jacobs, Rocky
Major: Psychology - Bachelor of Arts
University: Loyola Marymount University
Faculty Advisor: Matthew Linesch, School of Film and Television
Project Category: Arts, Music, & Design

Brigade (EP) **- A Declaration of Gaiety, Isolation, and Rage**
Brigade is an Extended Play (EP) record created to explore the undercurrents perpetuating volatility within the feminine experience. This record includes three songs – Between the Lines, Tidal, and Beckoned Back to Adam. Utilizing novel analog and digital recording techniques, Brigade seeks to articulate how traditional views of women within the gender binary and as the tamer sex fuel a collective rage within women's experiences. It seeks to validate the anger brought upon by generations of institutional oppression and double standards. Brigade also hopes to celebrate the full breadth of emotion encompassed in the feminine experience, from frivolity to desire to fury. The artist hopes listeners will recognize the universality of these sentiments within this record, noting that liberation requires a collective effort and active discourse about genuine, feminine experiences.

214
Name: Jacobson, John
Major: Forestry - Bachelor of Science
Faculty Advisor: Adam Polinko, FWRC - Forestry

Analyzing Annual and Interannual Growth Trends in Midrotation Loblolly Pine Post-Prescribed Fire Using Dendrochronology
Over the last several decades, prescribed fire has increased as a forest management technique in the Southeast. Though prescribed fire usage is increasing, there are still conflicting reports on the relationship between tree growth and prescribed fire. For example, a study on Monterey pine (*Pinus radiata*) found growth suppression and reduced basal area increment post-fire, while some studies conducted on ponderosa pine (*P. ponderosa*) and longleaf pine (*P. palustris*) found that prescribed fire increased tree growth rate. This study focuses on changes in tree growth in loblolly pine (*P. taeda*) by analyzing wood formation pre- and post-prescribed fire. Stands of varying productivity were selected on both federal and private land near Starkville, MS. Stands predominantly consisted of loblolly pine (≥ 90% basal area dominated) with a documented burn history. A minimum of six dominant and co-dominant trees were selected haphazardly from each stand. Fixed area plots were established around each tree and diameter and spatial location were recorded for all neighboring trees. Two increment cores were collected from the North and East side of each plot center tree and transported to the lab at Mississippi State University. Each core was dried, mounted, scanned, and dated in the lab. Cores were dated using CooRecorder imaging software, then cross dated using the dplR package in R. Regression techniques will be used to analyze the relationship between annual and interannual variation in growth following prescribed fire. The results of this study will be presented and discussed. Preliminary results suggest an increase in annual growth following prescribed fire relative to growth rate prior to the fire. The results of this study will help guide management practices that best promote tree growth and vigor in loblolly pine stands in the southeastern United States.

215
Name: Jenkins, Anna
Major: Forestry - Bachelor of Science
Faculty Advisor: Esteban Galeano Gomez, FWRC - Forestry
Project Category: Biological and Life Sciences

Asexual propagation of elite germplasm of eastern cottonwood aiming biofuel production
In the last four decades, the Forest Service, some private companies, and the Department of Forestry (Dr. Randall Rousseau, retired) at Mississippi State University have made tremendous efforts to collect elite material and perform breeding of eastern cottonwood, and use it as biomass feedstock for biofuel and bioproducts with the potential to mitigate rising atmospheric CO_2 concentrations. Currently, some selected clones are in danger of getting lost, so the intention of this project was to propagate the material asexually to test their drought and heat resistance. As methods, during fall 2023, we propagated eleven clones asexually (16 cuttings per clone). Then, we assessed the performance (growth and resilience) of the different clones. This project provided information about eastern cottonwood's drought and heat resilience, aiding the continued propagation of these clones and ensuring that the clones previously produced will not be lost.

97
Name: Jennings, Andy
Major: Kinesiology - Bachelor of Science
Faculty Advisor: Zachary Gillen, Kinesiology
Co-Author(s): Morgan Wood, JohnEric Smith
Project Category: Education

Effects of Ammonia Inhalant on Isometric Strength
The purpose of this study was to examine the effects of an ammonia inhalant of muscular strength during isometric leg extensions and flexions. Nineteen college aged males and females participated in this study (mean ± standard deviation, height =175.8 ± 11.0 cm, weight = 76.4 ± 17.5 kg). Ammonia inhalant, placebo (menthol), or no inhalant were given to participants directly before performing isometric leg extension and flexion muscle actions across three visits, separated by 48 hours between visits. For the ammonia inhalant and placebo trials, the substance was placed in an opaque container with a cotton ball over the substance. For the control trial, a cotton ball was placed in the container with no substance beneath it. For all trials, the container was held open, 10 cm away from the participant's nose, and they were instructed to inhale through the nose for 3 seconds. Immediately following inhalation subjects completed 3 maximal isometric leg extension and flexion muscle actions. Subjects performed the inhalation before each isometric muscle action. Peak torque (PT) and time to peak torque (TTPT) were taken from each isometric muscle action. Repeated measures ANOVAs compared the effect of condition on PT and TTPT. There were no differences across conditions for any variables (p ≥ 0.509). Despite the claim that ammonia inhalants may promote acute improvements in muscular strength and power, no improvements were

seen in PT and TTPT during isometric muscle actions. Future studies should explore the potential psychological effects of ammonia inhalants.

45
Name: Johnson, Bria
Major: Biochemistry - Bachelor of Science
Faculty Advisor: Carrie Vance, Biochemistry, Molecular Biology, Entomology, and Plant Pathology
Co-Author(s): Olalekan Olabde, Hashani Abeysinghe Herath Mudiyanselage
Project Category: Physical Sciences

Solvated electron reductions of per- and polyfluoroalkyl substances (PFAS)
PFAS are a group of nearly 15,000 artificial fluorine-rich and alkynyl structures used in consumer and everyday products such as food packaging, cookware, and firefighting foams. They exhibit chemical stability due to their strong C-F backbone and do not degrade quickly. Studies have established the presence of PFAS in over 45 % of tap water sources in the United States and the blood and urine of humans. PFAS concentrations higher than 70 ng/L have been linked to cancer, reduced fertility, hormonal disruption, and thyroid disorders. These compounds enter the environment through industrial discharge, atmospheric decomposition, landfills, etc. Thus, we have reported the degradation of PFOA, PFOS, GENX, and NFBSA via solvated electron reduction generated in a Na/liquid Ammonia system. Solvated electrons interact with PFAS, initiating diverse reaction pathways and product formations. Fluorine substituents' strong electron-withdrawing properties facilitate electron transfer, generating radical anions and transient intermediates. The degradation efficiency was measured by fluoride ion selective electrode and liquid chromatography-mass spectrometry. XRD, XPS, and FTIR also did characterizations. Our results indicate that the degradation efficiency increased with increasing the moles of solvated electrons. Degradation efficiency was obtained by close to 100 % for the PFAS. Analysis of the number of moles of Na used/number of moles of fluoride produced gave 1.96, 2.56, 2.13, and 2.28 for PFOA, PFOS, GENX, and NFBSA, respectively.

216
Name: Johnson, Kristen
Major: Animal and Dairy Science - Bachelor of Science
Faculty Advisor: Jean Feugang, Animal and Dairy Sciences
Co-Author(s): Serge L Kameni, Notsile H Dlamini
Funding: College of Agriculture and Life Sciences URSP
Project Category: Biological and Life Sciences

Discriminating Highly Resilient Spermatozoa during Long-term chilled Storage
Artificial insemination (AI) is the leading reproductive tool used for genetic improvement in pig breeding. AI with extended semen is the most effective, with several extenders developed for long-term storage. Regardless, there is gradual decline of sperm quality during prolonged storage. We hypothesized that boar ejaculates are not experiencing the same fertility decline over time. Therefore, the objective of the study was to investigate potential disparities of boar semen during a 10-day liquid at 17°C storage using a commercial extender.   Freshly collected Duroc boar semen samples (n=29) were extended at a commercial boar stud (Prestage Farms, MS) and transported to the laboratory. Semen samples were processed and stored in an incubator at 17°C for up to 10 days. On days 0 (semen collection), 3, 7, and 10, samples were analyzed for total motility (TM), progressive (PM) and normal morphology (NM) using the computer-assisted sperm analyzer (CASA, CEROS II). Data were analyzed as repeated measures using ANOVA. Mean motility data ($^{3/4}$SD) was used for survival discrimination between "good" and "bad" semen. $P<0.05$ was considered significant. All sperm parameters significantly decreased over time, from day-0 to day-10 (TM: 78.2±1.0% to 42.8±4.3%; PM: 46.1±1.8% to 16.2±2.3%, and NM: 85.1±1.0% to76.1±1.9%). Velocity parameters (VAP, VSL, and VCL) remained unchanged during the storage, while the distal droplets contributed most of the morphological defects. Survival discrimination indicated the highest deviations from overall averages on day-7. Hence, good (n=8) and bad (n=7) semen samples had significantly different TM (80.2±1.4% and 21.7±4.6%, respectively), PM (39.7±2.7% and 4.7±1.7%, respectively), and NM (87.9±1.9 and 66.4±2.6%, respectively). Likewise, the velocity parameters were significantly different between both sample groups. These findings indicate that subsets of boar semen may be well-suited for survival during long-term chilled preservation. Thus, development of tools for early discrimination of semen doses could greatly enhance semen storage.

135
Name: Jones, Erin
Major: Data Science - Bachelor of Science
Faculty Advisor: Jarrod Moss, Psychology
Co-Author(s): Emily Creel
Project Category: Social Sciences

Using Machine Learning to Detect and Predict Cognitive Restructuring

The phenomenon of cognitive restructuring, characterized by the pivotal "aha!" moment in problem solving, has yet to be fully grasped in psychology research. This study aimed to unravel factors contributing to restructuring using machine learning (ML). Participants (N= 200) were asked to solve three classic insight problems, and only data for the Nine Dot problem were included in this analysis. The primary manipulation was different levels of access to unsuccessful problem attempts while solving the problem, such that Group 1 were provided with three experimenter-generated attempts that have been previously reported within this problem, Group 2 were able to see their own six most recent unsuccessful problem attempts, and Group 0, the control group, were only shown the problem while solving. This manipulation was an attempt to operationalize a problem-solving heuristic that states people often mentally analyze their previous problem attempts when they become stuck while solving. We hypothesized that offloading unsuccessful problem attempts to the screen while participants were solving would facilitate restructuring, but the data did not support this hypothesis. Employing ML classification models, we further analyzed the data to identify predictors of restructuring. Factors such as level of exposure to previous attempts, time spent per attempt, total number of attempts, and the problem-solving strategy were included in the models. Additionally, mutual information analysis was conducted to determine the significance of each factor. We hypothesized that the integration of attempt data and individual problem-solving dynamics will predict restructuring. Preliminary analysis suggests a nuanced relationship between problem exposure and restructuring, supporting our hypothesis that access to previous attempts enhances problem-solving efficacy. This research not only deepens our understanding of restructuring but also showcases the potential of ML in psychological research. The findings can offer insights into problem-solving mechanics, guiding the development of more effective cognitive strategies and educational tools.

22
Name: Jones, Jennefer
Major: Electrical Engineering - Bachelor of Science
Faculty Advisor: Sathish Samiappan, Geosystems Research Institute
Project Category: Engineering

Hyperspectral Imaging for Real-Time Monitoring of Cyanobacteria in Catfish Aquaculture

Catfish aquaculture is a commercially significant industry heavily reliant on water quality management. Specific cyanobacteria strains can negatively impact the final product's taste. Gesomin and 2-methylisoborneol are volatile flavor compounds that are responsible for earthy and musty "off-flavors" in farm-raised channel catfish in the southeastern US. These compounds are produced by cyanobacteria species (i.e., blue-green algae) that grow in aquaculture ponds. Traditional methods for cyanobacteria detection involve laboratory analysis of water samples, hindering real-time monitoring. This research proposes the utilization of hyperspectral imaging for rapid, in-situ detection of off-flavor causing bacteria in catfish aquaculture ponds. Hyperspectral data captures detailed spectral signatures across a wide range of wavelengths, providing a high-resolution representation of the aquatic environment. By analyzing these signatures, the project aims to identify unique spectral patterns associated with the presence of problematic bacteria. Machine learning algorithms, including convolutional neural networks (CNNs) and support vector machines (SVMs), will be trained on the hyperspectral datasets to recognize patterns indicative of cyanobacteria. Dimensionality reduction techniques will be explored to optimize model complexity for real-time application. The ultimate goal is to develop a reliable and efficient tool for continuous monitoring of catfish aquaculture ponds, enabling prompt intervention and mitigation strategies to maintain optimal water quality and catfish flavor profile.

217
Name: Jones, Nyla
Major: Nat Res & Envir Conservation - Bachelor of Science
Faculty Advisor: Courtney Siegert, FWRC - Forestry
Co-Author(s): Brooke Dominici, Waqar Shafqat, 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 two years and all sites, nitrate concentrations were reduced by 23%, and ammonia concentrations were reduced by 51% relative to concentrations in agricultural soils. In both years, multi-genotype plots reduced soil ammonia concentrations more than single-genotype plots, while the opposite trend was observed for soil nitrogen. 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.

23
Name: Jones, Tanner
Major: Biomedical Engineering - Bachelor of Science
Faculty Advisor: Lauren Priddy, Agricultural and Biological Engineering
Co-Author(s): Caitlin Luke, Micah Foster, Alyna-Marie Janus, Halleigh Faulkner, Alexis Graham
Funding: Medtronic, Inc.
Project Category: Engineering

Replication of Impact Parameters from Cadaveric Lumbar Interbody Fusion Using a Benchtop Device
Transforaminal lumbar interbody fusion (TLIF) involves the insertion of an interbody fusion device (IFD) into the disc space to relieve lower back pain caused by various disc pathologies. The IFD is attached to an insertion tool and inserted via malleting, which can damage the IFD due to the high forces and energies imparted into the system. While cadavers have been used to refine surgical approaches, limited data exist on impact force and energy during insertion of IFDs, and inconsistency in cadaveric anatomies and pathologies introduces variance in data and testing conditions. The objective of this work was to design and validate a drop weight benchtop device which replicates cadaveric loading conditions for quantifying impaction forces and energies during insertion of IFDs. Four key impact waveform parameters were quantified: (i) initial slope of the waveform, (ii) peak force, (iii) area under the impulse (force-time) curve, and (iv) duration of the impact event. Cadaveric data was collected using the TLIF procedure to validate the results of the benchtop device. Upon comparison of cadaveric and benchtop device data, modifications were made to the benchtop device to better mimic the cadaveric waveform characteristics. Aluminum drop weights replaced steel drop weights to better match cadaveric impact duration. Additionally, the drop height range was increased to replicate cadaveric peak force. To improve alignment of the insertion tool and consistency of lateral compressive forces acting on the platens, a new compression system was developed. Ongoing work includes outfitting the device with velocity sensors to further investigate energy absorption in the system and modifying the device to allow for the testing of lateral lumbar interbody fusion, as well as cervical fusion and arthroplasty devices.

218
Name: Kaiser, Kimberly
Major: Anthropology - Bachelor of Arts
Faculty Advisor: Anna Osterholtz, Anthropology
Project Category: Biological and Life Sciences

A Study of Sternal End Clavicular Wear in the Tell Abraq Skeletal Collection
Existing literature has suggested that the presence of a rhomboid fossa (pitting on the posterior-medial portion of the clavicle), can be linked to age at death as well as estimated sex. This project focused on the prevalence of the rhomboid fossa in individuals recovered from the Bronze Age ossuary at Tell Abraq, a site located on the Arabian Peninsula in use between 2200 and 2000 BCE. The ossuary contains the remains of at least 243 adults (both males and females), and so provides an excellent case study in the analysis of skeletal morphology and indicators of activity. The development of the rhomboid fossa is linked to hypertrophy of the costoclavicular ligament, responsible for raising and lowering the clavicle. This poster will detail the analysis of 55 clavicles, roughly 28 males and 27 females. Sex was estimated using mixed metric and morphological analysis, as this population is physically large and are not particularly conducive to the use of modern metrics for analysis. This meant taking midshaft as well as max length measurements and applying cutpoint analysis to determine a general estimation while keeping in mind that the strong s-curves associated with many of the clavicles at this site highly affected max length. These clavicles were scored for the presence and severity of the rhomboid fossa. Overall, the prevalence of the rhomboid fossa in males is higher than in females, and so suggests that gendered labor existed in this time and location, with males and females engaged in different habitual activities.

219
Name: Kalmbach, Catherine
Major: Animal and Dairy Science - Bachelor of Science
Faculty Advisor: Brian Rude, Animal and Dairy Sciences
Co-Author(s): Morgan Brown
Funding: College of Agriculture and Life Sciences URSP
Project Category: Biological and Life Sciences

Solubility and degradation of human fertility-promoting molecules in a rumen environment

Myo-inositol, a fertility-promoting molecule found in the body, has been shown to enhance breeding performance and pregnancy success in both males and females across several species, including cattle (Martins, et al., 2022). Oral supplementation of inositol to ruminants has not been evaluated. It is unknown if inositol is soluble in the rumen environment, if it is degraded by the microbes in the rumen, or the timeframe for degradation from oral supplementation. The objectives of this study were to evaluate disappearance of different forms of inositol (myo-, chiro-), and the compound Pyrroloquinoline Quinone (PQQ-)); and to quantify the in-vitro ruminal degradability of myo-inositol over time. Inositol was placed in Ankom bags and heat sealed. Bags were placed in glass fleakers with artificial saliva solution and rumen fluid, then incubated at 39C in a warm shaker bath to simulate ruminal digestion. Two bags of each inositol form were removed from incubation at different time points. Duplicate ruminal fluid samples were collected for myo-inositol concentration determination. These were then evaluated for disappearance of each form from the bags and repeated for a total of five replicates. For all forms of inositol, 0.00% was removed at 0 hr., and by 1 hr. 99.0 % inositol had disappeared ($P > 0.05$). Ruminal fluid concentration of myo-inositol increased ($P < 0.0001$) from 0.197 to 5.39 g/L, and remained constant ($P > 0.05$) until hour 24 when it had decreased ($P < 0.0001$) to 2.766 g/L, and decreased (P, 0.0001) further by 48 hours to 0.377 g/L. This data indicates that inositol is soluble in the rumen environment, though not immediately, with inositol concentrations peaking between 12 and 24 hours and disappearing mostly by hour 48.

24
Name: Kamal, Khaoula
Major: Biomedical Engineering - Bachelor of Science
Faculty Advisor: Lauren Priddy, Agricultural and Biological Engineering
Co-Author(s): Parker Odom, Sophie McLay, Holger Jahr
Project Category: Engineering

Mitigating Degradation of Additively Manufactured Porous Magnesium Scaffolds Using Hydroxyapatite Coating

Bone implants typically consist of metals such as titanium, stainless steel, and cobalt chromium due to their mechanical strength. However, the strength of these materials exceeds that of bone which can lead to stress shielding, atrophy of bone, and/or pain, requiring revision surgeries. As an alternative biodegradable material, magnesium promotes osteogenesis and matches the mechanical properties of bone; however, magnesium can degrade too fast causing gas pockets and/or insufficient mechanical strength. Ceramic coatings such as hydroxyapatite (HA) are an effective means to modulate degradation, as we have demonstrated on solid pure magnesium discs. The objective of this work was to evaluate the effects of HA coating on the degradation kinetics of additively manufactured porous magnesium (Mg) scaffolds. Our hypothesis was that the HA coating would mitigate degradation of the magnesium scaffolds. Additively manufactured WE43 Mg alloy scaffolds were coated with HA using a solution deposition method. A 20-day degradation study performed on a rocker plate demonstrated constant mass, less change in pH, and higher surface height values for the HA-coated scaffolds, indicating they had degraded less than the non-coated scaffolds. A 1-day degradation study in a bioreactor revealed similar results to rocker plate degradation in which HA-coated scaffolds degraded slower and released less magnesium than non-coated scaffolds. A reduction in cell viability was observed from MC3T3 preosteoblasts cultured with extract from non-coated scaffolds compared to that from HA-coated scaffolds. Likewise, cells remained viable when cultured on HA-coated scaffolds, but significant cell death was observed on non-coated scaffolds. Collectively, these results demonstrate the utility of the HA coating for mitigating degradation of magnesium alloys.

25
Name: Kemp, Jennifer
Major: Biomedical Engineering - Bachelor of Science
Faculty Advisor: David Van Den Heever, Agricultural and Biological Engineering
Co-Author(s): Jackson Christ
Project Category: Engineering

Unleashing the Power of the Brain: Exploring Cognitive Activity in E-Sports.

This study explores the cognitive activity of video gamers, examining the correlation between winning versus losing and analyzing the differences in EEG Alpha and Beta power among amateurs and experts. This study aims to shed light on the cognitive benefits of video gaming, providing insights that can be utilized to enhance the training experience for e-gamers.
The electroencephalogram (EEG) measures real-time cognitive activity in the brain. To explore the impact of cognitive activity on whether the participants win or lose, 12 participants, consisting of six amateur and six expert video gamers, were recruited to play Super Smash Brothers on a Nintendo Switch. The experiment was designed based on the participant's experience level, with the CPU and difficulty level adjusted accordingly. The participants' baseline psychological state was obtained with eyes open and closed for two minutes before completing ten practice trials and recording 60 trials in two hours while their winning versus losing ratios were being recorded. Matlab was used to analyze the frequency response through power spectral analysis. The aim of this analysis is to observe any

trends related to the power of the frequency bands. With this new perspective, approaches using brain activity associated with winning can enhance the training experience with positive results. Overall, this study sheds light on the cognitive differences between amateur and expert video gamers and provides valuable insights into the impact of winning versus losing on cognitive activity. The results of this study can be utilized to improve the training experience for e-gamers and to understand the neural mechanisms that underlie the cognitive benefits of video gaming.

220
Name: Kercheval, Caroline
Major: Microbiology - Bachelor of Science
Faculty Advisor: Ling Li, Biological Sciences
Co-Author(s): Rezwan Tanvir
Project Category: Biological and Life Sciences

Taxonomically Restricted *QQS* Associated 1 (*TRQA1*): universal expression and enhanced leaf starch content in Arabidopsis
QQS (Qua-Quine Starch) is a unique orphan gene found exclusively in Arabidopsis plants, regulating carbon and nitrogen allocation. Previous research has demonstrated *QQS'* ability to increase protein levels, reduce starch accumulation, and enhance plant resistance to diseases and pests. Despite these findings, not much is known about the regulatory networks controlling plant metabolism via *QQS*. *TRQA1* (Taxonomically Restricted *QQS* Associated 1) has been identified as a potential regulator linked to *QQS*, with its expression profile indicating a reciprocal relationship with *QQS* levels. However, the metabolic impact of *TRQA* remains largely unexplored. Here, we engineered Arabidopsis plants with altered *TRQA1* expression levels and assessed their starch content. Our findings reveal that *TRQA1* overexpression significantly elevates leaf starch levels, while suppression or knockout reduces starch accumulation. In addition, we generated plants expressing a *TRQA1* promoter-*GUS* (β-glucuronidase) reporter construct, enabling visualization of *TRQA1* expression patterns across different developmental stages via *GUS* staining with X-Gluc (5-bromo-4-chloro-3-indolyl glucuronide) solution. Under normal growth conditions, *TRQA1* exhibits ubiquitous expression throughout various plant organs, consistent with publicly available RNA-Seq data. Specifically, heightened *TRQA1* expression is observed in early stages in leaf cotyledons, root meristems, and vascular tissues, transitioning to young leaves, shoot meristems, and root branching junctions in later stages. This widespread expression profile and its impact on starch content suggest a regulatory role for *TRQA1* in diverse biological processes and plant metabolism modulation, positioning it as a promising candidate for enhancing nutritional quality and reducing starch accumulation in plants.

26
Name: Keyes, Kennedy
Major: Software Engineering - Bachelor of Science
Faculty Advisor: Daniel Carruth, Center for Advanced Vehicular Systems
Funding: US Army Engineer Research and Development Center (ERDC)
Project Category: Engineering

Evaluating Computer Vision Algorithms in Snow-filled Environments with MAVS
Snow cover presents a challenge to perception algorithms on autonomous ground vehicles. The Mississippi State University Autonomous Vehicle Simulator (MAVS) is used to evaluate performance of autonomous ground vehicles. In this project, a model of snowfall and snow cover was implemented to generate snow-covered virtual environments to support simulated testing of autonomous ground vehicles in various depths of snow. Using MAVS, we trained and evaluated multiple computer vision algorithms to estimate the effect of snow on algorithm performance. Our project objectives were: (1) to build a 3D MAVS environment with objects including cows, vehicles, people, and trees; (2) to generate various depths of snow cover; (3) to simulate vehicle drives with and without snow cover in MAVS and generate single image frames; (4) to test 4 computer vision algorithms on the captured single frame images; and (5) to compare each algorithm's performance on the snow and non-snow environments. The algorithms tested included (1) SIFT (Scale-invariant feature transform), which identifies distinctive features in an image and matches these features between two images, (2) YOLO (You Only Look Once), which classifies objects within an image in real-time, (3) COLMAP 3D, which takes a set of images and estimates a 3D structure of the scene captured by the images, and (4) GrabCut, which estimates the color distribution of the foreground and background, and segments the image into these two regions. Future development should (a) use MAVS snow-covered environments to develop and test a snow removal algorithm that can clear the snow from the snow environment images; (b) embed the algorithms into MAVS to simulate self-driving in snow-covered environments; and (c) create larger datasets for training and testing. Accurately simulating cold environments can help lead to the development and realization of secure autonomous vehicles that operate efficiently in all weather conditions.

221
Name: Keys, P. Aaliyah
Major: Animal and Dairy Science - Bachelor of Science
Faculty Advisor: Richard Baird, Biochemistry, Molecular Biology, Entomology, and Plant Pathology
Co-Author(s): Hannah Purcha
Funding: ORED Undergraduate Research Program
Project Category: Biological and Life Sciences

Untargeted Metabolomic Analysis of the Impact of Selenium Supplementation and SELENOH Formation on the Regulation of Nonpolar Liver Metabolites
Selenium is an essential micronutrient that provides important health-related functions and is available in various forms of selenoproteins within the body. Selenium deficiencies have been implicated in a variety of diseases, including cardiovascular disease and type 2 diabetes. Selenium's nutritional status directly effects the production of the different selenoproteins, such as SELENOH, which are essential to mitigate oxidative stress in an organism. Though some information is known regarding the regulation of polar (primary) metabolites associated with selenium nutritional status, investigations into the nonpolar (secondary) metabolites are sparse. In this study, 10-month-old SELENOH knockout and wild-type mice were fed either a selenium-adequate diet or a selenium-deficient diet for 8 weeks. Livers from these mice were used to extract nonpolar metabolites and were analyzed on the NMR platform. Results from these analyses are presented in the poster.

