32nd Annual

Spring Undergraduate Research & Creativity Symposium

April 25-26, 2023

NC STATE

Office of Undergraduate Research

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2023 Spring Symposium Schedule

Tuesday | April 25	
10:00 am - 10:30 am	Breakfast and chat with the OUR advisory board, partners, students, and employers
10:30 am - 11:15 am	Oral Session 1 (O1)
11:30 am - 12:30 pm	Poster Session 1 (P1)
12:30 pm - 1:00 pm	Lunch Break
1:00 pm - 1:45 pm	Oral Session 2 (O2)
2:00 pm - 2:45 pm	Oral Session 3 (O3)
2:45 pm - 3:00 pm	Closing Remarks

Wednesday | April 26	
10:00 am - 10:30 am	Breakfast and chat with the OUR advisory board, partners, students, and employers
10:45 am - 11:45 am	Poster Session 2 (P2)
11:45 am - 12:00 pm	Michael Dickey Outstanding Research Mentor Award Presentation
12:00 pm - 12:30 pm	Lunch Break
12:30 pm - 1:30 pm	Poster Session 3 (P3)
1:45 pm - 2:45 pm	Poster Session 4 (P4)
2:45 pm - 3:00 pm	Closing Remarks

Presenter Index
(Alphabetically by Last Name)

Lead Presenter	Co-Presenters	Session	Room/Poster	Mentor(s)	Project Title
Sofia Abello (College of Engineering)		P2	1	Dr. Januka Budhathoki Uprety (Wilson College of Textiles)	Polymer modifications to optimize nanosensor output for analyte detection
Sabah Afroz (College of Engineering)		P2	2	Professor Mary Estrada (College of Humanities and Social Sciences)	Virtual Reality In Mental Health
Mary Aiesi (College of Sciences)		P2	3	Dr. E. Javier Lopez Soto (College of Veterinary Medicine)	PRESTO-Tango assay for the detection of pain signaling neuropeptides
Sydney Andersen (College of Sciences)	Lauren Rogers (College of Sciences)	P3	1	Dr. Jim Martin (College of Sciences)	Unraveling the Mechanisms of Solution Crystal Growth: Insights from ZnCl2· R H2O System
Emanuel Aponte (College of Engineering)		P2	4	Dr. Praveen Kolar (College of Engineering)	Effects of Biochar on Catalytic Treatment of Graywater
Maddy Arena (College of Sciences)		P1	1	Dr. Reade Roberts (College of Sciences)	Investigating the link between neuronal conserved non-coding element variance and habitat preference in Lake Malawi cichlids
Maddy Arena (College of Sciences)		P2	5	Dr. Ryan Paerl (College of Sciences)	Examining the chemotactic responses of marine bacteria to vitamin B1 and its vitamers
R.B. Armstrong (College of Natural Resources)		P1	2	Dr. Erin McKenney (College of Agriculture and Life Sciences)	Traditional Ecological Knowledge and what we can learn from it

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Keegan Bader (College of Engineering)		P4	1	Dr. Richard Spontak (College of Engineering) Mr. Julio Teran (Wilson College of Textiles)	The Influence of Macromolecular Architecture on the Surface Properties of Linear Copolyesters
Ray Baek (College of Agriculture and Life Sciences)	Lanvy Lutz (College of Agriculture and Life Sciences) Khalid Tejan-Sie (College of Agriculture and Life Sciences)	P4	2	Mr. Henry Havey (Ajinomoto North America) Dr. Fernanda Santos (College of Agriculture and Life Sciences) Ms. Megan Watson (College of Agriculture and Life Sciences)	Use of Cold-Water Low-Bloom Fish Gelatin in Food Product Development
Sydney Baker (College of Agriculture and Life Sciences)	Alex Kay (College of Agriculture and Life Sciences) Breana Lavallee (College of Agriculture and Life Sciences) Laura Radford (College of Agriculture and Life Sciences) Will Adams (College of Agriculture and Life Sciences)	P1	3	Dr. Fernanda Santos (College of Agriculture and Life Sciences) Ms. Ashley Gernat (College of Agriculture and Life Sciences)	Effectivity of Peanut Skins As An Alternative Antimicrobial Against Foodborne Pathogens
Elias Balderrama (College of Engineering)		P4	3	Dr. Katherine Saul (College of Engineering) Ms. Morgan Dalman (College of Engineering)	Creating Scalable Anthropometric Models of the Upper Arm for Medical Applications
Olivia Ball(College of Humanities and Social Sciences)		P4	4	Dr. Virginia Riel (College of Humanities and Social Sciences)	Navigating Student Housing: A Comparison of PWI and HBCU Students

Lead Presenter	Co-Presenters	Session	Room/Poster	Mentor(s)	Project Title
Abigail Barfield (College of Humanities and Social Sciences)		O1	3221	Dr. Joseph Brazel (Poole College of Management)	Anxiety in the University
Gaven Bell (College of Sciences)		O3	3285	Dr. Elizabeth Lucas Mentor is not employed by NC State Ms.Kristen Adcock Binion (College of Veterinary Medicine) Dr. Nina Baumgartner (University of Alabama at Birmingham)	Estrous cycle regulation of amygdala activation following threat conditioning in C57Bl/6j mice
Gaven Bell (College of Sciences)		O2	3222	Ms. Mia Self (University College)	Staged Science: How I used research to bridge theatre and science
Kathryn Benedict (College of Engineering)		P2	6	Dr. Jacqueline Cole (College of Engineering) Ms. Sandra Stangeland-Molo (College of Engineering)	Characterization of Porous, Mineralized Collagen-Chitosan Scaffolds for use in a Bone-On-Chip Platform
Molly Bennett (College of Agriculture and Life Sciences)	Ananya Badhri (College of Agriculture and Life Sciences) Hannah Polizzi (College of Agriculture and Life Sciences)	P2	7	Mr. Homayoon Ershadi Dr. Fernanda Santos (College of Agriculture and Life Sciences)	Color Change of a Cucumber-Mint Beverage
Andrew Berley (College of Engineering)		P2	8	Dr. Hsuan Chen (College of Agriculture and Life Sciences)	Chromosome Doubling Trials of Albizia

Lead Presenter	Co-Presenters	Session	Room/ Poster	Mentor(s)	Project Title
Perry Berlin (College of Agriculture and Life Sciences)		P4	5	Dr. Joe Sagues (College of Agriculture and Life Sciences) Mr. Ethan Woods (College of Engineering)	Composting Coupled with Gaseous CO2 Capture
Thomas Bernabe-Bacilio (College of Engineering)		P2	9	Dr. Edgar Lobaton (College of Engineering) Jeffrey Barahona (College of Engineering)	ARoSClinical Data Server Project
Zachary Bevans (College of Engineering)	Jesse Hines (College of Engineering)	P2	10	Dr. Maria Avramova (College of Engineering) Dr. Kostadin Ivanov (College of Engineering)	Fuel Management and Reload Cycle Length Optimization for a Westinghouse 2-Loop PWR
Shamik Bhattacharya (College of Natural Resources)		P2	11	Dr. Forrest M. Hoffman (Oak Ridge National Laboratory) Dr. Bharat Sharma (Oak Ridge National Laboratory) Dr. Gaurab KC (Oak Ridge National Laboratory) Dr. Nathan Collier (Oak Ridge National Laboratory) Dr. Min Xu (Oak Ridge National Laboratory) Dr. Michael Kelleher (Oak Ridge National Laboratory)	Using Statistical Learning Methods to Accelerate Model Parameter Sensitivity Experiments

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Jordan Birkner (College of Humanities and Social Sciences)		O3	3221	Dr. Gary Comstock (College of Humanities and Social Sciences)	Moral Enhancement Technologies and ASD: Ethical Gentrification of a Population
Priscilla Boaheng (College of Humanities and Social Sciences)		O1	3210	Dr. Vanessa Volpe (College of Humanities and Social Sciences)	Generational Status in Black Immigrants and Its Relationship to Emotional Eating
Marina Botros (College of Agriculture and Life Sciences)		P1	4	Dr. Trino Ascencio-Ibáñez (College of Agriculture and Life Sciences)	Geminiviral DNA Analyzed Through Two-Dimensional Gel Electrophoresis
Noah Bowman (College of Engineering)		P3	2	Dr. Brandon McConnell (College of Engineering)	NFTs for Trustless Donations
Angel Boyette (College of Engineering)		P3	3	Dr. Michael Dickey (College of Engineering)	Fabrication and Application of Hydrogel Fibers Containing EGaIn Liquid Metal Microdroplets
Hannah Braun (College of Humanities and Social Sciences)		P3	4	Dr. Steven Greene (College of Humanities and Social Sciences)	The Impact of a Social Media Stimulus on Electoral Reform Attitudes
Austin Bridger (College of Sciences)	Tyson King (College of Sciences) Silas Huckins (College of Sciences)	P2	12	Dr. Emily Griffith (College of Sciences) Dr Stephany Dunstan (College of Sciences)	Examining the effect of an academic intervention on graduation rate
Scott Brueshaber (College of Sciences)		P4	6	Dr. Jenny Campbell (College of Sciences)	Investigating the Effects of Physical Contact in Animal Ambassador Programs on Visitors' Perceptions of Ambassador Animal Well-Being
Anh Bui (Wilson College of Textiles)		P4	7	Dr. Xiaomeng Fang (Wilson College of Textiles)	Lightweight Paper Origami Robot Driven by Pneumatic Fiber Actuators

Lead Presenter	Co-Presenters	Session	Room/Poster	Mentor(s)	Project Title
Tiara Caldwell (College of Humanities and Social Sciences)		O1	3210	Dr. Michaela DeSoucey (College of Humanities and Social Sciences)	The Black Male Experience and Toxic Masculinity in the Black Community: Testimonies from The Black Man
Duru Caner (College of Engineering)		P3	5	Professor Mary Estrada (College of Humanities and Social Sciences)	How Does Culture And Major Alter How We Think About Colors?
Brenna Carter (College of Agriculture and Life Sciences)	Austin Wolf (College of Natural Resources)	P3	6	Dr. Erin McKenney (College of Agriculture and Life Sciences)	Feral Hog Impacts in the US
Caleb Carwell (College of Humanities and Social Sciences)		P3	7	Dr. Chris Mayhorn (College of Humanities and Social Sciences)	Investigating the Effects of the Word Repetition Exercise on Inhibition and Switching Efficiency
Alexia Cash (College of Engineering)		O1	3222	Dr. Mike Sano (College of Engineering) Mr. Robert Williamson (College of Engineering)	Optimization of CRISPR Cas 9 Delivery Using Electroporation
Sahib Chandi (College of Agriculture and Life Sciences)		P4	8	Dr. Carly Sjogren (College of Sciences)	Utilizing RNA-Sequencing Technology to Identify Gene Networks Responsible for Over-Proliferative Traits in Glycine max
Ryan Charrette (College of Engineering)	Harrison Storms (College of Engineering) Declan Miller (College of Engineering) Madison Turmon (College of Engineering)	P2	13	Dr. Alexander Bataller (College of Engineering)	Application of Tuning Forks in Measuring Viscosity and Density of Molten Salt Systems

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Nitin Chitrala (College of Engineering)		O2	3210	Dr. Ashok Gopalarathnam (College of Engineering) Mr. Yi Tsung Lee (College of Engineering)	Effect of Gust and Pitch on an Airfoil Lift Studied Using a Discrete Vortex Simulation
Ben Cipriano (College of Sciences)		O3	3285	Dr. Joshua Pierce (College of Sciences) Mr. Alejandro Valdes Pena (College of Sciences)	Facile Synthesis of 1,4,2-Oxothiazols via MnO2 Cyclization
Rex Colvard (College of Engineering)		P3	8	Dr. Michael Dickey (College of Engineering) Mr. Zach Park (College of Engineering) Dr. Peter Fedkiw (College of Engineering)	Self-Healing Liquid Metal Lithium-Ion Battery
Christina Conrad (College of Natural Resources)	Bridget Monahan (College of Sciences) George Tyler Jr. (College of Agriculture and Life Sciences)	P4	9	Dr. Carlos Goller (College of Sciences) Dr. Mahmoud Sharara (College of Agriculture and Life Sciences) Piysuh Patil (College of Agriculture and Life Sciences)	Greenhouse gas reduction in composting and impacts on microbial communities
Tori Crunkleton (College of Engineering)		P1	5	Dr. Ramón Collazo (College of Engineering) Dr. Will Mecouch (Adroit Materials) Dr. Ronny Kirste (College of Engineering)	Depositing Oxides in an RF Sputter System to Fabricate a Distributed Bragg Reflector Mirror for UV Lasers

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Caitlyn Cuddy (College of Agriculture and Life Sciences)		O1	3285	Dr. Shannon Pratt-Phillips (College of Agriculture and Life Sciences)	Horse owner's survey regarding equine feeding management post colic surgery
Gabrielle Cummings (College of Agriculture and Life Sciences)		P1	6	Dr. Charlotte Meli (College of Agriculture and Life Sciences)	Farm/Ambassador Internship Program at Riverbanks Zoo and Garden
Erica Curran (College of Sciences)	Atli Davidsson (College of Sciences)	P1	7	Dr. Thomas Theis (College of Sciences) Mr. Keilian MacCulloch (College of Sciences)	Pyruvate Hyperpolarization in Biocompatible Solvents through Signal Amplification by Reversible Exchange
Ari D'Alessandro (College of Humanities and Social Sciences)		P2	14	Dr. Veljko Dubljevic (College of Humanities and Social Sciences) Mr. Ronald Dempsey (College of Humanities and Social Sciences)	Repetitive Transcranial Magnetic Stimulation and and Its Efficacy in Treating Major Depressive Disorder: A Scoping Review
Chloe Dalton (College of Agriculture and Life Sciences)		P1	8	Dr. Trino Ascencio-Ibáñez (College of Agriculture and Life Sciences)	The Isolation and Up-Scale of Collagen via Cell Agriculture
Sara Dawson (College of Agriculture and Life Sciences)	Gabriel Chapman (College of Natural Resources)	P3	9	Dr. Erin McKenney (College of Agriculture and Life Sciences)	Reinstating Controlled Burns
Abigail Dayton (College of Natural Resources)		P3	10	Dr. Karl Wegmann (College of Sciences)	Identifying Landslide Hazards to the Pacific Northwest Regional Power Grid
Atharv Dixit (College of Engineering)		P2	15	Dr. Praveen Kolar (College of Engineering)	Innovation in Medicine through Sustainability in Biotechnology: Synthesis of a Biochar-based Magnetic Core Shell Nanoprobe

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Sarah Do (Wilson College of Textiles)		P1	9	Dr. Anne Porterfield (Wilson College of Textiles) Ms. Janie Woodbridge (Wilson College of Textiles)	Computer Aided Designs and Zero Waste
Sam Doak (College of Engineering)		P2	16	Dr. Stefanie Chen (College of Sciences)	Binding Interactions of E. coli DNA Repair Protein RadD
Nishant Dodla (College of Sciences)	Tyler Southward (College of Sciences) Jenna Christensen (College of Sciences)	P2	17	Dr. Emily Griffith (College of Sciences) Dr. Stephany Dunstan (College of Sciences)	The Impact of Student Success Programs on Transfer Rates between Colleges
Daniela Duker (College of Sciences)		P3	11	Dr. Erin Krupa (College of Education)	As a Research Assistant I Have Much to Offer and Much to Gain
Jack Dunham (College of Engineering)		P4	10	Dr. Matthew Bryant (College of Engineering) Mr. Michael Hughes (College of Engineering)	Preliminary Study on the Wake of a Triangular Cylinder Bluff Bodies
Brooke Dunkley (College of Engineering)		P2	18	Dr. Jacqueline Cole (College of Engineering) Dr. Katherine R. Saul (College of Engineering) Ms. Kayla B. Bosh (College of Engineering)	Effects of Brachial Plexus Birth Injury on Composition of Biceps, Supraspinatus, & Subscapularis Muscles

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Mindy Dunn (College of Natural Resources)	Drew Bresingham (College of Natural Resources) Luke Goodin (College of Natural Resources) Darius Ledbetter (College of Natural Resources)	P2	19	Dr. Elizabeth Guthrie Nichols (College of Natural Resources)	CAFO Lagoon Breach Impact On Nutrients and Metals in Soils
Jamie Earley (College of Sciences)		P4	11	Dr. Carlos Goller (College of Sciences)	*Delftia* and *Comamonas* Bacteria: Opportunistic Pathogens and Antibiotic Resistance
Margaret Ann Edel (College of Agriculture and Life Sciences)	Lexi Roof (College of Agriculture and Life Sciences) Jess Schinsky (College of Agriculture and Life Sciences) Alana Boone (College of Agriculture and Life Sciences)	P4	66	Dr. Marnie Metzler (College of Veterinary Medicine) Dr. Shweta Trivedi (College of Agriculture and Life Sciences) Dr. Jenny Estes (College of Veterinary Medicine)	Interpretation and Validation of Ethogram Behaviors in Research Canines
Adam Ehmke (College of Sciences)	Rebecca Olson (College of Sciences) Tiffany Brocco (College of Sciences)	P2	20	Dr. Lisa Paciulli (College of Sciences) Mr. David Q. Watts (Federal Law Enforcement Training Centers)	Enclosure usage of a captive postpartum mother aye-aye lemur (*Daubentonia madagascariensis*)
Kathryn Eller (College of Natural Resources)		P4	12	Dr. Carli Arendt (College of Sciences)	Investigating trace metal concentrations in saltwater samples from coastal North Carolina.

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Cecille Ernst (College of Natural Resources)	Nick Cruz (College of Natural Resources) Michely Coimbra (College of Natural Resources)	P1	11	Dr. Erin McKenney (College of Agriculture and Life Sciences)	Coral Reefs – The “World’s Lungs” Rehabilitation and Restoration
Isabella Evans (College of Humanities and Social Sciences)		P1	12	Dr. Jing Feng (College of Humanities and Social Sciences) Michael Wilkinson (College of Humanities and Social Sciences)	User's Acceptance of Transitions in Virtual Reality
Ayden Ferrell (College of Engineering)		P1	13	Dr. Trino Ascencio-Ibáñez (College of Agriculture and Life Sciences)	Methods for Reorganizing the Flows and Patterns in a Research Lab
Macy Ferrell (College of Humanities and Social Sciences)		P2	21	Dr. Veljko Dubljevic (College of Humanities and Social Sciences)	Ethical Issues Pertaining to Neuromarketing Research
Sarah Fletcher (College of Sciences)		P1	14	Dr. John Meitzen (College of Sciences)	Medium spiny neuron electrophysiological properties differ by region, sex, and developmental period: excitability is increased in early development.
Jessika Foland (College of Humanities and Social Sciences)		P3	12	Dr. Seth Kullman (College of Sciences)	TPhP on Caudal Fin Regeneration
Ariana Frazier (College of Humanities and Social Sciences)		P4	13	Dr. Kanton Reynolds (College of Engineering)	The Ebony Metamorphosis: Understanding Nigrescence and Black Racial Consciousness
Daniel Friday (College of Engineering)		P3	13	Dr. Joel Ducoste (College of Engineering)	Analysis of Grease Interceptor Design to Maximize Oil Separation: Impact of Coalescence Mechanism

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Rishika Gaddam (College of Sciences)		P3	14	Dr. Claire Gordy (College of Sciences)	An Analysis of Tactile Teaching Tool's effects on GN 312 Students' Understanding of Illumina Sequencing
Alex Gaines (College of Agriculture and Life Sciences)		P3	15	Dr. Justin Whitehill (College of Natural Resources) Mr. Yannick Farve (College of Natural Resources) Ms. Angela Chiang (College of Natural Resources)	Developing Bioluminescent Fraser Fir Christmas Trees: A Proof of Concept
Meredythe Galliher (College of Humanities and Social Sciences)		P4	14	Dr. Jocelyn Taliaferro (College of Humanities and Social Sciences)	Black Women's Mental Health Study: Question 89
Thusna Gardiyehewa (College of Sciences)		P1	15	Dr. Michael Sikes (College of Sciences) Ms. Lisa Metzger (College of Sciences)	The Role of USF1 in Lymphocyte Responses to Double-Stranded DNA Breaks
Bridget Gigliotti (College of Sciences)		P4	15	Dr. Carlos Goller (College of Sciences)	Digital PCR for the Detection of Antibiotic Resistance Genes in Compost
Cameron Gilbert (College of Sciences)		P4	16	Dr. Markus Petters (College of Sciences) Mr. Sunandan Mahant (College of Sciences)	Characterization and Application of an Ice Nucleating Cold Stage
Justin Gilleland (College of Agriculture and Life Sciences)		P3	16	Dr. Deepti Salvi (College of Agriculture and Life Sciences) Ms. Urvi Shah (College of Agriculture and Life Sciences)	Evaluate various stages of inoculation on shell eggs and role of plasma technology in shell egg surface sanitization

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Chloe Glynn (College of Sciences)		P3	17	Dr. Lisa Paciulli (College of Sciences) Ms. Rebecca Olson (College of Sciences) Mr. Adam Ehmke (College of Sciences) Ms. Allie Monahan (College of Sciences) Mr. David Q. Watts (Federal Law Enforcement Training Centers)	Working on the Paciulli Lab Mother Aye-Aye Lemur (*Daubentonia madagascariensis*) Anxiety Project
Ariel Gomez Arellano (College of Engineering)		P2	22	Dr. Januka Budhathoki-Uprety (Wilson College of Textiles) Ms. Meghan Lord (Wilson College of Textiles)	Effect of dyes on polymer properties
Angelina Gonzalez (College of Sciences)	Bailee Porter (College of Sciences)& (College of Humanities and Social Sciences)	P1	16	Dr. Astrid Schnetzer (College of Sciences)	Analysis of Microplankton Community Composition in Bogue Sound, North Carolina
Hallie Gooch (College of Sciences)		P4	18	Dr. Lisa Paciulli (College of Sciences)	The behavior of ring-tailed lemur (*Lemur catta*) mothers toward male offspring
Nick Goodwin (College of Engineering)		O2	3210	Dr. Olgha Qaqish (College of Engineering)	Engineering Education Systematic Literature Review
Reshma Goud (College of Agriculture and Life Sciences)		P1	17	Dr. Trino Ascencio-Ibáñez (College of Agriculture and Life Sciences)	Standard Curve Implementation to Estimate Viral Loads of Geminivirus Infectious Clones *Pepper Huasteco Yellow Vein Virus* (PHYVV) and *Pepper Golden Mosaic Virus* (PepGMV) in Tomato Lanai and Pepper.