61
Name: Kilpatrick, Saylor
Major: English - Bachelor of Arts
Faculty Advisor: Dhanashree Thorat, English
Project Category: Arts, Music, & Design

Phillip Noyce's Filmic Rendition of "Rabbit-Proof Fence" to Further the Juxtaposition Regarding Matriarchy vs Patriarchy as Pertains to Education
Phillip Noyce, an Australian director, dissects a plethora of themes including the connection gendered based societies have on Indigenous education through the filmic adaptation of "Rabbit-Proof Fence." The book that inspired this film is by Doris Pilkington and recounts the events that befell three girls of the Jigalong Tribe in 1931. I focus on this film to further study the visuals brought forth by the cinematic world built in order to then draw on how certain choices tie into the narrative of the piece as well as the authentic history represented in "Rabbit-Proof Fence." Scholars such as Anna Haebich, Patricia Colangelo and Roger Geertz González, as well as Elizabeth Archuleta are versed in this topic of study, and I found myself compelled to use their indivualized research as building blocks for my own. González and Colangelo speak on the role paternalism more often than not plays in the colonial education taught to Indigenous children. Haebich branches further on to establish the common practice the colonial mind had on combining religious practices as a method of coercion within Indigenous communities. Archuleta flips the same premise of this construct and discusses the grounds on which the Indigenous education, which is often maternal and funnelled through the Jigalong Tribe in the film, does not find its value in pondering the possibilities already established by the western-world alone. My research suggests that these three elements are connected and, therefore, delve into the ugly underbelly that dictates education as a means of control while also studying the answer to right this wrong. On this premise, my research argues that education is often manipulated into a method of power that feeds off codependency and ignorance, but when the educator shifts to establish a focus that embraces the possibilities of the child, the child becomes the future.

54
Name: Kirkpatrick, Annie
Major: English - Bachelor of Arts
Faculty Advisor: Eric Vivier, English
Project Category: Humanities

A "World Without Verona Walls": Why Juliet Makes Romeo her Bride in Shakespeare's *Romeo and Juliet*
Though early scholarship tends to, as Carolyn E. Brown writes in her article "Juliet's Taming of Romeo," understand the play as being "primarily about Romeo" and his experiences with love, more recent criticism informed by feminist frameworks has shifted its focus to Juliet, analyzing her as "a multifaceted character who transcends Romeo in maturity, complexity, insight, and rhetorical dexterity" (333). My essay takes a similar approach by questioning what initially draws Juliet to Romeo, prompts her sudden marriage proposal, and ultimately leads her to suicide. First, I will argue that Romeo disrupts Juliet's predictable world created by the patriarchal certainties of motherhood and marriage with his mysterious identity and disregard for the future. After proving this to be Romeo's initial allure, I will explain that his alienation from Verona and other characters throughout the play make him an opportunity for Juliet to escape her

family and find limited freedom through marriage. Finally, I will redefine the play's tragedy by exploring how Romeo fails Juliet by assuming the feminine role in their relationship and leaving her to die by phallic violence. In the end my analysis will reveal that Romeo is for Juliet at first a passionate mystery that unravels into an insufficient opportunity to escape a world defined by patriarchal rule.

222
Name: Knight, Hannah
Major: Forestry - Bachelor of Science
Faculty Advisor: Robert Grala, FWRC - Forestry
Funding: College of Agriculture and Life Sciences URSP
Project Category: Biological and Life Sciences

Factors Affecting the Location of Forest Products Manufacturers in Mississippi
The forest products industry in Mississippi is a crucial pillar of the state's economy with the industry generating over 12 billion dollars in total economic output annually. However, since 2005 the number of forest products manufacturers in the state has been decreasing. It is not clear what factors affect the manufacturer's decision to locate a processing facility in a specific area. This study analyzed the distribution of forest products manufacturers across Mississippi to determine how manufacturer locations correlated with factors such as timber inventory, labor availability, and proximity to transportation infrastructure. Manufacturers' locations were mapped, and the nearest neighbor analysis was implemented to determine if the manufacturers' locations represented a clustering pattern. Subsequently, a cluster and outlier analysis was used to identify specific geographic clusters of forest product manufacturers. A Poisson regression analysis was used to determine what factors had an impact on cluster location. Results will be an important determinant of the current state of industry clusters in Mississippi, specify where forest product industries are thriving, and indicate where new industries have the potential to succeed. This study will help identify areas of Mississippi that can best support traditional forest products manufacturers as well as emerging industries, such as bioenergy manufacturers, that are considering establishing locations in the state.

223
Name: Knotts, Garrett
Major: Biochemistry - Bachelor of Science
Faculty Advisor: Christopher Johnson, Chemistry
Co-Author(s): Emily Campbell, Steven Gwaltney
Funding: Shackouls Honors College Research Fellowship
Project Category: Biological and Life Sciences

An All Atom Model Of The Human Cardiac Sodium Channel (Nav1.5) In A Lipid Bi-Layer With Explicit Salt And Water Provides Insight Into Non Conducting Configurations
Voltage-gated sodium channels (Nav's) are responsible for the initial upstroke of an action potential in excitable cells, and appropriate function is required for health. During the past decade significant advancements have been made with structural characterization of ion channels. However, descriptions of most cytosolic components are lacking as the flexibility of these regions can impair data collection and or interpretation of a defined structure. Conversely, many investigations have biophysically characterized reconstituted cytosolic components and their interactions, however, elucidating the function and influence on structural properties of an intact ion channel can be challenging. To address this, we have developed an all-atom model of the human cardiac sodium channel (Nav1.5) in a lipid bilayer with explicit salt and water. Our model contains descriptions of cytosolic components that are poorly predicted by alpha fold, and lacking in many CryoEM structures. During two of our four one microsecond simulations we observed dissociation of the C terminal domain from the cytosolic linker that is utilized for fast inactivation. Analysis of our models suggest new aspects of Nav structure that can participate in allosteric communication between the cytosolic components and the channel pore.

224
Name: Koenig, Allie
Major: Microbiology - Bachelor of Science
Faculty Advisor: Richard Baird, Biochemistry, Molecular Biology, Entomology, and Plant Pathology
Co-Author(s): Hannah Purcha
Funding: ORED Undergraduate Research Program
Project Category: Biological and Life Sciences

Analysis of Soybean Response to Drought and *M. phaseolina* Infection
Macrophomina phaseolina (MP) is a soilborne fungal pathogen of pressing agricultural concern. This pathogen is extremely detrimental to over 500 species of plants around the world as it heterobiotrophic nature results in necrotic tissue within its host's vascular system, thereby impeding the transport of water and nutrients and ultimately killing the host plant. *M. phaseolina* is a growing concern in

agriculture due to its wide host range and capacity for devastation. Soybean (*Glycine max* (L.) Merr.) is especially vulnerable to MP infection when it is grown in the hot and dry conditions that MP prefers, which makes the development of resistant soybean cultivars essential for continued agricultural production. In this study, these two stressors' impact on soybean plants were assessed through four treatments: MP infection only, drought only, MP infection and drought, and a non-infected control. In two separate greenhouse trials, data regarding the growth and overall condition of the soybean plants were collected, including height, internode length, and state of the roots. Analyses of these parameters were conducted, and the results will be presented in the poster.

46
Name: Koloc, Jackson
Major: Physics - Bachelor of Science
Faculty Advisor: Torsten Clay, Physics & Astronomy
Co-Author(s): Dipangkar Dutta
Funding: ORED Undergraduate Research Program
Project Category: Physical Sciences

Utilizing Machine Learning Track Stitching Methods to Reconstruct Fragmented Proton Tracks from the Jefferson Labs TDIS Experiment
Tracking the path of protons in a continuous manner can prove difficult with modern instrumentation. Tracks can be left with gaps in between them where data was unable to be recorded which makes utilizing that data less reliable. This missing data can be predicted using machine learning software to essentially "stitch" the tracks together. The database this project seeks to benefit comes from the Jefferson Lab Tagged Deep Inelastic Scattering experiment (TDIS), which will measure the mesonic content of protons and neutrons by scattering off the virtual pion cloud that surrounds them. The TDIS experiment will need to pick out a small number of low energy recoiling protons form a very high rate charged particle background (10s of MHz). To achieve this, a multi-time projection chamber is being built as the recoil proton detector with high occupancy in addition to the high rate. Using simulated ideal tracks, a training module can be built to create a machine learning algorithm to create the full stitched tracks from the TDIS experiment data. Utilizing a primarily python code and dependency database called "Stone-Soup", this project aims to refine the process of track stitching to be used in predicting proton tracks and evaluate the tracking efficiency for realistic tracks which may have only partial information.

27
Name: Lai, Theodore
School: MSMS
Faculty Advisor: Nayeon Lee, Center for Advanced Vehicular Systems
Project Category: Engineering

Nanosurface characterization of eggshells and its antimicrobial properties
In this research, we investigated the surface structure of eggshell in nanoscale in a pathway to study antimicrobial nanotextures. Our hypothesis was that eggshell might possess antimicrobial properties since eggs laid by birds are rarely infected by bacteria, even when laid in dirt and other bacterial-infested areas. Surface roughness plays a vital role in antimicrobial properties, as surfaces with a higher surface roughness can trap bacteria and make it difficult for them to adhere to the surface. If bacteria cannot adhere to the eggshell's surface, they will be unable to colonize and multiply. In this investigation, we took micro x-ray CT scans on the eggshell and produced 2D image stacks of a physical object to analyze the interior of the eggshell without destroying the eggshell. The 2D images from the micro CT scan was also used to construct 3D models to quantify pores and surface roughness using a software, ScanIP. Also, to examine the roughness of the eggshell experimentally, atomic force microscopy (AFM) was used to study the topography and surface texture at a nanoscale accurately. Our study provided surface characteristics that could be related to antimicrobial nanotexture.

225
Name: Laird, Tanner
Major: Horticulture - Bachelor of Science
Faculty Advisor: Jordan Smink, Biological Sciences
Co-Author(s): Heather Jordan
Project Category: Biological and Life Sciences

Feed for Feed: Black Soldier Fly Growth and Development on Commercial Food Substrates With and Without Bacterial Supplementation
Black soldier fly (BSF) larvae are a potential solution to reducing agricultural and food waste and serving as a food source for animals and humans. We evaluated different commercial foods that represent potential consumer food wastes and tested their effects on BSF growth and development compared to a Gainesville Diet control. We hypothesized that the control Gainesville Diet (67% water, 17%

wheat bran, 6.6% maize flour, and 9.9% alfalfa) would be more beneficial to BSF because the alfalfa protein and carbohydrate mixture would represent a balanced diet. We tested chicken, pasta, corn, and Gainesville Diet alone and in combination and evaluated these with our without bacterial supplement. Our results showed that bacterial supplementation did not increase survivability in any of our diets. The bacterial supplementation trials with the Gainesville Diet and chicken had a higher mortality than without the bacteria. The bacteria did increase larval weight gain in the Gainesville Diet, corn, and pasta diets. These data suggest that bacterial supplementation has the greatest probiotic effect in diets with significant portions of grains. This experiment demonstrates that healthy larvae can be reared on potential consumer food wastes which will represent lower input costs for producers. Our data also point to potential probiotic effects of bacterial supplementation for bsf producers. As larvae are sold by weight, increased weight of larvae means increased profit for producers.

226
Name: Land, Jacob
Major: Landscape Architecture - Bachelor of Landscape Arch
Faculty Advisor: Guihong Bi, Plant and Soil Sciences
Project Category: Biological and Life Sciences

Papaya Cultivation in North Mississippi
This research project investigates the feasibility of growing papayas in Mississippi, a subtropical region with distinct climate conditions. Papaya (Carica papaya) is an herbaceous fruit-bearing plant native to tropical regions of the Americas, particularly Central America and southern Mexico. It is prized for its antioxidant properties, abundance of Vitamin C and A, papain, and high fiber content. Through a comprehensive study, we aimed to assess the viability of papaya cultivation in Mississippi. Our findings indicate that while papayas can be grown in this region, they require careful attention to environmental factors such as sunlight exposure and protection from frost and wind. Despite challenges posed by the climate, our study demonstrates promising results regarding papaya growth and fruit production under optimal conditions. These findings offer valuable insights into the potential for expanding papaya cultivation in non-tropical regions and highlight the importance of tailored approaches to meet the unique needs of these environments.

47
Name: Lawson, Hannah
Major: Biochemistry - Bachelor of Science
Faculty Advisor: Amanda Patrick, Chemistry
Co-Author(s): Matthew Carlo
Project Category: Physical Sciences

Evaluating the use of drift gas modifiers to increase the separation of isobars in ion mobility spectrometry
Mass Spectrometry (MS) is an important tool in determining the identity of an analyte based on its mass (measured as a mass-to-charge ratio, m/z). However, isobars, species which have the same nominal m/z value, cannot be differentiated by mass spectrometry alone, especially in cases where they share fragmentation patterns. Ion Mobility Spectrometry (IMS), which measures the drift time of an analyte as it is pulled through a buffer gas by an electric field, separates ions based on their size and shape. IMS can be used in tandem with MS to separate isobars prior to m/z analysis for more specificity. IMS, while useful for the differentiation of some isobar species, may not always provide sufficient separation, especially for small molecules. Drift gas modifiers (DGMs) can be added to the drift tube of the IMS and have been proposed as an approach to enhance the separation of isobar species due to differential interactions with the DGM. The goal of this work was to explore this proposition, with the aim of evaluating the potential analytical utility of DGM-assisted IMS for small molecule isobar characterization. In this study, five isobar sets will be subjected to IMS with pure N_2 drift gas and then with the DGM (2-butanol)-doped N_2 drift gas to determine if a higher degree of separation can be attained. We will especially be interesting in determining whether analytes with certain functional groups or structural features are more affected than others. The isomer/isobar sets are quinoline and isoquinoline (C_9H_7N, 129.16 g/mol); leucine and isoleucine ($C_6H_{13}NO_2$, 131.17 g/mol); ortho-, meta-, and para-aminobenzoic acid ($C_7H_{13}NO_2$, 137.14 g/mol); salbutamol ($C_{13}H_{21}NO$, 239.31 g/mol), isoetharine ($C_{13}H_{21}NO$, 239.31 g/mol), and diphenamide ($C_{16}H_{17}NO$, 239.31 g/mol); and salmeterol ($C_{25}H_{37}NO_4$, 415.6 g/mol) and tomatidine ($C_{27}H_{45}NO_2$, 415.7 g/mol).

227
Name: Leach, Ryan
Major: Landscape Architecture - Bachelor of Landscape Arch
Faculty Advisor: Timothy Schauwecker, Landscape Architecture
Co-Author(s): Paul Perez
Funding: College of Agriculture and Life Sciences URSP
Project Category: Biological and Life Sciences

Mapping, estimation of vegetation density, and control of *Ligustrum sinense* **in the Redbud-Catalpa Creek watershed.**
Ligustrum sinense (Chinese privet) is a rapidly growing non-native invasive species. It grows in the under story of forests, on forest edges, and along creek banks and occupies space that would otherwise be available for native species that would improve biodiversity. To determine the distribution of Chinese privet we have mapped the density within the watershed, which has headwaters underneath the Mississippi State football stadium and collects storm water runoff from the southern part of the university. The watershed contains most of South Farm and turns east through the MAFES Dairy Unit before turning north and flowing into Tibbee Creek. The total acreage of mapping includes surveys conducted on privet in roadways, creeks, and university properties in the watershed. Mapping indicating vegetation density of privet is shown using Google Earth. The hack-and-squirt method was used: a small cut at the base of the privet was made and Triclopyr was applied. Initial results showed greater than 80% success with this application method. Using the hack-and-squirt method of removal will help us find a good estimation for production rate for removal. Mapping the density of privet will result in increased knowledge of control methods for habitat restoration, stream restoration, and biodiversity.

28
Name: Leatherman, Olivia
Major: Mechanical Engineering - Bachelor of Science
Faculty Advisor: Mohsen Azimi, Mechanical Engineering
Co-Author(s): Naoufel Ghannami, Abel Nettles, Ethan Vallerga, Matthew Templeton, Dalila Belaidi
Project Category: Engineering

Simulating the Effects of a Micrometeorite Impact on an Extraterrestrial SmartHab Using HabSim
In recent decades, humanity has had hopes of inhabiting and exploring extraterrestrial bodies, such as Mars and the Moon. To inhabit an extraterrestrial body, it is vital to develop living spaces that can meet the needs of the crew and respond to hazardous conditions. The Resilient Extra-Terrestrial Habitats Institute (RETHi) at Purdue University, along with several collaborators from other universities have been conducting research on extraterrestrial smart habitats known as SmartHabs, where the word "smart" points to their automated features. RETHi has developed a Modular Coupled Virtual Testbed (MCVT), named HabSim, for simulating contingency events known as disruption scenarios that endanger both the integrity of the habitat and the crew on board. HabSim contains 28 damageable components that can be affected by the disruption scenarios, and it allows the users to experiment with the consequences of variety of decisions that determine the habitat's responses to a particular simulated disruption scenario. The disruption scenario studied in this work is the collision of a micrometeorite with the SmartHab. HabSim simulates the effects of a micrometeorite impact on various components of SmartHab for parameters that can be changed by users, including the repair rates and the repair order of the damaged components. The length of the simulation and the time that the micrometeorite strikes the habitat can also be varied. The response of the SmartHab to various disruption scenarios allows researchers to better understand the effect of each subsystem on other subsystems in hazardous states, which in turn results in development of more informed protocol for future extraterrestrial missions.

228
Name: LeBlanc, Sophie
Major: Animal and Dairy Science - Bachelor of Science
University: Louisiana State University
Faculty Advisor: Constantine Simintiras, School of Animal Sciences (LSU)
Funding: LSU Discover Research Grant
Project Category: Biological and Life Sciences

Extending Ungulate Embryo Development *In Vitro*
Mammalian reproduction involves a complex dialogue between the developing conceptus (embryo and extra-embryonic tissues) and the maternal uterus. In several agriculturally relevant ungulate species (e.g., cattle, sheep, and pigs) the conceptus undergoes an extended pre-implantation development period, termed conceptus elongation. If the conceptus does not elongate enough, the estrous cycle will resume, and the pregnancy will be lost. This elongation window coincides with a period of high pregnancy losses. To date, conceptus elongation has not been recapitulated in the lab (*in vitro*). However, many studies show that select metabolites are present in uterine fluid and likely important to elongation. Bovine embryos were produced using standard methods — cumulus-oocyte-complexes (**COC**) were purchased (DeSoto Biosciences) and matured for 20-22 h before washing in in vitro fertilization (IVF) medium (IVF Bioscience). Next, purified frozen-thawed semen (ST Genetics) was used for fertilization at a concentration of 2 million sperm/ml. Oocyte fertilization proceeded for 18 h at 38.5 °C in a humidified atmosphere of 5% CO_2 in air. Cumulus cells were removed with wash media (IVF Bioscience) and vortex. Presumptive zygotes were then transferred to 400 μl IVC medium (IVF Bioscience) under mineral oil (Sigma Aldrich) where they matured to the blastocyst stage. These early blastocysts were transferred to either a control or experimental group and monitored daily. Our hypothesis is that supplementing metabolites to *in vitro* embryo culture media will extend embryo development (conceptus elongation) in the lab. If successful, this work could improve ungulate reproductive efficiency, which is the main driver of farm profitability.

58
Name: Lee, Kyndle
Major: History - Bachelor of Arts
Faculty Advisor: Joseph Thompson, History
Project Category: Humanities

How Starkville's Intense Racial History Led to the Landmark Supreme Court Cause, Shelley v. Kraemer
My presentation will cover how Starkville's intense racial history led to the landmark Supreme Court case, Shelley v. Kraemer. J.D. Shelley, a Starkville native, ultimately decides to move himself and his family further north for better opportunities in St. Louis, MO. He leaves his family behind in Starkville to find work in St. Louis, and once he does, they move up there with them. While there, he does fairly well economically and decides to purchase a home. His realtor sells him a home in a white neighborhood that has a racial covenant already established. At the time the house is sold to him, he and his family do not know that the neighborhood is white, so they are surprised once they move in and their neighbors are fighting to get them out of their neighborhood. Eventually, the battle is taken to the Supreme Court of the United States, and they rule that racial covenants in neighborhoods are unconstitutional as it violates the 14th amendment. Knowing that J.D. Shelley and his family are from Starkville, one of the many places in the South that possess a pretty intense racial history going back to the early 19th century, explains why he decided to make the move to St. Louis in the first place. I believe that this side of Mississippi history, something so close to home, must be preserved or else it will be forgotten forever.

229
Name: Lee, Seung Heon (Seth)
Major: Biochemistry - Bachelor of Science
Faculty Advisor: Seung-Joon Ahn, Biochemistry, Molecular Biology, Entomology, and Plant Pathology
Funding: College of Agriculture and Life Sciences URSP
Project Category: Biological and Life Sciences

Transcriptome analysis of the Hibiscus sawfly: Unraveling molecular mechanisms of detoxification
Sawflies, primitive wasps whose larval stages feed on various trees and shrubs, pose a significant threat to plant health through defoliation, known as "leaf skeletonization." The Hibiscus sawfly (*Atomacera decepta*) was identified on the MSU campus, particularly affecting Hibiscus and rose mallows. Despite its impact, little is known about this defoliator's biology, including its chemical defense mechanisms against noxious plant toxic compounds. This project investigated the transcriptomes of the Hibiscus sawflies, aiming to uncover the molecular mechanisms underlying food digestion and chemical detoxification. Employing RNA sequencing technology, we analyzed both larval and adult transcriptomes, revealing a plethora of differentially expressed genes between these two distinct life stages. Specifically, we identified larval-specific genes related to digestion, detoxification, and development. Further details are presented in the accompanying poster. This study marks a crucial step towards understanding the unique biology of this defoliator and developing effective management strategies to mitigate its impact on plant health.

230
Name: Leighton, Renae
Major: Wildlife, Fisheries & Aqua - Bachelor of Science
Faculty Advisor: Garrett Street, FWRC-Wildlife, Fisheries & Aquaculture
Co-Author(s): Ira Parsons
Funding: College of Forest Resources: Forest And Wildlife Research Center URSP
Project Category: Biological and Life Sciences

The Trouble with Time: Beware of Time Drift in On-Board Data Loggers in Wildlife Research
Animal-borne accelerometer and magnetometer (AM) data loggers are increasingly popular in ecological research, particularly in studies of animal behavior. At sub-second rates, triaxial AM loggers record three dimensional changes in speed, direction, and body position that allow scientists to identify certain behaviors. Many of these devices are store-on-board loggers that utilize crystal oscillators to keep time. However, when the crystal oscillates too fast or too slow, it can cause time drift - a deviation in device recorded time versus real time. Unpublished field data suggests that these devices may accumulate substantial time drift but this is yet to be replicated in a controlled environment. Thus, we deployed 12 AM devices in a laboratory setting over the course of 8 months. The devices were benchmarked (moved in distinctive ways with real time recorded) in order to determine the prevalence, consistency, and predictability of any observed time drift. We found that all devices exhibited consistent and substantial linear drift, but every device was drifting differently with no consistent magnitude or direction. The observed drift ranged from -2.32 seconds per day to 1.46 seconds per month with a standard deviation of 5 seconds per week, which could be problematic for behavioral identification. Thus, researchers

need to be made aware of potential time drift in on-board data loggers. We suggest researchers utilize caution and implement movement benchmarks before and after deployment to allow for drift correction if needed.

231
Name: Lisowski, Austin
Major: Wildlife, Fisheries & Aqua - Bachelor of Science
Faculty Advisor: Michael Sandel, FWRC-Wildlife, Fisheries & Aquaculture
Co-Author(s): Kayla Fast, Kevin Jones, J. Wes Neal
Funding: College of Forest Resources Undergraduate Research Scholars Program
Project Category: Biological and Life Sciences

Investigating the Genetic and Morphological Diversity of Southern Walleye (*Sander vitreus*)
The Walleye (*Sander vitreus*) is a widespread freshwater sportfish species with commercial importance. Within *S. vitreus*, three evolutionary distinct units have been identified: Northern Glaciated, Central Highlands, and Southern. The Southern strain of Walleye, also know as the Gulf Coast strain, is of particular interest as it is native to Mississippi. Southern Walleye samples have been collected from three populations within Mississippi and Alabama – from the Pearl River, the Tombigbee River, and the Alabama River. The genetic and morphometric/meristic characteristics of the samples from these three populations will be compared to each other, and to samples from Northern Glaciated and Central Highland units, with Principal Coordinates Analyses (PCoA). A phylogenetic tree will be constructed using the maximum likelihood optimality criterion and ancestry coefficients will be calculated using packages in the R statistical computing environment. These comparisons should provide insight into the origin of these populations, whether they be native Southern strain or introduced Northern Glaciated or Central Highland strain. By understanding the genetic and physical characteristics of these different populations, fisheries managers can make more informed decisions on managing this native species.

232
Name: Little, Alyssia
Major: Animal and Dairy Science - Bachelor of Science
Faculty Advisor: Lauren Priddy, Agricultural & Biological Engineering
Co-Author(s): Claylee Chism, Annemarie Coatney, Railey Mayatt, Emma Roden, Eden Tanner
Funding: College of Agriculture and Life Sciences URSP
Project Category: Biological and Life Sciences

Chitosan Hydrogels with Novel Ionic Liquids Reduce Staphylococcus Aureus Activity
Osteomyelitis, or bone infection, is commonly caused by *Staphylococcus aureus (S. aureus)*, which can become antibiotic resistant and form biofilms. Although long-term antibiotic solutions exist, sometimes more drastic measures such as bone and tissue removal are necessary. Previously, we demonstrated the innate antimicrobial efficacy of ionic liquids (ILs) and chitosan independently, as alternatives to antibiotics. Here, our objective was to evaluate their antimicrobial properties when combined. The ILs tested, choline decanoate (CADA), choline undecanoate (CAUA), and choline dodecanoate (CADDA), have a double anion tail and a single cation head with varying carbon chain lengths (10, 11, and 12, respectively) between each ion. Our hypothesis was ILs with longer carbon chains at higher concentrations in chitosan hydrogel would most effectively eliminate bacteria. ILs at 0.25%, 0.5%, and 1% (v/v%) alone or loaded in 3.6% chitosan hydrogel were evaluated against ATCC 6538-GFP *S. aureus* in planktonic (liquid) form. For all ILs alone, antimicrobial efficacy increased with increasing IL concentration, with CADDA more effective than CADA and CAUA at all concentrations. When the 1% ILs were incorporated into chitosan hydrogel, CADA killed more planktonic bacteria than CAUA, but surprisingly, the opposite was observed in the Kirby-Bauer test, where CAUA had more bacterial clearance than CADA. CADDA in chitosan showed moderate efficacy in both assays. In conclusion, our findings demonstrate the antimicrobial efficacy of ionic liquids with chitosan hydrogel. Further studies will include testing ILs with longer carbon chain lengths at higher concentrations.

233
Name: Loper, Aleese
Major: Biochemistry - Bachelor of Science
Faculty Advisor: Jiaxu Li, Biochem,MolBio,Entmology&Plant Path
Funding: College of Agriculture and Life Sciences URSP
Project Category: Biological and Life Sciences

Role of small peptides in regulating soybean responses to drought
Abiotic stresses such as heat, drought and salinity are main factors limiting crop production. Improving plant resilience to stress are key to sustainable and future agricultural productivity. A significant part of the cell-to-cell communication in plants is mediated by small signaling peptides. Recently, small signaling peptides have emerged as an important class of regulatory molecules in plants involved in

the control of plant growth and development. However, the involvement in small peptides as regulatory molecules in abiotic stress responses remains to be determined. In this study, we examined the effects of drought stress on the expression of small proteins/peptides. Small proteins/peptides were extracted from the leaves of soybean plants subjected to drought stress as well as from the control plants. The extracted proteins/peptides were separated by tricine-sodium dodecyl sulphate polyacrylamide gel electrophoresis. Two peptides were found to be up-regulated by drought stress. The amino acid sequences of the *up-regulated drought*-responsive *peptides were analyzed by* mass spectrometry-based de novo sequencing. These results suggest that *drought*-responsive *peptides* may play an important role in drought stress perception and response. Further functional analysis of the *drought*-responsive *peptides will elucidate their roles* in drought adaptation and tolerance in soybean.

234
Name: Lott, Kailyn
Major: Microbiology - Bachelor of Science
Faculty Advisor: Barbara Kaplan, Comparative Biomedical Sciences, CVM
Co-Author(s): Arpita Deb
Funding: NIH R15 ES027650
Project Category: Biological and Life Sciences

Characterization of Fcγ Receptors in Mouse Splenocytes Stimulated with IgG1 Immune Complex
Our previous studies have shown that aryl hydrocarbon receptor (AhR) ligand 2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD) suppressed IgG1 antibody production from B cells in vitro. Antibodies, such as IgG1, can trigger cellular functions on innate cells such as macrophages. To do this, IgG1 must form an immune complex and bind to one of several Fcγ receptors. Thus, this study aims to characterize Fcγ receptors on mouse innate cells and determine whether the IgG1 immune complex signals through those receptors. We hypothesize that the IgG1 immune complex will signal through CD16 (FcγRIII), CD64 (FcγRI), and possibly FcRn. The IgG1 immune complex was comprised of streptavidin bound to biotinylated IgG1 (SBIgG1). First, we determined the expression level of the Fcγ receptors on mouse innate cells (male or female splenocytes or RAW mouse macrophage cell line). Second, mouse innate cells were treated with the SBIgG1 immune complex in the presence of antibodies directed against the Fcγ receptors. The data show that RAW cells expressed higher levels of Fcγ receptors than splenocytes. Blocking with a CD16 antibody slightly decreased SBIgG1-stimulated cytokine production and complement C3a protein release. The data also showed that mouse innate cells expressed FcRn and blocking FcRn also slightly decreased SBIgG1-stimulated cytokine production and complement C3a protein release. Overall, the data show that SBIgG1 can stimulate mouse innate cells with a mechanism that involves CD16 and FcRn. Future studies will focus on the role of CD64. These studies have established an important model for us to further examine the immunotoxicity of TCDD.

235
Name: Lowe, Jariyah
School: Starkville High School
Faculty Advisor: Zack Gillen, Kinesiology
Co-Author(s): Morgan Wood
Project Category: Biological and Life Sciences

The Effects of Fatigue on Hamstrings-to-Quadriceps Ratio
Hamstrings-to-quadriceps ratio (HTQ) is a commonly used measurement to determine if there are muscular imbalances in the thigh musculature and provide a potential index of knee injury risk. The purpose of this study was to examine the effects of fatigue on HTQ. Nineteen college-aged completed this study (mean±standard deviation, height=175.8±11.0 cm, weight=76.4±17.5 kg). Participants completed a fatiguing test consisting of 50 maximal isokinetic knee extensions and flexions at an angular velocity of $180°·s^{-1}$. Peak torque (PT) was averaged across the first three repetitions (initial) and last three repetitions (final). PT from knee flexion was divided by PT from knee extension to determine initial and final HTQ. A two-way repeated measures analysis of variance examined differences between knee extension and flexion PT from initial to final. A dependent samples t-test examined differences in initial and final HTQ. Initial PT was greater for knee extension than flexion (p=0.001), but not final PT (p=0.505). For knee extension and flexion, PT decreased from initial to final (p<0.001). HTQ increased from initial to final (p=0.001). The quadriceps and hamstrings both experienced fatigue as a result of the fatiguing test, but it appears that the quadriceps fatigued to a greater extent than the hamstrings. Due to this, HTQ increased from initial to final (0.71 vs. 1.14), an interesting finding of the present study. This suggests that fatigue may result in greater reliance on the hamstrings during dynamic movements involving knee extension and flexion, potentially putting the hamstrings, and subsequently the knee, at greater injury risk. When fatigue is a factor of performance, coaches and practitioners should consider appropriate training regimens to ensure individuals do not overly rely on the hamstrings or quadriceps.

85
Name: Mackey, Shawn
Major: Architecture - Bachelor of Architecture
Faculty Advisor: Leah Kemp, Fred Carl Jr. Small Town Center
Funding: Belinda Stewart Architects Fellowship
Project Category: Education

Preserving the Past, Securing the Future: Safeguarding Historic Structures in Tornado-Prone Communities
This research identifies ways to help small towns better prepare for tornados and recover in the aftermath. Tornadoes have become increasingly common in MS over the last decade, with a record of 118 tornadoes in 2022 alone. This surge in tornadic activity has prompted discussions about preparedness and response strategies as they pertain to our built environment. Despite the increase in tornadic activity, there is a lack of specific attention and strategy focused on preserving historic structures in MS. Many of our communities have historic structures that are at risk or have been damaged in these types of storms. Yet, some structures have survived numerous high-wind events. But how? The purpose of this research is to develop a knowledge base around how to help preserve historic structures in tornadoes and learn from the building and construction methods that have contributed to their survival over time. Preservation in the context of tornadoes refers to the proactive efforts to protect and safeguard historical and cultural assets, such as historic buildings, artifacts, and landmarks, from the destructive forces of tornadoes. This can include implementing structural reinforcements, disaster preparedness plans, and emergency response strategies that specifically address historic structures' unique vulnerabilities and value. Preservation efforts aim to minimize damage, ensure the long-term survival of these cultural treasures, and maintain their historical and architectural significance in the face of tornado threats. This research accomplishes the understanding of how to build resilience for a future disaster through the culmination of case studies, interviews, and research. Case studies gave an understanding of how affected buildings recovered from the disaster. Interviews helped us gain better knowledge of what regulations and requirements were needed throughout the recovery process, and research through other toolkits gave a baseline and precedent for achieving our goals.

236
Name: Maddox, Bronwen
Major: Wildlife, Fisheries & Aqua - Bachelor of Science
Faculty Advisor: Scott Rush, FWRC-Wildlife,Fisheries&Aquaculture
Funding: College of Agriculture and Life Sciences URSP
Project Category: Biological and Life Sciences

Compounds and microbiota in wetlands and wildlife
Fecal coliform and various hormones are often found in waterbodies affected by human discharge. Understanding the origin of these materials allows us to identify potential non-point sources as well as potential implications for wildlife. For instance, 17α-Ethinylestradiol is a synthetic human estradiol commonly used as a form of birth control where it is taken orally as a contraceptive pill and released into the environment as a xenoestrogen waste product. Many species utilize water bodies that are contaminated with these compounds and the effects of this exposure are under-studied. We are exploring the exposure of wildlife to human-derived compounds, micro-, and macro-biota by sampling waterbodies and wildlife. Blood samples are collected through trapping of a variety of species known to live within, or forage along, waterbodies, with a special focus on turtles found in water bodies around Oktibbeha County. Collected blood samples are tested through an Enzyme-Linked Immunosorbent Assay. Currently, our analysis reveals low estradiol concentrations in pond sliders (*Trachemys scripta*) and high concentrations in black vultures (*Coragyps atratus*), especially in adult males of this species. The significance of these findings is not fully understood but may point to the exposure of vultures as scavengers who acquire estradiol by feeding on anthropogenic waste. This study can provide insight into the spread of estradiol throughout the environment and into different species. It is another step toward understanding the effect of urban systems on wildlife.

86
Name: Magee, Hannah
Major: Kinesiology - Bachelor of Science
Faculty Advisor: Harish Chander, Kinesiology
Co-Author(s): Leyton Riley, Sally Barfield, Aaron Griffith, Adam Knight
Funding: Shackouls Honors College Research Fellowship
Project Category: Education

A Comparison of The Y-Balance Test As A Measure Of Dynamic Stability Among Collegiate Soccer Athletes And Collegiate Students
The Y-Balance Test (YBT) serves as a valuable tool for assessing lower extremity rehabilitation among collegiate female students and

NCAA Division I Women's Soccer players. It involves balancing on one leg and reaching with the other leg in three directions (anterior, posteromedial, and posterolateral). Research indicates that shorter reach distances may increase the risk of lower extremity injuries. Thus, this study aimed to compare these reach distances between the two groups at a single time point, examining potential differences. Participants from both groups underwent testing once during the semester. They balanced on one leg and reached the opposite leg in three directions on a sliding block, measuring the furthest distance reached. Composite scores were calculated by normalizing reach distances to leg length, summing the three directions, adjusting for leg length, and then multiplying by 100. An independent samples t-test revealed no significant differences between collegiate female students and NCAA Division I Women's players in reach distances (t = .822, P <.001). At this single time point, no significant variations were observed between the two groups in lower extremity reach distances. However, continued monitoring and targeted interventions for enhancing lower extremity stability remain essential for both collegiate female students and NCAA Division I Women's Soccer players. Future studies should explore longitudinal changes and incorporate larger sample sizes for more robust comparisons.

68
Name: Manuel, Breunna
Major: Architecture - Bachelor of Architecture
Faculty Advisor: Alexis Gregory, School of Architecture
Funding: College of Architecture, Art and Design Catalyst Grant
Project Category: Arts, Music, & Design

Exploring Ethics and Empathy In Architecture Education
Architecture is a field of study that broadly affects people from all walks of life. It is the primary purpose of those who join the profession to satisfy all when designing the built environment. Architects have the advantage to control many things such as functionality in a space, setting the tone of the environment, creating social bonding, making all feel welcomed, and even controlling emotions. How are architects and future architects being trained to meet these standards and needs? This research is an examination of the inclusion of ethics and empathy in the education of future architects. The data collected will take a deeper dive into the objectives and standards set in architecture curricula at select universities. The universities were chosen based on previous research interviewing students from those. Each university falls under one of several categories such as; HBCU (Historically Black College and University, PWI (Primarily White Institution), public land grant, and private university. Course descriptions of required courses in the curriculum from the selected B.Arch. (Bachelor of Architecture) programs were reviewed for the inclusion of specific key words. Prior to documentation and research, a set of key words were anticipated to be found in the course descriptions. Empathy, ethics, community, community-engagement, ethnicity, and race were the key words used in the review. With the exception of community, not all terms were located but words such as economic diversity, social equity, and identity closely correlated with the original key words. The goal of this research is to seek answers on what is currently included in architecture curricula at a variety of universities to help propose a solution for an all-inclusive curriculum of architecture using ethics and empathy.

269
Name: Marlow, Tanner
Major: Agronomy - Bachelor of Science
Faculty Advisor: Richard Harkess, Plant and Soil Sciences
Co-Author(s): Rachel Bobo
Funding: College of Agriculture and Life Sciences URSP
Project Category: Biological and Life Sciences

Using Cutting Immersion to Apply Rooting Hormone for Rooting *Camellia japonica*.
Few varieties of *Camellia japonica* have a high success rate in rooting cuttings. Once rooted, the subsequent growth rate is slow and varies by variety. This makes commercial production of *Camellia* challenging. Previous research on *C. japonica* propagation confirms using a cutting basal dip in indole-3-butyric acid (IBA) is effective in rooting *C. japonica*. However, basal dip application can be time-consuming as each cutting must be dipped. Foliar applications and total cutting immersion are more efficient methods of rooting hormone application, but they have not been thoroughly tested with *Camellia*. The effective concentration of IBA varies across cultivars. The objective of this research was to determine the effective IBA concentration applied as a total cutting immersion to stimulate rooting. On June 23, 2023, 240 semi-hardwood, terminal cuttings, 60 cuttings per variety, were collected from *C. japonica* varieties 'Lady Clare', 'Sarah Frost', 'Imura', and 'Magnoliaeflora'. All cuttings received a half-inch wound on one side near the base of the cutting before auxin treatments. IBA treatments were applied to five sets of 12 cuttings of each variety. Four IBA treatments are applied at 0, 200, 400, or 600 ppm for 5 minutes immersion. One additional IBA treatment at 3000 ppm for 15 seconds basal dip was used as a control. Although the results are non-conclusive, we have observed each variety of *C. japonica* tested responded differently to increasing IBA, especially 'Magnoliaeflora'. The total immersion application was no different than the basal dip application indicating this more efficient method of application is effective for use in *Camelia* propagation.

136
Name: Martin, Abigail
Major: Psychology - Bachelor of Science
Faculty Advisor: Cliff McKinney, Psychology
Co-Author(s): Tram Nguyen
Funding: Shackouls Honors College Research Fellowship
Project Category: Social Sciences

The Indirect Effect of Current Maltreatment by Parents Via Trauma Appraisal and Emotion Dysregulation
Barlow et al. (2017) found that negative trauma appraisal, emotion regulation difficulties, and lower levels of self-compassion fully accounts for the link between exposure to childhood abuse and the presence of PTSD symptoms in emerging adults. These findings underscore the importance of trauma appraisal and emotion dysregulation in understanding PTSD symptoms following childhood maltreatment. Prior research predominantly examined the effect of maltreatment on children, but less is known about the impact of past-year maltreatment on emerging adults. This research aims to examine the indirect effect of past-year parental maltreatment on emotion dysregulation via trauma appraisal. Additionally, we expanded the model to emerging adult ROTC students. Research suggests that ROTC emerging adults differ from non-ROTC emerging adults in many ways, ranging from their background, aptitudes, social environment, values, interests, and attitudes (Dosono et al., 2017). Participants included 49 ROTC emerging adults and 110 non-ROTC emerging adults. Participants completed surveys via Qualtrics. Data collection has been concluded and result analysis is in progress. The significance of understanding trauma appraisal cannot be overstated, as the ability to process and cope with traumatic events can influence one's future mental health, interpersonal relationships, and overall life trajectory (Bernandi et al., 2019). As we continue refining our understanding of factors that place people at risk for mental health issues, the ability to identify self-appraisal profiles, and underlying factors contributing to risk and resilience, may play a vital role in developing preventions and treatments for stress-related mental health disorders.

137
Name: May, Grace
Major: Human Development & Family Sci - Bachelor of Science
Faculty Advisor: Lori Elmore-Staton, Human Development and Family Science
Funding: Mississippi Department of Human Services
Project Category: Social Sciences

Evaluation of Knowledge and Skills Gained Through Family Resource Management Parenting Toolkits for Mississippi Families
The American Psychological Association (APA) reports that adults rank finances and the economy as their top source of stress, and 79% of parents reported that money caused them significant stress (American Psychological Association, 2023). To assist parents with dealing with this stress and enhance family functioning and child development, the Protect and Connect Extension Program at Mississippi State University provides resources and educational materials to families in Mississippi. The Protect and Connect Program is a novel approach to parent education and is patterned after a subscription box model where parents are mailed a series of five toolkits. The fourth of which, the Family Resource Management Toolkit (the Toolkit), was created to address the financial stress that families commonly face and includes items focused on budgeting, managing time, and creating routines. Using data from 446 families who completed evaluations of the program, this study aimed to examine the effectiveness of the Toolkit to promote parental knowledge and skills across six domains: (1) nurturing parenting practices, (2) safety threats and protection strategies, (3) positive guidance (i.e., discipline) strategies, (4) family stress and conflict management strategies, (5) practices to promote child development, and (6) co-parenting strategies.
The evaluation method used was a modified version of the MSU Extension Standardized Evaluation Survey. Participants answered questions on a 1-5 scale ranging from strongly disagree (1) to strongly agree (5), with higher scores representing perception of gains in knowledge and skills of the six aforementioned domains. The results suggest that the Toolkit promoted gains in knowledge and skills across all six domains, with the greatest gains in increasing knowledge of nurturing and responsive parenting practices and increasing knowledge of positive guidance strategies. Overall, these preliminary data indicate caregivers found the Toolkit improved their parenting skills across several domains.

237
Name: Mayatt, Railey
Major: Biomedical Engineering - Bachelor of Science
Faculty Advisor: Lauren Priddy, Agricultural and Biological Engineering
Co-Author(s): Dhanush Amarasekara, Luke Tucker, Emma Roden, Alyssia Little, Annemarie Coatney
Project Category: Biological and Life Sciences

Characterization of Chitosan Hydrogel Loaded with Elastin-Like Protein Functionalized Gold Nanoparticles

Staphylococcus aureus is a pathogen commonly associated with soft tissue infections and osteomyelitis. While antibiotic therapy may be effective in treating some *S. aureus* infections, certain strains of *S. aureus* (such as MRSA) are resistant to many antibiotics and are more challenging to treat. Gold nanoparticles (AuNPs) can be used as an alternative antimicrobial treatment when irradiated with a near-infrared laser due to their high photothermal conversion efficiency and biocompatibility. Agglomerated AuNPs have a higher photothermal conversion efficiency, so the Fitzkee lab functionalized AuNPs with elastin-like protein (ELP), which binds to itself above a certain. Our goal was to evaluate the effectiveness of using chitosan (CH) hydrogel as a delivery vehicle for ELP-functionalized AuNPs against *S. aureus in vitro* and to see if the AuNPs retained the same agglomeration capacity in hydrogel as in water. CH hydrogels are thermosensitive and biocompatible and can be injected locally to treat infections like osteomyelitis. Here, 200nM, 100nM, and 50nM of ELP-functionalized AuNPs were loaded into CH hydrogels composed of 2%, 4%, and 8% chitosan. A 1.8W laser irradiated the AuNP-loaded hydrogels, hydrogel controls, and AuNPs in water for 15 minutes, and the temperature changes of the samples were measured using a heat gun. Samples that reached a target temperature of 55°C in 5-10 minutes have an appropriate CH percentage and ELP-functionalized AuNP concentration for treatment against *S. aureus* infections. We hypothesized that the hydrogels containing 50nM AuNPs would heat up slower and have a lower final temperature than hydrogels containing higher concentrations of AuNPs. The heating curves show that the hydrogel containing 200nM heated up more effectively than hydrogels with lower concentrations of AuNPs. This work demonstrates that CH hydrogel can be used as an effective delivery vehicle for ELP-functionalized AuNPs.

238
Name: Mays, Adriana
Major: Biological Sciences - Bachelor of Science
Faculty Advisor: Nayeon Lee, Center for Advanced Vehicular Systems
Funding: ORED Undergraduate Research Program
Project Category: Biological and Life Sciences

Analysis of Antibacterial Properties in Nano-Structures of Ti-64

Preventing infection and biofilm formation is a big goal in all medical procedures. Many treatments such as antibiotics and coating techniques have reduced the risk of infections resulting in the chance of infection remains very low. However, in procedures where bacteria are constantly proliferating, such as dental and bone procedures, infection can be as high as 3 % [1]. Interestingly, natural materials such as plants' roots rarely develop infection or biofilm although plants' roots are constantly exposed to wide range of bacteria under the ground. Inspired by the nano surface structures of natural materials, we developed nanotextures on Ti-6Al-4V using hydrothermal etching, analyzed the surfaces structures and quantified antibacterial properties. Ti-6A1-4V samples were hydrothermally etched for times ranging from one to ten hours, producing a nanostructure that could provide an example of what type of structure we can look to find I natural materials that will prevent bacterial adhesions. The chemically etched titanium alloy went through bacterial testing with three kinds of bacteria commonly causing biofilm production, staphylococcus aureus, escherichia coli, and pseudomonas aeruginosa. We then observed the biofilm production and used the IVIS machine to quantify bacterial attachments and the SEM machine to physically see how the bacteria and titanium alloy were interacting with each other. The results showed that the titanium plates that were etched for four hours showed the most bacterial adherence while the plates etched for ten hours showed the least. The plates that showed the most and least bacterial adherence were consistent across all bacteria types used as well.

62
Name: McAurthur, Kathryn
Major: Music Education - Bachelor of Music Education
Faculty Advisor: Sheri Falcone, Music
Project Category: Arts, Music, & Design

An Exploration of Gabriel Fauré's "Pavane, Op. 50" and its Evolution Into Modern Chamber Music and Pop Culture Mediums.

French composer Gabriel Fauré (1845-1924) composed works during a transitional period between the Romantic era of music and the modernism of the second quarter of the 20th century. One of his more well-known works is Pavane, Op. 50. The work is titled after the slow processional Spanish court dance of the same name. Originally written for piano, Pavane is better known for its versions for orchestra and optional chorus. The orchestral forces consist of strings and one pair each of flutes, oboes, clarinets, bassoons, and horns, which is reminiscent of the time period. Much of Fauré's music is characterized by clear melodies that soar above flowing and elegant harmonies. Pavane, with and without chorus, has proven to be immensely popular, and has been transcribed for all sorts of mediums, from solo guitar to brass band to a flute, clarinet, and piano trio. The captivating melody of Pavane has also found itself to be utilized in modern pop culture in music and movies. This presentation examines various elements of historical context, provides a broad analysis of the piece, and offers insight into the evolution of this work into modern chamber music as well as pop culture mediums.

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Name: McCullough, Cassidy

Major: Animal and Dairy Science - Bachelor of Science

Faculty Advisor: Molly Nicodemus, Animal & Dairy Science

Co-Author(s): Emma Farnlacher, Clay Cavinder, Katie Holtcamp, Dean Jousan, Molly Friend

Project Category: Social Sciences

Comparison of short- and long-term equine interaction for promoting skill development and mental health within college students

Since the COVID-19 pandemic, an uptick in depression, anxiety, and substance abuse has been reported within college students promoting additional offering of campus-based therapeutic intervention opportunities including equine interaction programs. Nonetheless, research concerning curriculum length for such programming is conflicting. Therefore, the objectives of this study were to compare a short-term equine interaction program to that of a long-term program for promoting skill development, stress reduction, and self-perception among college students. College students selected between participation in one of the following non-therapeutic based equine interaction programs: 1) short-term (n=8): a one-hour session taking place on one day or 2) long-term (n=32): a 10-hour program spread out across a semester (15 weeks). Both groups completed a pre- and post- survey instrument with questions targeting equine-based skill development (18 questions), academic-related stress levels (6 questions), and views concerning self-perception (7 questions). While long-term interaction did not significantly promote perceived skill development (P>0.05), short-term interaction demonstrated significant improvement within one question covering basic handling skills working with specific breeds (P=0.0294). As for questions associated with stress levels, the short-term interaction resulted in reduced perceived stress associated with four questions: Typical daily stress levels (P=0.0093), stress levels concerning grades (P=0.0331), studying for finals (P=0.0185), and taking finals (P=0.0053). For the long-term interaction, only two questions demonstrated a reduction in perceived stress: Overall grade point average (P=0.0440) and general test anxiety (P=0.0293). While the short-term interaction demonstrated no improvement in the questions associated with self-perception (P>0.05), three questions for the long-term interaction demonstrated significant improvements: Confidence (P=0.0280), assertiveness (P=0.0354), and goal pursuit (P=0.0124). Nevertheless, no significant differences were found for pre-responses (P=0.3121), post-responses (P=0.6040), nor pre-post-response differences (P=0.9617) between the two groups, suggesting besides improvement in self-perception the long-term equine interaction does not offer additional benefits from that of short-term equine interaction.

239

Name: McFatter, Emily

Major: Food Sc Nutr. Health Prom (UG) - Bachelor of Science

Faculty Advisor: Wes Shilling, Food Science Nutrition and Health Promotion

Co-Author(s): Sujan Poudel, Durga Chinthalapudi, Raju Bheemanahalli, Shankar Ganapathi Shanmugam

Project Category: Biological and Life Sciences

Assessing the Impact of Drought on Soil Microbial Metabolic Diversity in Cowpea (Vigna unguiculata) Crop

Climate change is leading to more frequent droughts, severely impacting plants' growth and developmental processes. Essential processes like carbon storage and nutrient cycling are driven by soil microbiota and are critical to soil health and regulating various ecological systems and functions. Plant growth-promoting microbes are increasingly being harnessed to improve plant performance under stress. However, the magnitude and diversity of the soil microbiome impacts on both structural and physiological plant traits under water-limited and optimum conditions are not well-characterized. In this study, we investigated microbial metabolic diversity in a cowpea drought study using Biolog EcoPlates. Cowpea is a legume crop grown in arid and semi-arid regions for food and feed. Two cowpea genotypes, UCR 369 and EpicSelect.4, were exposed to two soil moisture regimes during the V2, V4, R1, and R2 growth phases over a period of 14 days. Soil moisture was controlled using a semi-automated irrigation system, set to either full watering (100% irrigation) as the control condition or reduced watering (50% irrigation) to simulate drought conditions. Biolog EcoPlates measure functional microbial diversity by examining the utilization of various carbon sources. The Biolog EcoPlates are designed with a total of 96 distinct carbon source wells. The Biolog EcoPlates contain three replications of a control well and three replications for each of the 31 carbon source wells; the wells are comprised of a mixture of six types of carbon compound families: carbohydrates, carboxylic acids, amino acids, polymers, amines, and phenolic acids. The use of Biolog EcoPlates bypasses the need to isolate cultures and directly reduces the colorless triphenyl tetrazolium chloride to purple triphenyl formazan to measure the varying levels of carbon substrate consumption. The color of the wells is spectrophotometrically quantified by a plate reader, and the well color is used to measure the range of microbial diversity.

240
Name: McKnight, Madeline
Major: Animal and Dairy Science - Bachelor of Science
Faculty Advisor: Isaac Jumper, Pathobiology and Population Medicine, CVM
Co-Author(s): Mason Drewery, Cody Potts, Juan Cordero, Dr. Jason Russell, Dr. David Smith
Funding: College of Agriculture and Life Sciences URSP
Project Category: Biological and Life Sciences

Describing the consumption of chlortetracycline-containing mineral offered free-choice to pregnant commercial beef cows on pasture
Many beef cattle production systems rely on free-choice mineral supplementation to meet animal nutrient requirements. When free-choice mineral supplement is used to deliver medication such as chlortetracycline (CTC), an antimicrobial used to mitigate the risk of bovine anaplasmosis in beef herds, variation in daily supplement intake may lead to individual over or underconsumption of the medication. The objective of this study was to describe the consumption patterns of a granular, CTC-containing mineral supplement offered free-choice to cows on pasture. A total of 100 nonlactating, pregnant, crossbred beef cows were assigned to 1 of 3 pastures equipped with a portable, self-contained individual feeding unit (SmartFeed; C-Lock Inc.). SmartFeed units were used to record individual animal supplement intake and frequency. Cows were offered dried distillers' grains for 14 days of acclimation (mean intake = 1.03 kg/day) before transition to a commercially available granular mineral containing CTC (6,160 mg/kg) on day 0 for 162 days. The mean number of consecutive days a cow did or did not consume mineral was 2.4 and 3.1 days, respectively. Mean mineral supplement consumption was 86.6 g/cow/day, which lead to an average CTC consumption of 0.54 g /cow/day. Label instructions indicate each cow should consume 1.1 mg CTC/kg of body weight daily. Using individual body weights collected prior to the study, the expected total CTC intake for the trial period was calculated for each cow. The average study cow (BW=530kg) should, therefore, consume a total of 15.3kg of mineral supplement over 162 days to receive a total of 94.5 g CTC during the trial. However, only 42.1% (40/95) of cows consumed their expected amount of mineral throughout this study. In conclusion, feeding CTC-containing mineral supplement in a free-choice manner did not ensure cows consumed the labelled CTC dose of 1.1mg/kg/day.