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Caroline Grant (College of Humanities and Social Sciences)	Brooke Wilson (College of Humanities and Social Sciences) Ambrose McNally (College of Humanities and Social Sciences)	P3	19	Dr. Kelly Mulvey (College of Humanities and Social Sciences) Ms. Jackie Cerda-Smith (College of Humanities and Social Sciences)	Stamped Intervention: Impacts on Student and Teacher Critical Reflection
Maddie Greenway (College of Sciences)		P3	20	Dr. Lisa Paciulli (College of Sciences)	Coquerel's Sifaka (*Propithecus coquereli*) mothers' behavior toward female offspring as they mature
Will Gunther (College of Natural Resources)	Sydney Pollock (College of Natural Resources)	P1	18	Dr. Erin McKenney (College of Agriculture and Life Sciences)	Soil Health and Management
Ebernoe Guzman-Bonilla (College of Humanities and Social Sciences)	Imani Bynum (College of Humanities and Social Sciences)	P3	21	Dr. Anne McLaughlin (College of Humanities and Social Sciences) Ms. Imani Murph (College of Humanities and Social Sciences)	Diminished Reality and Training: A Pilot Study
Suzannah Hale (College of Agriculture and Life Sciences)	Ainsley Deese (College of Natural Resources)	P1	19	Dr. Erin McKenney (College of Agriculture and Life Sciences)	Environmental Impacts of Urbanization
Terry Han (College of Engineering)		P3	22	Dr. Brian Diekman (College of Engineering) Dr. Wubin Bai (University of North Carolina at Chapel Hill)	Multilayer Biomimetic Electronic Skin for Active Wound Healing

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Asher Hancock (College of Engineering)		P4	17	Dr. David Zaharoff (College of Engineering) Ms. Siena Mantooth (College of Engineering)	Development of an injectable hydrogel for local delivery of CAR-T cell therapy
Rose Hansen (College of Engineering)		P2	23	Dr. Jacqueline Cole (College of Engineering) Dr. Katherine Saul (College of Engineering) Mr. Jason Cox (College of Engineering)	Verifying Quality of Joint Reaction Forces Obtained from Musculoskeletal Models for Contact Finite Element Analysis of the Rat Shoulder Following BPBI
Manuella Harb (College of Engineering)		P4	18	Dr. Kimberly Nellenbach (College of Engineering)	Analysis of Synthetic Platelets Containing Fibrin Knob Peptides for Wound Healing
Skylar Harrelson (College of Agriculture and Life Sciences)	Kourosh Salamati (College of Agriculture and Life Sciences)	P1	20	Dr. Trino Ascencio-Ibáñez (College of Agriculture and Life Sciences)	Testing a Battery of Small Molecules with Putative Binding to a Viral Protein Necessary for Viral Replication
Siham Hashi (College of Humanities and Social Sciences)		P4	19	Dr. Kristen Alff (College of Humanities and Social Sciences)	Reagan is it the Hostages or the Soviet Union?
Emily Haupt (College of Agriculture and Life Sciences)		P1	21	Dr. Shweta Trivedi (College of Agriculture and Life Sciences) Dr. Dan Dombrowski (North Carolina Museum of Natural Sciences) Mr. Shane Christian (North Carolina Museum of Natural Sciences)	Participant Evaluation of the Ten years of VetPAC Museum Medicine Internship

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Grace Herring (College of Agriculture and Life Sciences)		P2	24	Dr. Marcela Rojas-Pierce (College of Agriculture and Life Sciences) Ms. Anne-Marie Pullen (College of Agriculture and Life Sciences)	Understanding the Mechanism of the HOPS Complex During Vacuole Fusion in Stomatal Guard Cells
Taylor Hildreth (College of Engineering)		P4	20	Dr. Katherine Saul (College of Engineering) Ms. Morgan Dalman (College of Engineering)	Data Collection of Isometric Upper Limb and Functional Tasks Movements for the Development and Use of Musculoskeletal Models
Ransom Hill (College of Sciences)		P2	25	Dr. Yi Xiao (College of Sciences) Mr. Juan Cannora (College of Sciences) Mr. Obtin Alkhamis (College of Sciences)	High-Throughput Characterization of Aptamers for Cocaine Detection
Chloe Hincher (College of Engineering)		P4	21	Dr. Lauren Schnabel (College of Veterinary Medicine) Dr. Kimberly Young (College of Veterinary Medicine)	Comparison of multiple routes of administration of bone marrow-derived equine mesenchymal stem cells for ophthalmologic applications
Emily Hitesman (College of Sciences)		P4	22	Dr. Elsa Youngsteadt (College of Agriculture and Life Sciences)	Does Bee Heat Tolerance Depend on Body Size?
Samuel Holdsclaw (College of Sciences)	Trevor Phelps (College of Natural Resources)	P2	26	Dr. Dani Lin Hunter (College of Natural Resources) Dr. Caren Cooper (College of Natural Resources)	Lead Contamination Risk Across Regions of North Carolina

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Daija Holliday (College of Humanities and Social Sciences)		P4	23	Dr. Vanessa Volpe (College of Humanities and Social Sciences)	Understanding Black Emerging Adults Purpose for Twitter Usage with Qualitative Methods Approach
Mason Hooks (College of Engineering)	Jeffrey Whitenack (College of Engineering)	P3	23	Dr. Kenneth Granlund (College of Engineering)	Utilizing a Water Table for the Analysis of Compressible, Supersonic Flow
Stewart Hopper (College of Sciences)		P1	22	Dr. Michael Taveirne (College of Sciences)	Isolating and Identifying Antimicrobial Producing Bacteria from Soil on NC State's Main Campus
Olivia Howell (College of Humanities and Social Sciences)		O2	3222	Dr. Christian Doll (College of Humanities and Social Sciences)	Creativity: Toward a Steadily Formed Young-Adult Identity
Amy Hu (College of Humanities and Social Sciences)	Isra Siddiqui (College of Humanities and Social Sciences)	O2	3221	Dr. Amy Halberstadt (College of Humanities and Social Sciences) Ms. Xi Liu (College of Humanities and Social Sciences)	Exploring the Cultural Differences in Respect Conditionality: A Comparison between US Mainstream and Chinese Culture
Jenny Huang (College of Humanities and Social Sciences)	Karina Seebaluck (College of Humanities and Social Sciences) Summer Phommachieng (College of Humanities and Social Sciences)	O2	3221	Dr. Amy Halberstadt (College of Humanities and Social Sciences) Ms. Xi Liu (College of Humanities and Social Sciences)	Context Matters: Respect Concepts are Embedded within Culture and Close Relationships
Andrew Igdal (College of Sciences)		O3	3285	Dr. Daniel Dougherty (College of Sciences)	Intercalation of Tetramethylammonium Bromide into Chromium Chloride: An Investigation of Electronic Property Modification

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Kristina Jones (College of Agriculture and Life Sciences)		P1	23	Dr. Mahmoud Sharara (College of Agriculture and Life Sciences)	A Modified Method for Spectrophotometric Quantification of Poultry Litter Hydrogen Sulfide Emissions
Alina Jugan (College of Engineering)		P2	27	Dr. Alexander Bataller (College of Engineering)	Material Quantification of Molten Salts via Glow Discharge Electrolysis
Karen Kaiser (College of Sciences)		P4	25	Dr. Jennifer Baltzegar (College of Sciences)	Examining the Impacts of *Ae. aegypti* and *Ae. albopictus* on Public Health
Sreya Kanamurlapudi (College of Engineering)		P1	24	Dr. Michael Gamcsik (College of Engineering)	Comparative study of Buthionine Sulfoximine Treatment in aggressive versus nonaggressive cancer lines
Sky Kanoy (College of Engineering)		P3	24	Dr. Martin Thuo (College of Engineering)	Mapping sources of Variations in Charge Tunneling Using Meta Data
Maria Kanton (University College - DASA)		P2	28	Dr. Jillian Perry (University of North Carolina at Chapel Hill) Dr. Shaomin Tian (University of North Carolina at Chapel Hill)	In Situ Detection of Virus-Specific Immunity in the Skin Using 3D-Printed Microneedle Patches
Marina Kapitanov (College of Engineering)		P1	25	Dr. Donald Freytes (College of Engineering) Dr. Andreea Biehl (College of Engineering)	Microtissue Contraction of Human Mesenchymal Stem Cells in Extracellular Matrix Hydrogels Derived from Respiratory Tissues
Victoria Kapps (College of Sciences)		P2	29	Dr. Kurt Marsden (College of Sciences) Ms. Melody Hancock (College of Sciences)	Effects of Developmental Exposure to BMAA and MCLR on Adult Zebrafish

Lead Presenter	Co-Presenters	Session	Room/ Poster	Mentor(s)	Project Title
Caleb Keaveney (College of Sciences)		P1	26	Dr. Gary Lackmann (College of Sciences)	Modeling the Dynamics and Evolution of Jupiter's Great Red Spot
Erimi Kendrick (College of Natural Resources)		P4	26	Dr. Elizabeth Nichols (College of Natural Resources)	The Importance of Field Safety Information in Universities
Coley Kida (College of Sciences)		O2	3285	Dr. Catherine Showalter (University College - DASA) Dr. Holly Hurlburt (University College - DASA)	Breast Cancer Treatment Accessibility: Making a Decision
Mia Kidwell (College of Sciences)		P1	27	Dr. Christopher Guilluy (College of Veterinary Medicine) Dr. Elizabeth Benson (College of Veterinary Medicine)	Loss of GEF Ect2 and GTPase RhoA Inhibits Cell Cycle Progression through G1/S
Jean Kim (College of Sciences)		P4	28	Dr. Catherine Hoyo (College of Sciences) Ms. Bess Smith (College of Sciences)	Demographic Analysis of Ethnicities and Rate of Completion of Biological Samples in a Large-Scale Research Study (STRIVE)
Hillary Kim (College of Sciences)		P4	27	Dr. Linda Hanley Bowdoin (College of Agriculture and Life Sciences) Ms. Mary M. Dallas (College of Agriculture and Life Sciences)	Cassava Mosaic Disease
Claire Kim (College of Sciences)		P2	30	Dr. Mike Sano (College of Engineering) Mr. Robert Williamson (College of Engineering)	Reversible Electroporation for Treatment of Tumor Cells

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Katy Klein (College of Agriculture and Life Sciences)		P1	29	Dr. Guozhou Xu (College of Agriculture and Life Sciences)	Designing Immunosuppressive Peptides to Inhibit IκB Kinase Activation
Tyler Knapp (College of Sciences)	Elena Shippman (College of Sciences)	P2	31	Dr. James Martin (College of Sciences)	Development of a Crystal Nucleation Model using Oligoacenes
Amanda Knizley (College of Engineering)		P1	28	Dr. Jacqueline Cole (College of Engineering) Ms. Sandra Stangeland-Molo (College of Engineering)	Characterizing Architecture of a Biomimetic Bone Scaffold
Robert Kobrin (College of Engineering)		O1	3222	Dr. David Zaharoff (College of Engineering) Ms. Siena Mantooth (College of Engineering)	Chitosan-Glycerol Injectable Hydrogel for Intratumoral Delivery of Immunotherapeutics
Seth Kodikara (College of Engineering)		P1	29	Dr. Albert Keung (College of Engineering) Dr. Balaji Rao (College of Engineering) Ms. Alison Waldman (College of Engineering)	Mapping the Specificity of the p300 Acetyltransferase to H3 and H4 Histone Variants
Seth Kodikara (College of Engineering)		P2	32	Dr. Veljko Dubljevic (College of Humanities and Social Sciences) Mr. Steven Peppers (College of Humanities and Social Sciences)	A Rapid Review of the Cognitive Enhancing Capacity of Guanfacine

Lead Presenter	Co-Presenters	Session	Room/Poster	Mentor(s)	Project Title
Viosa Koliqi (College of Sciences)		P3	25	Dr. Daniel Gruehn (College of Humanities and Social Sciences)	Relationship between Reading and Loneliness
Sophie Korenek (College of Agriculture and Life Sciences)		P3	26	Melanie Korenek (College of Agriculture and Life Sciences) Dr. Brenna Zimmer (College of Agriculture and Life Sciences) Ms. Linlin Ma (College of Agriculture and Life Sciences)	Characterizing the Role of The AGC Kinase RPS6KA2 in Castration-Resistant Prostate Cancer
Ruth Kraus (College of Humanities and Social Sciences)		P4	30	Dr. Lynne Baker-Ward (College of Humanities and Social Sciences)	Effect of Simultaneous Music Presentation on Preschool Children's Executive Function Performance
Sarah Krementz (College of Natural Resources)		P1	30	Mr. Eric Teitsworth (College of Natural Resources) Dr. Krishna Pacifici (College of Natural Resources)	Where are Neuse River Waterdogs Reproducing in the Neuse and Tar River Basins?
James Kurdi (College of Engineering)		P1	31	Dr. Jason Haugh (College of Engineering) Mr. Ravi Appalabholta (College of Engineering) Mr. Joseph Koelbl (College of Engineering)	Tunable Gradient Development Enables Exploration of Context-Dependent Cell Migration
Francesca Kyanda (College of Humanities and Social Sciences)		O3	3221	Dr. Robin Dodsworth (College of Humanities and Social Sciences)	Ralinguistics: Conversations, Data and Analysis

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Addison Lane (College of Sciences)		P4	31	Dr. Alexander Nevzorov (College of Sciences) Dr. Azamat Galiakhmetov (College of Sciences)	Novel Peptoid-Based Macrodiscs for Structural Studies of Membrane Proteins
Shayleigh Larsen (Wilson College of Textiles)		P3	27	Dr. Traci Lamar (Wilson College of Textiles)	Exploration of the Twine TS-1800 Machine through Novelty Embroidery Application
Peter Lawing (College of Sciences)		P2	33	Dr. Jonathan Lindsey (College of Sciences)	Targeting the NTS1R Receptor for Radiopharmaceutical Treatment of Cancer
Brandon Le (College of Engineering)		P3	28	Dr. Ryan Sartor (College of Agriculture and Life Sciences) Dr. Colleen Doherty (College of Agriculture and Life Sciences)	Utilizing Neural Networks on Biological data
Jaden Leatherman (College of Engineering)		P1	32	Dr. Peter Fedkiw (College of Engineering) Mr. Mike Petrecca (College of Engineering)	Next Generation Functional Battery Separators with Unique Dendritic Morphology
Amy Leister (College of Engineering)		P1	33	Dr. Albert Keung (College of Engineering) Ms. Leandra Caywood (College of Engineering)	Optogenetic regulation of transcription factor dynamics and downstream gene expression in single cells
Steven Lin (College of Engineering)		P2	34	Mr. Vishal Srikanth (College of Engineering) Dr. Andrey Kuznetsov (College of Engineering)	Turbulence Dissipation During Impingement on Porous Media

Lead Presenter	Co-Presenters	Session	Room/Poster	Mentor(s)	Project Title
Yiting Liu (College of Humanities and Social Sciences)		P1	34	Dr. Yingchen He (College of Humanities and Social Sciences)	Study on Optimal Scaling of 3D-Printed Replicas for Blind and Low-Vision Museum Visitors
Honiah Locklear (College of Humanities and Social Sciences)		P3	29	Dr. April Fogleman (College of Agriculture and Life Sciences)	Correlation between Breastfeeding and Post-Partum Depression
Sid Lohia (College of Engineering)		P2	35	Dr. Saad Khan (College of Engineering)	Synthesis and Applications of Graphene Aerogels
Kathryn Lu (College of Engineering)		P2	36	Dr. Noboru Matsuda (College of Engineering) Dr. Xiaolin Duan (College of Humanities and Social Sciences)	Investigating The Effect Of Interactive Map Comparison As a Facilitator of Multivocal Thinking In History Education
Ta'Kia Lucas (College of Natural Resources)		P2	37	Dr. Marcela Rojas-Pierce (College of Agriculture and Life Sciences) Dr. Katharina Stapelmann (College of Engineering) Mr. Connor Robinson (College of Engineering)	Effects of Plasma Activated Water (PAW) on Arabidopsis Stress Responses
Kiara Malloy (College of Sciences)		P4	32	Dr. Carlos Goller (College of Sciences) Dr. Claire Gordy (College of Sciences)	The prevention of infection of the *Delftia acidovorans* on the greater wax moth using anti-inflammatories
Carmela Mangini (College of Humanities and Social Sciences)		P3	30	Dr. Scott Stage (College of Humanities and Social Sciences)	A Mixed Methods Research Synthesis of the Content Published on Multi-Tiered Systems of Support

Lead Presenter	Co-Presenters	Session	Room/Poster	Mentor(s)	Project Title
Mimi Marriott (College of Natural Resources)	Suzanne Teague (College of Natural Resources)	O1	3221	Dr. Rajan Parajuli (College of Natural Resources) Dr. Stephanie Chizmar (United States Forest Service)	Challenges and Opportunities for Agroforestry Practitioners to Participate in State Preferential Property Tax Programs for Agriculture and Forestry
Tyler Mason (College of Engineering)		P4	33	Dr. Katherine Saul (College of Engineering) Ms. Morgan Dalman (College of Engineering)	Muscle Contribution and Torque Generation During Dart Throwing Motion
Nicolas Mastrovito (College of Agriculture and Life Sciences)	Connor Allaway (College of Agriculture and Life Sciences)	P1	35	Dr. Trino Ascencio-Ibáñez (College of Agriculture and Life Sciences)	Identification of *A. thaliana* CKL5 and CKL6 Partner Cyclins During CaLCuV Infection
Arnav Mathur (College of Engineering)		P3	31	Professor Mary Estrada (College of Humanities and Social Sciences)	The Impact of Zero Transfer Credits on the Progress Toward International Students' Degrees
Katherine Matthes (College of Humanities and Social Sciences)		P1	36	Dr. Sarah Ascienzo (College of Humanities and Social Sciences)	The Impact of Organizational Factors on Secondary Traumatic Stress in Behavioral Health Workers: A Mixed-Methods Study
Patrick McArthur (College of Agriculture and Life Sciences)		P3	32	Dr. Ryan Sartor (College of Agriculture and Life Sciences) Dr. Colleen Doherty (College of Agriculture and Life Sciences) Ms. Alice Chesley (College of Agriculture and Life Sciences)	Cryogenic Preservation of the Lemnaceae Species *Lemna gibba*

Lead Presenter	Co-Presenters	Session	Room/ Poster	Mentor(s)	Project Title
Chase McCrary (College of Humanities and Social Sciences)	Lauren Conway (College of Natural Resources)	P4	34	Dr. Angela Allen (College of Natural Resources) Dr. Elizabeth Nichols (College of Natural Resources) Dr. Stephanie Jeffries (College of Natural Resources)	Continuous Compliance Monitoring of Water Quality to Determine the Effects of Urbanization on Richland Creek
Hanna McDaniel (College of Engineering)		P3	33	Dr. Ashok Gopalarathnam (College of Engineering) Mr. Michael Jenkins (College of Engineering) Mr. Jacob Fine (College of Engineering)	Estimating the Behavior of Long Tethers For Energy Generating Kites
Olivia McDonald (College of Natural Resources)	Jalin Cox (College of Natural Resources) Danielle Sheets (College of Natural Resources)	P1	37	Dr. Erin McKenney (College of Agriculture and Life Sciences)	The Cougar Initiative -- Rewinding North Carolina Through Reintroduction
Sarah McKee (College of Sciences)		P3	34	Dr. Chris Gorman (College of Sciences) Dr. Ivan Cockman (College of Sciences)	Synthetic Strategies To Access Higher Azaacenes
Jadyn McLean (College of Humanities and Social Sciences)		P4	35	Ms. Rebecca Shisler (College of Humanities and Social Sciences)	God, It's Good: Exploring the Intersections of Ethnic Food and Health Culture
Audrey McLeod (College of Sciences)	Emery Meyer (College of Sciences)	P4	36	Dr. Carlos Goller (College of Sciences)	Comamonas and You; From infection to Bioremedication

Lead Presenter	Co-Presenters	Session	Room/ Poster	Mentor(s)	Project Title
Eleanor McNamee (College of Humanities and Social Sciences)	Demi Stamatakos (College of Sciences)	P3	35	Dr. Anne McLaughlin (College of Humanities and Social Sciences) Mr. Frank Lodge (College of Humanities and Social Sciences)	Novel Experimental Procedure in Virtual Reality Task Can Help Account for Effects from Past VR Experience
Bryce Medlock (College of Engineering)		O2	3285	Dr. Jun Ohata (College of Sciences) Mr. Seiya Ishizawa (College of Sciences)	Developing Protein Modification Method for Cancer Treatment
Jayden Meggett (College of Humanities and Social Sciences)	Sofie Yingling (College of Humanities and Social Sciences)	P3	36	Dr. Erin McKenney (College of Agriculture and Life Sciences)	Illegal Wildlife Trade and Poaching in Asia
Alissa Meyerhoffer (College of Sciences)		P2	38	Dr. Manuel Kleiner (College of Agriculture and Life Sciences) Dr. J. Alfredo Blakeley-Ruiz (College of Agriculture and Life Sciences)	Assessing the growth of *Bacteroides thetaiotaomicron* on different sources of dietary protein
Madelyn Milazzo (College of Humanities and Social Sciences)		P3	37	Dr. Ayse Ercumen (College of Natural Resources)	Correcting a History of Poor Urban Planning and Design for Improved Community Health
Makayla Miller (College of Agriculture and Life Sciences)	Whitney Pesce (College of Agriculture and Life Sciences)	P1	38	Dr. Trino Ascencio-Ibáñez (College of Agriculture and Life Sciences)	Transference of infectious clones from *E. coli* into *agrobacterium* vectors without intellectual property issues
Kay Millikan (College of Agriculture and Life Sciences)		P3	38	Dr. Thomas Makris (College of Agriculture and Life Sciences) Mr. Han Phan (College of Agriculture and Life Sciences)	Structural and kinetic studies of Chlamydia Associating with Death Domains (CADD)

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Ansley Mills (College of Sciences)		P4	37	Dr. Matthew Breen (College of Veterinary Medicine) Dr. Rachael Thomas (College of Veterinary Medicine)	Identification of a Canine Hereditary Chromosomal Aberration using Chromosome Banding
Amela Minerali (College of Humanities and Social Sciences)		P4	38	Dr. Jamie Pearson (College of Education) Ms. DeVoshia Mason Martin (College of Education)	Suicide in Black Autistic Youth
Molly Mizenko (College of Sciences)		P3	39	Dr. Claire Gordy (College of Sciences)	Investigating Genetics Students' Understanding of Illumina Sequencing Using a 3D Virtual Tour and Case Study
Aleya Mohamed (College of Agriculture and Life Sciences)		P2	39	Dr. Colleen Doherty (College of Agriculture and Life Sciences) Dr. Kanjana Laosuntisuk (College of Agriculture and Life Sciences)	Cold and Microgravity Promoter Cloning
Allie Monahan (College of Sciences)		P2	40	Dr. Lisa Paciulli (College of Sciences)	Exploring Demodex Mites on Captive Lemurs (Class: Arachnida)
Alayna Moore (College of Sciences)		P1	39	Dr. Reade Roberts (College of Sciences) Mr. Aldo Carmona-Baez (College of Sciences)	Identifying Candidate Genes and Genetic Variants Associated with Gut Length Differences in African Cichlid Fishes

Lead Presenter	Co-Presenters	Session	Room/ Poster	Mentor(s)	Project Title
Juan Morales Zapata (College of Sciences)		P3	40	Dr. Daniel Dougherty (College of Sciences) Ms. Samanvitha Sridhar (College of Sciences) Mr. Gaurab Thapa (College of Sciences) Mr. Ario Khansari (College of Sciences)	Growth of CrCl3 Films in a High Vacuum Tube Furnace
Courtney Morgan (College of Natural Resources)		O2	3221	Ms. Bee Rinaldi (College of Humanities and Social Sciences)	A Response to Governmental Action Against Native Cultures Within the United States A Retelling of Cultural Genocide within the Catawba Nation
Xue Mullane (College of Humanities and Social Sciences)		P1	40	Dr. Laura Widman (College of Humanities and Social Sciences) Ms. Julia Brasileiro (College of Humanities and Social Sciences)	Identifying Improvements for STI/HIV Prevention Programs Delivered to Youth in Juvenile Justice Facilities
Emma Mullins (College of Natural Resources)	Andrea Putri (College of Natural Resources) Kyla Jenkins (College of Natural Resources) Casey Bielefeld (College of Natural Resources)	P2	41	Dr. Elizabeth Guthrie Nichols (College of Natural Resources)	CAFO Lagoon Breach Effects on Nutrients and Metals in Surface Waters
Lily Mullins (College of Humanities and Social Sciences)		P1	41	Dr. Laura Widman (College of Humanities and Social Sciences)	Informing Sex Education: Teens' Questions about Sex and Relationships
Hazeen Naikzada (College of Agriculture and Life Sciences)		P3	41	Dr. Deepti Salvi (College of Agriculture and Life Sciences)	Novel Antimicrobial Edible Coating against *Salmonella*: Optimizing UV-C Light Absorbance

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Sam Nechyba (College of Sciences)		P3	42	Dr. Divine Kumah (College of Sciences)	Exploring the Impacts of Growth Conditions on the Structure and Superconducting Properties of Lanthanum Oxide
Geigh Neill (College of Engineering)		P1	42	Dr. Xiaomeng Fang (Wilson College of Textiles) Mr. Muh Amdal Hoque (Wilson College of Textiles)	Proportional-Integral-Derivative Control of Assistive Knee Brace Orthosis Device
Kate Nierle (College of Sciences)		P3	43	Dr. Katarzyna Dembek (College of Veterinary Medicine)	Decreased Intestinal Peptide Hormones Found in Horses Hospitalized for Equine Colic
Anne Norris (College of Engineering)	Samantha Baxter (College of Engineering)	P4	39	Dr. David Zaharoff (College of Engineering)	Optimizing the Degree of Substitution in Chitosan Nanoparticles for a Novel Fentanyl Overdose Vaccine
Emilie Norwood (College of Engineering)		P1	43	Dr. Leslie Sombers (College of Sciences) Ms. Alexandra G. Forderhase (College of Sciences)	Optimized Fabrication of Carbon-Fiber Microbiosensors for Simultaneous Detection of Glucose and Dopamine in Brain Tissue
Zacharia Nyambega (College of Engineering)		P3	44	Dr. Michael Dickey (College of Engineering) Dr. Sooik Im (Wilson College of Textiles)	Re-polymerization of double-network hydrogels by liquid metal particles

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Wafaa Osman (College of Engineering)	Sadat Pollard (College of Engineering) Vincent Wang (College of Engineering) Julian Colvin (College of Engineering)	P2	42	Dr. Maria Avramova (College of Engineering) Dr. Kostadin Ivanov (College of Engineering) Dr. Baxter Durham (Westinghouse) Dr. Blaine Taylor (Westinghouse)	Fuel Management and Reload Cycle Length Optimization of a Westinghouse 4-Loop PWR
Justin Overman (College of Engineering)		P2	43	Dr. Alexander Bataller (College of Engineering) Mr. Syed Rizvi (College of Engineering)	Toward Thermal Conductivity Measurements of Molten Salts using Spatial Domain Thermoreflectance
Emely Pacheco (College of Agriculture and Life Sciences)		P3	45	Ms. Anna Dye (College of Agriculture and Life Sciences) Dr. Trino Ascencio-Ibàñez (College of Agriculture and Life Sciences) Dr. George Kennedy (College of Agriculture and Life Sciences) Dr. Linda Hanley-Bowdoin (College of Agriculture and Life Sciences)	The characterization of a partial mixed infection of two tomato *begomoviruses*
Emely Pacheco (College of Natural Resources)		P4	40	Dr. Elizabeth Nichols (College of Natural Resources)	Community Engagement for Wastewater reuse
Lily Palmer (College of Humanities and Social Sciences)		P2	44	Dr. Isaac Woods (College of Humanities and Social Sciences)	Social Justice Across School Professionals: a Keywords-in-Context Analysis of School Professional Organizations' Standards

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Taylor Parker (College of Sciences)		P4	41	Dr. Antonio Planchart (College of Sciences) Dr. Ryan Weeks (University of North Carolina at Chapel Hill) Mr. Alex Wall (College of Sciences) Ms. Laura Montes (College of Veterinary Medicine)	Genotyping Zebrafish for a Potentially Lethal TDP-43 and Tardbpl Double Knockout
Anjali Patel (College of Education)	Jackson Bunte (College of Sciences)	P2	45	Dr. Emily Griffith (College of Sciences) Dr. Stephany Dunstan (College of Sciences)	Impact of COVID-19 on Masters Degree Completion Time
Manav Patel (College of Sciences)		P3	46	Dr. Orlando Arguello-Miranda (College of Agriculture and Life Sciences)	Investigating CNN Methodologies for Identifying Fungal Plant Pathogens
Manav Patel (College of Natural Resources)		P4	42	Dr. Orlando Arguello-Miranda (College of Agriculture and Life Sciences)	Data-driven automated classification of pathogenic and mycorrhizal fungi
Trevor Patten (College of Humanities and Social Sciences)		P3	47	Dr. Anne McLaughlin (College of Humanities and Social Sciences)	Examination of Veterinary Student Beliefs Regarding Their Education in Safety Culture
Lucy Payne (College of Agriculture and Life Sciences)		P1	44	Dr. Jessica Gluck (Wilson College of Textiles) Ms. Kiran Mumtaz Ali (Wilson College of Textiles)	How to be a Heartbreaker: Decellularizing Porcine Heart Tissue to Isolate Extracellular Matrix Proteins
Jordan Peeler (College of Agriculture and Life Sciences)		P1	45	Dr. Casey Nestor (College of Agriculture and Life Sciences)	Examining the impact of chronic undernutrition on insulin secretion in male and female sheep.

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Bailey Pelt (College of Sciences)		P3	48	Dr. Ryan Paerl (College of Sciences)	Investigating the Relationship Between Proteins and Vitamin B1: Does Protein Binding Impact Vitamin Acquisition in Model Marine Bacteria?
Rachel Pennebaker (College of Agriculture and Life Sciences)	Linh Phan (College of Sciences)	P1	46	Dr. Ross Sozzani (College of Agriculture and Life Sciences) Dr. Imani Madison (College of Agriculture and Life Sciences)	Investigating Possible Solutions to Phosphate Starvation in *Arabidopsis thaliana*
Sheena Perdiz (College of Agriculture and Life Sciences)	Anamitraa Dutta (College of Natural Resources)	P1	47	Dr. Erin McKenney (College of Agriculture and Life Sciences)	Gatekeeping of the Conservation Sciences
Jacob Perry (College of Sciences)		P2	46	Dr. Yi Xiao (College of Sciences) Dr. Juan Canoura (College of Sciences) Mr. Obtin Alkhamis (College of Sciences)	Analysis of aptamer exonuclease digestion products with urea-PAGE
Whitney Pesce (College of Agriculture and Life Sciences)		O1	3285	Dr. Alejandra Huerta (College of Agriculture and Life Sciences) Dr. Katherine D'Amico-Willman (College of Agriculture and Life Sciences) Dr. José Ascencio-Ibañez (College of Agriculture and Life Sciences)	Exploring Genetic Mechanisms Underlying Susceptibility to Bacteriophage Infections in the Plant Pathogenic Bacteria, *Xanthomonas arboricola pv. pruni*
Carlos Petzold (College of Sciences)	Alexa Russell (College of Sciences) Liam Stuart (College of Sciences)	P2	47	Dr. Emily Griffith (College of Sciences) Dr. Stephany Dunstan (College of Sciences)	Student Intervention Analysis Based on First Generation Status

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Alex Pezold (College of Natural Resources)	Paige Collins (College of Natural Resources) Matthew Moore (College of Natural Resources) Shrusti Patel (College of Natural Resources) Alex Fucci (College of Natural Resources)	P2	48	Dr. Elizabeth Guthrie Nichols (College of Natural Resources)	CAFO Lagoon Breach on E. coli and Coliform in Surface Waters
Sydney Pollock (College of Natural Resources)	Darius Ledbetter (College of Natural Resources) Zach Trainor (College of Natural Resources)	P3	66	Dr. Jennifer Richmond-Bryant (College of Natural Resources)	Association of PM2.5 concentrations with burn events at an open-burn/open-detonation hazardous waste facility in Colfax, Louisiana
Hoke Pollock (College of Agriculture and Life Sciences)	Sydney Johnson (College of Agriculture and Life Sciences) Karlyn Matheson (College of Agriculture and Life Sciences) Hannah Potthoff (College of Agriculture and Life Sciences) Riley Smith (College of Agriculture and Life Sciences)	P1	48	Dr. Michael Goshe (College of Agriculture and Life Sciences)	Novel Treatment and Detection Methods for Protein Aggregate-Associated Neuropathologies

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Deana Poteat (College of Agriculture and Life Sciences)	Amit Sen (College of Agriculture and Life Sciences) Sophia Chamberlain (College of Humanities and Social Sciences)	P2	49	Dr. Danielle Lin Hunter (College of Natural Resources) Dr. Caren Cooper (College of Natural Resources)	Relationship Between Household Location and Risk of Lead Contamination in North Carolina
Jeff Powell (College of Sciences)		P4	43	Dr. Brian Space (College of Sciences) Dr. Adam Hogan (College of Sciences)	GPU-Based Implementation of Many Body Van der Waals Interactions
Prerana Prabhushankar (College of Agriculture and Life Sciences)		P1	50	Dr. Gabriel Harris (College of Agriculture and Life Sciences) Dr. Lynette Johnston (College of Agriculture and Life Sciences) Mr. Jason Frye (College of Agriculture and Life Sciences)	Development of Coffee-Based Toothpaste to Inhibit Growth of Cavity-Promoting S. mutans
Annika Pratt (College of Sciences)		P1	51	Dr. Whitney Jones (College of Sciences) Dr. Christopher Halweg (College of Sciences)	Influence of a 3D Printed Chromosome Model on Student Understanding of the Processes of Mitosis and Meiosis
Fiona Prestemon (College of Humanities and Social Sciences)	Miles Eustis (College of Humanities and Social Sciences) Gouri Kallambella (College of Sciences) Carinah Townsend (College of Humanities and Social Sciences)	P3	49	Dr. Kelly Lynn Mulvey (College of Humanities and Social Sciences) Ms. Christina Marlow (College of Humanities and Social Sciences)	Age-Related Differences in Children's Reasoning and Justification of Rule-Breaking

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Sydney Preston (College of Sciences)		P1	52	Dr. Robert Smart (College of Sciences)	Discovery and Mapping of a Long Noncoding RNA that is DNA Damage-Inducible and Suppresses p53-Mediated Apoptosis
Aly Prockter (College of Sciences)		P2	50	Ms. Jessica Stevens (College of Sciences) Dr. Hein Tran (College of Sciences)	Redefining the Model for Chemical Absorption in Human Skin
Sarah Rachita (College of Natural Resources)		P4	44	Dr. Elizabeth Nichols (College of Natural Resources) Dr. Ayse Ercumen (College of Natural Resources) Ms. Hayden Rudd (College of Natural Resources)	Using suspect-screening HRMS to assess organic chemical removal by low-cost point of use filters
Roshan Raju (College of Engineering)		P4	45	Dr. Mengmeng Zhu (Wilson College of Textiles)	Importance of generation of wind power energy
Sahana Ramamurthy (College of Engineering)		O3	3210	Dr. Ann Von Holle (National Institute of Environmental Health Sciences) Dr. Clarice Weinberg (National Institute of Environmental Health Sciences)	Association between Body Iron Status and Biological Aging
Dan Richard (College of Agriculture and Life Sciences)		P3	50	Dr. Arion Kennedy (College of Agriculture and Life Sciences) Ms. Mareca Lodge (College of Agriculture and Life Sciences)	Inhibition of the pentose phosphate pathway leads to increased inflammation in fructose-treated Immortalized Kupffer Cells

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Lauren Richards (College of Humanities and Social Sciences)		P1	53	Dr. Laura Widman (College of Humanities and Social Sciences) Ms. Julia Brasileiro (College of Humanities and Social Sciences)	Sexual Health Programs for Parents of Youth with Intellectual Disabilities: A Review
Nicholas Ristaino (College of Humanities and Social Sciences)		P3	51	Dr. Mark Nance (College of Humanities and Social Sciences)	De-Risking in Foreign Embassies
Zoe Roberts (College of Agriculture and Life Sciences)	Leah Hohman (College of Agriculture and Life Sciences) Mitchell Langston (College of Agriculture and Life Sciences)	P2	51	Dr. Matthew Allan (College of Agriculture and Life Sciences) Dr. Fernanda Santos (College of Agriculture and Life Sciences) Ms. Megan Watson (College of Agriculture and Life Sciences)	Methods to Delay Beta-carotene Degradation in Oven-Dried Orange-Fleshed Sweet Potatoes
Sarah Madeline Rodan (College of Humanities and Social Sciences)		P3	52	Dr. Kelly Lynn Mulvey (College of Humanities and Social Sciences) Dr. Channing Matthews (University of Virginia)	Identifying the most impactful factors of Informal STEM Learning Sites on student interest and understanding of STEM fields
Courtney Rogers (College of Engineering)		P4	46	Dr. Yevgeny Brudno (College of Engineering) Ms. Sharda Pandit (College of Engineering)	Improving Multifunctional Alginate Scaffolds for T-cell Engineering and Release (MASTER) for use in CAR-T Cell Cancer Therapeutics

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Lexi Roof (College of Agriculture and Life Sciences)	Bailey Jones (College of Agriculture and Life Sciences) Savannah Lindsey (College of Agriculture and Life Sciences) Joshua Miller (College of Agriculture and Life Sciences) Leia Neely (College of Agriculture and Life Sciences) Margaret Edel (College of Agriculture and Life Sciences) Alexis Oliver (College of Agriculture and Life Sciences)	P1	54	Dr. Suzanne Leonard (College of Agriculture and Life Sciences)	Development of precise milk feeding system for sows
Oliver Roper (College of Sciences)		P4	47	Dr. Elsa Youngsteadt (College of Agriculture and Life Sciences) Ms. Melina Keighron (College of Agriculture and Life Sciences)	Effects of Habitat Management on Bee Pollination Efficiency in Urban Gardens
Nicole Garcia (College of Natural Resources)		P4	48	Dr. Steph Jeffries (College of Natural Resources)	Impact of Impervious Surface on Tree Growth at NC State
Barrett Rose (College of Sciences)	Kaitlin Litwin (College of Sciences)	P1	55	Dr. Astrid Schnetzer (College of Sciences) Dr. Scott Belcher (College of Sciences) Dr. Craig Harms (Center for Marine Sciences and Technology) Dr. Kady Lyons (Georgia Aquarium)	Marine Cyanotoxin Microcystin in Sea Turtles, Alligators, and Sharks

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Kaya Rosselle (College of Agriculture and Life Sciences)		P2	52	Dr. Lisa Paciulli (College of Sciences) Ms. Rebecca Olson (College of Sciences) Ms. Tiffany Brocco (College of Sciences)	Aye-aye (*Daubentonia madgascariensis*) Infant Nursing During the First Days of Life
Onyx Royal (College of Humanities and Social Sciences)		P3	53	Dr. Amanda Kennell (College of Humanities and Social Sciences)	Anime and Cross-cultural Adaptations of Ancient China in the Contemporary Japanese Imagination
Pierson Rucker (College of Agriculture and Life Sciences)		P3	54	Dr. Thomas Makris (College of Agriculture and Life Sciences) Ms. Sydney Skirboll (College of Agriculture and Life Sciences) Mr. Han Phan (College of Agriculture and Life Sciences)	p-aminobenzoic acid synthesis and host-cell apoptosis by CADD from *Chlamydia trachomatis*
Srigouri Rudravaram (College of Engineering)		P3	55	Dr. Ryan Sartor (College of Agriculture and Life Sciences) Ms. Alice Chesley (College of Agriculture and Life Sciences)	Variety Determination of Duckweed by Spectral Fingerprinting
Frederick Russell (College of Natural Resources)		P2	53	Dr. Christopher Moorman (College of Natural Resources) Dr. Nathan Hostetter (College of Agriculture and Life Sciences) Ms. Mikiah Carver (College of Agriculture and Life Sciences)	Factors influencing white-tailed deer birth-site selection along an urban-rural gradient
Hadie Sabbah (College of Engineering)		P2	54	Dr. Venkat Narayanaswamy (College of Engineering)	Morphing Wings In Supersonic Conditions

Lead Presenter	Co-Presenters	Session	Room/ Poster	Mentor(s)	Project Title
Yamini Saggurthi (College of Sciences)		P3	56	Ms. Isabella Livingston (College of Sciences) Dr. Matthew Breen (College of Veterinary Medicine)	ISOLATING VECTOR-BORNE DISEASES IN MOSQUITOES
Gioia Salamido (College of Agriculture and Life Sciences)		P4	49	Dr. Imara Perera (College of Agriculture and Life Sciences) Ms. Aurora Toennisson (College of Agriculture and Life Sciences)	Lunar Gardens? Evaluating Plant Growth Promotion by Space Flight Isolated Microbes
Olivia Samuelson (College of Agriculture and Life Sciences)		P1	56	Dr. Carrie Thomas (College of Sciences) Dr. Gregory Lewbart (College of Veterinary Medicine)	Ocular Health of Captive Fish
Jayson Sanchez (College of Agriculture and Life Sciences)		P1	57	Dr. Trino Ascencio-Ibáñez (College of Agriculture and Life Sciences)	Implementation of Virus induced gene silencing vectors for cell cycle analysis in geminivirus infected *Arabidopsis thaliana* Col-0
Ryan Santiago (College of Sciences)		P4	50	Dr. Joshua Pierce (College of Sciences)	Rational Synthesis of Clausenamide and Pyrrolidine Dione Derivatives
Katie Savant (College of Natural Resources)	Kyle Scavo (College of Natural Resources) Dominic Zecca (College of Natural Resources) Harrison Skidmore (College of Natural Resources)	P2	55	Dr. Elizabeth Guthrie Nichols (College of Natural Resources)	Impact of CAFO Lagoon Breach on Nutrients in Surface Waters