241
Name: McPhail, Michael
Major: Forestry - Bachelor of Science
Faculty Advisor: Adam Polinko, FWRC - Forestry
Co-Author(s): Joshua Granger
Funding: College of Forest Resources Undergraduate Research Scholars Program
Project Category: Biological and Life Sciences

ATCO Bottomland Hardwoods Research Project
Historically, the Mississippi Alluvial Valley and the surrounding minor bottoms were dominated by bottomland hardwood forests. However, land-type conversion to agriculture has reduced bottomland hardwood forests across the Lower Mississippi Alluvial Valley. This range-wide decrease, compounded by changes in disturbance regimes, has resulted in shifts in species composition. Notably, there has been a considerable reduction in the recruitment of overstory red oak species into the overstory due to residual trees reducing sunlight and human-caused disturbances such as new levee systems. This study investigates the structural and silvicultural characteristics associated with changes in disturbance regime and silvicultural practices in bottomland hardwood forests. Specifically, we used a 50-year permanent inventory dataset to 1) evaluate changes in stand structure and species composition across a range of sites in the lower Mississippi alluvial valley and 2) evaluate changes in individual tree and stand level growth through time. When evaluating the data, we used several silvicultural methods to distinguish the desired trends we were seeking. Changes in species composition through time were evaluated by importance values that incorporate relative frequency, density, and abundance. These methods allowed us to see the dominant species inhabiting this region and which species became suppressed over the 50-year measurement period. The goal of this project is to gain a better understanding of the different growth trends by species of bottomland hardwoods and how foresters can implement better management practices to maintain ecologically and economically species.

242
Name: Miceli, Audrey
Major: Animal and Dairy Science - Bachelor of Science
Faculty Advisor: Barbara Kaplan, Comparative Biomedical Sciences, CVM
Co-Author(s): Arpita Deb
Funding: NIH R15 ES027650
Project Category: Biological and Life Sciences

AHR Ligand Effects on Igg2b Immune Complex-Stimulated Mouse Innate Cells

We initially established that aryl hydrocarbon receptor (AHR) ligand 2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD) inhibited MOG-specific IgG2a and IgG2b antibody production in mice with autoimmune disease versus mice treated with saline. We also showed that TCDD and another AHR ligand ITE (2-(1H-Indol-3-ylcarbonyl)-4-thiazolecarboxylic acid methyl ester) inhibited IgG2a and IgG2b antibody production in vitro. Therefore, our hypothesis was that AHR ligand-mediated suppression of IgG2a and IgG2b antibody production will correlate with the IgG2a-and IgG2b-stimulated immune responses in cells expressing antibody receptors (FcγRs). We created streptavidin-biotinylated (S-BIgG) complexes with the antibodies IgG1, IgG2a, and IgG2b to treat mouse splenocytes (SPLC) or mouse macrophages. We found that the IgG1 and IgG2b immune complexes stimulated cytokine production (IL-6 and TNF-α) and C3a complement protein production, but IgG2a immune complexes did not. We then used the RAW macrophage cell line and found again that IgG2b immune complexes could stimulate but not IgG2a immune complexes. We found similar results using peritoneal macrophages (PM). Next, we assessed if other AHR ligands (TCDD, ITE, FICZ (6-Formylindolo[3,2-b]carbazole), and I3C (5-amino-2,4,6-triiodobenzene-1,3-dicarboxylic acid)) would inhibit IgG2b immune complex-stimulated innate cells. We found that TNF-α was most sensitive to inhibition by AHR ligands. Our results showed that S-BIgG1 and S-BIgG2b increased IL-6 and TNF-α cytokine production and complement protein C3a in all innate cells tested. Overall, these data show that AHR ligands can suppress IgG2a and IgG2b antibody production, but only IgG2b immune complexes stimulated the innate cells. Using the IgG2b immune complexes AHR ligands suppressed TNF-α. Future studies will be focused on the mechanisms by which AHR ligands suppress this antibody mediated signaling.

139
Name: Miller, Henry
Major: Psychology - Bachelor of Science
Faculty Advisor: Ty Stafford, Psychology
Project Category: Social Sciences

Nawalan ng Boses: Bringing the Bakla Identity to the Forefront of American Academia

In contemporary western psychology and social science, the pressing need for an understanding of diverse gender identities, especially those that challenge Western binaries, is clear. This poster focuses on the Bakla identity, a third gender found within Filipino culture. Factors that have shaped the modern bakla identity are explored, including 381 years of Western colonization, in an attempt to fully understand the struggle for unconditional acceptance within modern Filipino society. Such acceptance is further complemented by the importance of maintaining and reclaiming native terminology which is faced with obsoletism in the rise in popularization of Western gender and sexual orientation terminology. Specifically, the disregard and misunderstanding of native terminologies by both Filipino and American academia contributes to erasure of these identities. This erasure is countered by Filipino indigenous psychology, which advocates for a holistic understanding of the intersectional identity of Filipinos, challenges academics to be culturally competent, and contributes to the full inclusion of individuals of differing cultures. Such a holistic understanding of the bakla identity also calls for an understanding of the economic and social factors that affect these individuals' actions in their daily lives, especially within the significantly underrepresented bakla population who are part of the Filipino diaspora in America. Such cultural competence is deeply important in a country where Filipino Americans make up the third largest Asian ethnic group, and where 75% of their members have had no experience with mental health professionals. Recommendations for next steps and resources to learn additional information are also provided.

29
Name: Mishra, Ashwani Kumar
Major: Computer Science - Bachelor of Science
Faculty Advisor: Vuk Marojevic, Electrical and Computer Engineering
Co-Author(s): Oliver Higginbotham, Wen Chen
Funding: NSF REU: 2120442, ONR Award N00014-23-1-2808
Project Category: Engineering

Identification of Resource Allocation in Virtualized O-RAN Systems for Enhanced 5G Research Workflows

The Open Artificial Intelligences Cellular (OAIC) research platform developed at MSU establishes a community research platform, which is software that runs on a software radio research testbed using powerful commodity servers and workstations. One significant challenge in advanced wireless and networking research is the limited hardware resources that can negatively affect the software's overall performance. The problem of hardware resource limitation stemming from sharing the testbed among multiple users simultaneously can be tackled through the implementation of a hypervisor on a very powerful computing system to enhance the testbed experience for researchers. By using a hypervisor, the researchers can remotely access their designated virtual machines for critical testing and software demonstrations. This research focuses on identifying the bottlenecks of such systems when they are being run for computationally intensive workloads by multiple researchers. The program used to gather data is HWiNFO64 allowing for direct

sensor recording. The primary sensors that could reveal resource bottlenecks include cache, DRAM read/write bandwidth, per core usage, power usage vs thermal design power, and disk usage. Therefore, our research includes the comprehensive analysis of such parameters for supporting cutting edge wireless communications and networking research on Edge computing platforms. This research involves a system with at least four configurations: barebone hypervisor, a single VM, five VMs, and 10 VMs. By analyzing these parameters using the different configurations and comparing the recorded values with what the system has available, we can examine what improved parameters each VM will need for scalability. Additionally, we will analyze what the critical resources and minimal configurations of the system should be so that we can compensate for those in future system configurations. In the end, this research will determine exactly what specific resources are used the most on a virtualized O-RAN system for enabling research and development.

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Name: Moody, Monroe
Major: Forestry - Bachelor of Science
Faculty Advisor: Raymond Iglay, Wildlife, Fisheries, and Aquaculture
Co-Author(s): Christopher Silva, U.S. Department of Agriculture; Shlok Tomar, Washington State University
Funding: USDA ARS
Project Category: Biological and Life Sciences

Characterizing Chronic Wasting Disease (CWD) prevalence through remote sensing
Chronic Wasting Disease (CWD) is a fatal neurodegenerative prion disease found in cervids such as white-tailed deer (Odocoileus virginianus). Infected animals often do not express symptoms until chronic. Hence, infected individuals often interact with multiple animals and areas prior to detection, effectively spreading the disease and increasing infection rates. Current CWD testing methods occur post-mortem analyzing brain tissue or lymph nodes. Some nonlethal testing methods are being developed but still unavailable for public use. However, both testing approaches require direct contact with animals. Therefore, it is imperative to develop remote CWD detection and monitoring programs to identify infected animals, herds or populations prior to chronic infection. Aerial imagery and animal movements are two sources of remote sensing data that could inform CWD monitoring. These data could be used to identify target animals and paired with machine learning, determine distribution or movement patterns associated with CWD infection otherwise undetected by human observers. Aerial imagery from satellites and drones (i.e., Unmanned Aircraft Systems) differ in their image resolution, costs, spatial coverage, and ease of use for frequent monitoring. Meanwhile, tracking animal movement patterns can have similar constraints of current CWD testing approaches regarding direct contact with individuals being GPS-collared, but provide finer spatial and temporal resolution data than most aerial imagery techniques. Furthermore, distribution analysis could be used to reveal patterns such as animal clustering and distances from nearest neighbors among short animal activity periods. We present an overview of these methods including preliminary analyses of a GPS-collared red deer (Cervus elaphus) population and provide recommendations for future research.

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Name: Moore, Jordan
Major: Fashion Design & Merchandising - Bachelor of Science
Faculty Advisor: JuYoung Lee, School of Human Sciences
Co-Author(s): Kairringtyn Harris, Addie Grace, Zaheim Bender, Emma Cole, Regan Crow
Project Category: Social Sciences

How Social Media affects the intentions of online shopping purchases of men vs women?
Research has found that women are more likely to engage in online shopping than men) because of social media usage. According to a 2021 article from Pew Research Center, 77% of women say that they use Facebook whereas only 61% of men use the platform, and 44% of women use Instagram with 36% of men use Instagram . Online shopping is done mostly by women compared to men . It is believed that there are differences in men and women in terms of online shopping because of emotional factors resulting in a positive relationship with online shopping . However, there hasn't been a lot of studies to compare the effect of social media on different genders in the context of online shopping purchase intentions. Therefore, the purpose of this research is to understand the relationship between time spent on social media and the number of online shopping purchases between males and females. The objective of this research is to conduct surveys to collect data and assess understanding of the correlation between high levels of social media usage and online shopping purchases. This project will assess and explain the correlation between high social media usage and online shopping purchases through surveys of women and men purchase intents. By investigating the differences between men and women in online shopping purchase intentions, new marketing strategies can be created in catering to the emotional appeal of women. This will open new doors on how strong the influence actually is and allow us to retrieve new and accurate data. In this study, the authors utilized Qualtrics to conduct an online survey to women and men about their online purchasing patterns and social media usage. The participants were recruited through MechanicalTurk.

244
Name: Morphis, Lydia
Major: Wildlife, Fisheries & Aqua - Bachelor of Science
Faculty Advisor: Raymond Iglay, Wildlife, Fisheries, and Aquaculture
Funding: College of Agriculture and Life Sciences URSP
Project Category: Biological and Life Sciences

Aerial vs Terrestrial: Evaluating Methods of White-tailed Deer Population Monitoring
Collecting accurate data on population estimates and demographics is essential when monitoring wildlife populations, such as white-tailed deer (Odocoileus virginianus). Two methods of data collection include more traditional camera trapping or contemporary and novel UAS/drone thermal imagery. We evaluated these methods based on time, cost, effort, and performance for estimating relative population size and demographics of deer on two private properties in Mississippi. Camera trap sampling occurred over two weeks in mid-February 2023. Drone surveys occurred during one day for each property. Density estimates (acres per deer) were determined through review of photos generated by each sampling method and applying a common math formula to camera trapping images. Camera trapping generated an estimate of 4.86 and 7.02 acres/deer for the two properties while drone surveys generated an estimate of 14.8 and 20.5 acres/deer. Images from camera trapping allowed for collection of demographic data and the potential to identify individual bucks, while images from drone surveys were not of high enough quality to discern sex or age class. The short survey period of flights could be a cause of the low estimates generated by the drone data, and conducting multiple flights over multiple days during greatest activity periods could help create a more accurate depiction of the population. UAS technology must improve greatly before it is feasible to make the switch from camera trapping.

245
Name: Mosby, Morgan
Major: Agricultural Science - Bachelor of Science
Faculty Advisor: Xue Zhang, FNHP
Co-Author(s): Sawyer Smith, M. Wes Schilling
Funding: College of Agriculture and Life Sciences URSP
Project Category: Biological and Life Sciences

Effect of UVC lighting on the mortality of mites on dry cured ham cubes
Tyrophagus putrescentiae is the most common and difficult pests to control in the dry-cured ham industry. Ultraviolet C shows promise as a physical means to control mite infestations. This study aimed to investigate the effect of UV-C exposure on the mortality rate of ham mites. A 3×3 factorial structure within a randomized complete block (RCB) design with 3 replications (block) was used to evaluate the impact of light source (darkness, LED, UV-C) and exposure duration (5, 10, 15 min) on the mortality of mites (n = 5). Fifty adult mixed-sex mites were inoculated onto ham cubes (2.54-cm). Following inoculation, ham cubes were placed directly under the light treatment for the specified time, then placed in a ventilated jar for 24 h and mobile mites were then enumerated. Data were analyzed using two-way ANOVA, with block as the random factor. Interaction did not exist (P = 0.1582) between lighting and exposure duration . When averaged over exposure duration, the UV-C treatment resulted in a higher mortality rate of 74% (P = 0.0006) compared to the LED treatment (29%) and the darkness treatment (27%). This means that on average, there 13 live mobile mites on the UV-C treatment and 35 to 37 live mites on the other cubes. No time effect was observed (P = 0.7192) when averaged over different lighting. The results of this study demonstrate the potential of UV-C lighting's potential to contribute to the control of ham mite infestations in dry-cured ham facilities. In conclusion, this study emphasizes the potential of UV-C lighting as a tool for inclusion in integrated pest management in the dry-cured ham industry. Future studies will optimize UV-C lighting intensity, distance to the hams, and exposure times to achieve higher efficacy in controlling ham mite infestations.

246
Name: Moschella, Colin
Major: Data Science - Bachelor of Science
Faculty Advisor: Jonathan Barlow, Data Science
Project Category: Biological and Life Sciences

Using computer vision to recognize and measure human martial arts-related combat movements
Using computer vision to track the human body and its movements is an established concept, but this project aims to measure the speed of certain sub-movements,. Inspired by the system of measurement used in fighting video games, the goal is to measure *startup*, *active*, and *recovery* portions of an attack movement. The approach uses a deep learning model that classifies a person's movement as an 'attack.' The system then returns numbers measuring how long the attack took to 'startup' (the time the movement starts until it

becomes 'active'), the time it was 'active' (the short moment where the attack would be able to properly hit a target), and the length of 'recovery' time imposed by the move (the time the person would take to withdraw their move and go back into a neutral stance). In addition, it returns the speed of the whole motion, from start to finish. Using the already established model *YOLO* (*You Only Look Once*) as a starting point, measuring movement speed and tracking joint movements separately is made easily possible, but the goal of this project is to get the model to classify certain movements as attacks, measure the speed of the attack, and to split the movement into 3 sub-movements.

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Name: Nicholas, Charles
Major: Chemical Engineering - Bachelor of Science
Faculty Advisor: Neeraj Rai, Chemical Engineering
Co-Author(s): Leyton Riley, Sally Barfield, Aaron Griffith, Harish Chander, Adam Knight
Funding: San Shuttlesworth Adkerson Presidential Endowed Scholarship, Research Funding
Project Category: Education

Examining Neuromuscular Activity in Primary Ankle Stabilizers in College Students When Performing a Dynamic Balance Test
An estimated 23,000 ankle sprains occur every day in the United States, which amounts to approximately 1 in every 10,000 people and can lead to chronic ankle instability (CAI). Chronic ankle instability (CAI) refers to persistent symptoms of instability or giving way of the ankle joint after an initial sprain. Current research investigating the muscle activity of the tibialis anterior (TA) and medial gastrocnemius (MG) as predictors for CAI is limited. The purpose of this research was to determine the impact of muscle activity of the primary dorsiflexor and plantar flexor muscles on the risk for the development of CAI. A sample (n=10) of college students performed a dynamic balance test while electromyographic (EMG) readings were taken of the TA and MG. The Y-Balance Test (YBT) measured balance, and EMG readings were normalized against the participant's maximum voluntary isometric contraction (MVIC). This process quantified muscle activity during each task. A repeated measures paired samples T-test was run on the mean percentages for each muscle and each leg in the three reach directions. No significant difference was seen in the muscle activity when the YBT was performed between both legs during the YBT (p <.001). Overall, the risk for developing CAI was minimal in our sample size based upon the data analyzed. Based upon the data reported, these participants have a low risk for developing CAI due to ideal muscle activity displayed in both muscles during the dynamic balance task.

247
Name: Nicholls, Sophia
Major: Animal and Dairy Science - Bachelor of Science
Faculty Advisor: Rhonda Vann, Animal & Dairy Science
Funding: College of Agriculture and Life Sciences URSP
Project Category: Biological and Life Sciences

Utilization of Melatonin for improvement in conception rates to AI in small ruminants
Sheep are seasonal estrus animals and are dependent upon the region, breed, and daylight conditions. Research indicates that melatonin (MT) can make sheep enter estrus in non-breeding seasons. Melatonin is an endogenic hormone regulating estrus of sheep and secretion is affected by light and by season. Utilization of artificial insemination (AI) in sheep has been increasing however, this is an expensive process and is usually done prior to the regular sheep estrus season. Therefore, utilization of Melatonin as a feed additive to increase conception rates to AI could be an economic benefit to producers. Crossbred ewes (n=29) were randomly assigned to two treatment groups either control (n=15) or melatonin (n=14; 10 mg/animal/day). All ewes were individually fed daily (0.57 kg) with the respective treatments added 30 days prior to laproscopic AI. Ewes underwent estrus synchronization and laproscopic AI was performed by a veterinarian with MSU-CVM. Ewes were ultrasound for pregnancy 45 days after AI and additionally blood samples were drawn for verification of pregnancy to go along with the ultrasound. Blood samples were taken on days 0, 15, 30 and 45 for evaluation of progesterone and melatonin concentrations. Clean-up rams were put in with ewes 7 days after AI equipped with marking harness which indicates breeding and remained for 45 days. Ewes were checked twice daily for markings and actual breeding dates were recorded. Conception rates to AI were 21% for the melatonin group (3/14) and 27% for the control group (4/15; P>0.10). Overall conception rates to AI and natural breeding were 100% for the melatonin group and 94% for the control group. Timing of AI may have impacted the conception rates to the estrus synchronization protocol utilized in this study. Further research is needed to explore other estrus synchronization protocols and timing of AI in sheep utilizing melatonin supplementation.

248
Name: Null, Julia
Major: Wildlife, Fisheries & Aqua - Bachelor of Science
Faculty Advisor: Sandra Correa, FWRC-Wildlife,Fisheries&Aquaculture

Project Category: Biological and Life Sciences

Using a Genetic Approach for the Identification and Phylogenic Study of Larval Fish Species in the Seasonally Flooded Forests Alongside the Pascagoula River
While research has shown that floodplain forests serve as critical habitat for adult freshwater fish, little is known about fish in their early life stages. Thus, determining the species composition of larval and juvenile fish communities in Southeastern flooded forests has important implications for further wetland and critical fish habitat conservation measures. Larval and juvenile fish species can be difficult to morphologically differentiate due to their underdeveloped pigmentation and lack of distinguishable characteristics. Molecular tools and techniques are emerging resources capable of identifying organisms at the species level. Our aim is to elucidate the identity of larval and juvenile fish species through DNA extraction and PCR amplification of mitochondrial DNA, which will illustrate the relationship between fish phylogeny, age class, and their geospatial patterns of habitat use and selection. The samples with less species identification confidence were categorized and ranked into three main priority groups, priority 1 being the least identifiable and priority 3 being the most identifiable by species. The 266 samples that were separated into priority groups 1 and 2 were then put through the DNA extraction process. The extracted DNA samples were tested for purity and PCR viability to ensure successful downstream PCR amplification of the mitochondrial DNA. 85 percent of our extracted samples proved adequate for the next steps in the PCR process, which will enable us to verify and analyze the varying identities of Southeastern fish species and their geospatial distributions in association with varying age classes in the seasonally flooded forests. This data will provide further implications for the conservation of vital larval and juvenile fish habitat and emphasize the importance of maintaining river ecosystem connectivity.

69
Name: Odom, Lauren
Major: Architecture - Bachelor of Architecture
Faculty Advisor: Alexis Gregory, School of Architecture
Project Category: Arts, Music, & Design

Deconstructing the Mental Health of Architecture Students
Architecture Education is a highly competitive, mentally and physically demanding aspect of the industry. Through journal review, published literature on the subject, and university experiences, this study offers solutions to the problems in the field from a feminist theory perspective, with the goal to foster a healthy work-life balance for students and faculty alike. At some schools, the five-year Bachelor of Architecture degree program is deliberately designed to "weed out" students who seemingly do not fit the bill. Students are known to forsake their sleep schedule, healthy eating, time with friends, other classes, are unlikely to have a part-time job, and are under a lot of stress to keep up with the workload. When speaking to Architecture students, one will hear these experiences and much more. The mental well-being of Architecture students has been a very low priority in the educational field, but why? And what can be done about it? According to the National Council of Architectural Registration Board (NCARB), the diversity of the field is lacking, with a majority of the successful professional or licensed architects representing white men. In history, those who excelled in the field were wealthy or white, and those who don't fit into these categories are left behind or ignored, and students' performances are based on these unrealistic expectations. Architecture is not as perfect and polished as it is believed to be, and student's mental health suffers to keep up the façade.

75
Name: Oen, Morgan
Major: Business Economics - Bachelor of Business Adm
University: Louisiana State University
Faculty Advisor: Jamie Kurash, Finance
Project Category: Business and Economics

The Consequences of Globalization on Housing Markets in *Low-Income* Countries
When discussing globalization, it's essential to recognize the multitude of positive examples worldwide that underscore its benefits, ranging from increased trade opportunities to cultural exchange. Nevertheless, I choose to direct my attention toward its effects, particularly within low-income countries, focusing specifically on the intricate relationship between globalization, the housing market, and property rights. Within this context, I emphasize the indispensable role that secure property rights play in driving economic growth and fostering widespread prosperity. Shockingly, it's interesting to note that over a billion households in low-income nations lack the basic security of documented, publicly registered, and tradable rights to their homes, a situation that significantly impedes their economic advancement. Furthermore, I delve into the historical and contemporary factors contributing to the prolonged underdevelopment experienced by these nations over several decades. This exploration sheds light on the stark disparities between

their socio-economic realities and those of more affluent societies, underscoring the systemic challenges that hinder progress. One of the critical factors exacerbating these challenges is corruption, which permeates many aspects of governance and economic activity in low-income countries, leading to further obstacles in achieving sustainable development. Addressing these issues is paramount in mitigating the adverse effects of globalization on vulnerable populations and promoting inclusive growth on a global scale.

141
Name: Owens, Tony
Major: Interdisciplinary Studies - Bachelor of Science
Faculty Advisor: Shrinidhi Ambinakudige, Geosciences
Funding: NSF REU: NSF-funded project "An Interdisciplinary Program for Research, Education, and Outreach on Climate Change and Adaptive Resilience in the Yazoo - Mississippi Delta" (#2316382)
Project Category: Social Sciences

An investigation into Social Vulnerability and Flood Risks in the Yazoo-Mississippi Delta
The Yazoo-Mississippi Delta (the Delta), frequently faces natural hazards and physical events such as droughts, floods, tornadoes, and severe storm surges, resulting in adverse effects on socially vulnerable communities. Despite being acknowledged as one of the most agriculturally productive regions in the United States, the Delta is also characterized by high levels of poverty and economic hardship. These socioeconomic inequalities among various groups, households, and communities significantly influence susceptibility to disasters. Evaluating a community's social vulnerability helps elucidate why some individuals experience the impact differently, even when the entire community faces the same hazard, such as flooding. Moreover, the nature of social vulnerability varies depending on the type of hazard to which the community is exposed. The social vulnerability index serves as a commonly utilized metric for understanding the level of vulnerability within a community. This project conducts a spatial analysis to assess social vulnerability in the Delta, utilizing data from the CDC/ATSDR Social Vulnerability Index. Additionally, flood zone mapping and historical flooding data in the Delta will be utilized to explore areas susceptible to flooding and identify socially vulnerable communities within those regions.

249
Name: Palmer, Emma
Major: Biochemistry - Bachelor of Science
Faculty Advisor: Natraj Krishnan, Biochemistry, Molecular Biology, Entomology, and Plant Pathology
Co-Author(s): Madelyn Hunter, Sydney Davis
Funding: College of Agriculture and Life Sciences URSP
Project Category: Biological and Life Sciences

Enhanced expression of matrix metalloproteinases in brain results in deficits in locomotor activity in a Drosophila model of Spinocerebellar ataxia Type 1
Matrix metalloproteinases (MMPs) are a family of zinc- and calcium-dependent endopeptidases that are responsible for degrading extracellular matrix (ECM) proteins. Dysregulation of MMPs has been implicated to be the proximal factor in many diseases and disorders including neurodegenerative diseases. The fruit fly Drosophila melanogaster with only two MMP genes, dMMP1 and dMMP2 offers an excellent model system to investigate the role MMPs in age related motor deficits and also in neurodegenerative diseases where motor dysfunction is a common symptom. The yeast two hybrid system (GAL4/UAS) was used to develop a Drosophila model of spinocerebellar ataxia Type 1 (SCA1), a polyglutamine disease causing neurodegeneration. P{UAS-Hsap\ATX1.82Q}M6 which expresses humanAtaxin1 (ATX1 or SCA1) with a long PolyQ repeat of 82 amino acids under control of UAS was crossed to elav-GAL4, a pan-neuronal driver (elav-GAL4/UAS-ATX1.82Q) for driving gene expression throughout the nervous system. dMMP1 and dMMP2 expression was found to increase in an age dependent manner in controls (UAS-ATX1.82Q/+ and elav-GAL4/+) but was significantly enhanced in SCA 1 flies (elav-GAL4/UAS-ATX1.82Q). Concomitant with increased expression of dMMP, a marked decline in negative geotaxis activity was recorded in SCA1 flies. Additionally, a dampening of daily locomotor activity rhythm was recorded in SCA1 flies compared to controls. It has been shown previously from transcriptomic analysis that dMMP1 expression is a bonafide biomarker of aging in motor neurons. While expression of tissue inhibitor of matrix metalloproteinase (dTMP1) was enhanced in SCA1 flies, we found that enhanced expression of dMMP2 could have a negative regulatory effect on dTIMP1. Taken together, our results support the idea that matrix metalloproteinase 1 is acting as a downstream effector of antagonistic pleiotropy in motor neurons and is deleterious when reactivated/ enhanced in SCA1 flies.