Lead Presenter	Co-Presenters	Session	Room/ Poster	Mentor(s)	Project Title
Emma Scardina (College of Sciences)	Mario Hernandez (College of Sciences)	P2	56	Dr. Yi Xiao (College of Sciences) Mr. Obtin Alkhamis (College of Sciences)	Identifying Optimal Dyes for Aptamer-Based Dye Displacement Assays
Callan Schroeder (College of Sciences)		P3	57	Dr. Seth Kullman (College of Sciences) Ms. Morgan Ritter (College of Sciences)	Disruption of Vitamin D receptor signaling impacts ASD risk gene expression
Gabrielle Schuh (College of Sciences)		P2	57	Dr. Patricia Estes (College of Sciences)	The Single-minded Gene Affects Feeding Behavior in *Drosophila melanogaster*
Izabella Sciora (College of Engineering)		P4	51	Dr. Venkateswaran Narayanaswamy (College of Engineering) Mr. Abinash Sahoo (College of Engineering)	Design and Development of a Microgravity Capable Drone Equipped with Payload
Madeline Scott (College of Sciences)		P4	52	Dr. Heather Patisaul (College of Sciences) Ms. Stacy Schkoda (College of Sciences)	Effect of Developmental Flame Retardant Exposure On Oxytocin Receptor Expression in the Rat Brain
Nikole Sena Carneiro (College of Agriculture and Life Sciences)	Zade Freij (College of Agriculture and Life Sciences) Catherine Lawrence (College of Agriculture and Life Sciences) Caidin Biggers (College of Agriculture and Life Sciences)	P4	53	Dr. Sebastian Wolfrum (College of Agriculture and Life Sciences) Mr. Mark Stevens (Novozymes)	Utilization of Raw Barley and Exogenous Enzymes in Low-Fermentable Wort
Delaney Serpan (College of Natural Resources)		P3	58	Dr. Kelly Oten (College of Natural Resources)	Phenology of Elm ZIgzag Sawfly in North Carolina

Lead Presenter	Co-Presenters	Session	Room/ Poster	Mentor(s)	Project Title
Sarah Sessoms (College of Agriculture and Life Sciences)	Jess Schinsky (College of Sciences) Dani Carter (College of Agriculture and Life Sciences) Beatrice Eddy (College of Agriculture and Life Sciences) Katelyn Simkins (College of Agriculture and Life Sciences) Katy Hagopian (College of Agriculture and Life Sciences) Madison Manzo (College of Agriculture and Life Sciences) Alexis Oliver (College of Agriculture and Life Sciences)	P1	58	Dr. Shweta Trivedi (College of Agriculture and Life Sciences)	Training Undergraduates for Fieldwork Research in a South African Wildlife Conservation Study Abroad
Beatrice Sewell (College of Agriculture and Life Sciences)	Molly Reid (College of Agriculture and Life Sciences)	P1	59	Dr. Michael Goshe (College of Agriculture and Life Sciences) Dr. Robert Rose (College of Agriculture and Life Sciences)	The Development of a Recombinant Protein Expression System for Bovine Serum Albumin to Characterize the Mechanism of Disulfide-Mediated Amyloid Formation
Ayushma Sharma (College of Sciences)		P4	54	Dr. Jonathan Hall (College of Sciences) Ms. Emma E.Tobin (College of Sciences) Ms. Sophia C. Gray (College of Sciences) Mr. Jonathan R. Hall (College of Sciences)	The Loss of CCAAT Enhancing Protein β (C/EBPβ) Activates Caspase-mediated Regulated Cell Death in Response to UVB induced DNA Damage
Robin Shin (College of Engineering)		P2	58	Dr. Mark Pankow (College of Engineering)	Impact Shape Sensing Using Triaxial Accelerometers

Lead Presenter	Co-Presenters	Session	Room/ Poster	Mentor(s)	Project Title
Logan Shreve (College of Humanities and Social Sciences)		O1	3221	Dr. Dana Kotter-Gruehn (College of Humanities and Social Sciences)	Perceived Availability, Accessibility and Effectiveness of Support Services on NC State's Campus
Dylan Snarr (College of Engineering)		P2	59	Dr. Mark Pankow (College of Engineering) Mr. Shahriar Chowdhury (College of Engineering)	Bio-Based Composites for Marine Hydrokinetic Energy Generation off the North Carolina Coast
Carlin Spence (College of Humanities and Social Sciences)		P1	60	Dr. Laura Widman (College of Humanities and Social Sciences)	Examining the Connection Between Parental Monitoring and Depressive Symptoms in LGBTQ+ Youth
Shaan Stephen (College of Engineering)		P2	60	Dr. Venketeswaran Narayanaswamy (College of Engineering)	Development and Implementation of Distortion Generators in High Speed Flows
Chris Strang (College of Sciences)		P3	59	Dr. Karl Wegmann (College of Sciences)	Analysis of suspended sediments upstream, within, and below the Rocky Branch beaver impoundment, NC State Campus, Raleigh, NC.
Anna Stuffelbeam (Wilson College of Textiles)		O2	3222	Dr. Traci Lamar (Wilson College of Textiles)	Textile Product Development Using Wool from Heritage Sheep Breeds
Eythan Suber (College of Engineering)		P4	55	Dr. De-Yu Xie (College of Agriculture and Life Sciences) Ms. Bethany Mostert (College of Agriculture and Life Sciences)	The Optimization of CPR1 and CPR2 Expression for Artemisinin Production
Nico Swanson Villares (College of Sciences)		P4	56	Dr. David Buchwalter (College of Sciences)	The Mass Rearing of Freshwater Diatoms for the Development of a Mayfly Diet

Lead Presenter	Co-Presenters	Session	Room/Poster	Mentor(s)	Project Title
Katie Taran (College of Engineering)		P2	61	Dr. Jacqueline Cole (College of Engineering) Ms. Kyla Bosh (College of Engineering)	Gait Impairment in a Rat Model of Brachial Plexus Birth Injury
Lauren Teague (College of Engineering)		P3	60	Dr. Fanxing Li (College of Engineering) Dr. Runxia Cai (College of Engineering)	Optimization of Perovskite Oxides for Thermochemical Energy Storage Using a High-Throughput Combinatorial Approach
Suzanne Teague (College of Natural Resources)		P4	57	Dr. Rajan Parajuli (College of Natural Resources) Dr. Stephanie Chizmar (USDA Forest Service) Dr. Robert Bardon (College of Natural Resources)	Economic Significance of Forestry in North Carolina Counties
Anna Thomas (College of Agriculture and Life Sciences)	Chloe Patterson (Wilson College of Textiles)	P1	61	Dr. Natalie Cooke (College of Agriculture and Life Sciences) Dr. Carolyn Dunn (College of Agriculture and Life Sciences) Ms. Catherine Hill (College of Agriculture and Life Sciences)	Development of “Cooking Essentials: Ingredients for Life” Curriculum Facilitator Training and Self-Efficacy Survey
Steven Thompson (College of Engineering)		O2	3285	Dr. Jacqueline Cole (College of Engineering) Dr. Katherine Saul (College of Engineering) Ms. Kyla Bosh (College of Engineering)	Understanding Paw Preference Associated with Brachial Plexus Birth Injury

Lead Presenter	Co-Presenters	Session	Room/ Poster	Mentor(s)	Project Title
Asa Thurnau (Poole College of Management)		O3	3210	Professor Autumn Belk (University College - DASA)	The Psychological Effects of Dancing in a Studio Environment on Adolescents
Olivia Townsend (College of Humanities and Social Sciences)		P4	58	Dr. Katherine Charron (College of Humanities and Social Sciences)	Grassroots Advocacy Against the Lack of Equitable Education in Rural North Carolina
Meric Trombley (College of Sciences)		P4	59	Dr. Caroline Proulx (College of Sciences) Mr. Maxwell Bowles (College of Sciences)	Investigating The Metal Binding Properties of Azapeptides
Preston Truett (College of Natural Resources)		P4	60	Dr. Robert Jetton (College of Natural Resources)	Response of Mushroom Fructification to Selected Forest Disturbances
Izzy Van Dyk (College of Natural Resources)	Elizabeth Mitchell (College of Agriculture and Life Sciences)	P3	61	Dr. Erin McKenney (College of Agriculture and Life Sciences)	Conservation of Endemic Species in NC
Jude Vanne (College of Humanities and Social Sciences)		O3	3221	Dr. Kathryn Grossman (College of Humanities and Social Sciences)	Reviving Tom Parker's Life Work
Max Velasco (College of Engineering)	Luke Shuler (College of Engineering) Matthew Nash (College of Engineering) Jendayi Brown (College of Engineering)	P2	62	Dr. Scott Palmtag (College of Engineering)	24-month Cycle Transition and Optimization for a 4-Loop PWR Core
Leslie Vespermann (College of Humanities and Social Sciences)		P2	63	Dr. Paige Averett (College of Humanities and Social Sciences)	Three Women Navigating Sexual Identity, Compulsory Heterosexuality, and Hypersexuality: A Case Study Across Generations

Lead Presenter	Co-Presenters	Session	Room/Poster	Mentor(s)	Project Title
Jennie Vo (College of Humanities and Social Sciences)		P4	61	Mr. Dylan Hewitt (College of Humanities and Social Sciences) Dr. Yingchen He (College of Humanities and Social Sciences)	Web Accessibility: A Review of U.S. State and Territory COVID- 19 Websites for Visually-Impaired Users
Lainey Volz (Wilson College of Textiles)		P1	62	Dr. Anne Porterfield (Wilson College of Textiles) Dr. Janie Woodbridge (Wilson College of Textiles)	Bringing Digital Fashion Designs Into Reality
Farrah Waddell (College of Sciences)		P3	62	Dr. Lin Walker (College of Agriculture and Life Sciences) Ms. Mary Mendoza (College of Agriculture and Life Sciences)	Building AMR Profiles of *Campylobacter jejuni* Isolates
Ria Wadhavkar (College of Sciences)	Abhay Kothari (College of Sciences) George Katsoulis (College of Sciences)	P2	64	Dr. Emily Griffith (College of Sciences) Dr Stephany Dunstan (College of Sciences)	Parental Education Inequality in Graduate Completion Rates
Sara Wall (College of Natural Resources)		P3	63	Dr. Catherine Davis (College of Sciences)	Foraminifera Distribution and Associated Fauna from Coastal Carolina Plankton Tows
Joshua Wang (College of Sciences)	Gabe Milburn (College of Sciences) Kevin Xu (College of Sciences)	P2	65	Dr. Emily Griffith (College of Sciences) Dr Stephany Dunstan (College of Sciences)	Does GRE Score Relate To Graduate Student's Success

Lead Presenter	Co-Presenters	Session	Room/Poster	Mentor(s)	Project Title
Carter Wang (College of Engineering)		P4	62	Dr. Katherine Saul (College of Engineering) Mr. Christopher Jadelis (College of Engineering)	Upper Arm Muscle Activation Variability in Stroke During Reaching Tasks
Samantha Watson (College of Engineering)		O2	3210	Dr. Matthew Fisher (College of Engineering) Mr. Zachary G. Davis (College of Engineering)	The Effect of Incorporating Decellularized ECM in Direct-write, Near-field Electrospun Gelatin Solution On Fiber Stiffness
Jada West (College of Natural Resources)		P4	63	Dr. Angela Allen (College of Natural Resources)	The Continual Analysis of the Effects of Poor Infrastructure and Environmental Justice on the Hydrologic Systems of the Walnut Creek
Riley Westman (College of Natural Resources)		P3	64	Dr. Katherine Martin (College of Natural Resources)	Evaluating Water Quality in Constructed Ponds and Wetlands on Centennial Campus
Hannah Widdowson (University College - DASA)		P4	64	Dr. Skylar Hopkins (College of Agriculture and Life Sciences) Dr. Kenzie Pereira (College of Agriculture and Life Sciences)	Parasitism and Disease in North American Snakes
Em Wilds (College of Agriculture and Life Sciences)		P4	65	Dr. Melanie Simpson (College of Agriculture and Life Sciences) Dr. Brenna Zimmer (College of Agriculture and Life Sciences)	RSK3 Turnover Time in Castration-Resistant Prostate Cancer Cells

Lead Presenter	Co-Presenters	Session	Room/ Poster	Mentor(s)	Project Title
Lia Willcoxon (College of Humanities and Social Sciences)		O3	3210	Dr. Seth Murray (College of Agriculture and Life Sciences) Dr. Scott Madry (University of North Carolina at Chapel Hill)	Preserving the Past for the Future: Digitizing 40+ Years of Research Data Collected from Burgundy, France
Chloe Williams (College of Agriculture and Life Sciences)		P3	65	Dr. Susana Milla-Lewis (College of Agriculture and Life Sciences)	Overview of the NCSU Turfgrass Breeding and Genetics Program
Kody Willingham (College of Sciences)		P1	63	Dr. Erin McKenney (College of Sciences) Ms. Tisha Mentnech (NC State University Libraries)	The Implementation of Indigenous Land Practices
Kris Wilson (College of Sciences)		O1	3210	Dr. Marcia Gumpterz (College of Sciences)	Investigating Experiences of Historically-Underrepresented Minority Graduate Students
Casey Wofford (College of Natural Resources)		P1	64	Dr. Jodi Forrester (College of Natural Resources)	Establishment Patterns of Carolina Hemlock Ecosystems in the Southern Appalachians
Brandon Woodley (College of Agriculture and Life Sciences)	Benjamin Heckmann (College of Agriculture and Life Sciences) Riley Adams (College of Agriculture and Life Sciences)	P1	65	Dr. John Sheppard (College of Agriculture and Life Sciences) Mr. Eric Gibble (Goose and the Monkey Brewhouse)	Native Yeast Isolation and Utilization in Beer Production
Angela Yao (College of Sciences)		P1	66	Dr. Wei-Chen Chang (College of Sciences) Mr. Lide Cha, (College of Sciences)	Identification of Cyclopropanation Catalyzed by Fe/2OG Enzymes
Joey Zhao (Wilson College of Textiles)		P2	66	Dr. Januka Budhathoki-Uprety (Wilson College of Textiles) Ms. Hannah Dewey (Wilson College of Textiles)	Chirality Purification of Single-Walled Carbon Nanotubes for Nanosensor Development

ABSTRACTS

ORAL SESSION 1 (O1) | TUESDAY, APRIL 25 | 10:30 am - 11:15 am

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Generational Status in Black Immigrants and Its Relationship to Emotional Eating

Author(s): **Priscilla Boaheng**
Mentor(s): **Dr. Vanessa Volpe**
Room: **3210**

While there is a broader reservoir of literature on how Black individuals at large respond to systemic racism through emotional eating, there is not much existing literature about how Black immigrants respond to stress-factors related to nuanced aspects of discrimination through emotional eating. It is pertinent to reject the idea, especially in research, that the experience of Black people is monolithic. For Black immigrants, the experiences of anti-Black racism can intersect with the forces of oppression of xenophobia while they are acculturating to the United States. This presentation will discuss the literature review process that allowed us to define generational and nativity status of Black immigrants and the associations that these varying statuses have with emotional eating.

The Black Male Experience and Toxic Masculinity in the Black Community: Testimonies from The Black Man

Author(s): **Tiara Caldwell**
Mentor(s): **Dr. Michaela DeSoucey**
Room: **3210**

This study aims to conduct an analysis regarding toxic masculinity and Black male fragility that manifests through the Black-American community. Toxic masculinity is a concept that historically has not been clearly defined in previous studies, therefore, an overview, background and theoretical framework is necessary for creating a general understanding of the portrayal of toxic masculinity in the Black American community. This study explores previous research regarding toxic masculinity and its impact on the American community at large along with the more particular experience as identified by black males in order to determine potential explanations

for the notion that black men are at higher risk of being predisposed to toxic masculinity and thus, more likely to become perpetrators of the concept in their adult life. This thesis also does this by analyzing six narratives involving toxic masculinity and black male fragility in order to present an analysis of the cyclical process of toxic masculinity and its manifestations in black men in America along with those implications onto the entirety of society.

Investigating Experiences of Historically-Underrepresented Minority Graduate Students

Author(s): **Kris Wilson**
Mentor(s): **Dr. Marcia Gumpterz**
Room: **3210**

We are interested in identifying the factors that are most associated with student retention in doctoral programs, particularly students who identify as a historically-underrepresented minority (URM) group, as they often lack the same resources and support systems as their peers. An anonymous survey was conducted by The Alliances for Graduate Education and the Professoriate (AGEP-NC) to investigate experiences of URM doctoral students in the universities that make up the AGEP-NC Alliance: North Carolina A&T (NC A&T), North Carolina State University (NCSU), and University of North Carolina at Charlotte (UNCC). The research question was measured via students' level of agreement to the statement, "I would recommend this department to other students or postdocs" with responses ranging from "Strongly Disagree (1)" to "Strongly Agree (5)". Analytical methods include Cochran-Mantel-Haenszel tests for association and linear regression models to predict students' responses to the research question. The two most important predictors–regardless of university–are the level of trust students have in their department and whether students feel their department fosters a welcoming environment. Further analysis could be done on the relationship between faculty and student relationships as it relates to historically underrepresented minorities.

Anxiety in the University

Author(s): **Abigail Barfield**
Mentor(s): **Dr. Joseph Brazel**
Room: **3221**

My focus will be on different coping strategies used by students with generalized anxiety disorder. Mental health has been a major topic of discussion in today's world

as of late. Knowing that anxiety can become paralyzing and debilitating, my goal is figure out the best ways to overcome anxiety in order attend university classes, events, and live an overall productive lifestyle. While I don't have a scale to exactly measure the outcomes, successful strategies will be based on number of positive interactions with others, potentially grades in classes (however this is still up for debate), and how often a participants anxiety arises. This research project is at the very beginning stages, and has not truly been started yet, as I am still putting together criteria for the research and developing surveys to obtain participants.

Challenges and Opportunities for Agroforestry Practitioners to Participate in State Preferential Property Tax Programs for Agriculture and Forestry

Author(s): **Mimi Marriott, Suzanne Teague**
Mentor(s): **Dr. Rajan Parajuli, Dr. Stephanie Chizmar**
Room: **3221**

"Agroforestry, which involves the cultivation and conservation of trees alongside agricultural practices, has the potential to mitigate the impacts of climate change and support conservation efforts. However, agroforestry practitioners face significant challenges in obtaining economic relief for their land due to the narrow focus of state-level preferential property tax programs (PPTP). This is particularly problematic as some eligibility requirements in PPTPs could be obstacles for the enrollment of agroforestry lands that could offer multiple goods and ecosystem services on a small scale.
This study examines relevant tax manuals and related documents to determine whether agroforestry lands are eligible for PPTP in the United States. We reviewed and coded the identified publications according to their compatibility with characteristics of agroforestry practices. Our preliminary findings suggest that PPTPs often overlook the specifics of agroforestry practices, thereby impeding landowners from incorporating it into their practices. In addition, the inclusion of agroforestry in PPTP programs frequently lacks specificity, rendering the necessary policy clarification a challenging undertaking.
This study provides guidelines for policymakers to make informed decisions regarding PPTP enrollment, as well as recommendations for adapting property tax assessment programs to better accommodate agroforestry systems. Additionally, this study discusses the relationship between current land-use systems and local policy and provides easily accessible documentation for landowners interested in enrolling in PPTP. "

Perceived Availability, Accessibility and Effectiveness of Support Services on NC State's Campus

Author(s): **Logan Shreve**
Mentor(s): **Dr. Dana Kotter-Gruehn**
Room: **3221**

Recent conversations on university campuses across the country have focused on mental health and support services (e.g., advising) offered to students. Although usage statistics can shed light on how many students use support services, less is known about how students actually perceive the availability of such services and the reasons for using them or not. The present study examined the perceived availability, accessibility, and effectiveness of academic, career, and mental health services at NC State University. Data was collected from approximately 300 undergraduate students who completed a quantitative survey. Preliminary data suggests a need for increased advertising of support services and more accessibility for current students. Results of this study could be used to open the conversation among all stakeholders to improve knowledge about, usage of, and access to support services.

Optimization of CRISPR Cas 9 Delivery Using Electroporation

Author(s): **Alexia Cash**
Mentor(s): **Dr. Mike Sano, Mr. Robert Williamson**
Room: **3222**

The field of genetic engineering has experienced a renewed interest in DNA based approaches for drug/vaccine delivery, resulting in greater investigation into the field. However, clinical translation of these technologies have been hindered by the need to use viral vectors to deliver genetic payloads. Recently discovered Clustered Regularly Interspaced Palindromic Repeats (CRISPR / CAS9) enables the precise delivery of DNA to target locations within the genome but, viral delivery of these genetic tools remains a challenge as multiple viruses must be used to deliver the donor DNA, guide RNA, and Cas9 protein required for a successful edit. These viruses have the potential to stimulate unwanted and unpredictable immune responses so, in its place, pulsed electric fields can be used to deliver CRISPR payloads to skin and muscle tissue. Administering the correct pulse electric field creates pores in the membrane of a cell, via electroporation, without killing the cell entirely. There are three main components that must be transfected or brought into a target cell through the expanded pores for gene editing to take place: the donor plasmid, the guide RNA, and the CAS 9 molecule. Flow cytometry was used to identify protocols which maximized expression of marker proteins while minimizing cytotoxicity. The

aim of this work is to discover one common protocol that produces optimal viability and transfection for all three components.

Chitosan-Glycerol Injectable Hydrogel for Intratumoral Delivery of Immunotherapeutics

Author(s): **Robert Kobrin**
Mentor(s): **Dr. David Zaharoff, Ms. Siena Mantooth**
Room: **3222**

"Localized cancer therapeutic delivery provides several advantages over systemic delivery, including increased retention and reduction of systemic side effects. In particular, intratumoral injections are an advantageous delivery method for cancer treatment because they maximize therapeutic concentration while limiting systemic exposure. However, the dense extracellular matrix and higher-pressure tumor environment severely limit local retention, as less viscous solutions often leak out of an injected tumor. Hydrogel-based delivery systems address this limitation through resistance to shear stress and hence improve retention at the tumor site, allowing for the long-term, controlled release of therapeutics.
A novel chitosan-glycerol injectable hydrogel was developed to improve therapeutic retention for intratumoral delivery. Chitosan, a polysaccharide derived from crustaceans, is used in hydrogel creation due to its availability and biocompatibility. A range of glycerol:chitosan ratios, from 5 to 95% glycerol, were tested to determine the optimal gelation conditions. PBS was incorporated into the glycerol:chitosan solution, which was then raised to a pH of 7.8 with NaOH. After centrifugation at 10,000 rpm for 5 minutes, chitosan-glycerol gel was formed. Glycerol most significantly impacted gelation conditions independent of chitosan concentration, with gelation occurring between 70-85% relative volume glycerol. The gel proved to be injectable through a 25-gauge needle into agar-based tumor phantoms. Dispersion, load retention, and release patterns of model drugs were observed. The hydrogel was then exposed to a variety of cell and protein immunotherapeutics to determine optimal use cases. Due to its increased retention time and injectability, chitosan-glycerol gel offers an effective platform for intratumoral delivery of immunotherapeutics."

Horse owner's survey regarding equine feeding management post colic surgery

Author(s): **Caitlyn Cuddy**
Mentor(s): **Dr. Shannon Pratt-Phillips**
Room: **3285**

Nutritional care following colic surgery may be important to help prevent further digestive issues and prolong the life of the equine patients. The objective of this study was to determine how horses are managed nutritionally following colic surgery. Upon approval of the University's Institutional Review Board, an anonymous survey was created using the program Qualtrics. The survey recorded dietary information before and after surgery as well as where they received their nutritional recommendations. A list of all equine colic surgeries performed at the NC State University vet school since 2019 was obtained. 81% of respondents were happy with their horse's overall appearance and performance prior to the colic episode. Approximately 48% of the living horses were back to their pre-colic workload at the time of the survey. Several owners (21%) reported receiving minimal nutritional instructions at discharge, while others were encouraged to change their horse's hay or pasture (25%), grain (41%) and/or add a supplement (48%). Seventy percent of owners reported gaining nutritional advice from sources outside the surgical clinic, 73% of which spoke with their regular veterinarian, while others consulted friends, online sources, and nutritionists. The majority of supplements implemented by owners were those designed for gastrointestinal health (eg. probiotics, psyllium, etc.). At the time they completed the survey, 29.6% of respondents reported at least one instance of colic following the horse's discharge. Based on the number of respondents seeking outside advice, the results imply that owners may benefit from professional nutritional resources following their horse's surgery.

Exploring Genetic Mechanisms Underlying Susceptibility to Bacteriophage Infections in the Plant Pathogenic Bacteria, Xanthomonas arboricola pv. pruni

Author(s): **Whitney Pesce**
Mentor(s): **Dr. Alejandra Huerta, Dr. Katherine D'Amico-Willman, Dr. José Ascencio-Ibañez**
Room: **3285**

Bacterial plant pathogens, including Xanthomonas arboricola pv. pruni (Xap), contribute to annual crop losses. Bacteriophage (phage), viruses that infect bacteria, are being considered to control bacterial pathogens. However, some bacteria show resistance to phage. Seven Xap strains varying in susceptibility to phage were sequenced to generate whole genomes. Four genes are present only in the

susceptible strains. Our objective is to test whether these genes contribute to phage susceptibility by generating mutant Xap strains no longer carrying the target genes. We hypothesize the mutant strains will be less susceptible to phage infection. To generate a Xap mutant, a construct was designed containing an antibiotic marker which confers resistance to kanamycin. This construct will replace the target gene in the Xap genome to test its effect on phage susceptibility. Primers were designed for the regions upstream and downstream of the target gene in Xap and for the kanamycin marker-containing plasmid to generate the inserts for our transformation vector by PCR amplifying each region .These products were digested, purified, and ligated into the digested destination plasmid, prk415. E. coli was transformed with the synthesized plasmid. An empty plasmid without a kanamycin marker was used as a negative control. However, following transformation, all E. coli strains, including the negative control, grew on media containing kanamycin. The resistance in the empty plasmid suggests contamination in the transformation process, most likely in the prk415 stock. An uncontaminated prk415 stock will be acquired to continue the objective of this project to examine genes underlying phage-bacteria interactions.

Investigating the link between neuronal conserved non-coding element variance and habitat preference in Lake Malawi cichlids

Author(s): **Maddy Arena**
Mentor(s): **Dr. Reade Roberts**
Poster: **1**

Across teleost fishes, there has been an observed non-coding element (CNE) within a conserved 10-base sequence (AACATATTCC) located in a cluster of neuronal cell adhesion molecule (nCAM) genes within the Actinopterygii class, including in most species of cichlids. Previous analysis has revealed variance in the sequence for two species of cichlids within the Haplochromine subfamily– a heterozygous CNE A/G allele at the second to last codon in Metralima aurora and a homozygous G allele at the CNE in Aulonocara baenschi, both deviating from the conserved homozygous A allele. These deviations have been observed to potentially correlate with habitat preference and movement, with the presence of the A allele at the CNE correlating to a sheltered, rocky habitat preference and quicker movement and the presence of the G allele at the CNE correlating to an open sandy habitat preference and slower movement, with the heterozygous A/G allele presence correlating to an intermediate phenotype. To test this hypothesis, we conducted 48 behavioral assays to assess the habitat preference between rocky and sandy habitats of 10 Lake Malawi cichlids, characterized by African lineage in the subfamily Pseudocrenilabrinae. These species included previously tested species M. aurora and A. baenschi and untested species Pseudotropheus livingstoni, Tropheops tropheops, Metriaclima pyrsonotus, Labidochromis caeruleus, Labidochromis hongi, Metriclima zebra, and Otopharynx lithobates. Motion tracking of test subjects was processed through ArcGIS and Python motion tracking programs to create quantitative heat maps. Determination of variance in the CNE was determined by Sanger Sequencing of fin-clip tissue DNA extractions.

Traditional Ecological Knowledge and what we can learn from it

Author(s): **R.B. Armstrong**
Mentor(s): **Dr. Erin McKenney**
Poster: **2**

Would you ignore hundreds of years of knowledge and environmental practices proven to better manage the ecosystem? If you said no, then I'm happy to inform you that indigenous peoples in North America and around the world have been practicing sustainable management strategies for thousands of years. Unfortunately, Traditional Ecological Knowledge (TEK) that was passed down for generations has been ignored by scientists and instead replaced with management practices much less effective than TEK. However, many people don't know about TEK, or how effective these traditional practices actually are. The goal of this project is to share traditional practices with the public, and how different landscapes can look after these practices are used. To do this, I conducted an extensive analysis of primary and secondary sources to find the most beneficial practices from Traditional Ecological Knowledge. I found that in areas where plots of land are too small or too degraded to be used for agriculture, replanting local species and converting from agricultural to traditional management practices lead to a decrease in the amount of land degraded. I hope my examples pave the way to rediscover and apply TEK to address other ecological grand challenges.

Effectivity of Peanut Skins As An Alternative Antimicrobial Against Foodborne Pathogens

Author(s): **Sydney Baker, Alex Kay, Breana Lavallee, Laura Radford, Will Adams**
Mentor(s): **Dr. Fernanda Santos, Ms. Ashley Gernat**
Poster: **3**

Due to the limited usage of antibiotics in poultry, the research conducted investigated how effective peanut skins (PS)- an agricultural byproduct- can be as an antimicrobial replacement. In addition to antioxidants, PS contain antimicrobial compounds that have been shown to be effective against a variety of pathogens but have been utilized in few agricultural productions. The present research aimed to investigate if PS affected the growth of four specific indicators of foodborne pathogens; Escherichia coli (EC), Salmonella enterica (SE), Listeria innocua (LI), and Staphylococcus aureus (SA). Two experiments were conducted; however, a methodological error was made in Experiment I. For Experiment II, cultures of EC, LS, SE, and SA taken from a original batch culture were incubated in BHI broth with and without PS in triplicate (skins were ground and added to the medium). Cultures were

incubated overnight at 37°C and 200 rpm. Serial dilutions were performed to estimate the microbial population by direct plate count.. Experiment II results showed a significant decrease in SA, LI and SE growth when compared to the control ($P<0.05$). No significant reduction was detected for EC growth ($P=0.0557$). Overall, the anova test determined that the p-value was significant for SA, LI, and SE, thus concluding that the peanut skins can help prevent the growth of most prevalent foodborne illnesses.

Geminiviral DNA Analyzed Through Two-Dimensional Gel Electrophoresis

Author(s): **Marina Botros**
Mentor(s): **Dr. Trino Ascencio-Ibáñez**
Poster: **4**

Geminiviral DNA is circular and single-stranded but its replicative intermediates can also be double-stranded. Two-dimensional gel electrophoresis is used to detect different forms of DNA molecules. Through this research, two-dimensional gel electrophoresis will be used to analyze the replicative forms of geminivirus DNA. We will use tomato Lanai infected with the Tomato yellow leaf curl virus. A two-dimensional gel electrophoresis was first conducted with a molecular weight marker to confirm that two-dimensional gel electrophoresis can be performed using the equipment available in the lab, as this has never been done before in the lab. After running a one-dimensional gel, a sliver of that gel was cut and rotated 90˚ and positioned on top of another gel and then that gel was run. The results show a differential migration of the molecular weight marker suggesting that we can run two-dimensional gels in the lab. Our next step is to use the total DNA from geminivirus-infected plants to run a double-dimensional agarose gel, transfer it to a nylon membrane and hybridize it with a viral probe to detect all of the replicative forms of the virus in the plant.

Depositing Oxides in an RF Sputter System to Fabricate a Distributed Bragg Reflector Mirror for UV Lasers

Author(s): **Tori Crunkleton**
Mentor(s): **Dr. Ramón Collazo, Dr. Will Mecouch, Dr. Ronny Kirste**
Poster: **5**

This research aimed to use an RF sputter system to deposit a distributed Bragg reflector (DBR) mirror. Alternating oxide layers create the DBR mirror, which will be used for high reflectivity of ultraviolet (UV) light in the 260 to 280 nm range on

optoelectronic devices such as UV lasers and LEDs. The oxides, SiO_2 and HfO_2, were chosen to be UV transparent as they both have a bandgap exceeding 6 eV. Appropriate operating conditions were established to allow for a deposition rate that could easily create thin films on a scale of tens of nanometers. An optical setup consisting of a lamp, iris, aluminum mirror, and an optical fiber was used to measure the reflectance of the DBRs. Thickness and uniformity were analyzed using scanning electron microscopy, profilometry, and reflectance. Subsequent error analysis was performed, which revealed uniform and consistent layers within the DBR. Further, reflectance measurements revealed that the DBRs are highly reflective in the intended UV wavelength region, and the measured reflectance matches well with simulations. Conformal analysis was performed on DBRs deposited on mesas of gallium nitride to give insight into the further application of DBRs for UV lasers.

Farm/Ambassador Internship Program at Riverbanks Zoo and Garden

Author(s): **Gabrielle Cummings**
Mentor(s): **Dr. Charlotte Meli**
Poster: **6**

During the Summer of 2022, I participated in the Farm/Ambassador Internship Program at Riverbanks Zoo and Garden, where I was able to gain in-depth knowledge of zookeeping and zoo operations that will greatly benefit me in my future academic and professional career. The internship focused on the overall operation and management of the Farm/Ambassador department at Riverbanks, as well as the importance of research, training, enrichment and conservation in zoological facilities. The first half of my internship was spent assisting animal keepers in the husbandry, enrichment, and training of all animals in the farm, zebra, and ostrich enclosures. During this time, I was able to design and implement various environmental enrichment techniques, as well as observe operant conditioning techniques used for training and veterinary care in zoo facilities. The second half of the internship involved management of the ambassador animal collection at Riverbanks, as well as a four week training program where I gained extensive knowledge of operant conditioning and proper training techniques utilized by zookeepers around the world. My participation in the Farm/Ambassador Internship Program has allowed me to gain in depth knowledge and understanding of animal care and conservation, and the knowledge and skills gained through this experience will have lasting impacts on my future career.

Pyruvate Hyperpolarization in Biocompatible Solvents through Signal Amplification by Reversible Exchange

Author(s): **Erica Curran, Atli Davidsson**
Mentor(s): **Dr. Thomas Theis, Mr. Keilian MacCulloch**
Poster: **7**

Hyperpolarization of 1-13C labeled pyruvate presents a promising advancement for signal enhancement in Nuclear Magnetic Resonance (NMR) and Magnetic Resonance Imaging (MRI). MR techniques have inherently low sensitivity due to small energy splitting of spin states, leading to minute thermal spin polarization even at high magnetic fields and low temperatures. To combat this, we utilize hyperpolarization to induce spin polarization far above what is achieved at thermal equilibrium. Furthermore, this technique allows for increased sensitivity of select nuclei on desired molecules. Signal Amplification By Reversible Exchange (SABRE) is a relatively new, cheap, and quick alternative to common methods of hyperpolarization such as Dynamic Nuclear Polarization (DNP) and ParaHydrogen Induced Polarization (PHIP). Previously, hyperpolarization of pyruvate was most efficient in methanol, a toxic organic solvent, restricting SABRE's use in clinical trials. A transition to a more tolerable solvent such as a ethanol/water mixture, is desirable due to its increase in biocompatibility. The substrate of interest, pyruvate, is a central component in metabolism and is sensitive to its environment, making it an attractive molecule for early cancer detection. Optimization of SABRE hyperpolarized pyruvate in an ethanol/water mixture was studied through an analysis of solution composition and experimental parameters. Specifically, altered ratios of ethanol/water, DMSO concentration, Ir-(1,3-bis(2,4,6-trimethylphenyl)imidazole-2-ylidene) (IMES) catalyst concentration, pyruvate concentration, flow rate, bubbling rate, polarization transfer field, and temperature studies were investigated. Further studies on the effects of different pH values on polarization of pyruvate are of interest in the future.

The Isolation and Up-Scale of Collagen via Cell Agriculture

Author(s): **Chloe Dalton**
Mentor(s): **Dr. Trino Ascencio-Ibáñez**
Poster: **8**

Collagen is the most abundant protein in the human body. It is a versatile, unique protein imperative to an endless number of biological functions making it a lucrative commodity in today's market. Collagen forms the extracellular matrix of connective tissues providing strength and stability while varying in functions dependent on cell type. Currently 31 different types of collagen have been discovered ranging from

matrix for skin, connective tissues, to bones. Reduced collagen production results in a variety of effects including premature aging, wrinkled skin, muscle fatigue and decreased strength, joint pain, and brittle hair/nails/bones making collagen supplements high in demand. Marine and bovine collagen are taken directly from the animal thus killing it in the process. This inhumane method is costly due to animal maintenance and requires many purification steps. Instead, the goal is to form bovine or marine cell lines that collagen can be isolated from on a large scale in a cost effective and timely manner. This method would spare countless animal lives and eliminate that burden of housing, feeding, and maintaining the animals. This process involved creating a cell line, determining how to maintain the cells at a relatively low cost, what kind of media to use, isolating the collagen, and measuring the quality and quantity of collagen being produced. An additional challenge to further remove animal products from this process and gain FDA approval for usage is determining how to maintain robust cells without the use of serum or with a well-defines serum alternative.

Computer Aided Designs and Zero Waste

Author(s): **Sarah Do**
Mentor(s): **Dr. Anne Porterfield, Ms. Janie Woodbridge**
Poster: **9**

The human body has many curves to consider when making patterns, but with our technology we can eliminate waste using technology and simulations to test designs without using paper or producing scraps. CLO3D is a fashion design software that renders fabric and garment designs and virtually brings them to life. In this research, virtual garments are compared to real garments to explore the concept of creating zero waste designs and testing them through simulation to reduce the need for prototypes. With the help of CLO3D and other software, we can move closer to a more sustainable future and discover how effective computer aided design software contribute to a zero waste design.

Coral Reefs – The "World's Lungs" Rehabilitation and Restoration

Author(s): **Cecille Ernst, Nick Cruz, Michely Coimbra**
Mentor(s): **Dr. Erin McKenney**
Poster: **11**

Coral reefs are one of the most important ecosystems on earth, containing 30% of the world's biodiversity while covering only 0.1% of its surface, and they are declining

at an alarming rate. Rising sea levels, increasing sea surface temperatures, pollution, and fishing malpractices all exacerbate coral bleaching, which further contributes to coral reef declines. Together, these pressures not only harm the coral but also the ecosystems reliant on the coral. However, with a stronger push for wide-scale change and understanding, we can slow/stop coral degradation. By educating the public, we aim to raise awareness of the importance of coral reefs in their ecosystems, the causes of degradation, and why rehabilitation/restoration efforts are necessary. To accomplish this goal, we explored new restoration and rehabilitation techniques such as artificial reefs, coral nurseries, and reef transplanting, and other innovative solutions being implemented by scientists and conservationists worldwide that highlight the symbiotic nature of corals. We have synthesized our findings into digestible, impactful, and relevant information that we can share with the general public. We hope that this newfound understanding of the critical role of coral reefs will inspire individuals to change their personal habits and actively support conservation efforts to protect and preserve these essential ecosystems. Coral reefs support a diverse range of marine life, protect coastlines from storms and erosion, promote biodiversity, and help regulate the Earth's climate. By prioritizing the preservation of these vital ecosystems, we can ensure a sustainable future for both humans and the planet.

User's Acceptance of Transitions in Virtual Reality

Author(s): **Isabella Evans**
Mentor(s): **Dr. Jing Feng, Mr. Michael Wilkinson**
Poster: **12**

There is a lack of research surrounding transition effects into virtual reality. Yet with its rising popularity, it is necessary to determine which transitions best facilitate user experience. This work presents an ongoing study that investigates the effects of different transitions in virtual reality from a lab setting into a virtual nature scene. Participants were exposed to various transitions, a direct transition, a fading transition, and a door portal. The secondary study discussed implements the transition to examine the feasibility of driving training in virtual reality with multiple learning modules applied. It will provide evidence for a specific learning approach to further skill training in virtual reality. This study is still under the process of revision and will have no data presented. The main conclusion of the transition study illustrates that transitions into virtual reality influence user experience and should be considered when utilizing virtual reality.

Methods for Reorganizing the Flows and Patterns in a Research Lab

Author(s): **Ayden Ferrell**
Mentor(s): **Dr. Trino Ascencio-Ibáñez**
Poster: **13**

This project focused on improving the flow and organization of the BURT-P lab in the Department of Biochemistry, which initially exhibited a general disorganization and a lack of working flow. The sinks and surrounding bench spaces were filled with unwashed dishes, old buffers were stacked in random clusters on the bench tops, pipettes lay about on the counters, and equipment appeared to be placed at random. The drawers were unorganized and contained old instruments, some of which could no longer be used. Trash littered the drawers, countertops, and shelves. Since the BURT-P lab is a training lab for over 20 undergrad students, it is important to present a clean and organized environment with logical and practical flows. One of the main issues is that there were not enough bench spaces for all of the students to work in nor were there regular practices put into place. This presentation discusses the procedures taken in cleaning the lab as well as the methods used for reorganizing the lab with the proposal of equipment and resources placed logically and tested for ergonomics and flow.

Medium spiny neuron electrophysiological properties differ by region, sex, and developmental period: excitability is increased in early development.

Author(s): **Sarah Fletcher**
Mentor(s): **Dr. John Meitzen**
Poster: **14**

The striatal brain regions are key for important processes like premotor function, habituation, and motivated behaviors. When these regions are disrupted, disorders such as Parkinson's Disease and drug addiction can result. The medium spiny neuron (MSN) is a key neuron type of the striatal brain regions such as the caudate putamen (CP) and the nucleus accumbens core (AcbC). It is unclear whether the physiological properties of the MSN differ between each of those regions. This is an unfortunate gap in knowledge given that many computational models assume identical MSN properties across regions, despite these regions mediating different behavior properties. Very few neuroscience studies differentiate between sex and developmental period even though there are known sex and developmental differences in the functional output of the striatal regions. Thus, we tested if MSN electrophysiological properties differ by striatal brain region, sex and developmental period using previously collected laboratory data. Our meta-analysis found that MSN

excitability differed by region, development, and in some cases by sex. Developmental period exerted the most influence on MSN properties, particularly excitability. Excitability was assessed via a battery of biophysical attributes describing the input-output properties of the MSN. For example, rheobase, the amount of current needed to elicit an action potential, differed significantly in the CP between prepubertal male rats and adult male rats ($p<0.0001$). Overall, adult rat MSNs are less excitable than those of prepubertal rats. These findings indicate that MSN neuron properties exhibit complex regional, developmental, and sex-based specificity not accounted for by existing models.

The Role of USF1 in Lymphocyte Responses to Double-Stranded DNA Breaks

Author(s): **Thusna Gardiyehewa**
Mentor(s): **Dr. Michael Sikes, Ms. Lisa Metzger**
Poster: **15**

We are investigating the role of DNA break-induced activity of the Upstream Stimulatory Factor 1 (USF1) transcription factor in lymphocytes. Double-stranded DNA breaks (DSBs) are the most dangerous forms of DNA lesion. Most research on DSB repair has focused on early actions of the transcription factor p53. In contrast, steps that occur days after DNA damage as cells complete repairs are not well known. We found that DSBs alter USF1 activity for days after DNA damage. Lymphocyte cell lines that were engineered by RNA interference to lack activity from both USF proteins (USF1 and USF2) showed changes in the transcriptomic response to DSBs for days. To test the specific role of USF1, we used RNAi to knock down only USF1 expression, and then exposed USF1 RNAi cell lines to the topoisomerase inhibitor etoposide. We measured transcription of DSB response genes in USF1KD clones and controls that carry a scrambled RNAi at 1, 3, and 6 day time points. By three days, Trp53 transcript levels were induced in control cells, but this induction was blocked in USF1 RNAi cells. We also found that USF1 RNAi disrupted the profile of Cdk6 expression. When live cells were counted at each time point, we found that USF1 RNAi populations accumulated significantly faster between days 3 and 6 than controls, suggesting that loss of USF1 disrupts cell cycle control in the late stages of a DSB response. This work provides an essential stepping stone for further research on DSB response mechanisms and cell growth control.