142
Name: Palocsik, Owen
Major: Criminology - Bachelor of Arts
Faculty Advisor: David May, Sociology
Co-Author(s): Susanna J. Gaddis

I always feel like somebody's watching me: Examining the Use of Video Surveillance Among Police Departments in Mississippi

The use of video technology among law enforcement agencies in the United States has dramatically changed policing in the 21st century. Police departments regularly utilize stationary video cameras, License Plate Readers (LPRs), Body-worn-cameras (BWCs), and even aerial video technology, such as drones, to aid in and enhance their law enforcement mission. Nevertheless, no research we are aware of has examined the types of video surveillance used by law enforcement in Mississippi. In this paper, we report the results from telephone and focus group interviews with police departments serving cities with populations of 10,000 or more in the state of Mississippi. Preliminary results suggest that the most prevalent use of video technology is BWCs, followed by LPRs and stationary cameras on poles. Very few departments use aerial video technology. Preliminary results also suggest that officers believe the use of video technology reduces crime in their communities. Lastly, this paper discusses implications for policy and future research.

76
Name: Palomino, Elena
Major: Marketing - Bachelor of Business Adm
Faculty Advisor: Myles Landers, Marketing/Quant Analysis/Bus Law
Project Category: Business and Economics

The interplay between tip framing techniques and social identity to influence restaurant tip choices

In many industries, it is customary to provide a monetary tip after receiving a service. In the United States, many restaurant servers receive the bulk of their income from tips. Given this, research on factors that affect tip amounts is very important. One area that has yet to be fully explored is the use of verbal labels attached to suggested tips on digital point-of-service devices, a practice that we call tip framing. This study explores the use of such verbal tip frames and their effect on tips. Using an online survey with a hypothetical dining scenario, we conducted two studies on three different tip frames: a percent frame (18%, 20%, and 22% without verbal descriptors), continuum frame (18% Poor, 20% Average, and 22% Best), and identity frame (18% Ole Miss, 20% Puppy, 22% Bulldog). Inspired by the psychological concept of Social Identity Theory, the identity frame was intended to use customer identity to influence tips. We hypothesized that the continuum frame would prompt customers to select higher tip amounts compared to the percent frame, but that the identity frame would shift them from 20% to 22% tips compared to the continuum frame. In Study 1, 93 students from Mississippi State University were randomly presented with either the percent frame or continuum frame. A significantly higher number of customers chose 22% over other tips when presented with the continuum frame versus the precent frame. In Study 2, 293 students were randomly presented with one of three tip frames: percent, continuum, or identity. Results showed that fewer customers chose 18% when presented with the continuum frame versus the percent frame. Also, more customers chose 22% when presented with the identity frame versus the continuum frame. This suggests that tip frames that play on customer identity can influence customers to tip more.

143
Name: Parker, Zoe
Major: Fashion Design & Merchandising - Bachelor of Science
Faculty Advisor: JuYoung Lee, School of Human Sciences
Co-Author(s): Katie Smith, Carly Lambert, Reagan Winnie, Sarah Morrow, Jordyn Comeauex
Project Category: Social Sciences

Short Term Benefits of Retail Therapy

Retail therapy, the act of shopping to alleviate negative emotions, has become a prevalent phenomenon, especially among young adults facing challenges such as sadness and loneliness. This study aims to explore the short-term relief offered by retail therapy for young adults experiencing feelings of sadness. Drawing from previous research, our research investigates the cycle of retail therapy in relation to sadness and its potential consequences on someone's mental health and well-being. The study hypothesizes that while retail therapy may temporarily alleviate sadness, it could lead to negative outcomes in the long term, especially if it becomes someone's primary coping mechanism. Through our research, the study underscores the importance of understanding the psychological mechanisms underlying retail therapy and the impact it has on young adults, particularly during challenging life transitions from home to college or the real world. In this study, the authors utilized Qualtrics to conduct an online survey to young adults about the effects of retail therapy. The participants were recruited through MechanicalTurK. The study utilized data analysis and the SPSS software. Measures for individual characteristics were retail therapy, and the brand-associated variable was sadness. They were examined on a categorical scale. Arnold and Reynolds' (2003) scale measured the gratification of shopping. Isen's (1984) scale was used to investigate the relationship between shopping and mood repair. Hausman (2000) measured the hedonic aspect of consumption. Faber and O'Guinn (1992) examined the compulsive attitudes shoppers exemplify. Edwards's (1993) scales measured both dysfunctional spending

behavior and post-purchase guilt shoppers feel after their experience. By shedding light on the complex relationship between retail therapy and emotions, this research contributes to a deeper understanding of consumer behavior and its implications on mental health.

70
Name: Patino, Gabriela
Major: Fashion Design & Merchandising - Bachelor of Science
Faculty Advisor: Catherine Black, School of Human Sciences
Funding: ORED Undergraduate Research Program
Project Category: Arts, Music, & Design

Haute Couture Design Research
Most educators would agree that the development of creativity is a crucial part of an apparel design curriculum and an essential component in the success of students. This creative design project is a means of exploring "couture design techniques" a skill set not currently taught in the Fashion Design and Merchandising (FDM) undergraduate program of study.
To increase an understanding and awareness of Haute Couture and Couture the student used the Conceptual Model of Creative Thinking in Apparel Design (CTAD) to develop a couture design ensemble. The Conceptual Model of Creative Thinking in Apparel Design (CTAD) focuses on developing the designer's understanding of product intention, thinking process, and assessment and evaluation through divergent and convergent thinking. The model provides a conceptual basis for creative thinking; while strategies provide specific techniques that can effectively assist in enhancing students' creative output.
Strategies for design development included investigating luxury fabrics, silhouettes through historical fashion, couture construction techniques, and creating samples of couture techniques. Pattern drafting was used to create a custom couture garment. Pattern drafting and sewing techniques are the highest form of innovation and creativity in fashion. In addition, the unique lines and fit of the ensemble, along with exquisite workmanship embody couture.

144
Name: Patridge, Mia
Major: Fashion Design & Merchandising - Bachelor of Science
Faculty Advisor: JuYoung Lee, School of Human Sciences
Co-Author(s): Jaden Johnson, Mckenzie McDermott, Amber Horton, Madison Banks
Project Category: Social Sciences

How the social media app Tik Tok affects impulsive buying in women.
This research investigates the impact of the social media platform TikTok on impulsive buying behavior in women, addressing a gap in understanding within the realm of consumer psychology. With the rise of TikTok as one of the most popular social media platforms, characterized by its engaging short-form videos and influencer-driven content, questions arise regarding its influence on consumer behavior, particularly in the context of impulse buying. The study aims to explore the relationship between TikTok usage and impulsive buying tendencies among women of different age groups, focusing on Millennials and Generation Z. Drawing upon existing literature on social media influence and consumer behavior, the research formulates hypotheses suggesting a positive correlation between TikTok usage and impulsive buying, with income and age serving as potential moderators. This investigation employed Qualtrics to administer an online survey targeting millennials and Generation Z, aiming to discern the impact of the TikTok social media app on impulsive buying behaviors (Araujo, 2022). The participant pool was recruited via MechanicalTurk. Individual traits, specifically spontaneity and TikTok usage, were assessed utilizing a comprehensive five-point scale developed for this study. Operationalizing concepts through established scales for measuring impulsivity, TikTok addiction, and demographic variables, the study employs a multi-dimensional approach to assess the relationship between TikTok usage and impulsive buying behavior. The study contributes to the growing body of literature on social media influence on consumer behavior by providing empirical evidence of TikTok's role in shaping impulsive buying behavior in women. Insights garnered from this research have implications for marketers, policymakers, and social media platforms seeking to understand and leverage the influence of TikTok on consumer decision-making processes, particularly in the context of impulse buying.

145
Name: Patterson, Billie
Major: Ag Educ., Leadership & Comm - Bachelor of Science
Faculty Advisor: OP McCubbins, School of Human Sciences
Funding: College of Agriculture and Life Sciences URSP
Project Category: Social Sciences

Determining the Professional Development Needs of College of Agriculture and Life Sciences Faculty with Teaching Responsibilities

Most university faculty with teaching responsibilities have little to no formal teacher training. Professional development related to teaching can help faculty who struggle in this area. This study sought to identify the professional development needs of the College of Agriculture and Life Sciences faculty at Mississippi State University. Through a Qualtrics survey, participants self-reported their perceived competence in various teaching methods and the value they place on teaching. Faculty also reported what they believe is prioritized, research or teaching, by their department and college and identified barriers to teaching professional development. While most faculty felt competent in lecturing and syllabus writing (considered foundational skills), they felt least competent in teaching different learning preferences and engaging students. Faculty placed high importance on motivating and challenging students and critical thinking skills, engaging students, using real-life problem-based assessments, improving student reading and writing, and lecturing. However, they perceived that CALS, departments, and tenure and promotion committees prioritize research over teaching. Despite their motivation for professional development, faculty are hindered by time constraints, lack of knowledge about alternative teaching approaches, and insufficient emphasis on teaching in the promotion and tenure process. Responsibilities in other appointment areas that "carry more weight," a lack of opportunities and rewards for professional development participation, and a lack of resources were also identified as barriers to improving teaching. One participant noted the lack of funds within CALS earmarked for classroom upgrades and the existing funding not being distributed equitably. To address these challenges, more professional development opportunities are needed to focus on pedagogical knowledge, teaching to various learning preferences, and engaging students. CALS could also commit to recognizing the scholarship of teaching and learning in tenure and promotion, which could help faculty with teaching responsibilities maximize their time and effort.

88
Name: Patterson, Sarah
Major: Kinesiology - Bachelor of Science
Faculty Advisor: Chih Chia Chen, Kinesiology
Co-Author(s): Faith Hagan
Project Category: Education

Students' Perceptions and Experiences of Leisure Activities among Residents in Senior Living Facilities Following a Service-Learning Course

The objective of this study was to evaluate the perceptions and experiences of undergraduate students in a service-learning course regarding promoting two leisure activities (i.e., Seated Tai Chi and Bingocize®) among older adults over the semester at two senior living facilities. Students were required to attend at least three activity sessions and submit a reflection paper at the end of the course. Qualitative analysis was used to examine the students' perceptions and experiences. The results indicated that most students had a positive reaction when they learned about the addition of this practicum experience to the course. Students' involvement provided different types of social support to encourage activity participation and motivation. Although older adults received physical, mental, cognitive, and social benefits, physical limitations were identified as the main barrier preventing older adults from participating in the activities. Students reported they gained emotional satisfaction, knowledge enrichment, role model learning, and career preparation from this assignment. Based on our findings, we recommended further research to validate these findings.

250
Name: Pennington, Abby
Major: Horticulture - Bachelor of Science
Faculty Advisor: Tongyin Li, Plant and Soil Sciences
Co-Author(s): Jacob Arthur, Guihong Bi
Funding: College of Agriculture and Life Sciences URSP
Project Category: Biological and Life Sciences

Growth, Yield, and Mineral Nutrient Compositions of Four Microgreen Species as Affected by Seeding Density and Substrate Type.

Microgreens are young seedlings that are harvested 7-21 days after germination. They are a popular specialty crop reported to have high concentrations of mineral nutrient and bioactive compounds, used to enhance appearance, and add flavor and texture in various foods. Seeds contribute to an important portion of the production cost. Optimal seeding density for many microgreen species remain unclear. Four herbal microgreen species including chive (Allium schoenoprasum), scallion (Allium fistulosum), green shiso (Perilla frutescens var. crispa), and dark opal basil (Ocimum basilicum var. purpurascens) were evaluated for growth and quality when grown with five seeding densities and two substrate types. The five seeding densities include 80 g·m-2, 160 g·m-2, 240 g·m-2, 320 g·m-2, and 400 g·m-2. Each species was grown with a peat-based soilless substrate or a hydroponic mat made from jute fibers. Microgreens were

assessed for shoot height, fresh and dry shoot weights, individual shoot weight and mineral nutrients concentrations. Among species, scallion and shiso produced the highest fresh shoot weights of 2980 g·m-2 and 2595 g·m-2 when planted at the highest density of400 g·m-2. Compared with jute mat, scallion and shiso both showed higher fresh shoot weight when grown using peat as the substrate. As seeding density increase, shiso had a decreasing trend in shoot weight. Nitrogen concentrations were highest for all species when seeds were planted at the highest seeding density of 400 g·m-2.

30
Name: Perkins, Vincent
Major: Mechanical Engineering - Bachelor of Science
Faculty Advisor: Nayeon Lee, Ctr for Advanced Vehicular Systems
Project Category: Engineering

Developing Nanopatterns on the titanium surface using electrochemical anodization and frequencies
The most common complications of dental implants or bone implants which are anchored into the bone for a long period of time is an infection. Although there have been many methods developed and suggested to address this problem, infection is still a serious issue. In this study, we developed nanotextures to mechanically hinder bacterial attachment and biofilm formation on the surface of titanium alloy (Ti-6Al-4V). The 200 samples of Ti alloy were prepared by polishing and cleaning to with a smooth surface for anodization. We are using a solution of acetic acid and hydrofluoric acid that contains the volumetric ratio was measure from 1: 7 with 125 ml of Acetic acid and 875 ml of solution with 0.5% of hydrofluoric acid and deionized water. Then, the samples were treated using four different conditions to evaluate the effect of different frequencies on nanotexture formation. The conditions were 10 V and 20V with 10 KHz and without frequencies. Afterwards the samples were rinsed by deionized water. Using the SEM, it was observed that those patterns on titanium can be used to prevent potential infections while protecting the titanium that integrated within the bone. In the future study, the samples are going to be performed of bacterial testing to see how they affect to bacterial attachment.

146
Name: Petersen, Sarah
Major: Psychology - Bachelor of Science
Faculty Advisor: Hilary DeShong, Psychology
Funding: NIMH R-15 Grant number MH122937-01A1
Project Category: Social Sciences

Personality Disorder Diagnoses and UPPS-P Impulsivity Traits: A Preliminary Investigation
The UPPS-P model of Impulsivity consists of negative and positive urgency, sensation seeking, lack of perseverance, and lack of premeditation. Personality disorders (PD) are often categorized into one of three clusters based on overlapping symptomology. Cluster A, the Odd/ Eccentric group, includes Paranoid, Schizotypal, and Schizoid PDs. Cluster B, the Dramatic/ Erratic group, includes Antisocial, Borderline, Narcissistic, and Histrionic PD's. Cluster C, the Anxious/ Inhibited group, includes Avoidant, Dependent, and Obsessive-Compulsive PDs. Previous research has primarily investigated impulsivity with Cluster B, with a few studies also investigating Cluster C, and with no studies investigating Cluster A. Negative Urgency has been most associated with all Cluster B disorders and DPD. Sensation seeking is associated with all Cluster B disorders and AvPD and OCPD. Lack of premeditation shows mixed relationships with BPD, negative relations with NPD, and positive associations with ASPD, AvPD, and DPD. Lack of perseverance has been previously associated with BPD, AvPD, and DPD. The current study expands on previous research by assessing the UPPS-P in relation to all ten categorical personality disorder diagnoses. It was hypothesized that negative and positive urgency, sensation seeking, and lack of perseverance would demonstrate strong positive associations with Cluster B and Cluster C. Meanwhile, lack of premeditation would show a nonsignificant relation with Cluster B and a positive association with Cluster C. Correlations with individual PD diagnoses will also be presented. The results demonstrate positive correlations between Negative Urgency with Cluster B and Cluster C. The findings indicate that negative urgency may be a particularly strong impulsivity trait driving symptoms of BPD, NPD, and OCPD, manifesting differently across the three disorders. The current study is still ongoing, and additional data may improve the ability to detect these relationships.

251
Name: Peterson, Grant
Major: Wildlife, Fisheries & Aqua - Bachelor of Science
Faculty Advisor: Joshua Granger, Forestry
Funding: College of Forest Resources URSP
Project Category: Biological and Life Sciences

A checklist and species distribution of the woody flora of Scattertown Trail in Sam D. Hamilton Noxubee National Wildlife Refuge, Mississippi, USA

Scattertown Trail is a hiking trail at the edge of Sam D. Hamilton Noxubee National Wildlife Refuge bordering the Tombigbee National Forest. The trail is managed by the U.S. Fish and Wildlife Service but has been left mostly untouched since its creation in 1997. The area is largely comprised of deciduous upland forest containing a variety of conifer and hardwood tree species and a diverse array of shrubs and woody vines. Though the trail is regularly utilized by the public, as well as by classes in the College of Forest Resources at Mississippi State University, a formal inventory of the woody plant species present on the site has never been conducted, thus potentially underestimating the value of the area for educational training and research purposes. Our goal was to (1) complete a floristic survey of woody plant species in the Scattertown Trail area, and (2) assess the distribution of the woody plant species based on soil and topographic variation in the area. To representatively sample the roughly 60-acre site, 66 transects (10ft wide x 100ft long) were conducted on the property. The abundance of each species of woody plant observed during each transect was recorded. Thus far, we have identified over 60 native and introduced species of woody plants in the area bound by the trail. There is a notable difference between plant communities in xeric areas and mesic areas, and further geospatial analyses will be conducted to determine the relationship between plant diversity and topography, soil, and hydrology. Results from this study will be provided to land managers at the National Wildlife Refuge and present a more accurate estimation of the species present at the site, which could have implications for management (e.g., prevalence of invasive plant species) and educational training programs on plant biodiversity and conservation.

252
Name: Phillips, Aaron
Major: Biochemistry - Bachelor of Science
Faculty Advisor: Richard Baird, Biochemistry, Molecular Biology, Entomology, and Plant Pathology
Co-Author(s): Hannah Purcha
Funding: College of Agriculture and Life Sciences URSP
Project Category: Biological and Life Sciences

Untargeted Metabolomic Analysis of Soybean Subjected to Two Epigenetic Factors: *Macrophomina phaseolina* Infection and Drought
With the persistent threat of climate change driven by human-induced greenhouse gas emissions, ensuring food security and maintaining crop viability have emerged as critical areas of research. Essential crops like soybeans face escalating risks from novel and intensified abiotic and biotic stressors, including drought and pathogenic infections. One pathogen of particular concern is *Macrophomina phaseolina* (Tassi) Goid., a robust fungus known for its resilience and wide host range that exceeds 500 plant species. Given its devastating potential and preference for arid and hot conditions, there is a pressing need to develop strategies to mitigate the inevitable spread of M. *phaseolina*. Plants respond to stress by modulating their metabolic pathways, potentially rendering them more susceptible to pathogens such as M. *phaseolina*. However, the specific mechanisms underlying this dynamic response have yet to be fully elucidated. Towards this aim, this study explores the metabolic impact on soybeans (*Glycine max* (L.) Merr.) induced by drought (D) and M. *phaseolina* (MP) infection. In a greenhouse trial, four treatments were administered to soybean plants: MP-/D-, MP-/D+, MP+/D-, and MP+/D+. Across three dates, the plants were destructively harvested. Roots were plated to confirm the presence of MP, and the foliar tissue had its metabolites extracted for ^{1}H NMR analysis. Through this investigation, we aim to unravel the metabolic regulations induced by these stressors in soybeans, and to therefore identify potential biomarkers for enhanced stress tolerance in breeding selection.

147
Name: Pittman, K'Lee
Major: Psychology - Bachelor of Arts
Faculty Advisor: Danielle Nadorff, Psychology
Project Category: Social Sciences

The intersection of discrimination and family structure on suicidal thoughts
Experiences of discrimination are linked with suicidal ideation and an increased likelihood of suicide within racial and ethnic minority groups. Race-based trauma symptoms have been identified as a mediator of this relation, highlighting the importance of accounting for contextual factors when working with diverse populations (Polanco-Roman, 2021). Another contextual factor of importance is family structure. Studies demonstrate that individuals raised in kincare, namely grandfamilies, endorse elevated suicide risk. Approximately 5.9 million children are raised by their grandparents in the United States, of which 45.8% identify as a racial or ethnic minority. This study sought to expand upon race-based trauma models outlined by Polanco-Roman to explore how family structure, specifically being raised by a grandparent, may impact the relations between discrimination, race-based trauma symptoms, and suicidal thoughts. The current study sampled 369 undergraduate students (*M* age= 19.41, SD= 3.70; 23.8% male, 75.1% female; 74.6% White, 16.0% Black; 33.3% raised by grandparents) through Qualtrics Panel Survey. A moderated mediation regression analysis was conducted using SPSS 28 v4.2 (Model 59) to assess the indirect impacts of discriminatory experiences on suicidal ideation via race-based trauma symptoms, and the role of family upbringing upon this relation. Results indicated that, as expected, discriminatory experiences were linked with suicidal

thoughts and feelings (b=-0.07, p=.047), and this relation was mediated by race-based trauma symptoms (b-0.01, 95% CI [0.01, 0.05]. Results also indicated the presence of moderation by family type (b=0.07, p=.001), such that as experiences of discrimination increased, individuals raised by grandparents experienced significantly lower suicidal ideation compared tot heir same-age peers. Implications suggest family structure may be a protective factor and should be further explored to assess their utility in treating experiences of discrimination and suicidal ideation in racial and ethnic minority populations.

148
Name: Poe, Michael
Major: Psychology - Bachelor of Science
Faculty Advisor: Allison Jaeger, Psychology
Co-Author(s): Katelyn Simmons, Madison Chenaille, Skylar Kline, Christopher Jolivette, Rachel Apperson
Funding: NSF REU: NSF# 2307285
Project Category: Social Sciences

Generating versus providing diagrams: What supports science text comprehension?
Research suggests that drawing is a useful tool for supporting learning in science. The goal of this study was to examine if generating diagrams supports science text comprehension and helps students make more accurate judgments of their learning compared to viewing provided diagrams. Participants (N = 189) from the psychology subject pool were randomly assigned to one of four conditions. In two conditions (partial generate, full generate), students generated their own diagrams while reading chemistry texts. In the two other conditions (static diagram, dynamic diagram), students were provided with diagrams while reading. After reading and judging all 4 texts, students completed a set of drawing tests (Time 1 – T1). Following a one-week delay, participants made a new series of drawing judgments and completed the same set of drawing tests (Time 2 – T2). Results showed that participants made higher drawing judgments at T1 than T2. Further, participants in the dynamic diagram condition showed the highest judgments at T1 and the lowest at T2, resulting in a significant interaction. For drawing test performance, scores were higher overall at T1 than T2. Again, participants in the dynamic diagram condition scored the highest overall, but also showed the greatest decrease from T1 to T2. To assess the accuracy of participants drawing judgments (i.e., how well judgments aligned with performance), we computed a measure called relative metacomprehension accuracy. There was no overall difference in metacomprehension accuracy across the four conditions, however there was a marginal effect of timepoint, with participants having more accurate judgments at T2 than T1. In conclusion, providing participants with a dynamic diagram while reading resulted in an immediate benefit to comprehension but this faded after a one-week delay. In terms of judgment accuracy, an opposite pattern was observed such that judgments became more accurate after a one-week delay.

253
Name: Pollack, Theo
Major: Agricultural Science - Bachelor of Science
Faculty Advisor: Fred Musser, Biochemistry, Molecular Biology, Entomology, and Plant Pathology
Co-Author(s): Justin George
Funding: College of Agriculture and Life Sciences URSP
Project Category: Biological and Life Sciences

Testing Pheromone Traps to Monitor Tarnished Plant Bug, *Lygus lineolaris* **(Palisot de Beauvois) (Miridae: Hemiptera)**
Tarnished plant bugs are the most economically damaging pest of cotton in the mid-south region of the United States. Typically, tarnished plant bugs are monitored by a sweep net sample (25 sweeps/ sample) and there are thresholds in place for this monitoring method. For this research, we placed a recently developed sex pheromone lure on red sticky cards, bucket traps, and delta traps to determine which pheromone trap type attracted the most tarnished plant bugs. Our research was spaced over three east Mississippi counties: Noxubee, Lowndes, and Oktibbeha. We used 18 different replications, 8 in cotton, 4 in soybean and non-crop, and 2 in alfalfa. Each replication housed 1 of each trap, spaced no less than 30m apart. Samples were taken once every week for the next 8 weeks. In conclusion, the pheromone-baited red sticky card caught as many or more tarnished plant bug adults as the other trap types in all habitats. However, it also caught as many or more non-target insects as the other pheromone traps. The relationship between pheromone catches and sweep net catches was poor.

48
Name: Pope, William
Major: Biological Sciences - Bachelor of Science
Faculty Advisor: Oshani Rathnayaka Mudiyanselage, FWRC-Sustainable Bioproducts
Project Category: Physical Sciences

Enhancing Hydrophobicity and Oil Resistance in Lignocellulosic Fibers through Metal-Ion Modification

Plastic pollution remains a global issue today and emphasizes the need for the development of biodegradable alternatives. The purpose of this study is to enhance hydrophobicity and oil resistance in lignocellulosic fibers for the eventual use of environmentally friendly paper and tableware. Lignocellulose fiber-based products are a promising alternative to current harmful plastic. However, lignocellulosic materials face challenges due to natural hydrophilicity and limited water resistance. Further, the porous nature of lignocellulosic fibers poses challenges in terms of oil resistance. This study introduces a novel metal-ion modification (MIM) technique, effectively transforming conventional hydrophilic paper and wood pulp into biodegradable hydrophobic and oil-resistant counterparts without additional hydrophobic chemicals.

Metal ions, notably Fe^{3+} and Zr^{4+}, play a pivotal role in the MIM process by coordinating with polar groups in pulp fibers, inducing the self-assembly of cellulose nanofibrils on fiber surfaces. This structural modification leads to a densely packed architecture with reduced accessibility of OH groups, significantly enhancing hydrophobicity and water resistance. Remarkably, a mere ~3 mg of metal ions per gram of kraft pulp triggers a wettability transition, resulting in hydrophobic paper and tableware with exceptionally high water contact angles.

Furthermore, the coordinated Fe^{3+} and Zr^{4+}, ions demonstrate stability, exhibiting minimal metal leaching during practical usage. Incorporating both MIM and nano cellulose, either as a coating or blended with lignocellulosic fibers, enhances the materials' resistance to oil, making them well-suited for food packaging applications. This study illuminates the synergistic interaction between nanocellulose and high-valent metal cations within lignocellulosic fibers, elucidating how the nanocellulose coating reinforces resistance to oil penetration. Integration of the environmentally safe metal cations and nanocellulose into existing pulp-making processes enables large-scale production of hydrophobic and oil-resistant molded fiber products, and tableware, offering a promising pathway towards sustainable and biodegradable alternatives to traditional plastics.