Analysis of Microplankton Community Composition in Bogue Sound, North Carolina

Author(s): **Angelina Gonzalez, Bailee Porter**
Mentor(s): **Dr. Astrid Schnetzer**
Poster: **16**

Bogue Sound is an estuary of ecological importance that harbors seagrass beds and oyster reefs. However, as many coastal systems, changes in water quality in response to human activities (eutrophication, climate change) can affect overall ecosystem productivity and health. Protists, unicellular eukaryotes that are major primary producers and consumers at the bottom of aquatic food webs are often the first to be affected by these perturbations where abundance and community structure shifts of protist microplankton reflect overall levels of nutrients and contaminants. In this study, we characterize changes in these microplankton communities over varying temporal scales (from seasonal to interannual) using settling, microscopy techniques, and by identification of common protistan taxa from the Bogue Sound time series study site (since 2012). We discuss microplankton community dynamics in relation to physicochemical factors and, in doing so, aim to gain a better understanding of the factors that drive changes in plankton assemblages in Bogue Sound.

Standard Curve Implementation to Estimate Viral Loads of Geminivirus Infectious Clones Pepper Huasteco Yellow Vein Virus (PHYVV) and Pepper Golden Mosaic Virus (PepGMV) in Tomato Lanai and Pepper.

Author(s): **Reshma Goud**
Mentor(s): **Dr. Trino Ascencio-Ibáñez**
Poster: **17**

To further characterize the infection of Pepper Huasteco Yellow Vein Virus (PHYVV) and Pepper Golden Mosaic Virus (PepGMV) in tomato Lanai, the use of standard curves and qPCR are utilized. The first step involved optimizing the annealing temperature for the primers and producing monomers through digestion and gel electrophoresis. The concentrations of viral DNA were then calculated and used for serial dilutions to create standard curves for both viruses (A and B components). In the second part of this project, viral DNA from infected Poblano and Habanero peppers and tomato Lanai plants at 33 days post-infection (dpi) will be extracted and normalized, followed by qPCR and comparison with the previously created standard curves. The use of standard curves will enable accurate quantification of viral DNA in each sample. By using standard curves, we will be able to quantify the viral DNA in

each sample and determine the presence of PHYVV and PepGMV in the infected plants. The amplification of viral DNA in the qPCR will be used to confirm the presence of these viruses in the samples. This approach will provide a reliable method for estimating the viral presence in each plant sample. The successful implementation of this project will yield valuable insights into the infection of PHYVV and PepGMV in tomato Lanai, Poblano, and Habanero peppers within different tissues, which could inform future research and assist in the development of effective control strategies for these viruses.

Soil Health and Management

Author(s): **Will Gunther, Sydney Pollock**
Mentor(s): **Dr. Erin McKenney**
Poster: **18**

Proper soil health is vital to provide the products used everyday and the lifestyles of people around the world. Current farming practices common across the agricultural industry, such as overgrazing and the degradation of fields, have negatively impacted soil health. Unsustainable soil management techniques such as the depletion of nutrients and the loss of groundcover cause erosion and lead to poor soil health. However, with effective soil management techniques, these negative impacts can be prevented and even reversed. The goal of this project is to offer potential conservation strategies to mitigate soil erosion and improve soil health. We have conducted substantial research via literature review, including methods such as field rotation, cover cropping, residue return and reducing overcrowding in pastures. We aim to spread awareness about the effects of poor soil management and how to implement new strategies that improve soil quality; and we have tailored this information for the agricultural sector and members of the public who interact with agricultural products. By spreading this information to individuals who can utilize it directly, we hope these practices will be implemented in a realistic time frame in order to improve soil health and agricultural practices worldwide. The improvements in soil management techniques we offer can improve soil health and preserve fields and pastures for future generations.

Environmental Impacts of Urbanization

Author(s): **Suzannah Hale, Ainsley Deese**
Mentor(s): **Dr. Erin McKenney**
Poster: **19**

"Habitat loss and fragmentation have been identified as major threats to biodiversity, putting many important native species at risk. Many studies across the world have identified urbanization as a direct driver of habitat loss in fragmented areas. While there are efforts to incorporate biodiversity into urban landscapes, such as using green-spaces in cities to plant ornamental plants, there is a lack of native planting and civilian involvement in conservation efforts. The goal of this project is to explore conservation strategies to minimize the effects of urbanization and make landscapes more habitable for native species. To accomplish this goal, we conducted an extensive literature review to examine habitat loss due to urbanization from diverse perspectives. Specifically, we aim to leverage global knowledge to inform individual actions and local policy. Maintaining the biodiversity of local habitats is important to the overall wellness of many species – including humans. By researching conservation efforts, we can assist in the growth of numerous native species, ensuring their survival and benefiting ecosystems globally.

Testing a Battery of Small Molecules with Putative Binding to a Viral Protein Necessary for Viral Replication

Author(s): **Skylar Harrelson, Kourosh Salamati**
Mentor(s): **Dr. Trino Ascencio-Ibáñez**
Poster: **20**

"Geminiviruses belong to a large family of small, circular single stranded DNA viruses infecting a large range of plant species.These viruses are transmitted by insect vectors and have caused many crop losses and continue to be a threat to food security throughout the world. All genera of Geminiviruses produce a common replication associated protein, known as Rep. Rep is necessary for viral DNA replication. It also binds to several host's regulatory factors, such as the retinoblastoma protein (RBR), that regulate cell cycle and differentiation in the plant and interfere with the genes that activate regulation of plant metabolic homeostasis.

In a collaboration with Atomwise, we provided a model of Cabbage leaf curl virus (CaLCuV) Rep based on a similar Tomato yellow leaf curl virus, and the company performed in silico modeling of small molecule binding identifying 84 small molecules that putatively bind to Rep in the catalytic areas for DNA binding and

cleavage. We are now attempting to test them for binding to Rep in vitro using Nuclear Magnetic Resonance (NMR) Spectroscopy. One big advantage to this method is that it can be used to screen multiple molecules at the same time. Based on similar properties, we combined the molecules into groups of four and ran NMR on these groups. We are planning to maximize our purification process for CaLCuV Rep, run these groups of molecules with the purified protein using NMR, and compare the data to ascertain which molecules bind to the protein.

Participant Evaluation of the Ten years of VetPAC Museum Medicine Internship

Author(s): **Emily Haupt**
Mentor(s): **Dr. Shweta Trivedi, Dr. Dan Dombrowski, Mr. Shane Christian**
Poster: **21**

The Veterinary Professions Advising Center (VetPAC) at NC State has partnered with the North Carolina Museum of Natural Sciences' veterinary team to provide an intensive, hands-on internship with Living Collection species (reptiles, amphibians, birds, small mammals, and aquatics) for undergraduate students. The museum's Window on Animal Health clinic is uniquely designed to facilitate public viewing and interaction with the veterinary cases in real time. Since the internship has provided clinical experiences to students for over ten years, we plan to assess the impact of the internship on their professional education and careers, as well as identify areas for improvement for future interns. Participants of the online Qualtrics survey are the interns from Summer of 2011 to the Fall of 2022 (IRB # 25689). This survey is designed to gather participants' feedback on the value of this experience towards the clinical skills and soft attributes gained during the internship. It also will evaluate the impact that this experience has had on their professional development and will allow us to better understand the use of the skill set gained from this experience in their current workplace. We will submit our manuscript in The Journal of Veterinary Medical Education this summer.

Isolating and Identifying Antimicrobial Producing Bacteria from Soil on NC State's Main Campus

Author(s): **Stewart Hopper**
Mentor(s): **Dr. Michael Taveirne**
Poster: **22**

"The first antibiotic was discovered in 1928 and since then the use of antibiotics has dramatically increased to treat both human and animal bacterial infections. Due to

the high use of antibiotics and the fast mutation rate of bacteria, in recent years there has been an increase in the number of antibiotic resistant bacteria, specifically resistance to clinically relevant antibiotics. ESKAPE pathogens are a group of human bacterial pathogens that have acquired resistance to multiple clinically relevant antibiotics, some of which have been termed “super-bugs” as they are resistant to all available clinical antibiotics. As resistant populations are becoming prevalent, one avenue of research is discovery of novel antimicrobials to treat these bacterial infections. The goal of this project was to determine if novel antimicrobial producing bacteria could be isolated from soil at NC State University. Soil samples were collected from outside of Owen Hall and behind Carmichael Gym. Bacteria were isolated from soil using serial dilutions. We isolated 96 bacteria into pure culture. We assessed if these isolates could produce an antibiotic against the ESKAPE surrogate Bacillus subtilis using the patch-patch and spread-patch methods. We identified four isolates that produced a potential novel antimicrobial as evident by a zone of inhibition. Isolates were then identified via 16S rRNA gene sequencing and characterized using metabolic assays. We identified isolate 31A as a bacterium in the Streptomyces genus. Future goals for this project are to purify the antimicrobial compound, determine its structure, and assess its activity against other bacterial pathogens.

A Modified Method for Spectrophotometric Quantification of Poultry Litter Hydrogen Sulfide Emissions

Author(s): **Kristina Jones**
Mentor(s): **Dr. Mahmoud Sharara**
Poster: **23**

As sulfide-producing bacteria (SPB) degrade amino acids in poultry feces, a variety of volatile sulfur compounds are generated, most concerningly, hydrogen sulfide (H2S). Poultry subjected to low H2S concentrations experience a deteriorated sense of smell, reduced appetite, and reduced disease resistance. In relatively high concentrations, paralysis of the central nervous system is likely. Correlated with these factors are reduced growth rates, egg-laying ability, and a stark increase in disease incidence and mortality rates (Swelum, et al., 2021). Unlike other volatile compounds present in poultry environments, hydrogen sulfide is not readily quantifiable due to ambient concentrations being below most devices' detection limits. As a result, measuring gaseous H2S concentrations regularly requires expensive, specialized equipment. For this project, I attempted to verify the viability of an effective, more economically sustainable method of hydrogen sulfide quantification. To accomplish this, I modified fuel industry H2S absorption and quantification protocols similar to methylene blue spectrophotometry and developed a calibration curve using

controlled amounts of H2S for practical application. The effectiveness of developed methods will be compared to existing technologies, such as the Jerome-631X hydrogen sulfide analyzer and H2S diffusion tubes. Initial results indicate the modified spectroscopic method created is viable, though comparison to other technologies is ongoing.

Comparative study of Buthionine Sulfoximine Treatment in aggressive versus nonaggressive cancer lines

Author(s): **Sreya Kanamurlapudi**
Mentor(s): **Dr. Michael Gamcsik**
Poster: **24**

The tumor microenvironment is harsh, with varying concentrations of low and high oxygen and nutrient levels. However tumor cells still have high rates of proliferation and are capable of adapting to the varying oxygen concentrations and cytotoxic environments. Low-molecular weight thiols such as Glutathione (GSH) protect cancerous tumor cells from oxidative stress and are abundant in mammary cells, further promoting cancer development. Buthionine Sulfoximine (BSO) inhibits the synthesis of GSH, and may increase stress levels. We are currently analyzing the effects of induced oxidative stress using BSO on the growth of aggressive cancer and non aggressive cancers lines. Metabolic requirements for the aggressive tumor cell lines are likely higher than less-aggressive cell lines due to their rapid rate of proliferation. We postulate that the aggressive cancer is more reliant on Glutathione to reduce oxidative stress and is more susceptible to BSO-induced glutathione depletion. Our study compares two different cell lines, specifically the indolent, non-aggressive mouse mammary 67NR line and the highly metastatic 4T1 cell line. Both cell lines were cultured to a similar density and treated with BSO for 24 h. Cell viability was assayed using an MTT assay and the results were analyzed by performing a Paired Two sample for means T-Test. The BSO treated 4T1 cells showed reduced viability in comparison to the 67NR treated group, thus supporting the hypothesis.

Microtissue Contraction of Human Mesenchymal Stem Cells in Extracellular Matrix Hydrogels Derived from Respiratory Tissues

Author(s): **Marina Kapitanov**
Mentor(s): **Dr. Donald Freytes, Dr. Andreea Biehl**
Poster: **25**

Voice disorders affect millions of Americans each year, with one example being vocal fold (VF) fibrosis. VF fibrosis represents a challenging therapeutic scenario, associated with significant changes in composition and mechanical properties of the extracellular matrix (ECM). Our current study focuses on quantifying the in vitro contractile response of human MSCs (hMSCs) in ECM-derived hydrogels from respiratory system tissues (lung, vocal fold lamina propria (VFLP), supraglottic (SG)). A high-throughput in vitro model previously developed by our lab models different hMSC-infused hydrogel formulations. hMSCs were cultured at 25,000 and 50,000 cells/well in 3 mg/mL ECM for 5 days with image capture every 24h. Following digital camera image capture, microtissue contraction was measured using distances between embedded optical fibers. Photo analysis was performed using ImageJ and statistical significance was determined using two-way ANOVAs across time points and ECM types. Significant contraction was observed in VF in 50,000 cells/well after one day, with significant contraction through day four. After two days, SG ECM also demonstrated significant contraction at 50,000 cells/well. No significant contraction was found for collagen nor lung ECM. VF tissue's physiological role in the body of contracting the vocal folds supported significant contraction in vitro compared to collagen and lung tissue. These microtissue platform experiments show that at a higher seeding density, further studies can be performed using respiratory tissue ECM to measure microtissue contraction in vitro using a cost-effective, reproducible method.

Modeling the Dynamics and Evolution of Jupiter’s Great Red Spot

Author(s): **Caleb Keaveney**
Mentor(s): **Dr. Gary Lackmann**
Poster: **26**

Jupiter’s Great Red Spot (GRS) is a high-pressure anticyclone positioned in an easterly jet stream between the planet’s South Equatorial Belt and South Tropical Zone. It is the oldest and largest known discrete weather phenomenon; at its recorded peak in the late 1800s, the GRS spanned 15-20% of Jupiter’s local circumference. However, spacecraft and telescope observations reveal the GRS is shrinking at an exponential rate. This evolution is well-documented, but not

well-understood. Here, we use numerical simulations via the Explicit Planetary Isentropic Coordinate (EPIC) general circulation model to study a GRS-like vortex and its behavior in a model Jovian atmosphere, in pursuit of understanding the forces modulating the size of the vortex. Our simulations have produced an anticyclonic vortex that replicates numerous dynamical and morphological characteristics of the real GRS, including its wind and vorticity structure, its westward drift, and its dynamical size. This nominal vortex decays at an exponential rate, with its dynamical circulation evolving from Voyager-era to present-day observations over a period of 5-6 Earth months. The vorticity anomaly persists for at least 1200 Jupiter days. Presently, we are conducting simulations of interactions between this nominal vortex and smaller vortices, investigating whether these interactions have a sustaining, destructive, or negligible impact on the size and strength of the GRS. Preliminary modeling results suggest these interactions have little impact, despite recent Juno satellite observations of morphological changes in the GRS resulting from such interactions. However, long-term simulations are necessary and currently being pursued to confirm this result.

Loss of GEF Ect2 and GTPase RhoA Inhibits Cell Cycle Progression through G1/S

Author(s): **Mia Kidwell**
Mentor(s): **Dr. Christopher Guilluy, Dr. Elizabeth Benson**
Poster: **27**

Cell cycle progression is a highly regulated process that requires the convergence of many cellular signals, including mechanical tension. While the cell cycle is widely understood from a broader perspective, only recently have studies been conducted that are aimed at a detailed understanding of the mechanotransduction events that regulate cell proliferation. Earlier work from our group has demonstrated that the mechanical tension cells experience in late G1 causes nuclear flattening and that this nuclear flattening is required for G1/S progression. In this study, we sought to determine the signaling events associated with mechanical tension that regulate G1/S transition. We found that the GTPase RhoA is activated during late G1 and that RhoA activity is required for G1/S progression. We identify the GEF Ect2 as modulating the activity of RhoA and the movement of cells from G1 to S phase. Our results reveal that Ect2 activation of RhoA is required for the efficient transition of cells from G1 to S phase.

Characterizing Architecture of a Biomimetic Bone Scaffold

Author(s): **Amanda Knizley**
Mentor(s): **Dr. Jacqueline Cole**
Poster: **28**

Biomimetic bone scaffolds are widely studied for applications in wound healing via grafts and for improving microenvironments for in vitro studies. Previous scaffolds mimicking cancellous bone have prioritized mimicking either composition (protein and mineral components) or architecture (dense vs. porous) but not both simultaneously. As part of a larger study, we created porous, mineralized protein scaffolds, created by freeze-drying solutions of three different collagen:chitosan weight % ratios (10:0, 8:2, 6:4) to create pores, to mimic both composition and architecture. Scaffolds were then scanned using nano-computed tomography (1.5-μm voxels) to create a reconstructed 3D image. Using Dragonfly software (Object Research Systems), a small box region (1,284 x 2,017 x 2,302 μm) of interest in each scaffold was segmented, and the average pore size and percent porosity (void volume %) were measured. Analysis is ongoing, but preliminary data across the scaffold formulations show average pore sizes of 43.3 μm for 10:0, 51.8 μm for 8:2, and 57.4 μm for 6:4 and percent porosities of 88.3% for 10:0, 92.3% for 8:2, and 85.2% for 6:4 formulation. Scaffold pore sizes are slightly smaller than the 100-200 μm pores in cancellous bone, and scaffold porosities are a bit higher but comparable to the average porosity of 70-80% for cancellous bone. Scaffold formulations can be further optimized to produce a more accurate model mimicking both composition and architecture of native cancellous bone.

Mapping the Specificity of the p300 Acetyltransferase to H3 and H4 Histone Variants

Author(s): **Seth Kodikara**
Mentor(s): **Dr. Albert Keung, Dr. Balaji Rao, Ms. Alison Waldman**
Poster: **29**

"In eukaryotic cells, DNA complexes with RNA and histone proteins to form chromatin. Conformationally free peptide chains on the N- and C-termini of these histone proteins can serve as substrates for post-translational modifications such as methylation, phosphorylation, and acetylation. These modifications act combinatorially to regulate chromatin structure and gene expression as an important part of the epigenetic code. Variants of these histone proteins, typically differing in their sequence by only a few amino acids, have been observed to display unique cell-cycle independent and tissue-specific behaviors. The origin and function

of these histone variants is not well understood nor is their ability to serve as substrates for regulatory modification. An existing yeast-surface display system was modified to rapidly profile the interaction of the p300 acetyltransferase with a selective lysine knockout library of histone H3 and H4 variants. Following simultaneous expression in Saccharomyces cerevisiae of the acetyltransferase and substrate and subsequent endoplasmic reticulum sequestration, the histone variants were displayed on the surface of the cells. Cells displaying the enzyme expression proxy, a histone tail, and an acetylation at the available lysine site were sorted and profiled by next-generation sequencing to identify the variants and the lysine residues at which acetylation occurred. Site-specific H3 anti-acetylation antibodies were used in addition to a pan acetyllysine antibody for validation purposes. Distinct populations of acetyllysine-positive cells were sorted with multiple putative acetylation sites identified.

Where are Neuse River Waterdogs Reproducing in the Neuse and Tar River Basins?

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Mentor(s): **Mr. Eric Teitsworth, Dr. Krishna Pacifici**
Poster: **30**

The Neuse River Waterdog (Necturus lewisi) is a federally threatened salamander endemic to the Neuse and Tar rivers of North Carolina. The distribution of this species has steadily decreased for decades. Prior research has identified local and landscape features that drive adult N. lewisi occurrence; however, it is unclear if these same features are important for reproduction since the recommended minnow trapping survey method is biased toward adult detections. A new survey using leaf litter traps was conducted at four locations with known adult presence in an attempt to detect evidence of reproduction (i.e. young age classes). Traps were filled with decomposing leaf matter to mimic the substrate that juvenile waterdogs naturally select. The vinyl-coated wire traps were collected and sifted through biweekly to search for N. lewisi presence while minimizing habitat disturbance. When waterdogs were captured, their weight, total length, snout to vent length (SVL), and picture of their back were collected. Individuals were tagged using visible implant elastomer (VIE). Throughout the 14 weeks of data collection from May to August 2022, only two juvenile waterdogs were found within leaf litter traps. Dozens more were found by dipnetting natural leaf substrate on site, suggesting that the survey method was not effective at detecting evidence of reproduction. Completed habitat assessments illuminated that juvenile waterdogs occurred more in areas with boulder-filled bottom substrate, intact instream habitat, and higher light penetration. The results

suggest more surveying should be completed by dipnetting in large patches of natural leaf litter with confirmed adult presence.

Tunable Gradient Development Enables Exploration of Context-Dependent Cell Migration

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Poster: **31**

Cell migration is essential to many functions that sustain multicellular organisms, such as immune response and tissue repair. Understanding the cues that drive cell migration could enable us to inhibit the errant migration that causes cancer metastasis or repair impaired wound healing in patients with chronic wounds like diabetic ulcers. An understudied type of cell motility of particular importance to wound healing is haptotaxis. Haptotaxis is the migration of a cell in response to an immobilized ligand. In the context of wound healing, this ligand is the extracellular matrix protein fibronectin. Fibroblasts, migratory cells involved in late stage wound healing, have been observed to denude, or remodel, extracellular matrix proteins as they migrate. This phenomenon results in a self-generated surface gradient that may influence fibroblasts' directed motility to wound sites. Since fibroblasts can modify external cues, their responses to said cues may be context-dependent. Past studies have not explored cell migration across controlled gradient landscapes, so we have refined a highly tunable gradient generation technique to uncover context dependencies in migration. In this technique, called the meniscus method, a solution of fibronectin is applied to a microfluidic device consisting of polydimethylsiloxane (PDMS) bonded to a glass-bottom dish; the hydrophilicity of the dish confines the solution to a meniscus shape. Using this method, we have generated gradients at controlled intensities. Preliminary results have shown context-dependent denuding in self-generated gradients, which we plan to explore further in controlled gradients produced by the meniscus method.

Next Generation Functional Battery Separators with Unique Dendritic Morphology

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Mentor(s): **Dr. Peter Fedkiw, Mr. Mike Petrecca**
Poster: **32**

Lithium-ion batteries power numerous devices, such as phones, laptops, and electric vehicles. Growing use of these devices along with the rise of electric vehicles and other forms of electrification has led to increased demand for efficient energy storage devices. Lithium-sulfur batteries have a higher energy density and are less environmentally damaging when compared to their commercial lithium-ion counterparts. However, significant challenges remain to bring Li-S batteries to the market. For example, dissolution of sulfur during discharge, known as polysulfide shuttling, is a significant barrier to commercialization. This research aims to address the polysulfide shuttle problem by fabricating new functional battery separators with unique morphologies. The separators are fabricated via a precipitation process wherein a polymer solution is injected into a turbulently sheared non-solvent. The resulting morphologies of the solids formed are called soft dendritic colloids (SDCs). In this study, polyvinylidene fluoride (PVDF) serves as a model polymer for battery separators for application in lithium-sulfur batteries. Ceramic oxide nanoparticles are dispersed throughout the PVDF separator to capture the polysulfides via polar-polar interactions. The membranes are fabricated via a one-step vacuum filtration process of the SDCs. Electrochemical impedance spectroscopy is performed to measure the ionic resistance of the membranes after imbibing them with electrolyte. We hypothesize that the dendritic PVDF structure with dispersed ceramic nanoparticles will be effective in capturing polysulfides and thereby attenuate the problems associated with polysulfide shuttling in a Li-S battery.

Optogenetic regulation of transcription factor dynamics and downstream gene expression in single cells

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Mentor(s): **Dr. Albert Keung, Ms. Leandra Caywood**
Poster: **33**

Transcription factor p65, a subunit of the NFκB family, is involved in the regulation of cell immune response, inflammation, and carcinogenesis. The downstream gene expression from p65 activation is regulated by localization of the transcription factor into the nucleus of mammalian cells. Localization of p65 is triggered by external stimuli in the cell and is regulated by IκB proteins and the endogenous Nuclear

Exporting Signal (NES) and Nuclear Localization Signal (NLS) within p65. For precise manipulation of the translocation of p65, a synthetic approach utilizing an optogenetic system was employed to deliver the stimuli. We mutated the endogenous NLS and NES, allowing for the localization of the transcription factor to be completely dependent on the synthetic, optogenetic signal, and to be unaffected by any naturally occurring signal in the cell. Variations of the mutant p65 plasmid were cloned to compare how deviations of the NLS and NES sequence affect the localization of p65 and the corresponding gene expression output. Using a fluorescent tag, we are able to quantify the abundance of p65 within the nucleus through microscopy. By implementing this synthetic approach, a precise control over gene expression can be achieved, and naturally induced and synthetically induced gene expression can be compared in order to better understand p65-implicated disease progression.

Study on Optimal Scaling of 3D-Printed Replicas for Blind and Low-Vision Museum Visitors

Author(s): **Yiting Liu**
Mentor(s): **Dr. Yingchen He**
Poster: **34**

Museums are an important means of inspiring and educating people in a region. However, the heavy reliance on vision has always made it challenging for blind and low-vision individuals to visit museums. This underscores the urgent need for more innovative technologies to improve accessibility. The development of 3D printing technology, which has become more affordable, provides a promising way to create tactile information for the blind population. Here, we aim to find the optimal size to produce touchable 3D-printed replicas to enhance accessibility in museums. Touchable replicas were printed for each of the two terracotta warriors, each warrior in both small and large sizes. Participants were recruited through the NCSU SONA system and asked to touch the replicas and answer guided questions upon arrival. The testing order and replica sizes were counterbalanced. The guided questions included two types: description and localization. Data collection and analysis are ongoing. The experiment will identify critical feature sizes for printing touchable replicas, which can provide valuable insights for museums seeking to achieve universal accessibility.

Identification of A. thaliana CKL5 and CKL6 Partner Cyclins During CaLCuV Infection

Author(s): **Nicolas Mastrovito, Connor Allaway**
Mentor(s): **Dr. Trino Ascencio-Ibáñez**
Poster: **35**

Geminiviruses are vector-borne pathogens that harm important crops in many areas of the world. Previous gene expression studies in the model plant Arabidopsis thaliana have identified two cyclin-dependent kinase-like proteins, CKL5 and CKL6, that are upregulated in A. thaliana infected with the geminivirus Cabbage leaf curl virus (CaLCuV). Upregulation of CKL5 and CKL6 could indicate that they play an important role in the infection mechanism of CaLCuV. Co-expression analysis has also raised the possibility that six cyclins (CYCD1;1, CYCA1;2, CYCA2;1, CYCA2;2, CYCD3;1, and CYCA3;3) could function as molecular partners for CKL5 and CKL6. We are using RT-qPCR to compare the expression of these proteins in CaLCuV-infected A. thaliana to the expression of these genes in mock-infected A. thaliana. Co-upregulation of any of the cyclins with CKL5 or CKL6 would provide evidence to suggest that they are molecular partners whose function is integral to the CaLCuV infection mechanism. Primers were designed and tested for amplification of the sequences of the eight genes we are interested in. Plants were grown and petiole samples were collected. RNA was isolated from these samples for production of cDNA for use in RT-qPCR gene expression analysis. The delta-delta Ct statistical method was used to obtain relative gene expression values from raw RT-qPCR data. We have made significant progress in determining the proper conditions for sample collection and reliable gene expression analysis, as well as progress in confirming the previous finding that CKL5 and CKL6 expression is upregulated during CaLCuV infection.

The Impact of Organizational Factors on Secondary Traumatic Stress in Behavioral Health Workers: A Mixed-Methods Study

Author(s): **Katherine Matthes**
Mentor(s): **Dr. Sarah Ascienzo**
Poster: **36**

Background: While many behavioral health workers (BHW) derive fulfillment from their work, the associated challenges can contribute to adverse effects such as secondary traumatic stress (STS), a response to indirect trauma exposure. Prior research has identified individual factors that influence STS, but much less work has explored the impact of organizational factors. Consequently, the purpose of this study was to examine the impact of organizational factors on STS and explore how

organizations can better support BHWs. Methods: Using a convergent mixed-methods design, a racially diverse sample of BHWs (N=608) completed an online survey questionnaire containing open- and closed-ended items. For the quantitative strand, standard multiple regression was used to examine relationships between 13 organizational factors and STS, measured via the Secondary Traumatic Stress Scale (Bride, 2013). For the qualitative strand, thematic analysis was used to analyze responses to an open-ended question concerning how organizations could better support BHW wellbeing. Data integration occurred after analysis. Results: All 13 organizational factors significantly correlated with STS, and six factors significantly contributed to the regression model: organizational policies, training, supervision, interpersonal dynamics, organizational culture, and the emotional toll of the work [$F(6, 601) = 58.166$, $p < .001$, $adjR2 = .361$]. Analysis of qualitative data yielded five themes: need for mental health support, increased benefits, professional development, managerial and administrative changes, and improvements in workplace culture. Conclusions: Results suggest organizational factors impact STS, and interventions should therefore address organizational factors. Findings can be used to better support BHWs and inform policies and programs.

The Cougar Initiative -- Rewinding North Carolina Through Reintroduction

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Mentor(s): **Dr. Erin McKenney**
Poster: **37**

Graceful, agile, and powerful, the North American Cougar is an iconic and revered symbol across the United States. As apex predators, cougars are integral members of their ecosystems and play a key role in maintaining the functional integrity of those communities. However, since anthropogenic habitat degradation extirpated cougars from North Carolina in the late 1800s, populations of their most common prey - deer, elk, and other ruminant species - have increased, resulting in detrimental ecological shifts. To address this issue, we conducted an extensive literature review and proposed strategies tailored to engage specific audiences and stakeholders. Specifically, we propose to implement controlled cougar reintroductions throughout North Carolina to restore the integrity of at-risk landscapes. To support this goal, we aim to generate excitement and dispel misconceptions about cougars in North Carolina. We have designed compelling flyers, coloring pages, and a potential guide on how humans and cougars can coexist, to engage and inform diverse audiences. As cougar populations are restored and their range expands, so too will their positive effect on the environments that they once inhabited. Our project is relevant to ecological issues documented across the world as predators disappear from their native habitats. In a larger context, this work combats anthropogenic extinction

which, together with climate change, presents one of the biggest challenges faced by biodiversity and modern society.

Transference of infectious clones from E. coli into agrobacterium vectors without intellectual property issues

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Poster: **38**

Begomoviruses are circular, ssDNA plant-infecting mono or bipartite viruses from the Geminivirus family. The primary objective of this project is to transfer infectious clones from E. coli into “free to operate” agrobacterium vectors, bypassing any intellectual property issues. Cabbage leaf curl virus (CaLCuV), is the first bipartite geminivirus that will be transferred into the destination vector pMOA36. This will involve restriction mapping, restriction digestion, ligation, and transformation into E. coli, followed by PCR and sequencing. Agrobacterium will be transformed by electroporation and inoculated into host plants via syringe infiltration. Successful infection will be verified through PCR and symptom monitoring in inoculated plants. We used SnapGene to help us evaluate different restriction enzymes and ligation strategies. Final digestions were performed with KpnI and BamHI (A component) & KpnI and XbaI (B component). pMOA was digested to match both components. Gel Extractions were performed using two different kits to evaluate the capabilities of each. Our objective is to produce infectious clones with no intellectual property attachment and that are equal or better in producing infection in the target hosts.

Identifying Candidate Genes and Genetic Variants Associated with Gut Length Differences in African Cichlid Fishes

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Poster: **39**

When looking at trophic-level adaptation, there are many different traits that can be studied, such as gut length and jaw morphology, to identify the genetic basis and molecular mechanisms correlated with phenotypic differences (Roberts et al., 2011). Among trophic levels, there are gut length differences, with carnivores generally having shorter intestines than omnivores and herbivores. However, the genetic basis for how this adaptation occurs and becomes fixed in species of certain trophic levels remains unknown. Lake Malawi cichlids are an ideal model organism to study trophic

adaptation due to their extensive recent vertebrate adaptive radiation event producing hundreds of cichlid fish species in the past one to two million years, with diverse dietary adaptations. A previous study used quantitative trait loci (QTL) analysis to identify broad regions in the genome associated with gut length differences between two species (Carmona-Baez et al., 2023 in prep). This study also highlighted that the genetic basis of gut length diversity is controlled differently between sexes. In this research, I will identify and test specific candidate genes and genetic variants in the previously identified gut length QTL to reveal the molecular mechanisms that give rise to differences in gut length. I will then validate the association of genetic variants with trophic level and sexual dimorphic trends across many species of Lake Malawi cichlids. These results may identify genes important for gut development and homeostasis and will help reveal the evolved genetic basis of dietary adaptation.

Identifying Improvements for STI/HIV Prevention Programs Delivered to Youth in Juvenile Justice Facilities

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Mentor(s): **Dr. Laura Widman, Ms. Julia Brasileiro**
Poster: **40**

"Youth involved in juvenile justice facilities are at considerable risk for Sexually Transmitted Infections (STI/HIV), especially among youth involved in juvenile justice facilities as they are more likely to engage in risky sexual behavior. Despite their heightened risk, this vulnerable population of youth does not receive STI/HIV prevention programs adequately adapted to their experiences. The existing research analyzing how STI/HIV interventions could be improved for this vulnerable population is minimal. Thus, the purpose of this study was to synthesize the existing literature and pull out the recommendations given for next steps and improvements for STI/HIV intervention for justice-involved youth. We conducted a literature review using databases PsycInfo, PubMed, and Google Scholar to identify and determine best practices for STI/HIV prevention programs for justice-involved youth. Seven studies met our search criteria, and these included a mix of quantitative and qualitative study designs and literature reviews. These studies analyzed various STI/HIV prevention programs for justice-involved youth and identified improvements for future programs. Synthesis of these improvements includes deriving programs from empirically-driven data rather than relying on personal experience, utilizing community-engaging approaches, such as implementing Community Advisory Boards (CABs), and acknowledging the effect of various psychosocial factors (family, mental health, culture, trauma) on youth. When creating and/or adapting STI/HIV prevention programs, developers should take a trauma-informed and

culturally-aware approach to deliver a more effective program for these high-risk youth. Future researchers should consider how to implement these programs ethically for youth in juvenile justice facilities.

Informing Sex Education: Teens' Questions about Sex and Relationships

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Poster: **41**

Teens have expressed dissatisfaction with the sex education they receive in school, if they receive any at all (Barlow et al., 2016; Broadbear & Broadbear, 2012). While research strongly supports comprehensive sex education, expectations for the materials covered in sex education classes vary significantly across classrooms (Goldfarb & Lieberman, 2020). The purpose of this study is to inform the content taught in sex education programs by asking teens what they would like to learn. A diverse U.S. sample of 833 teens (Ages 14–17, M age=15.3; Gender: Girl=53%, Boy=31%, Non-Binary=12%, Transgender=4%; Sexual Orientation: Heterosexual=45%, Bisexual=21%, Gay/Lesbian=11%, Pansexual=8%, Other/Unsure=16%) were recruited through Instagram to participate in a confidential survey study. A subsample of 249 participants responded to the prompt: "write one question that you or other teens your age have about anything related to sex or relationships." Thematic analysis was used to analyze the responses to this open-ended question (Braun & Clarke, 2006). Two independent coders identified and later agreed upon 8 major themes: Sex Education, Thoughts & Opinions about Sex, Health, Communication, Relationships, Sexual Activity, LGBTQA+, and None & Irrelevant. Within these 8 major themes, 17 subthemes were identified. Preliminary results highlight that teens have questions about a broad range of topics related to sex and relationships such as building healthy relationships, communicating consent, and practicing safe sex. Going forward, we plan to analyze these responses to identify trends across the questions teens have about sex and relationships.

Proportional-Integral-Derivative Control of Assistive Knee Brace Orthosis Device

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Poster: **42**

A proportional-integral-derivative (PID) controller was proposed for automated control of an assistive knee brace orthosis device to model the angular trajectory of

the human gait cycle. The brace is driven by fiber-shaped pneumatic artificial muscles (FPAMs) to generate joint torque to aid in the knee flexion of the wearer. When pressurized, FPAMs produce a contractile force with a likeness to natural muscle fibers, which allows for application in various soft-body robotics. Due to the non-linear properties and behaviors presented in FPAMs, a system must be defined to effectively model their behavior during control. A force-strain model of the brace as well as relative FPAM modeling were constructed to define the parameters of the system. This system definition was then used by the controller to provide accurate pressure output, via an electronic pressure regulator, to create the torque necessary to achieve a desired angular position by the brace. An additional feed-forward term was discussed as a potential solution to undesired control hysteresis due to the unpredictable nature of FPAM control operation.

Optimized Fabrication of Carbon-Fiber Microbiosensors for Simultaneous Detection of Glucose and Dopamine in Brain Tissue

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Mentor(s): **Dr. Leslie Sombers, Ms. Alexandra G. Forderhase**
Poster: **43**

Glucose and lactate are important fuel sources that are employed to meet the considerable metabolic demands associated with neurotransmission. Neurodegenerative and dopamine-associated diseases, including Parkinson's disease and drug addiction, have been linked to dysregulation in brain metabolism. However, rapid fluctuations of glucose/lactate in the brain remain largely unexplored, largely due to a lack of analytical tools that work on the seconds timescale. In this work, carbon-fiber microelectrodes were modified with glucose oxidase (GOx) or lactate oxidase (LaOx) to allow for the detection of the non-electroactive molecules, glucose and lactate. Fast-scan cyclic voltammetry (FSCV) was paired with these enzyme-modified carbon-fiber microelectrodes for the real-time detection of the substrate dynamics while also monitoring dopamine, a major electroactive neurotransmitter in the striatum. A chitosan hydrogel was electrodeposited onto the carbon-fiber using linear sweep voltammetry, and the resultant membrane consistency and electrochemical performance were characterized to optimize deposition parameters including the potential range and deposition rate, as well as sensitivity to the targeted analytes. The optimized entrapment of the enzyme in the chitosan hydrogel allows for simultaneous, stable, sensitive, and selective detection of the enzyme substrate using FSCV in rat striatum, while also enabling detection of dopamine. The optimization of microbiosensor fabrication has informed mass production for commercialization, ultimately providing an important research tool to achieve simultaneous and real-time detection of dopamine signaling and the

resultant flux of neuroenergetic substrates that are locally delivered to meet metabolic demand in striatum.

How to be a Heartbreaker: Decellularizing Porcine Heart Tissue to Isolate Extracellular Matrix Proteins

Author(s): **Lucy Payne**
Mentor(s): **Dr. Jessica Gluck, Ms. Kiran Mumtaz Ali**
Poster: **44**

Cardiovascular disease is the global leading cause of death, responsible for approximately 17.9 million deaths annually. In many late-stage cases, surgical tissue repair and/or replacement is inevitable as tissue regeneration diminishes. Current surgical methods come with complications surrounding material durability, donor shortages, and host immune response. Engineered tissues have the potential to solve these problems as a more biocompatible alternative. Tissues are complex structures with diverse cell populations housed within a network of crosslinked proteins secreted by cells, called the extracellular matrix (ECM). The ECM not only provides structural support, but also promotes cell migration, adhesion, differentiation, and transmits biochemical, electrical, and spatial signals between cells. This research is a subsection of a larger effort to develop functional cardiovascular tissue from human induced pluripotent stem cells seeded on fibrous scaffolds derived from porcine heart ECM proteins. In theory, constructing the fibrous scaffold from natural ECM proteins will provide a biocompatible environment for stem cells to differentiate into functional cardiomyocytes. I focus specifically on optimizing protein isolation by executing three published tissue decellularization techniques to identify the most effective reagents and techniques. I am developing a hybrid procedure that (1) completely removes cells and cellular debris, (2) eliminates nucleic material to reduce immune response, and (3) preserves protein integrity during reagent exposure. Preliminary observations of visual changes in tissue pigmentation and morphology suggest that neutral buffers do not have a prominent effect on cell removal, but ionic and nonionic detergents do.

Examining the impact of chronic undernutrition on insulin secretion in male and female sheep.

Author(s): **Jordan Peeler**
Mentor(s): **Dr. Casey Nestor**
Poster: **45**

Peripheral metabolic hormones (i.e., insulin) regulate reproductive neurons. Kisspeptin neurons in the arcuate nucleus are key regulators of GnRH/LH secretion and express insulin receptors. Our lab has shown that chronic feed restriction inhibits LH secretion and reduces arcuate kisspeptin expression, supporting the idea that these neurons are inhibited during undernutrition. We hypothesized our model of chronically feed-restricted male and female sheep would have lower plasma insulin concentrations than control animals. Plasma samples were collected from gonadectomized male (n=14) and female sheep (n=15) either fed-to-maintain (FM; males = 6; females = 7) pre-study body weight or feed-restricted (FR; males = 7; females = 8) to lose 20% of the pre-study body weight by Week 13. For each animal, one plasma sample from Week 0 (experiment start) and Week 13 (experiment end) was assayed in duplicate using an ovine insulin ELISA kit and then analyzed using spectrophotometry. At Week 0, FM and FR males had similar insulin concentrations (0.234 + 0.06 µg/L and 0.195 + 0.04 µg/L, respectively). At Week 13, FR males (0.065 + 0.01 µg/L) appeared to have lower insulin concentrations compared to FM males (0.206 + 0.04 µg/L). At Week 0, FM and FR females had similar insulin concentrations (0.613 + 0.13 µg/L and 0.514 + 0.10 µg/L, respectively). At Week 13, FR females (0.228 + 0.03 µg/L) appeared to have lower insulin concentrations compared to FM females (0.360 + 0.08 µg/L). Thus, reduced insulin may be the missing stimulus to arcuate kisspeptin neurons, impairing reproduction during undernutrition.

Investigating Possible Solutions to Phosphate Starvation in Arabidopsis thaliana

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Mentor(s): **Dr. Ross Sozzani, Dr. Imani Madison**
Poster: **46**

Phosphate fertilizers are widely used in agriculture and cause negative impacts on the environment. My project aims to investigate possible solutions to reduce reliance on phosphate fertilization by determining the effects of Silicon treatments and different mutant plant lines on plant phosphate content and starvation responses. This was done by quantifying root growth and phosphate concentration of Arabidopsis thaliana plants grown on media that was phosphate-starved (-Pi) or

phosphate-sufficient (+Pi) and that was also treated with a Silicon compound (+silicate). Silicon was used in order to determine if the compound can counteract some of the stress responses induced by phosphate-starved media. Arabidopsis plants were grown on -Pi, -Pi + silicate,+Pi, and +Pi + silicate media. The root lengths were measured from days 2-14. As a result, the samples with +Pi showed significantly higher root lengths. On day 14, the whole plant underwent a molybdate blue assay to determine the concentration of phosphate present after each treatment. As a result, phosphate-starved plants had lower phosphate concentrations which silicate treatments did not significantly improve. We also compared root length and phosphate content in Arabidopsis plants mutated in genes involved in phosphate starvation responses, such as ZINC FINGER OF ARABIDOPSIS THALIANA 6 (ZAT6) and LOW PHOSPHATE ROOT 2 (LPR2). Studying the effects of phosphate starvation under different conditions and treatments will help to investigate future solutions for plants grown under phosphate-starved conditions to promote agricultural sustainability.