149
Name: Pulver, Abby
Major: Psychology - Bachelor of Science
Faculty Advisor: Cliff McKinney, Psychology
Project Category: Social Sciences

Relation Between Aggression and Psychopathy, as Moderated by Negative Urgency

The current study examined the relation between aggression and psychopathy in emerging adults and whether impulsivity moderated this relation. Proactive aggression has been characterized as the meticulous planning of aggressive conduct and reactive aggression has been characterized as emotional and instinctive responses to provocations or frustrations (Anderson & Kiehl, 2014). Past studies found that people with psychopathy predominantly commit proactive violence (Woodworth & Porter, 2002). However, other studies found that people with psychopathy may also implement reactive forms of aggression (Blair, 2010). Impulsivity appears to be a strong contributor to acting and reinforcing psychopaths' aggressive behavior (Porter et al., 2000). A prominent personality trait associated with impulsive behaviors is negative urgency, a trait broadly defined as the tendency to act impulsively in the face of negative affect (Whiteside & Lynam, 2001). 500 emerging adults completed the Psychopathic Personality Inventory-Revised: Short Form (PPI-R: SF; Lilienfeld & Widows, 2005) to measure fearless dominance, the Short Impulsive Behavior Scale (S-UPPS-P; Cyders et al., 2014) to assess negative urgency, and the Reactive-Proactive Aggression Questionnaire (RPQ; Raine et al., 2006) to measure reactive and proactive aggression. Fearless dominance was associated positively with proactive aggression, $B = 0.14$, $SE = 0.04$, $p < .001$. Negative urgency also was associated positively with proactive aggression, $B = 0.18$, $SE = 0.04$, $p < .001$. The interaction between fearless dominance and negative urgency was not significant, $B = 0.02$, $SE = 0.01$, $p = .18$. The relationship between fearless dominance and reactive aggression was not significant, $B = 0.04$, $SE = 0.05$, $p = .45$. Negative urgency was associated positively with reactive aggression, $B = 0.44$, $SE = 0.06$, $p < .001$. Results indicated fearless dominance was associated with only proactive aggression, whereas negative urgency was associated with both forms of aggression. The interaction between fearless dominance and negative urgency was not significant.

254
Name: Pye, Hannah
Major: Wildlife, Fisheries & Aqua - Bachelor of Science
Faculty Advisor: Michael Sandel, Wildlife, Fisheries & Aquaculture
Co-Author(s): Kayla Fast, Heather Jordan, Manuel Ruiz-Aravena, J. Marcus Drymon
Funding: ORED Undergraduate Research Program
Project Category: Biological and Life Sciences

Novel Aquatic Pathogen in Red Drum (*Sciaenops ocellatus*) in the Gulf of Mexico

Sciaenops ocellatus (Red Drum) is a popular sportfish native to the eastern coast of North America. Red Drum have been introduced in the Caribbean, Taiwan, and China with potentially detrimental impacts on native ecosystems. *Mycobacterium ulcerans* is an ulcerative disease-causing bacterial species found in aquatic environments around the globe. In humans, *M. ulcerans* causes Buruli ulcer, but no

cases have been reported in the southeastern United States. Lesions associated with *M. ulcerans* have been observed in Red Drum in southern Louisiana. Low concentrations of *M. ulcerans* have been detected in the environment in coastal ecosystems in the southeastern US and fish were found to carry *M. ulcerans* at a low prevalence. To determine a baseline of *M. ulcerans* presence in fishes from the Gulf of Mexico, we swabbed the cloacas and gills of fish collected in Deep Sea Fishing Rodeos in Alabama (n = 238) and Mississippi (n = 151). These collections include 38 different species representing both bony and cartilaginous fish. We noted that 7 individuals had skin lesions, and plan to test whether these are correlated with *M.ulcerans* presence. We extracted microbial DNA from swabs and used polymerase chain reaction (PCR) to detect *M. ulcerans*. The molecular marker used targets the par A gene of the bacterial plasmid. *M. ulcerans* is present in 12.5% of Red Drum (2/16). Phylogenetic analysis shows that the internal and external microbiomes of one of these individuals include two different ecovars of *M. ulcerans*. The ecovar isolated from the gills is novel while *M. ulcerans* ecovar *pseudoshottsii* was isolated from the cloaca. *M. ulcerans* ecovar *pseudoshottsii* was isolated from both the gills and cloaca of the second individual. This data suggests that it will be important to monitor the presence of *M. ulcerans* and other pathogens in fish of economic and recreational importance.

255
Name: Rainey, Wesley
Major: Food Sc Nutr. Health Prom (UG) - Bachelor of Science
Faculty Advisor: Shecoya White, Food Science, Nutrition, and Health Promotion
Funding: College of Agriculture and Life Sciences URSP
Project Category: Biological and Life Sciences

Impacts of AntiMicrobial Treatments on Germination and Growth of Broccoli Microgreens in a Greenhouse Environment
Seed sanitization is crucial for microgreen production because it helps prevent the growth of plant/human pathogens that can negatively impact the quality and safety of microgreens. This experiment aimed to determine the impact of seed sanitization methods on germination percentage, yield, and growth, on broccoli (Brassica oleracea var. italica) seeds used for microgreen production. For this study, broccoli seeds were exposed to Hydrogen Peroxide (HP) at 0.27%, Hot Deionized Water (HW) at 85 ± 2°C, peracetic acid-Tsunami™ (TS) at 0.04%, Vinegar (VN) at 1.25%, and Deionized Water (DI). Germination was recorded daily for 5 days. DI, HP, and VN-treated seeds had higher germination than other treatments by day 5 (96.9% (HP), 41.2% (HW), 3.3% (TS), 93.0% (VN), and 97.6% (DI)). Both HW and TS negatively affected germination rates with TS severely affecting germination. For the greenhouse trial, only one repetition was able to be conducted. For that trial, untreated broccoli seeds were tested with APC to get an initial microbial load (3 log CFU/g). Treated seeds were grown in greenhouse conditions for 7 days, harvested, weighed, measured, and tested for aerobic bacteria, coliforms, and yeast and mold with a control added. The greenhouse trial showed significant stunting of HW treatment with height (12.8 mm) and weight (N/A) and mild stunting of TS treatment with height (21.3 mm) and weight (12.4 g). The growth of VN, DI, and HP shoots was least affected. Most treatments resulted in an increase in counts for APC up to 5 log CFU/g with the cleanest sprouts being HW. Based on microbial counts, HW would be recommended for growers. However, VN or HP would be recommended based on impact of growth. Based on a combination of growth and microbial data, a lower PPM of TS would be the best recommendation.

71
Name: Ramos, Iliana
Major: Architecture - Bachelor of Architecture
Faculty Advisor: Alexis Gregory, School of Architecture
Project Category: Arts, Music, & Design

Evolution of the Domestic Sphere in Architecture
The rights of women have only been pushed forward to be protected by legislation for the past one hundred and fifty years in the United States. Both before the feminist movement and now, the role of women in society has been contentious. What is a "woman's place"? The nineteenth century answered this question with a value system known as the Culture of Domesticity. According to this cult of domesticity, women's place was within the domestic sphere, taking on sole responsibility for child-rearing, housekeeping, etc. This research will track the evolution of the idea of the domestic sphere in the United States, the similarities and differences between them, and its current presentation. The idea of the domestic sphere and how it as a concept evolved directly impacts American society today. Specifically, it will be analyzed as it relates to women's work in the architectural field, the evolution from being restrained to interiors and domestic architecture to the variety of works by women today as well as their reception by the broader community. Research methods include literature review of sources available in journals, books, and online.

150
Name: Rayborn, Brooke
Major: Psychology - Bachelor of Science
University: Louisiana State University

Faculty Advisor: Jas Sullivan, Psychology, Political Science, African American Studies
Co-Author(s): Julia Buckner
Project Category: Social Sciences

Race-Based Trauma Induced Social Dominance Orientation: An Exploratory Study
According to the United States Department of Justice, 63% of African Americans have experienced some form of "racially charged" trauma in their lifetime (2014). Race-based trauma is often a by-product of one's exposure to discrimination. While there's been a great deal of work on the effects of race-based trauma on cognitive and somatic outcomes, not much research has explored the ways race-based trauma affects social attitudes– such as, social dominance orientation (SDO). Consequently, in this exploratory study, we ask the following question: What is the effect of race-based trauma on SDO? Our expectation is that exposure to race-based trauma will increase SDO. The data for this study comes from a Qualtrics survey consisting of 149 college-aged students. The results show there was a significant association between the various symptoms of race-based trauma on SDO. For example, those experiencing greater levels of depression; hypervigilance; anger; physical symptoms; avoidance; and intrusion, due to experiences with racism, are more likely to hold SDO. These findings show that experiences with race-based trauma structures social attitudes.

49
Name: Raynor, Madeline
Major: Chemical Engineering - Bachelor of Science
Faculty Advisor: Erika Womack, Mississippi State Chemical Laboratory
Co-Author(s): Jordan Adams-Jackson, Christina Childers, Veronica Wigginton, Magan Green, Julie Toler
Funding: ORED Undergraduate Research Program
Project Category: Physical Sciences

Paraquat: A Comparison and Overview of Extraction Methods
Despite being one of the most used herbicides, the tests for detecting paraquat have had a significant amount of variability and leave much room for error. The chemical is extremely toxic when ingested in small amounts, so for the safety of consumers, it is especially important to develop a foolproof method for measuring the amount of paraquat found in plants. The purpose of this experiment is to compare three different methods of paraquat extraction to determine which one produces the highest percent recovery. The target range for percent recovery is 80-120%. The first method was developed by Tingting Zou and consists of extracting the vegetable sample, in this case turnip greens, with sonification and cleaning it with weak cation exchange solid phase extraction. The sample was then separated via a hydrophilic interaction liquid chromatography column. The second method was developed by the Mississippi State Chemical Laboratory, and the process consists of weighing out a portion of the sample, spiking fresh solution onto the sample, adding 50:50 MeOH and 0.1 M HCl in H2O, mixing it, heating it, allowing it to cool to room temperature, centrifuging it, decanting it, and then diluting it with a sample of ACN. Lastly, the third method was developed by the European Union, and the process consists of weighing out a portion of the sample, mixing it with 50:50 MeOH and 0.1 M HCl in H2O, adding H2O and EDTA, mixing it again, heating it, mixing it once more, centrifuging it, decanting it, and diluting it with ACN. The recovery range for Tingting's method was 50-60%, the Mississippi State Chemical Laboratory's was about 50%, and the European Union's method recovery range was 55-60%. Because none of the methods produced results within the 80-120% recovery range, further development and improvement of the methods is required.

151
Name: Rebala, Yashwanth
Major: Psychology - Bachelor of Science
Faculty Advisor: Carolyn Adams-Price, Psychology
Project Category: Social Sciences

Creative Writers and Predictors of the Creative Benefit Scale
This study examined the development of creative benefits in creative writers. The Creative Benefits Scale (CBS) is a measure of the benefits people say they receive from engaging in long-term creative hobbies. The 4 subscales are Identity, Recognition from Others, Calming, and Attachment to God/Nature. The purpose of the study was to see how the scale works with creative writers, and to see what aspects of the creative writing hobby predict the creative benefits for adult writers, aged 18-76, 70% of whom were female. Participants were 120 adults recruited from online creative writing groups on Facebook and Reddit. Participants completed the CBS. In addition, they were asked questions about how much time they participated in their hobby, how long they had been participating in their hobby, the importance of their hobby, their desire to be seen as gifted, and their desire to make money. Regression analyses were conducted for each CBS subscale, and the predictors above. The importance of their hobby predicted CBSidentity, CBSspirit, CBScalming, and marginally predicted CBS/Spiritual (i.e., attachment to God or nature). Length of participation in one's creative activity also predicted creative identity. Time spent on hobby was marginally associated with CBSRecognition. However, the desire to make

money and the desire to be seen as gifted did not predict any of the creative benefits. The results suggest persons who believe their writing is important are very likely to get benefits from writing.

256
Name: Reon, Lindsey
Major: Animal and Dairy Science - Bachelor of Science
Faculty Advisor: Peixin Fan, Animal and Dairy Sciences
Co-Author(s): Himani Joshi, Michael Caprio
Funding: College of Agriculture and Life Sciences URSP
Project Category: Biological and Life Sciences

Identification of potential rumen microbiome markers for heat stress prediction based on systematic review and machine learning
Heat stress has a huge negative impact on the global dairy industry, leading to reduction in milk production and impact on rumen fermentation. A systematic review was conducted on six studies evaluating the heat stress effects on rumen microbiota of dairy cattle, and identified only four bacterial genera (Prevotella, Streptococcus, Shuttleworthia, and Treponema) repetitively associated with heat stress. The inconsistency could be attributed to diet, lactating state, and microbiota analysis pipelines. To further evaluate the potential of rumen microbial markers to predict heat stress, we collected 16S data of 55 rumen samples of dairy cows from three out of these six studies that had available raw data and built machine learning models based on the relative abundance (RA) and the absence/presence (AP) profile of the rumen bacterial genera. The 16S data were analyzed with QIIME2 software and the Silva 138.1 database. The sequencing depth and 183 bacterial genera served as independent variables to predict heat stress as the response. The important independent variables that contributed to the model were first selected using Boruta. The feature-selected dataset contained thirteen important bacterial signatures based on RA and ten based on the AP, which were then individually trained using Support Vector Machines (SVMs). AP-based model outperformed RA-based model with an area under the receiver operating characteristic curve (AUROC) of 0.86-0.93 vs 0.70-0.88, suggesting the data performed better with the AP of microbiota as biomarkers. Moreover, the model selected certain important features, such as Bacteroidales BS11, and Prevotellaceae_UGC-001, which have also been reported to be enriched in heat-stressed cattle, suggesting their potential as bacterial markers for heat stress. In conclusion, the high accuracy of the built machine learning model indicates a unique rumen microbiota feature in heat-stressed cows, which may be specifically targeted to mitigate the heat stress responses in dairy cows.

257
Name: Robinette, Jillian
Major: Agribusiness - Bachelor of Science
Faculty Advisor: Te-Ming Tseng, Plant and Soil Sciences- Weed Science
Co-Author(s): Dante Elias, Tabata Oliveria, Antonio Augusto Tavares, Varsha Singh, Josiane Argenta
Funding: College of Agriculture and Life Sciences URSP
Project Category: Biological and Life Sciences

Improved Herbicide Selectivity in Tomato by Safening Action of Benoxacor, Fenclorim, Melatonin, and 2,4,6-trichlorophenoxyacetic acid.
Safeners are vital for protecting crops by enhancing their ability to metabolize various compounds, including herbicides. They primarily work by increasing the crop's tolerance to herbicide damage, activating herbicide-metabolizing proteins, and aiding in their detoxification. This study aimed to investigate the chemical effects of benoxacor, fenclorim, 2,4,6-T, and melatonin safeners in tomato cultivation, focusing on injury reduction and tissue protection. The experiment followed a randomized factorial design (5x4) with four replications, examining the effects of herbicides (dicamba, 2,4-D, metribuzin, and sulfentrazone at 1/100) and safeners (benoxacor, fenclorim, melatonin, 2,4,6-T, and a control). Treatments were applied to the aerial parts of tomato seedlings, and visual injury was evaluated at 7, 14, and 21 days after application (DAA). Biomass measurements were taken at 21 DAA. Results showed that pre-treating tomato seeds with 2,4,6-T, melatonin, and fenclorim significantly decreased injury at 7 DAA (25, 25, and 23% injury, respectively). Benoxacor and control treatments resulted in 33 and 32% injury, respectively. At 21 DAA, tomato plants exhibited over 50% injury with all herbicide and safener combinations, except 2,4,6-T safener, which resulted in the least injury (48%, average of all herbicides). Understanding plant defense mechanisms and the protective effects of safeners, such as benoxacor, fenclorim, 2,4,6-T, and melatonin, can enhance the health and resilience of tomato plants, offering valuable insights for effective weed management. This research highlights the potential of pre-treatment with 2,4,6-T, melatonin, and fenclorim to reduce injury, while the application of melatonin, benoxacor, and 2,4,6-T can increase dry biomass, with implications for improving crop health and productivity in tomato farming.

152
Name: Robinson, Carly
Major: Psychology - Bachelor of Science
Faculty Advisor: Deborah K. Eakin, Psychology
Project Category: Social Sciences

What Did You See?
Eyewitness memory research has concluded that eyewitness memory is impaired if eyewitnesses are exposed to misleading post-event information about a witnessed event (Eakin, et al., 2003). This impairment has been demonstrated using the misinformation paradigm: participants witness an event via a slide show presentation and then critical items are misled in a post-event narrative (misled condition) or mentioned generically (control condition). Memory is worse for the misled than control condition, resulting in what is called the misinformation effect. The purpose of the present experiment was to determine whether two factors could intervene in the misinformation effect: a warning and a practice test immediately after witnessing the event. Findings have indicated that warnings about potential misinformation minimize the misinformation effect (Blank & Launay, 2014). Additionally, research on the test effect (Karpicke et al., 2009) has shown that taking an immediate practice test improves memory. The aim of the present study was to use a combination of an immediate test and immediate warnings—and the combination—to determine whether the misinformation effect could be minimized or eliminated. Memory was better in the control ($M = .65$, $SE = .02$) than the misled ($M = .56$, $SE = .02$) condition; a significant misinformation effect was obtained, $p = .006$. The main effect of Test was not significant, although the direction supported the predicted effect of testing, overall, $p = .06$. There also was no main effect of warning, $p = .67$. The predicted reduction or elimination of the misinformation effect was not observed for either the Test or Warning interactions; neither was significant, $p = .79$ and $.96$ respectively. The three-way interaction was also not significant, $p = .91$. The findings will be discussed in terms of theories explaining the misinformation and test effects.

258
Name: Robinson, Lillie
Major: Wildlife, Fisheries & Aqua - Bachelor of Science
Faculty Advisor: Kristine Evans, FWRC-Wildlife,Fisheries&Aquaculture
Co-Author(s): Zoe Scott
Funding: College of Forest Resources URSP
Project Category: Biological and Life Sciences

Resource Selection of Nesting Red-headed Woodpeckers on a Commercially-Managed Pine Forest in Mississippi
The Red-headed Woodpecker (Melanerpes erthrocephalus; RHWO) is a primary cavity excavator found throughout North America and provides cavities for species that cannot excavate their own. This once abundant species has declined within the last 40 years due to habitat loss and fragmentation. While there have been recent efforts to better understand RHWO resource selection to prevent further decline, there is a lack of research knowledge pertaining to the selection of habitat components within managed forest stands. This study sought to understand the nesting preferences of RHWO as well as if the species would use artificially installed snags. The study took place within young, regenerating pine stands on a privately-owned forest in Noxubee County, MS from May to August 2023. We recorded cavity nesting birds and raptors using point count surveys in the vicinity surrounding each of four artificially installed snags and surveyed young pine stands throughout the northern portion of the property to identify active RHWO nests. We measured the diameter at breast height (dbh), height, number and size of cavities, decay class, foraging activity, and herbaceous coverage qualities for the active nesting tree and 10 additional unused snags in the surrounding area. A logistic mixed effects regression model was run using snag use as a response variable and snag dbh, herbaceous coverage, decay class, and proximity to stand edge as independent variables. We observed that the majority nested in the tallest snags, the highest portions of those snags, and in the older snag decay classes with a dbh greater than fifteen inches. RHWO were seen foraging on the artificially installed snags, however, there were no cavities excavated. Out of all the cavity nesting species in the area, RHWO had the greatest population and did not appear to be deterred by the perching of raptors on the actively used snags.

94
Name: Rouse, Adaline
Major: Agricultural Science - Bachelor of Science
Faculty Advisor: Jesse Morrison, Plant and Soil Sciences
Co-Author(s): Carley Morrison, OP McCubbins
Funding: College of Agriculture and Life Sciences URSP
Project Category: Education

Effect of College of Agriculture and Life Sciences Teaching Academy on Instructor's mindset towards Feedback

Receiving feedback is a vital tool for educators. How feedback is received has a significant effect on the mindset of the professor. If an individual is apprehensive when receiving feedback, the commentary may be less effective compared to approaching the situation with a more positive outlook. This scenario represents the difference between fixed and open mindsets. The primary purpose of this research project was to investigate how instructors responded to feedback before participating in the College of Agriculture and Life Sciences Teaching Academy (CTA). The project aimed to understand the impact of professional development programs, on instructors' responsiveness to feedback related to their teaching practices and likelihood to have a fixed or open mindset. By examining these responses, the study sought to provide insight into the effectiveness of educational interventions. The participants were asked to fill out an online Qualtrics survey which consisted of three questions. They were asked to complete the survey before attending CTA. In the results of this study, it was found that the participants' reactions to feedback could vary. After the CTA was completed, the participants were asked to complete the same survey to observe the effects of the CTA. The post-study expected to observe enhanced awareness, adaptability, and implementation of feedback-driven improvements in teaching practices among the participants. This information contributed to a nuanced understanding of the impact of professional development on instructor behavior. The conclusions of this study highlighted the positive correlation between participation in professional development programs, specifically the CTA, and increased positive responsiveness to feedback among instructors. Using the results of the surveys, customized recommendations could be created for participants. Recommendations stemming from the findings were provided to inform the development and enhancement of future educational interventions, emphasizing the importance of tailored and targeted approaches to support continuous improvement in teaching practices.

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Name: Ruckman, Sophia
Major: Biomedical Engineering - Bachelor of Science
Faculty Advisor: Amirtaha Taebi, Agricultural and Biological Engineering
Co-Author(s): Jigar Bhatt
Funding: ORED Undergraduate Research Program
Project Category: Biological and Life Sciences

Design and Usability Testing of a Wireless Multimodal Cardiovascular Monitor

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 device is comprised 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. One outer node reads electrocardiogram (ECG), seismocardiogram, and gyrocardiogram data, and the other outer node reads pulse oximetry data. The data collected by the outer nodes is sent wirelessly to the central node, which operates using an Arduino Uno. The central node determines what data is being collected and streamlines and stores it in one location. The central node is also connected to a local computer, allowing for easy data analysis and post-processing of the signals. User experience research is also being done to better understand how to make a product that is comfortable and easy to use for different user segments. Comparative analysis of various products on the market like our device were done. To better understand what features and functions of these products would be best for our device, usability testing is being done through interviews. Some of the devices on the market, including ECG patches and pulse oximeters were used in the usability testing. The set up of the interviews allows the researchers to analyze how the interviewees interact with these products. The data collected from these interviews will provide qualitative information on what features and functions were most compatible with the users.

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Name: Sampson, Rachel
Major: Architecture - Bachelor of Architecture
Faculty Advisor: Alexis Gregory, School of Architecture
Project Category: Arts, Music, & Design

Completing the Rainbow: Exploring the Voices of Lesbian and Transgender Architects

Typically, when sexual orientation is brought up in the world of design, it is through the lens that cisgender homosexual men offer, which is to the detriment of the rest of the LGBTQ+ community. This study examines the perspectives of lesbian women and transgender people in the field of architecture and design. The queer experience is multidimensional, and there are obstacles that lesbian women and transgender people experience that do not affect gay men. The world of design is meant to encourage architects to think about all people that may interact with the spaces they create, but the field is still predominantly white, cisgendered, heterosexual men. Because of this environment, it is increasingly difficult for LGBTQ+ architects to find a place to work where they feel safe being out as queer to their coworkers. A person's life experiences color how they design the built environment, and without queer architects there

becomes a lack of queer designed spaces. Through a literature review, the perspectives of lesbian women and transgender people are analyzed together to bridge the gap of the LGBTQ+ experience within the design field. Lesbian women and transgender people are being researched together under the assumption that there are fewer resources in comparison to that of cisgender, homosexual men.

153
Name: Sanders, Amya
Major: Fashion Design & Merchandising - Bachelor of Science
Faculty Advisor: JuYoung Lee, School of Human Sciences
Co-Author(s): Anna Mielke, Braelyn Clark, Molly Lambert, Brianna Smith, Gracie McCormack
Project Category: Social Sciences

Millennials' Social Media Use & Overconsumption in the Fashion Industry
The overall purpose of the study is to examine the relationship between millennials' social media use and overconsumption in the fashion industry. The research problems are millennials' overuse of social media and how this leads to overconsumption in the fashion industry. The problems that arises from this are debt and increased amounts of textile waste which leads to environmental pollution. The basic design of the study uses a survey, personal references, and statistics that examine the amount of overconsumption and subsequent consequences. In this study, we utilized quantitative methods with purposive sampling techniques to observe Millennials' social media use and engagement relating to their spending habits and consumption intake in the fashion industry. The major findings from our analysis showed there is a positive correlation between millennials' social media use and engagement and spending habits and purchases. Overall, more research must be conducted on the relationship between millennials' social media use and overconsumption, which is the aim of our study.

260
Name: Schmitz, Elanah
Major: Biological Sciences - Bachelor of Science
Faculty Advisor: Mark Welch, Biological Sciences
Co-Author(s): Blaklie Mitchell
Project Category: Biological and Life Sciences

Genetic Variation Among Subpopulations of *Iguana delicatissima*
The Lesser Antillean iguana (*Iguana delicatissima*) is an endangered species that is primarily threatened by habitat loss and hybridization with invasive green iguanas (*I. iguana*). Because small population sizes and introgressive hybridization greatly impact the genetic integrity of *I. delicatissima*, it is crucial to monitor the genetic composition of these populations when possible. To better inform the conservation management of this species, we assessed genetic variation among a population of *I. delicatissma* on the island of Dominica. In this project, we genotyped 24 species-specific microsatellite markers across 96 *I. delicatissima* samples, which were collected from different sites across Dominica. Variation within and between these genotypes was used to characterize the genetic structure of the population and to confirm their pedigree (i.e., pure *I. delicatissima*). The Microsoft Excel extension, GenAlEx, was used to calculate allele frequencies, deviations from Hardy-Weinberg equilibrium, and F-statistics. If genetic differentiation between sites is detected, this could indicate the presence of barriers between subpopulations. Additionally, if we discover private *I. iguana* alleles within the Dominica population, this would substantiate the threat of a genetic extinction imposed by invasive hybridization. Investigating the genetic architecture of the *I. delicatissima* population on Dominica is a critical component in saving this endangered species.

163
Name: Sekhon, Simranjeet
Major: Psychology - Bachelor of Arts
University: California State University, Fresno (Fresno State)
Faculty Advisor: Katherine Fobear, Women, Gender, and Sexuality Studies
Project Category: Social Sciences

The Journey of Gender Roles: Experiences Within Migration and Marriage of Punjabi Immigrant Women in Fresno County
The experiences of Punjabi women in California are often overlooked, so this study focuses on the narratives of these women. The purpose of this study is to provide a space where these women can voice their life stories, exploring the construction of gender roles through different stages of their lives such as migration and marriage. The study concentrates on the changes in geographical location in regard to cultural dynamics of gender expectations. Using qualitative semi-structured interviewing with six married Punjabi immigrant women in the Central Valley of California, the research shows how kinship, specifically the relationship with their parents, affects the lives of these women starting from a young age. The narratives of these women depict the impact of kinship on their journeys of migration and the difficulties they faced in the United States. Isolation, language barriers, and culture shock attributed to the hardships

of immigrant Punjabi women. Many struggled with maintaining their own identity in a foreign land as they honored the obligations to their spouses and children. However, the sense of loss strengthened these women's convictions of retaining a minimum of one aspect of their own identity. This research depicts the intersections of race, gender, geographical location, and marital status, which offers insight into the complexities of experiences within a singular minority community as they adjust to a foreign country and culture.

154
Name: Sells, Haley
Major: Psychology - Bachelor of Science
Faculty Advisor: Carolyn Adams-Price, Psychology
Co-Author(s): Ryah Tubbs, Anna Paine
Project Category: Social Sciences

Creativity and Cultural Identity: The Crafts in America Show on PBS
Crafts in America is a show that highlights the intersection of culture and creativity of artists in different ethnic groups who create art of different types. The purpose of this study was to look qualitatively at what artists say about how their work relates to their cultures. We downloaded transcripts from 6 different episodes (quilts, story tellers, identity, jewelry, threads, and families) and used qualitative analyses to find different themes in each episode, mentioned by several artists. Common themes included crafts as magical and powerful, crafts as a part of a culture's story, crafts as a rebellion against a hegemonic culture, and crafts as symbol of a group's survival. We will also discuss themes that are specific to different cultures and types of creative products. For example, jewelry artists tended to mention the inherent value of the materials themselves.

55
Name: Sifford, Audrie
Major: Secondary Education - Bachelor of Science
Faculty Advisor: Eric Vivier, English
Project Category: Humanities

Hamlet Undone: A Loss of Doctrine
In William Shakespeare's play, *Hamlet*, Hamlet is presented with a religious crisis brought on by the appearance of his father's ghost. Ghosts, according to Catholic theology were thought to be souls plagued by earthly attachments while trapped in purgatory. This directly conflicts with the education Hamlet received at the University of Wittenberg, where the teachings historically reflected Protestant theology. Within Protestant theology, purgatory does not exist, therefore ghosts were believed to be demons in disguise meant to lead people astray. This begs the question; how does Hamlet deal with this crisis? Hamlet's confusing religious affiliations have become a pressing discussion within the last two decades. Many critics believe that Hamlet's indifference towards his father's ghost at the end of the play means that he leans more towards his Protestant beliefs. Others claim that Hamlet's many soliloquies and speeches reflect Shakespeare's own belief in Catholicism. In this paper, I will argue that neither position is true. Instead, Hamlet's deep confusion in doctrine festers throughout the play as he is confronted with his own conscience and mortality, along with his plot of revenge. In the end, Hamlet casts aside both Protestantism and Catholicism to free himself from the constraints of theological doctrine.

261
Name: Simpson, Austin
Major: Wildlife, Fisheries & Aqua - Bachelor of Science
Faculty Advisor: Carrie Vance, Biochemistry, Molecular Biology, Entomology, and Plant Pathology
Funding: College of Agriculture and Life Sciences URSP
Project Category: Biological and Life Sciences

Validation of Near Infrared Reflectance Spectroscopy (NIRS) and Machine Learning for Prediction of Reproductive Hormones Through Enzyme-Linked Immunosorbent Assays (ELISA) of Estrogen (E2) and Progesterone (P4) in the Giant Panda and Red Panda
Conservation efforts for giant pandas (*Ailuropoda melanoleuca*) and red pandas (*Ailurus fulgens*) encounter problems when faced with male:female discrimination in wild population surveys. Both giant and red pandas have seen significant decline in their populations, with both being listed as endangered or vulnerable in recent years. Their large range across difficult terrain for the small numbers of both species make it difficult to locate the animals as well as determining male to female ratio for reproduction. A method that has shown promise for male:female discrimination of giant and red panda populations is fecal near infrared reflectance spectroscopy (FNIRS). FNIRS has been able to accurately identify 78% of giant panda adult male fecal samples and 81% of adult female fecal samples obtained in captivity. Red panda's sex was able to be identified accurately at 85% for males and 80% for females. The objective of this project was to compare and validate the findings of previous FNIRS research using fecal hormone extractions (FHE) to predict reproductive

hormones with enzyme-linked immunosorbent assays (ELISA). ELISA was used to detect and quantify estrogen (E2) and progesterone (P4), hormones that can be detected during the female estrous cycle and male breeding season. Previously used FNIRS fecal samples obtained in captivity during both species' breeding season were pulled from deep freeze. Fecal hormone extractions were performed on 90 male (n=3) and 49 female (n=2) red panda fecal samples and 74 male (n=3) and 126 female giant panda (n=4) fecal samples. 90% ethanol was used as a solvent to extract reproductive hormones from the samples. The hormones detected in all samples by ELISA were observed to differentiate males and females and compared to previous FNIRS data to determine validity of FNIRS and ELISA being used field work for estimating wild populations.

262
Name: Sisson, Anna
Major: Nat Res & Envir Conservation - Bachelor of Science
Faculty Advisor: Esteban Galeano Gomez, FWRC - Forestry
Funding: ORED Undergraduate Research Program
Project Category: Biological and Life Sciences

Seed collection and propagation of Bluff oak (*Quercus austrina***), a sensitive Southern U.S. oak species**
Bluff oak (Quercus austrina) is a species found in the Southern U.S. and has been reported as sensitive and with high ecological relevance (IUCN Red List Status) in the different ecosystems that can be found. Unfortunately, the population of this species is declining, and they are a part of the 29 species of conservation concern identified in the Conservation Gap Analysis of Native US Oaks (The Morton Arboretum). This project relates to previously funded efforts by Ron Lance at the North American Land Trust for Q. austrina. Nevertheless, there are no substantial efforts for gene conservation and significant gaps in understanding the loss of diversity of these three species. This project collected acorns from a parent Bluff Oak tree at Mullen's Bluff Park in West Point, Mississippi. Each time we visited the parent tree, we collected many acorns. The total amount of acorns collected was 261 acorns. For each acorn, we measured its height, width, weight, and the category of the condition of each acorn: (1) substantially broken, (2) partially broken, and (3) not broken. Also, we evaluated two different pots that will impact differently the root system: air pots and regular plastic pots. Seedlings with enough size will be transferred to bigger pots and placed in the greenhouse. Then, we will assess the performance of seedlings in a greenhouse. This project will inform us about effective collection, germination, and survival protocols.

31
Name: Smith, Kyler
Major: Computer Engineering - Bachelor of Science
Faculty Advisor: Cindy Bethel, Computer Science and Engineering
Funding: NSF Grant IIS-1900883
Project Category: Engineering

Evaluating the Ability of a Robot to Communicate Emotion through Generated Audio
This work explores the emotional communication ability of a non-humanoid robot, to advance the field of human-robot interaction. The non-humanoid robot is Therabot, a socially assistive robotic agent. In this work, the form factor of Therabot is that of a stuffed dog. Therabot's emotional communication ability is assessed when its audio is randomly generated. A Python script to generate audio was implemented and integrated into Therabot. A participatory design study was utilized to evaluate the effectiveness of the audio generated by the script in communicating emotion. Results indicate that emotion can be communicated by generative audio.

155
Name: Smith, Maurico
Major: Electrical Engineering - Bachelor of Science
Faculty Advisor: Angela Card, Ctr for Advanced Vehicular Systems
Funding: ORED Undergraduate Research Program
Project Category: Social Sciences

Investigation for the possibility for a Clean Cities Coalition for the state of Mississippi
In this research, the goal is to delve into the possibility of developing a Clean Cities Coalition in the state of Mississippi. Numerous environmental concerns are already present in Mississippi regarding sustainability. As it stands, the need for higher air quality is at an all-time high. With a Clean Cities Coalition, concerns such as greenhouse gas emissions, issues in transportation, and burning of fossil fuels are greatly reduced. To help combat this, different methodologies and strategies will be used with the main goal of sustainability in the environment within Mississippi. The use of implementing strategies, reviewing and creating policies, and experimental data combined with stakeholders such as government officials, companies revolving around the transportation industry, and the education of the public, all contribute to the successful implementation of a Clean Cities Coalition in Mississippi. Strategies would be specifically

aimed at the environmental needs of Mississippi. Renewable fuels such as hydrogen, electricity, and biodiesel present a shift towards a sustainable path to be made in Mississippi's transportation sector. As it stands now, Mississippi is behind the margin when referring to renewable fuels compared to other states with an existing coalition. By establishing a Clean Cities Coalition, strategic changes can be made in order to make way for a necessary environmental change within the state. Research also shows possible challenges associated with establishing a coalition in Mississippi. Concerns such as funding, complex policies, and acquiring stakeholders pose possible barriers when concerning the development of a Clean Cities Coalition in Mississippi. However, current research and assessments point to strong interest from stakeholders which will lead to a successful outcome throughout the establishment of the coalition. Overall, this research's main goal is to contribute to sustainability in the environmental landscape of Mississippi through the resources provided by establishing a Clean Cities Coalition. By taking into account Mississippi's environmental factors, appropriate actions can be taken to advance toward a more sustainable transportation sector in the state. By fostering relations with stakeholders, the availability of resources and funding increases, leading to effective progress towards sustainability.

78
Name: Smith, Sawyer
Major: Data Science - Bachelor of Science
Faculty Advisor: Jonathan Barlow, Data Science
Project Category: Business and Economics

Developing a Model for Predicting House Value in Oktibbeha County, Mississippi
A house is the most expensive product that the average American will purchase in his or her lifetime. Given this fact, it is important to be able to assess how cheaply or expensively a house is priced relative to its features. This research develops a model to predict the price of a house given its features. The model considers various features of a house, including location, size, lot size, and age. The data for this project contains a list of all homes, condos, and lots available for sale in Oktibbeha County in March 2024 that were listed on realtor.com. The project uses machine learning techniques, including Random Forest and Decision Tree. Ideally, the model will simply output a house price as a linear combination of housing attributes scaled by coefficients that will be discovered in the machine learning process, but this research will test other techniques in hopes of ensuring better accuracy.

156
Name: Smith, Tyrus
Major: Psychology - Bachelor of Science
Faculty Advisor: Jarrod Moss, Cognitive Psychology
Project Category: Social Sciences

Individual Differences in Strategy Selection
The overarching problem addressed in this study is how individuals differ from one another in their performance on problem-solving tasks. Understanding the underlying factors contributing to these differences is key in developing approaches to teach and train effective problem-solving skills. In particular, a previous study (Ho et al, 2023) used a maze task to show that people often do not update their representation of the mazes after they have learned one method to solve them even if a significantly better method becomes available on future mazes. Mazes presented earlier only had one path, but later mazes had a shortcut available if participants represented notches in the obstacles that were passable. Participants' initial move time and whether they used the available notch in later mazes were key measures in this prior work on human planning and problem solving. However, this prior work did not examine individual differences in adapting to the notches in the later mazes. Our study primarily focuses on these individual differences to identify factors that possibly contribute to a proper representation of a problem and it's efficient solution. Individual differences in inductive reasoning, attentional control, and cognitive reflection were measured along with performance on the maze task. The preliminary results show that attentional control was correlated with the proportion of time that participants used the notches in the later phase of maze task. The other individual differences did not correlate significantly with the primary measures of notch use and initial move time in the maze task in our sample. In addition, individuals display a heuristic strategy to complete the task and tend to ignore the identifiers within the study that suggest a reconstruction of the problem space. The findings show that attentional control is related to the ability to notice the need to change representations of a problem.

263
Name: Speak, Alexandria
Major: Animal and Dairy Science - Bachelor of Science
Faculty Advisor: Clay Cavinder, Animal & Dairy Science
Co-Author(s): Hannah Valigura
Funding: College of Agriculture and Life Sciences URSP
Project Category: Biological and Life Sciences

Effects of melatonin on muscle damage marker Lactate Dehydrogenase (LDH) in horses after exercise
Performance horses regularly undergo strenuous exercise, and resulting conditions such as oxidative stress (OS), inflammation, and tissue damage may negatively impact performance. Dietary antioxidant supplementation can mitigate negative effects of OS, aiding in tissue protection and repair. The study evaluated the effect of the antioxidant melatonin on biomarker Lactate Dehydrogenase (LDH), a muscle damage marker, in horses after exercise. Horses (n=6) were randomly assigned to 2 groups (CON; n=3, no supplement or MEL; n=3, 20g melatonin). A switchback design consisted of 2 experimental trial periods lasting 14-d with a 30-d washout period in-between. Supplementation was given orally on exercise days. Horses underwent 1.5hr of moderate-intensity exercise (avg >90 BPM), 3 d/wk. Blood was drawn before exercise (PRE), and at 30- and 90-min post-exercise. LDH Activity Assay kits (Thermo Fisher Scientific Inc., Massachusetts) were used to determine blood LDH concentration. All ED of each trial period was analyzed (ED1-6/ED7-12), and interactions of treatment, time, and day were analyzed with significance set at ($P \leq 0.05$). All horses showed elevated levels of LDH following exercise. T0 and T90 had significantly higher levels than PRE for all horses ($P > 0.0001$), but T0 and T90 were not significantly different from each other. There was a significant difference between treatments on ED3, 4, 7, and 12 ($P < 0.050$), with a tendency for a difference on ED1, 2, and 5 ($P < 0.09$). LDH levels were also significantly different between treatments at T0 ($P = 0.050$), and a tendency for a difference between treatments at T90 ($P = 0.080$). Finally, there was significant interaction between treatment and time within day ($P = 0.0016$), with supplemented horses having significantly lower levels of LDH than control horses, especially at T0 and T90. This indicates melatonin may have mitigated tissue damage during exercise, potentially due to a reduction in inflammation as indicated in previous data.

157
Name: Stephens, Christian
Major: Psychology - Bachelor of Science
University: The University of Alabama
Faculty Advisor: Jennifer Cox, Psychology
Funding: The University of Alabama Office of Undergraduate Research
Project Category: Social Sciences

Forensic Evaluators' Considerations of Contextual Information in Competence to Stand Trial Cases
Exposure to biasing, subjective, or irrelevant contextual information may prevent forensic mental health evaluators from reaching appropriate decisions. However, there is little published data regarding their considerations of contextual information sources in competence to stand trial (CST) evaluations. Thus, the present study investigated the agreement between evaluators' perceptions of their most useful, important, and task-relevant information sources within and across a variety of CST contexts. We also explored the relationship between source prioritization and perceptions of task-relevance. Utilizing a between-subjects design, licensed forensic mental health evaluators indicated their selection of 22 potential information sources within the context of a CST case vignette. Participants sequenced the information sources to indicate the order in which they viewed the data and rated each information source on its level of task-relevance. Evaluators generally selected collateral and CST interview information sources more frequently than clinical or competency tools. They shared moderate agreement in how to sequence the sources but less agreement in their perceptions of task-relevance. As a result, the relationship between source sequencing positions and perceived task-relevance ratings suggest task-relevant information sources were not always prioritized. Forensic mental health evaluators' personal judgements of source sequencing and perceived task-relevance may impact the reliability of CST opinions. Importantly, evaluators' varying interpretations of task-relevance may preclude reliable perceptions.

158
Name: Stepp, Julie
Major: Sociology - Bachelor of Arts
Faculty Advisor: Stacy Haynes, Sociology
Project Category: Social Sciences

The Impact of Childhood Trauma on Unhealthy Behaviors Among Correctional Staff in Mississippi
Each year, over 1 million adults are incarcerated in the United States. Research regarding the correctional staff that supervise these individuals, however, is limited. Using survey data collected from 111 staff members at a Mississippi correctional institution, I explored the impact of how childhood trauma affects the self-reported health of correctional officers in adulthood. Preliminary results suggest that those individuals experiencing the highest levels of childhood trauma self-report less healthy behaviors in their adult lives today. Implications for policy and future research are also discussed.

89
Name: Sweeney, Ella
Major: Educational Psychology - Bachelor of Science
Faculty Advisor: Kasia Gallo, CounselHEdEdPsyFound (CHEF)
Project Category: Education

An identification of the content gap within current podcasts in the realm of child advocacy and education
A podcast is a program made available in digital format for automatic download over the Internet (Merriam-webster.com). Podcasts are produced by individuals, organizations, or companies and are accessible through various platforms, such as podcast directories (i.e., Apple Podcasts), streaming services (i.e., Spotify), and dedicated podcasting apps (i.e., Pocket Casts). They typically come in one of three lengths: full-length podcasts (from 30 minutes to several hours long), short-form podcasts (15-20 minutes long), and quick bursts (a few minutes long). To better understand the landscape of current podcasts in the realm of child advocacy and education, I conducted a systematic review. I adapted the PRISMA guidelines for systematic literature reviews and used the following keywords to methodically search through podcasts in (list podcast directories/streaming services where you searched). After reviewing over 200 podcasts, I identified a content gap. I found podcasts for experts in the field and podcasts for abuse and neglect victims to share their testimonies, but very few informational podcasts that targeted the general audience of non-experts and informed them about abuse identification and prevention practices. The ones I have found (i.e., NRCAC Team Talk, One in Ten) were very difficult to discover and required significant filtering of search results. To bridge this gap, I intend to create a podcast for non-experts, including parents, educators, and lawmakers. The goal of the podcast will be to educate the lay audience on child abuse and child trauma, highlight ways non-experts can serve as child advocates, and how trauma-affected children are impacted in a learning environment. This podcast will serve as an educational tool and as a prevention mechanism. With more lay people educated in the realm of child advocacy, more children will hopefully be protected.

90
Name: Taquino, Agatha
School: Starkville High School - Base Pair Program
Faculty Advisor: Harish Chander, Kinesiology
Co-Author(s): Rosemary Boland, Faith Hagan, Adam Knight
Project Category: Education

The Virtual Moving Room Paradigm: Reloaded
Postural stability is impacted with exposure to immersive virtual reality (VR). Previous research using a virtual moving room demonstrated significantly lower postural stability, especially when the moving room is unexpected and towards the individual. The purpose of the study was to assess postural stability when exposed to a realistic virtual moving room, without and with anticipation, in different direction, and in different velocities. Sixteen healthy participants were tested for postural stability using BTracks™ balance plate in static (NoVR and VR) and dynamic (VR moving room) environments. The static environment testing consisted of eyes open without VR and with VR, while the dynamic moving room environment testing consisted of unexpected and expected trials, in forward and backward directions, as well as in slow, medium, and fast-moving velocities. All moving room trials were randomized. Center of pressure path length (PL) (cm) from static environment trails were analyzed using a two-way 2 [environment (NoVR vs. VR)] x 3 [trial (#1 vs. #2 vs. #3)] repeated measures ANOVA and moving room environment trials were analyzed using a two-way 2 [direction (forward vs. backward)] x 3 [velocity (slow-1m/s vs. medium-3m/s vs. fast-5m/s)] repeated measures ANOVA independently for UE and E conditions. No significant differences were observed in postural stability when comparing real (NoVR) versus virtual (VR) environment. Expected moving room in backward direction induced significantly (p = 0.031) lower PL compared to forward. For static environment trials, postural stability was not negatively impacted by VR, due to high realism and immersion. Findings from moving room trials suggested that backward moving room induced greater anticipatory postural stability compared to forward. While no significant differences were observed with unexpected moving room, postural stability was poor during unexpected backward moving room, especially with the fastest velocity.

159
Name: Tate, Avery
Major: Psychology - Bachelor of Science
Faculty Advisor: Holli Seitz, Communications
Funding: ORED Undergraduate Research Program
Project Category: Social Sciences

Vaccine Education for Older Adults in Rural Areas
In the United States, many adults aged 65 and over have not received vaccines for important vaccine-preventable diseases. Barriers to

vaccination may include cost, lack of a doctor recommendation, and uncertainty about how to schedule a vaccine appointment, and these barriers can be heightened for rural adults. Additionally, many adults may not know about recent shifts in what vaccines are covered under Medicare part D. To address these issues, we are developing and testing vaccine education materials for adults aged 65 and over in four counties in Mississippi: Clay, Noxubee, Oktibbeha, and Lowndes. Materials focus on six vaccines for preventable diseases that could be harmful for older adults: TDaP (Tetanus, Diphtheria, and Pertussis), COVID-19, Influenza (Flu), RSV (Respiratory Syncytial Virus), Shingles, and Pneumococcal disease. We adapted materials from the Center for Disease Control and Prevention (CDC) to develop vaccine information sheets, which feature relevant information for adults over 65, including what the disease is, why they need the vaccine, and where they can get vaccinated. We plan to distribute these information sheets through partnerships with pharmacies, churches, and libraries in the four focus counties. We are also developing radio public service announcements (PSAs) that will air on radio stations in the focus region. We plan to utilize biometric and survey data collection to analyze the effectiveness of the vaccine information sheets and PSAs. We will present preliminary results and conclusions from this study.

56
Name: Taylor, Alexandria
Major: English - Bachelor of Arts
Faculty Advisor: Jenna Altomonte, Art
Project Category: Humanities

May the Religions Be with You: Religious Imagery, Heroic Characters, and Parody Beliefs Within *Star Wars*
The use of religion within the Star Wars franchise is likely unsurprising for many viewers. The main plot involves two religious groups, the Sith and the Jedi. Both, in opposition, constantly seek to remove each other. However, what might shock viewers is the extent to which actual religions are used to build "the galaxy far far away." The religious influences within the Star Wars franchise are circular, with real-life beliefs inspiring fictional ideas which in turn become the inspiration for parody religions. By looking at both Abrahamic and Eastern religions as well as Joseph Campbell's The Hero With a Thousand Faces, the visual and thematic ideas within Star Wars center these religions as a significant part of how the plot is formed and how characters like Anakin Skywalker and Luke Skywalker become the heroes they are destined to be. Heroes are not simply any character within a story, rather they have a path carved for them by outside forces, which lead them to their destiny and mark them as defining figures. Anakin Skywalker and Luke Skywalker both have experiences throughout the Star Wars films that build their heroic image. These experiences are not just important for their character development though, they are also relevant because of the parallels with real-life religious imagery and ideas which further emphasize the divinely destined heroic form. My contribution to the Undergraduate Research Symposium will explore the use of religious imagery within *Star Wars* films, specifically involving the heroic image and how it is formed through religious parallels. I will also argue that religion is both influential to and influenced by the Star Wars franchise.

59
Name: Taylor, Alexandria
Major: English - Bachelor of Arts
Faculty Advisor: Eric Vivier, English
Project Category: Humanities

Humor In the Moment: The Change in Comedic Perception
"Humor in the Moment" questions the "happy ending" and ideas of comedy presented in The Merchant of Venice. Many scholars view comedy as reflective of a society's current culture and beliefs and therefore it is subject to change over time. What is humorous for a majority during one period will be viewed differently by a new audience later. Within this play, the main humor involves the views held towards Judaism and Christianity, with a focus being on Shylock as both a Jew and a villain. Throughout the play, he is viewed negatively and mistreated by Christian characters. This mistreatment is overlooked due to his religion and later because of his cruel desires for revenge. When it is time for the "happy ending," the solution to the play's problem is in part his conversion to Christianity as punishment. The play emphasizes the need for Christianity to be superior and remove other beliefs. Even outside of Shylock, there is an emphasis on Christianity over other beliefs to achieve "happiness," as seen in Jessica willingly converting from Judaism to Christianity as part of her marriage to Lorenzo. For the modern audience, this version of a "happy ending" falls short, as the humorous and desirable ideas presented are no longer relevant to the majority of people. The views towards Shylock's reasoning and punishment have changed, becoming more sympathetic to his treatment and the misuse of his punishment as a method of religious domination. For the Undergraduate Research Symposium, I am arguing that comedy is an ever-changing subject and the majority of the modern audience no longer view The Merchant of Venice as comedic.

91
Name: Thompson, Brooke
Major: Educational Psychology - Bachelor of Science
Faculty Advisor: Rebecca Spencer, CounselHEdEdPsyFound (CHEF)
Co-Author(s): Jamey Bachman
Project Category: Education

Using Behavioral Skills Training to Increase Appropriate Answers to Common Questions During an Interview in Young Adults with Autism
With only 14% of adults with autism spectrum disorder (ASD) having held a paid job within a community setting (Autism Speaks, 2017), it is important for young adults to develop workplace skills needed to both secure and maintain employment. It is common to think that a good interview experience increases an individual's odds of securing employment. To build upon the limited research showing that individuals with ASD can be taught how to respond with appropriate answers to common questions during a job interview to secure employment, we replicated a portion of the study conducted by Roberts et al. (2021) who evaluated the effects of behavioral skills training (BST) on interview skills of young adults with autism. We used a nonconcurrent multiple baseline design across participants for one response (i.e., answering common interview questions appropriately) to extend these results to three young adults with autism. BST consisted of instruction of appropriate criteria for question(s), a verbal model of the participant's developed answer, roleplay, and feedback. Over the course of the study, all three participants showed an increase in appropriate responses, with two participants requiring the addition of a verbal prompt for any criteria not provided by participants to reach mastery. Results aligned with that of the Roberts et al. study in demonstrating that young adults with autism can benefit from behavioral skills training, with or without a verbal prompt, to improve interview skills and future employment opportunities. One limitation of the study is that the number of participants was very small and only featured males. A more diverse population regarding sex of participants could produce interesting results.

32
Name: Thompson, Charlotte
Major: Mechanical Engineering - Bachelor of Science
Faculty Advisor: Matthew Priddy, Mechanical Engineering
Co-Author(s): Evan Garrison, Lillian Dejean, Santanu Kundu, Matthew W. Priddy
Funding: Shackouls Honors College Research Fellowship
Project Category: Engineering

Development of an Open-Source High-Temperature FDM 3D Printer for High-Performance Thermoplastic Materials
Various commercial systems have been developed to print high-temperature polymer materials such as carbon fiber, polyetherimide (PEI), and polyetheretherketone (PEEK) for use in applications such as medical implants, aerospace and automotive components, as well as electrical components. High-temperature polymers, such as PEEK and PEI, are considered high-performance thermoplastics due to their chemical resistance, heat resistance, and advantageous mechanical properties compared to polymer materials commonly used in fused deposition modeling (FDM) 3D printing, such as PLA, PETG, and ABS. These materials are difficult to print due to the high printing temperatures required, such as nozzle temperatures up to 450 ºC, chamber temperature of 150 ºC, and bed temperatures up to 170 ºC. Most commercial systems capable of fabricating these materials are cost-prohibitive and lack modularity to allow for user customization or modifications. Some open-source systems exist in published literature, but are not easily reproduced due to incomplete documentation and validation. Furthermore, these established open-source systems lack adaptability and modularity for the user to incorporate additional components (e.g., sensors) to enhance the system's capabilities.   The goal of this project is to design and construct an open-source, high-temperature FDM 3D printer for thermoplastic materials such as PEEK and PEI that is easily constructed, highly modular, and user-friendly. The printer developed in this work is constructed with readily available and commonly found materials, controlled with a Duet3D motherboard, and programmed with RepRap firmware to be highly customizable for the user. The frame was constructed with 40x40 mm aluminum t-slot channels to allow for customization throughout the structure, such as adding sensors or other optional components. All mounting parts for the motion system of this printer were designed in Solidworks and 3D printed out of PETG using a PRUSA MK3S+, which the user can easily modify to fit alternative configurations. The printer can accommodate a 500ºC nozzle temperature, bed temperature of 250ºC, and chamber temperature of 200ºC. In future work, this printer will be used to collect data to compare print quality to the mechanical properties of thermoplastic samples.

160
Name: Thompson, Hunter
Major: Psychology - Bachelor of Science
Faculty Advisor: Mary Nelson Robertson, School of Human Sciences
Co-Author(s): Mary Marshall Waller, Qula Madkin, Jasmine Harris-Speight, Ann Sansing, Mary Nelson Robertson

Project Category: Social Sciences

Evaluating Perceptions of Fuel for the Future Programming
Youth in Mississippi are particularly susceptible to the obesity crisis, with 23% having obesity and 19% considered overweight. This is partially due to a lack of physical activity, healthy food choices, and access to nutrition education. 25% of MS youth report no physical activity in the past seven days, implying a need for programming that promotes healthy eating and physical activity every day. Promoting Healthy Living Through Community Connections Teen Summit is a one-day event hosted by Mississippi State University Extension Service. The summit includes health-related workshops for youth and adults that promote advocacy and health. One of the youth workshops, "Fuel for the Future," is designed to promote healthy living by educating youth on the five food groups and demonstrating how to prepare a balanced snack. This study evaluated the effectiveness of the workshop. Upon completing the workshop, 61 of the 100 participating youth completed a 10-item paper evaluation survey. Most participants resided in the Delta region of Mississippi(71%), identified as female(77%) and black(76%), and had an average age of 16 years. Two–fifths of the participants were active 4-H members. When asked if the breakout session increased their understanding of how healthy eating increases healthy living, 96.7% reported "strongly agree." When asked if the workshop increased their understanding of how physical activity supports healthy living, nine in ten(91.8%) participants reported "strongly agree." Most of the sample viewed the training as effective, engaging, and informational. One participant shared, "This session helped me learn more about ways to eat healthy." Participant responses did not significantly differ by race, gender, or 4-H status. These findings suggest that the "Fuel for the Future" workshop was effective in short-term education, but further research is needed to determine if this program has long-term benefits in reducing obesity.

33
Name: Thompson, Jade
Major: Software Engineering - Bachelor of Science
Faculty Advisor: Cindy Bethel, Computer Science and Engineering
Co-Author(s): Kyler Smith, Kenna Henkel, Zachary Henkel
Project Category: Engineering

Emotibot: An Interactive Tool for Multi-Sensory Affect Communication
Effective emotional communication can have benefits in social interactions between a user and a robot. By developing a tool that can pivot easily between distinct emotional states in response to user presence or input, we have applied a multi-modal method for implementing affect communication in everyday interactions. Our interactive tool engages with users through three emotional avenues and has the potential for usage as an emotional or social support companion.

50
Name: Trahan, Allyson
Major: Forestry - Bachelor of Science
Faculty Advisor: Courtney Siegert, FWRC - Forestry
Co-Author(s): Jianing Liang
Project Category: Physical Sciences

Climate Change Mitigation Potential of Conservation Reserve Program Tree Planting Practices: Soil Nitrogen Cycling
The Conservation Reserve Program (CRP) is a land conservation program that provides financial assistance for farmers to remove sensitive agriculture land from production and restore the land to provide ecosystem services. One such ecosystem service that has been historically overlooked is climate change mitigation potential, especially in tree restoration practices. This project compares soil nitrogen cycling and microbial activity across CRP tree plantings in the southeast US to understand drivers of decomposition and carbon turnover. We conducted laboratory soil incubation trials of samples collected across Major Land Resource Areas, tree types, stand ages, and soil conditions (bulk density, soil texture, carbon content, pH). We measured nitrate and ammonium cycling as the difference between initial concentrations and after 21 days of incubation. We found that overall net nitrate transformation was greater in pine stands than in hardwood stands (13.73 ug N/g soil/d vs. 5.24 ug N/g soil/d), while overall net ammonium transformation was greater in hardwood stands than in pine stands (-415.87 ug N/g soil/d vs. 7.793 ug N/g soil/d). Overall net nitrate transformation was greatest in the 0–4-year age class (7.11 ug N/g soil/d vs. 6.88 ug N/g soil/d in 5–9-year age class, 5.31 ug N/g soil/d in 10–14-year age class, and 4.04 ug N/g soil/d in 15+ year age class). The total net ammonium transformation was also greatest in the 0–4-year age class (-2050.22 ug N/g soil/d vs. 6.08 ug N/g soil/d in 5–9-year age class, -1.10 ug N/g soil/d in 10–14-year age class, and 15.78 ug N/g soil/d in 15+ year age class). Finally, overall net nitrate transformation was greatest in the Southern Coastal Plain Major Land Resource Area (MLRA) (8.99 ug N/g soil/d vs. 5.48 ug N/g soil/d in the Alabama and Mississippi Blackland Prairie MLRA, 40.3 ug N/g soil/d in the Arkansas River Alluvium MLRA, 5.82 ug N/g soil/d in the Southern Coastal Plain MLRA, and 4.23 ug N/g soil/d in the Southern

Mississippi River Alluvium MLRA), while overall net ammonium transformation was greatest in the Alabama and Mississippi Blackland Prairie Major Land Resource Area (-1335.80 ug N/g soil/d vs. -3.26 in the Arkansas River Alluvium MLRA, 3.78 ug N/g soil/d in the Southern Coastal Plain MLRA, 21.59 ug N/g soil/d in the Southern Mississippi River Alluvium MLRA, and -4.07 ug N/g soil/d in the Southern Mississippi Valley Loess MLRA). This study will help in understanding soil carbon dynamics, as well as soil health and wildlife monitoring.

92
Name: Turner, Catherine
Major: Kinesiology - Bachelor of Science
Faculty Advisor: Harish Chander, Kinesiology
Co-Author(s): Hunter Derby, Adam Knight, Harish Chander
Project Category: Education

The Impact of Sub-Clinical And Clinical Compression Socks On Single Leg Postural Stability In Healthy Individuals Maintaining postural stability is achieved primarily through sensory information acquired through visual, vestibular, and somatosensory/proprioceptive feedback. Previous literature has shown the effects of compression socks on physically diminished or impaired individuals, potentially improving one's postural stability via increased proprioceptive feedback. The purpose of this study was to compare the effects of sub-clinical (SC: 15-20 mmHG) and clinical (CL: >20 mmHg) grade compression socks against barefoot (BF) conditions in healthy individuals. Twenty healthy participants (11 males, 9 females; age: 21.5 ± 2 years; height: 169.6 ± 9.2cm; weight: 72.1 ± 16.5kg) completed a single leg stance test on the Balance Tracking System balance platform (BTrackS™) in BF, SC, and CL compression socks in a counterbalanced order at an alpha level of 0.05. Center of pressure (COP) path length was analyzed using a 2 (limbs: left and right) x 3 (compression sock: BF, SC, CL) repeated measures ANOVA using JASP open-source statistical software to compare the effects of each compression sock condition. The current study revealed no significant differences in COP path length among compression sock conditions ($p = 0.236$), nor were there any significant differences between left and right legs ($p = 0.140$). Additionally, there were no significant interactions between compression sock conditions and left and right legs ($p = 0.481$). The current findings revealed similar postural stability and balance performance during single leg stance, suggesting that compression socks may not aid in improving postural stability in healthy individuals.

161
 Name: Turner, Marlee
Major: Agricultural Science - Bachelor of Science
Faculty Advisor: Jessica Benson, School of Human Sciences
Project Category: Social Sciences

The AI AgriRevolution: The Use of AI in Mississippi's Agricultural Extension Service
Artificial Intelligence (AI) has the potential to transform aspects of society, boost efficiency and productivity, promote innovation, and address many complex challenges. Agricultural Extension plays an integral role in disseminating knowledge and providing educational resources to the public, agriculturalists including farmers and ranchers, and the next generation at large. Through diverse programs and initiatives, Mississippi State Agricultural Extension serves the people of Mississippi with research backed information to empower individuals to make informed decisions about their economic, social, and cultural well-being. Agricultural Extension can utilize AI in multiple ways to amplify its effectiveness and impact in areas such as training and education, market intelligence, precision agriculture, remote sensing and monitoring, decision support systems, and crop yield prediction. By integrating AI across these areas, Agricultural Extension will be able to strengthen its influence and effectiveness. This study seeks to uncover the perceptions and attitudes of Mississippi State Agricultural Extension professionals towards AI adoption, aiming to identify hesitations, potential barriers, opportunities for collaboration and willingness to integrate AI technologies into practice. The objectives include understanding the Mississippi State Agriculture Extension Service's views on AI, identifying barriers and hesitations in AI utilization, and identifying professional development opportunities needed for AI integration. Through comprehensive data analysis and stakeholder engagement, this research aims to provide actionable insights and recommendations for maximizing the benefits of AI integration within Mississippi State Agricultural Extension, ultimately empowering professionals to better serve their constituents and drive positive change within the agricultural sector.

264
Name: U'Ren, Emma Blake
Major: Biochemistry - Bachelor of Science
Faculty Advisor: Priya Chakrabarti Basu, Biochemistry, Molecular Biology, Entomology, and Plant Pathology
Co-Author(s): Claire Green, Pierre Lau

Project Category: Biological and Life Sciences

Pollen Identification Database in the Southeast Region for Pollinator Research

As pollinators, especially western honey bees (*Apis mellifera*), are extremely important for food production and commercial pollination, there is an increasing need for improving the health of the honey bee colonies. Beekeepers are always looking for optimal habitats for honey bees and will hence benefit from a thorough understanding of the blooming landscape. Cataloguing the plants that honey bees pollinate in the southeast regions allows beekeepers and the general community to be conscious of what forage plants are important. A readily available pollen identification database also aids in general palynology research. This poster describes a preliminary database that has been constructed for plant pollens.

51
Name: Vanmali, Veer
Major: Chemical Engineering - Bachelor of Science
Faculty Advisor: Todd French, Chemical Engineering
Co-Author(s): Olalekan Olabode
Project Category: Physical Sciences

MnAl layered hydroxide modified pinewood biochar for the remediation of Molybdenum

Molybdenum (Mo) is a naturally occurring trace metal that exists majorly as the oxyanion molybdate (MoO_4^{2-}). Mo contamination results from industrial discharge and natural weathering sources. At high concentrations, Mo can be toxic to the digestive tract, kidney, and liver. In this study, Pinewood biochar MnAl layered double hydroxide (PWBC/MnAl LDH) composite was synthesized by coprecipitation method for the remediation of Molybdenum (Mo). The synthesized PWBC/MnAl LDH was characterized by XRD, XPS, BET, FTIR, elemental analysis, SEM, and SEM-EDS. Adsorption of Mo onto the surface of PWBC/MnAl LDH was confirmed by XPS and SEM-EDS. The batch adsorption process was optimized by varying the initial solution pH, contact time, initial Mo concentration, PWBC/MnAl PWBC dosage, ionic strength, and competitive ions. Dose optimization experiments in natural water samples were also carried out by spiking water samples obtained from Loakfoma and Bluff Lakes and equilibrating them with varying biochar dosages. The adsorption process fitted the pseudo-second-order kinetic model and the Langmuir isotherm model. pH study showed a decrease in adsorption capacity with increasing pH due to electrostatic repulsion at high pH. Also, adsorption capacity decreased with increasing ionic strength. PWBC/MnAl LDH generally showed selectivity towards Mo adsorption in the presence of competitive ions except for phosphate.

265
Name: Waldbieser, Sam
Major: Biochemistry - Bachelor of Science
Faculty Advisor: Esmaeil Amiri, Biochemistry, Molecular Biology, Entomology, & Plant Pathology
Co-Author(s): Julie Hardy, Kara Wagoner
Project Category: Biological and Life Sciences

The Influence of Queens on Varroa Infestation Levels and Virus Profiles in Honeybee Colonies

The genetic profile of a honeybee colony plays a crucial role in its resistance/tolerance to pests and pathogens. Bee breeding programs were developed to control colonies' Varroa mite populations. Breeding activities improved the hygienic behavior of the colonies to decrease mite populations. However, Varroa mites could potentially coevolve with hygienic bees. The impact of such coevolution on virus diversity and levels in honeybees and Varroa mite are not well understood. To address this question, we established two apiaries with colonies headed by queens selected for hygienic and non-hygienic behavior in Mississippi and North Carolina. Over a beekeeping season, we measured Varroa infestation levels between hygienic and non-hygienic colonies in both locations. We also collected honeybees and Varroa mite samples from all experimental colonies once every month to measure the virus diversity and infection level. Varroa infestation results exhibited a divergence between hygienic and non-hygienic colonies over time in both locations. Laboratory analysis is ongoing to identify virus diversity and levels in the collected Varroas and bees. The findings will be discussed in detail regarding virus-Varroa-honey bee interactions.

34
Name: Wheat, Addyson
Major: Aerospace Engineering - Bachelor of Science
Faculty Advisor: Rani Sullivan, Aerospace Engineering
Project Category: Engineering

Flatwise Tension Test of One-Sided Stitched Composites
Composites are widely used in aerospace structures due to their high strength and stiffness. However, they exhibit low interlaminar strength which limits their application in areas subjected to high out-of-plane loads. Composites can be stitched together in the through thickness direction as an alternative to mechanical fasteners. This greatly increases the out of plane strength and reduces the risk of delamination in structural components that are normally co-cured. Stitching increases the interlaminar strength of composites but may cause reduction in in-plane properties due to the formation of resin rich areas around the stitch threads. It is necessary to assess the mechanical properties of a stitched composite. In this study, flatwise tension tests are conducted to assess the interlaminar strength of a one-sided stitched composite. This study also uses Digital Image Correlation (DIC) to obtain surface strains and displacement.

266
Name: White, Emily
Major: Forestry - Bachelor of Science
Faculty Advisor: Courtney Siegert, FWRC - Forestry
Co-Author(s): Joshua Granger, William Booth, Drew Williams
Funding: ORED Undergraduate Research Program
Project Category: Biological and Life Sciences

Species Level Differences in Carbon Sequestration Potential of Trees in the Southeastern U.S.
Landowner participation in carbon exchange markets has become increasingly popular in the southeastern U.S.. Advances in the knowledge of species-specific carbon storage are critical for the development of accurate carbon quantification. Woody debris is a major component of the global carbon cycle, and the decomposition of wood is affected by the quality of substrate, climate, and the type and abundance of decomposer organisms. However, another major factor affecting long-term carbon storage is tree species. To address this question a field experiment was established to explore additional mechanisms of carbon sequestration in southeastern forests by identifying native tree species with reduced decomposition rates that can be assimilated into silvicultural activities. A field experiment was initiated in 2021 to test the decomposition rates across several common species that exist on the landscape that could have desirable traits to facilitate long-term carbon storage. Initial analysis found that wood density could be an indicator of sequestered carbon. Species density ranges from hickory, the densest with 0.939 g/cm^3 on average, to eastern redcedar, the least dense with 0.465 g/cm^3 on average. However, the species that has the highest percent density loss after 6 months of decomposition was white oak (15%) the species with the least change in density after 6 months of decomposition was loblolly pine (3.5%). Carbon loss data are being analyzed along with 12, 18, and 24-month decomposition data. This species-specific knowledge could offer area options for optimizing carbon sequestration in managed forests.

57
Name: White, Will
Major: Industrial Engineering - Bachelor of Science
Faculty Advisor: Eric Vivier, English
Project Category: Humanities

Tamburlaine's Victims: The Other Side of Religious Violence
Christopher Marlowe's *Tamburlaine*, his first theatrical success, depicts the title character's auspicious rise from a little-known Scythian shepherd with high ambitions, to a ruthless if not efficient warmonger, to finally a foremost ruler of Asia and Africa. While the play seems to work predominantly as a celebration of Tamburlaine's character, Marlowe includes several moments that complicate the full indulgence of his victories. Declaring himself the "scourge and wrath of God," Tamburlaine seems to figure himself as a tool of divine judgement upon his apparently wicked foes. Yet as the play progresses, the sense of justice thoroughly declines: his victims become less culpable, and their despair takes the forefront. So too does Marlowe underscore the Muslim identity of these victims, imparting Tamburlaine's cruelty with a sense of religious antagonism. In the intensely anti-Islamic climate of early modern England, Marlowe fosters sympathy for subjects of almost exclusive ridicule and caricature. This paper argues that Marlowe employs the humanist rhetorical practice of argument in *utramque partem* – the process of arguing both sides of an issue – to emphasize the suffering that results from religious violence, even as the play invites celebration of this same cruelty. With this subtle nuance, Marlowe depicts religion in a way that was really quite subversive in early modern England: in *Tamburlaine*, claims of religious authority serve only to justify excessive cruelty.

267
Name: Wilburn, Jordan
Major: Biochemistry - Bachelor of Science
Faculty Advisor: Richard Baird, Biochemistry, Molecular Biology, Entomology, & Plant Pathology
Co-Author(s): Hannah Easley
Funding: College of Agriculture and Life Sciences URSP
Project Category: Biological and Life Sciences

Untargeted Metabolomic Analysis of the Impact of Selenium Supplementation and SELENOH Formation on Polar Liver Metabolites
Selenoproteins support a variety of vital functions in the body, including the production of hormones and growth factors. However, selenium in deficiency or excess can cause disease pathologies, some specifically in liver tissue. SELENOH, a selenoprotein responsible for reducing reactive oxidative species, is known to be beneficial in managing inflammation and chronic disease. Research conducted by Dr. Wen-Hsing Cheng has linked selenium deficiency with insulin resistance and glucose intolerance in mice, raising questions about the interplay between selenium status and diabetes mellitus. In this study, 10-month-old SELENOH knockout and wildtype mice were fed either a selenium-adequate diet or a selenium-deficient diet for 8 weeks. Using the liver tissue from these mice, untargeted metabolomic analysis of the constituent polar metabolites was conducted using the NMR platform. The resultant data were analyzed to assess the relationships between selenium nutrition, selenoproteins, and the metabolic pathways implicated in these relationships and these results are presented in the poster.

73
Name: Wong, Yin
Major: Architecture - Bachelor of Architecture
Faculty Advisor: Jacob Gines, School of Architecture
Funding: Method Studio Undergraduate Research Fellowship
Project Category: Arts, Music, & Design

Rethinking the Paradigms of Design: Shaping Generative Artificial Intelligence as a Design Methodology
Design arises from the need to balance aesthetics, functionality, user experience, sustainability, and societal impact within any created solution, while continuously iterating based on feedback and evolving constraints. It's an ever evolving problem that demands creativity and analytical thinking in its solution. When it comes to design, generative artificial intelligence exhibits the problem of naivety. Its primary advantage is its rapid output; however, it lacks foresight, especially when tasked with designing with a broader intention in mind. Design inherently involves a cyclical, iterative process, contrasting sharply with the "one-and-done" approach characteristic of generative AI, which proves inadequate for comprehensive design tasks. Very often, these generations prove immature for project consideration. There is a critical evaluation of design that strikes a balance between preference and proven design principles, and it is the active role of a designer to provide this foresight. The primary aim of this study is to understand how the considerations from a designers standpoint influences and enhances the outcomes of the AI-driven design processes. This study was conducted by "crossbreeding" generated results, an iterative method of prompt engineering. Instead of generating the entire prompt at once, it would be broken down into compartments. The generations from each individual word or phrases would then be blended with similar images associated by context to create results that are more focused and less arbitrary. By employing an iterative approach, we observed a significant level of control in the outputs that resonate with human emotional and aesthetic preferences. This research underscores the potential of generative AI in transforming the fields of design and architecture, emphasizing the importance of human elements in the shaping of AI-generated outputs.

52
Name: Woo, Chandler
Major: Chemistry - Bachelor of Science
Faculty Advisor: Sidney Creutz, Chemistry
Co-Author(s): Rajesh Mukkera, Nghia Le, Charles Webster
Funding: ACS PRF
Project Category: Physical Sciences

Facile access to methylidyne ligands: A new dihydroanthracene based reagent
The electronic structure and reactivity of earth-abundant terminal metal-carbon multiple bonds remain poorly explored despite their importance in facilitating catalytic reactivity involving unsubstituted hydrocarbons. Investigations of these species are currently impeded by the lack of direct synthesis of these complexes. Hence, we have developed a new "C-H" transfer reagent to readily access methylidyne ligands for fundamental studies. This reagent features anthracene elimination, which has been previously employed to

synthesize other terminal metal-ligand multiply-bonded species. Methylidyne-containing complexes, such as [N3N]Mo≡CH, were synthesized with the transfer reagent to probe the reactivity and give insight on the kinetics and mechanism of the reagent. Furthermore, complexes featuring a pseudo-tetrahedral environment have also been tested due to the high-lying π^*-bonding orbitals in the d-manifold, which have been proven to assist in metal-ligand multiple bonding. The development of this reagent serves to greatly facilitate investigations into the reactivity of these species, as earth-abundant metal-carbon multiple bonds play an important role in catalytic cycles such as Fischer-Tropsch catalysis and a multitude of coupling reactions.

35
Name: Woodard, Katelyn
Major: Chemical Engineering - Bachelor of Science
Faculty Advisor: Julie Jessop, Swalm School of Chemical Engineering
Co-Author(s): Sage Schissel
Funding: NSF Grant
Project Category: Engineering

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

93
Name: Yamagowni, Hasini
School: Starkville High School - MS Base Pair Program
Faculty Advisor: Harish Chander, Kinesiology
Co-Author(s): Adam Knight
Project Category: Education

Pressure Pain Threshold Before and After a Physiological Workload
Subjective measures of muscular pain can be quantified using pressure pain threshold (PPT). PURPOSE: The purpose of the study was to assess the impact of a physiological workload on immediate and recovery PPT among four lower extremity muscles. Eighteen male participants (age: 21.27 ± 1.7 years; height: 177.67 ± 6.0 cm; mass: 87.95 ± 13.8 kg) were tested for PPT for four right lower extremity muscles, prior to (pre-test) and two times after a physical treadmill Bruce protocol; immediately (post-test 1) and 15 minutes after recovery (post-test 2). Participants were assessed with three trials of PPT recorded using the FPIX-25 digital algometer with a 1 cm^2 flat tip for knee extensors (rectus femoris-RF), knee flexors (biceps femoris-BF), ankle dorsiflexors (tibialis anterior-TA) and plantar flexors (medial gastrocnemius-MG). PPT values were recorded in force based on the output from the algometer and participants were not provided with any feedback during the PPT trials to avoid perception and anticipation of these subjective measures. A 3 (Time) x 4 (Muscles) repeated measures ANOVA at an alpha level of 0.05. Results revealed that PPT was significantly lower in MG compared to TA, RF, and BF, however, no significant difference was observed before and after workload and recovery. Previous findings from the current study reported significantly lowered PPT in ankle dorsiflexors immediately following the workload but was increased again with even 15 mins of recovery, suggesting a lowered threshold to resist pressure induced pain, which could be attributed to acute muscle soreness. The findings from the current analysis indicated significantly lower PPT for the muscle MG compared to the others, which could not be attributed only to the increased effort of MG in push-off during the workload but based on muscle anatomy.

162
Name: Yielding, Cora
Major: Foreign Language - Bachelor of Arts
Faculty Advisor: Justin Pinta, Classical & Modern Languages & Lit
Project Category: Social Sciences

Navigating Multidimensional Identities: Heritage Spanish Speakers in Mississippi
This research examines the intricate interplay among linguistic development, socio-economic statuses, and self-perceptions within Mississippi's heritage Spanish-speaking population. It focuses on individuals who have acquired Spanish in familial contexts and English through formal education. Grounded in qualitative methodological approaches, including semi-structured sociolinguistic interviews and surveys (Bernard 2006; Garrett et al. 2003), this study sheds light on the challenges and opportunities faced by heritage speakers and emphasizes the significance of preserving and promoting heritage languages within diverse linguistic landscapes. This study's focus on Mississippi addresses the need for a more diverse understanding of these issues via case studies geographically and culturally distant from the well-studied cases of California, southern Florida, New York, and Texas (Rao & Kuder 2016; Toribio & Bullock 2016). Through participant narratives, a common theme emerges—the universal quest for cultural preservation and belonging in the face of change. Despite different upbringings among participants, remarkable similarities in their values and identities underscore the profound influence of familial bonds as a unifying factor in shaping their perspectives and sociolinguistic outlooks. This study's comparing and contrasting of participant experiences, which offers insights into identity negotiation amidst societal changes, highlights the significance of maintaining cultural connections for personal identity and the sustainability of linguistic diversity. This study contributes to a deeper understanding of identity construction, linguistic adaptation, and economic integration in a unique context in the American Deep South, offering practical insights for policy makers, educators, and community leaders striving to create inclusive environments celebrating diverse cultural and linguistic heritage amidst globalization.

268
Name: Young, Kayla
Major: Biochemistry - Bachelor of Science
Faculty Advisor: Maryam Mohammadi-Aragh, Agricultural and Biological Engineering
Co-Author(s): Guihong Bi, Zhiheng Xing
Funding: College of Agriculture and Life Sciences URSP
Project Category: Biological and Life Sciences

Impact of biochar, mycorrhizal fungi, and fertilizer type on lettuce growth under drought stress
Climate change has led to higher overall temperatures and fluctuations in precipitation. This has contributed to more frequent and longer droughts, which has a substantial economic impact on agricultural systems and food security. Drought decreases photosynthesis as water is essential for chlorophyll synthesis. Sustainable methods are necessary to combat drought stress, especially in organic farming systems. Biochar is a charcoal-like substance created from the combustion of biomass. Biochar has active functional groups, a highly porous structure, and a high cation exchange capacity. These qualities allow biochar to increase the water-holding capacity of the soil and retain nutrients. Mycorrhizae are fungi that facilitate the absorption of water and nutrients to promote plant health. The objectives of this study were to investigate the impacts of biochar, mycorrhizae, and fertilizer type on lettuce growth under drought stress. Fertilizer types included Osmocote, chicken litter, and no fertilizer. The study included 12 treatment combinations with ten reps of each. Half of the lettuce plants received ample water and the other half underwent 70% drought stress. After 35 days of growth, the plants were harvested and the chlorophyll content (SPAD), fresh weight (FW), and height/width (PGI) were measured. Data was analyzed using one-way ANOVA in SAS at a significance level of $P \leq 0.05$. The results showed that drought, biochar, and fertilizer type had a significant effect on lettuce FW. Drought and fertilizer type had a significant effect on PGI. The fertilizer type had a significant impact on SPAD. As expected, plants that received more water and synthetic fertilizer performed best regarding FW and PGI. Plants under drought stress with chicken litter experienced greater PGI with 5% biochar and were statistically comparable to Osmocote-fertilized plants. Biochar and fungi can provide benefits to lettuce under drought stress; however, fertilizer type was the most critical factor.

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