Gatekeeping of the Conservation Sciences

Author(s): **Sheena Perdiz, Anamitraa Dutta**
Mentor(s): **Dr. Erin McKenney**
Poster: **47**

Conservation in America has a dirty history of genocide, colonization, and exclusion by white people against various marginalized communities.This legacy still affects minority students' persistence in pursuing their academic and personal goals in Science, Technology, Engineering, and Math (STEM) fields in systemic and pervasive ways. STEM is very important in fostering creativity and enabling the next generation of innovators. However, although diversity in STEM disciplines has recently acquired appeal as an abstract concept, implementing diversity in STEM has been a challenge over the years. Due to the United States' history, racism and bigotry are structurally ingrained in our social, economic, and educational systems. Furthermore, these institutions of higher education lack accountability for making meaningful change. The purpose of this campaign was to declare the inequalities of STEM for minorities, particularly with regards to- education, payroll, and employment. Our goal is to propose ways to implement diversity in education, provide mentors and social based support for minorities in STEM, and implement cultural holidays in both educational and work environments. Particularly in the US, discrepancies in identity-based sense of "belonging" in academia remain important. We've long understood that conservation efforts must be multifaceted; to be successful, we propose interventions of support for marginalized communities that address the root causes

of the continuing lack of diversity in STEM. Conservation is the grand challenge of our time, but we cannot address this challenge without leveraging the full innovative diversity of our global society.

Novel Treatment and Detection Methods for Protein Aggregate-Associated Neuropathologies

Author(s): **Hoke Pollock, Sydney Johnson, Karlyn Matheson, Hannah Potthoff, Riley Smith**
Mentor(s): **Dr. Michael Goshe**
Poster: **48**

According to 2023 U.S. census data, the estimated number of people above the age of 65 with Alzheimer's disease (AD) is 6.7 million (11%) and is the 7th leading cause of death worldwide. This underscores the fact that the majority of AD targeted drugs fail, emphasizing a need to understand the underlying mechanisms involved in protein aggregation in AD and other neuropathologies, such as amyotrophic lateral sclerosis (ALS). In our group, we performed literature searches published within the last several years to explore novel treatments and detection methods for aggregate-associated neuropathologies. We studied how AD progresses with regards to GLUT1 receptor reduction and the corresponding benefits associated with ketogenic diets. In terms of the mechanisms involved in aggregation, we learned that tau-protein aggregation associated with AD is more likely while tau is condensed in the liquid-liquid droplet phase. Monoclonal antibodies used to reduce amyloid-beta aggregates in the brain were compared based on various biochemical assays to characterize their binding properties to better understand their therapeutic effects. For ALS we examined the impact of structurally-disruptive mutations on SOD1 aggregation and learned that the addition of targeted single-domain antibodies could restore stability to SOD1 mutants. We also discovered that late stage ALS could be detected through aggregate protein citrullination, thus representing a possible new avenue for therapeutic intervention. Overall, we found encouraging research to better understand protein aggregation and therapies to combat neurodegeneration diseases but revealed the biochemical complexity of the mechanisms of protein aggregation that impede development of a medical breakthrough.

Development of Coffee-Based Toothpaste to Inhibit Growth of Cavity-Promoting S. mutans

Author(s): **Prerana Prabhushankar**
Mentor(s): **Dr. Gabriel Harris, Dr. Lynette Johnston, Mr. Jason Frye**
Poster: **50**

Dental caries is a major public health issue that affects all humans. A previous study by Antonio et. al reported a 4-log reduction of Streptococcus mutans (S. mutans), one of the primary bacteria involved in dental caries, after treatment with a Coffea canephora (C. canephora) extract (Barma et. al, 2021). This study indicated that the plaque-fighting benefits of C. canephora are only available in black coffee, without the added cream and sugar that many coffee lovers enjoy. Coffee drinking and the use of toothpaste are morning rituals for many people. In order to help consumers reap the potential dental benefits of coffee in an alternative manner, would it be possible to include a C. canephora extract in toothpaste? To answer this overarching question, we must first ask, does C. canephora have bactericidal effects when interacting with S. mutans biofilm? One concentration (55 g/L) of brewed green and three concentrations (55 g/L, 110 g/L, 220 g/L) of light roast, as well as ten concentrations of instant coffee were used to find trends in coffee concentration and S. mutans colony count. As the concentration of light roast coffee increased, the colony forming units of S. mutans decreased. The Minimal Bactericidal Concentration of instant coffee with S. mutans was 255 g/L. Next steps include replication in triplicate to create a standard curve of coffee concentration and colony forming units. After confirmation of these results, experiments will be repeated on model tooth substrates to find the optimal concentration to put into toothpaste.

Influence of a 3D Printed Chromosome Model on Student Understanding of the Processes of Mitosis and Meiosis

Author(s): **Annika Pratt**
Mentor(s): **Dr. Whitney Jones**
Poster: **51**

A university's aim is to create learning environments in which undergraduate students have access to demonstrations and learning tools that appeal to their unique learning styles. In undergraduate science courses, researchers have pursued interactive demonstrations and 3D models paired with a corresponding activity to aid in the understanding of molecular genetics and biological processes. As prior research has observed a difficulty for undergraduate students to understand the

biological processes surrounding mitosis and meiosis, this project aimed to increase the understanding of mitosis and meiosis in students through the use of a 3D chromosome and tubular cell membrane model. Pre/post assessment of learning outcomes addressed by this model revealed a statistically significant improvement in the number of students who answered each question correctly pre versus post assessment. Thus, it was concluded that the use of the 3D model and corresponding activity were an effective hands-on learning tool for undergraduates learning about the biological processes of mitosis and meiosis.

Discovery and Mapping of a Long Noncoding RNA that is DNA Damage-Inducible and Suppresses p53-Mediated Apoptosis

Author(s): **Sydney Preston**
Mentor(s): **Dr. Robert Smart**
Poster: **52**

Long noncoding RNAs (lncRNAs) have important roles in disease and normal cellular function. A novel lncRNA has been identified that is upregulated by UVB-treatment in mouse and human skin and keratinocytes in culture. The lncRNA is transcribed from the (+) DNA strand on chromosome 17 in a region partially aligned with a predicted lncRNA, Gm41556. A ~15-fold increase in the novel transcript is seen in both mouse keratinocytes and mouse epidermis when treated with UVB. RNAseq, PCR tiling, 3' RACE, and IsoSeq analysis shows the inducible transcript has two exons ~2900 RNA bases in length separated by an exon of 2405 base pairs. In UVB-treated keratinocytes, siRNA knockdown of the transcript resulted in increased apoptosis, increased p53 protein levels, increased p53 regulated pro-apoptotic factors, and decreased p53-regulated anti-apoptotic factors compared to control UVB-treated cells. These results indicate the novel transcript suppresses p53-mediated apoptosis and for this reason, the lncRNA has been named lncRNA, Soal (Suppressor of apoptosis by lncRNA). UVB-treated mouse keratinocytes treated with an ATM inhibitor decreased Soal induction, indicating the transcript's induction is regulated in an ATM-dependent manner. In the human genome, genomic synteny showed a possible homologous locus that partly aligns with a predicted lncRNA on chromosome 6, called XR_926759.2. Similar to mouse, this transcript is inducible by UVB ~27-fold in human keratinocytes, and knockdown data indicate it suppresses p53-mediated apoptosis. In summary, a novel lncRNA has been identified that suppresses p53-mediated apoptosis in response to UVB-induced DNA damage in mice and humans.

Sexual Health Programs for Parents of Youth with Intellectual Disabilities: A Review

Author(s): **Lauren Richards**
Mentor(s): **Dr. Laura Widman, Ms. Julia Brasileiro**
Poster: **53**

Parents play an important role in providing sexual education to their children. This education is especially valuable for youth with intellectual disabilities (IDs). Although youth with IDs express as much sexual desire as their non-disabled peers, they may possess less sexual health knowledge and experience higher rates of negative sexual health outcomes, such as abuse (Clatos & Asare, 2017; Pugliese et al., 2019; Frank & Sandman, 2021; Rooks-Ellis et al., 2020). The purpose of this literature review was to explore the current sexuality education programs that exist for parents of youth with IDs. A search of studies was conducted using PsycINFO, Google Scholar, and Summon databases. Studies were included if they were conducted in the U.S. and involved sexual health education programs for parents of adolescents (10-19 years) with intellectual disabilities of any type. Four studies (two quantitative, two qualitative) met the inclusion criteria. Studies varied in program length (one was one day, one was two weeks, one was one month, one was 12 weeks) and the disability addressed (one for youth with autism, one for down syndrome, two for multiple disabilities). Findings from all four indicated improvements in parental attitudes toward sexuality, sexual health knowledge, and comfort level in addressing sexual health topics with their children. In general, these studies provide strong preliminary support for the efficacy and effectiveness of tailored interventions for parents. With only four studies available, future research is needed to focus on the unique needs of parents and youth with IDs within more diverse communities.

Development of precise milk feeding system for sows

Author(s): **Lexi Roof, Bailey Jones, Savannah Lindsey, Joshua Miller, Leia Neely, Margaret Edel, Alexis Oliver**
Mentor(s): **Dr. Suzanne Leonard**
Poster: **54**

Feeding sows a partial milk diet can replace up to two-thirds of their typical cereal diet while still providing the needed nutrients at a reduced cost. A North Carolina commercial sow farm with a predominantly milk feeding system was partnered with for the present project. On the trial sow farm, the current milk delivery method in a single trough system does not account for individual amount adjustments, leading to less precise diet management for each sow. Improper body condition can

negatively impact sow performance in both farrowing and gestation. The objective of the present study was to develop a novel milk feeding system for individualized sow meal portions. A PVC-pipe network was attached to the main milk pump with separate valve adjustments at each sow stall. Custom dividers were created to separate the existing feed trough into sections for single-sow stall use while still allowing for proper cleaning regimens. Two materials differing in thickness, stiffness, and cost were tested along with two divider shapes. Measurements of flow rates were taken to denote variation within and across stall locations. The developed PVC milk delivery network permits lower feed costs, more consistent milk delivery and sow body condition with low implementation costs. Future work will focus on further system improvements and expansion to additional barns.

Marine Cyanotoxin Microcystin in Sea Turtles, Alligators, and Sharks

Author(s): **Barrett Rose, Kaitlin Litwin**
Mentor(s): **Dr. Astrid Schnetzer, Dr. Scott Belcher, Dr. Craig Harms, Dr. Kady Lyons**
Poster: **55**

Microcystins are phycotoxins produced by cyanobacteria (also called blue-green algae) that primarily bloom in freshwater and estuarine environments. These toxins are suspected to impact varying trophic levels in aquatic food webs and have been found in fish and shellfish in an increasing number of locations within NC coastal systems. However, little work has been done to explore the transfer of microcystins to higher trophic levels or apex predators along the East coast. In this research, we investigate the presence of microcystins in plasma samples of various sea turtle, shark, and alligator species along the Eastern U.S. Given the recent reports on the prevalence of cyanobacteria and the wide distribution of microcystin in NC estuaries, we expect positive results of microcystins in plasma samples for each of these animal groups.

Ocular Health of Captive Fish

Author(s): **Olivia Samuelson**
Mentor(s): **Dr. Carrie Thomas, Dr. Gregory Lewbart**
Poster: **56**

Identifying and analyzing data about ocular diseases in fishes is helpful to maintain standards of care (SOC) in aquariums, provide aquarists with insight into which fish families are most successful under human care, and potentially lead to cures for

certain ocular diseases in captive species. Previous studies have demonstrated that external disease in fishes commonly present as ocular change. Rapid identification of disease can prevent the spread to other individuals in public aquariums. Twenty-five public aquariums across the United States were surveyed with the intention of determining frequency of ocular disease in captive fishes and husbandry approaches for prevention and treatment. Three public aquariums fully responded to the survey. Many institutions may not be open to sharing information on disease statistics, which could potentially complicate this area of research. All three aquarium respondents observed ocular disease in marine fishes within the past year and all practiced preventative health methods of quarantine and water disinfection using ultraviolet light or ozone. Additionally, the three aquarium respondents have protocols in place for contacting their veterinarian when fishes develop gross ocular disease. The prevalence of ocular disease in aquariums throughout the United States suggests that current husbandry methods are not sufficient to entirely prevent introduction and spread of disease among captive animals.

Implementation of Virus induced gene silencing vectors for cell cycle analysis in geminivirus infected Arabidopsis thaliana Col-0

Author(s): **Jayson Sanchez**
Mentor(s): **Dr. Trino Ascencio-Ibáñez**
Poster: **57**

"Gene silencing is the process of downregulating specific gene expression in cells. We focused on the success of silencing specific genes using viral vectors in Arabidopsis thaliana Col-0. In plants, the downregulation of a gene can happen with post-transcriptional gene silencing (PTGS). We used virus-induced gene silencing (VIGS) to exploit the antiviral defense mechanism. For VIGS, viral genomes are modified as vectors which are used for regulating host gene expression. For this initial test, Tobacco Rattle Virus (TRV) was used as a viral vector to induce PTGS. The specific protein of interest is involved in chlorophyll production (Phytoene Desaturase). TRV plasmids (pYL196 and pYL154) were transformed into Agrobacterium tumefaciens strain G3101::pMP90 by electroporation. Afterwards, independent colonies were used to inoculate A. thaliana Col-0. We tested a streamlined method for inoculation. Our inoculation method was effective, as “bleaching” of the plant was prominent among all test subjects.
We have identified several cyclin-dependent kinases upregulated during geminivirus infection (CKL5 and CKL6). Bioinformatics analysis has identified putative cognate cyclins for these CDKs. We generated primers for every cyclin gene in A.thaliana Col-0 using SnapGene. Restrictions sites were added at each end of every primer to facilitate cloning into the TRV system. If successful with the cloning, we will then

inoculate A. thaliana Col-0 with geminivirus and silence cyclins involved with infection. Downregulation of cyclin expression would be observed by noting any differences in symptom development or viral DNA replication and will confirm its involvement in geminivirus infection."

Training Undergraduates for Fieldwork Research in a South African Wildlife Conservation Study Abroad

Author(s): **Sarah Sessoms, Jess Schinsky, Dani Carter, Beatrice Eddy, Katelyn Simkins, Katy Hagopian, Madison Manzo, Alexis Oliver**
Mentor(s): **Dr. Shweta Trivedi**
Poster: **58**

The opportunities to train undergraduate students for fieldwork research in a globally-engaged educational program are very few. ANS 395, Wildlife Conservation and Management in South Africa, is an intensive experiential course co-taught by their local veterinarians and NCSU faculty who work with highly endangered Southern White rhinoceros. In May 2022, student participants were trained to collect information on age, gender, microchip number and perform health assessments on 2 adult and 2 juvenile rhinos upon immobilization. The blood chemistry was performed for 11 parameters using i-STAT Alinity by the students. The two juveniles had average values including Na+ (119.5 mEq/L), Cl- (101.5 mEq/L), TCO2 (18.5 mEq/L), Urea Nitrogen (16 mg/dL), Creatinine (1.0 mg/dL), Glucose (85.0 mg/dL), iCa (1.01 mmol/L), Hematocrit (45.0% PCV), and Hemoglobin (15.3 g/dL). The two adults had average values including Na+ (126 mEq/L), K+ (7.1 mEq/L), Cl- (96.5 mEq/L), TCO2 (28.5 mEq/L), Urea Nitrogen (17.5 mg/dL), Creatinine (1.25 mg/dL), Glucose (78.0 mg/dL), iCa (1.31 mmol/L), AnGap (12.5 mEq/L), Hematocrit (50.5% PCV), and Hemoglobin (17.2 g/dL). It was determined that heart rate, respiratory rate, and temperature were within normal ranges for all animals. Blood chemistry ranges were normal for the 2 juveniles and 2 adult rhinos, however, the two juveniles had very high (>9.0 mEq/l) K+ levels indicating hyperkalemia.

The Development of a Recombinant Protein Expression System for Bovine Serum Albumin to Characterize the Mechanism of Disulfide-Mediated Amyloid Formation

Author(s): **Beatrice Sewell, Molly Reid**
Mentor(s): **Dr. Michael Goshe, Dr. Robert Rose**
Poster: **59**

Amyloid aggregation is commonly associated with pathogenic diseases such as Alzheimer's and Parkinson's disease. To develop therapeutic strategies to better combat these neurodegenerative disorders, it is important to elucidate the mechanisms of amyloid formation. In previous work performed in the laboratory, fibrillation of the model protein bovine serum albumin (BSA) was initiated by exposing buried cysteinyl disulfide bonds to a reducing redox environment to trigger a chain reaction of spontaneous non-native cysteinyl pairings that led to conformational changes within the protein to produce amyloid fibrils. To investigate the importance of the specific cysteinyl residues in this process, a recombinant system expressing BSA and site-directed mutants is being developed. After determining the proper sequence and primers for our recombinant system, cloning of the wild type BSA gene into the PSV272 plasmid was performed. The plasmid was then transformed into Origami 2, an Escherichia coli mutant containing several chaperonin proteins which assist with cysteinyl disulfide bond formation. Currently, work is being conducted to overexpress and purify the wild type BSA protein and to confirm the proper formation of native disulfide bonds. Future research will include site-directed mutagenesis and alanine scanning of cysteinyl residues within BSA. These BSA mutants will then be purified and tested for their propensity to aggregate under previously developed reducing redox conditions using the Thioflavin T spectroscopic assay and circular dichroism. By comparing the measurements between wild type and mutants, a better understanding of the mechanism of amyloid formation by BSA disulfide shuffling will be achieved.

Examining the Connection Between Parental Monitoring and Depressive Symptoms in LGBTQ+ Youth

Author(s): **Carlin Spence**
Mentor(s): **Dr. Laura Widman**
Poster: **60**

Rates of depression are on the rise nationwide, especially among adolescents. Youth identifying as part of the LGBTQ+ community are particularly vulnerable to experiencing depressive symptoms. This study examined the impact of parental

monitoring (or what parents/caregivers know about their child) on the presentation of depressive symptoms among sexual and gender minority (SGM) youth. Parental monitoring is shown to be an effective buffer for serious mental illness in adolescents. We hypothesized that increased parental monitoring would negatively correlate with presentation of depressive symptoms. Participants consisted of 102 U.S. adolescents (Mage=15.13; 27% White, 31% Black, 32% Hispanic, 10% Other/Mixed) self-identifying as a member of the LGBTQ+ community.Youth participants reported how much their caregivers know about their personal life. Youth also reported prevalence of depressive symptoms using the Short Mood and Feeling Questionnaire (SMFQ), a 13 item questionnaire rated on a scale from 0-2, with the total score being recorded. Results indicated no statistically significant correlation between parental monitoring and depressive symptoms among LGBTQ+ adolescents (r=-.161, p=0.106). Prevalence of depressive symptoms, however, were found to be incredibly high, regardless of parental monitoring. Given high rates of depression, more mental health services and interventions are needed to support this population. Future research should investigate parental monitoring criteria to determine what variables are likely to improve depression among LGBTQ+ youth.

Development of "Cooking Essentials: Ingredients for Life" Curriculum Facilitator Training and Self-Efficacy Survey

Author(s): **Anna Thomas, Chloe Patterson**
Mentor(s): **Dr. Natalie Cooke, Dr. Carolyn Dunn, Ms. Catherine Hill**
Poster: **61**

There is a deficit in research related to the impact community-based culinary nutrition education courses have on self-efficacy of emerging adults, ages eighteen through twenty-five. This population is susceptible to experiencing major life alterations, including changes in environment and increased independence, so it is vital to develop a curriculum to meet their needs. "Cooking Essentials, Ingredients for Life" aims to help this population cook with confidence. It encapsulates simple tools and ingredients, food safety techniques, adaptable recipes, and inexpensive ingredients. The research objectives were to (1) develop a training curriculum for facilitators (local family and consumer sciences extension agents) leading the program and (2) validate the pre- and post-course cooking self-efficacy surveys. To meet the first goal, the research team created eight facilitator PowerPoints and scripts to highlight important instructional components of each program session, convey the importance of catering to emerging adults, and emphasize why the program is necessary to the nutrition field. Future training curriculum-related work will include filming training videos, designing the training website, and recruiting and training facilitators for a state-wide pilot of the curriculum. To meet the second

goal, the research team received feedback on the survey from a panel of community nutrition education experts and made edits to the survey based on feedback. Before conducting cognitive interviews with emerging adults, research assistants engaged in a 5-phase qualitative research interviewer training. Future work for survey validation will involve completing cognitive interviews, receiving feedback from a second expert panel, and widespread survey administration for factor analysis.

Bringing Digital Fashion Designs Into Reality

Author(s): **Lainey Volz**
Mentor(s): **Dr. Anne Porterfield, Dr. Janie Woodbridge**
Poster: **62**

This study aims to discover a streamlined process for designing a real garment directly from digital design software. The finished product will provide the Wilson College of Textiles with a curriculum for bringing digital garments into reality. Additionally, as the fashion industry grows increasingly sustainably conscious, creating digital prototypes opposed to physical saves material from being wasted. A review of the existing literature suggests that in the digital fashion research space, there is a void for research on translating the digital designs into reality. Rather, research has placed emphasis upon the fluidity digital design gives designers from a creativity standpoint (with gravity not being a restriction). As I continued to delve into existing literature, I was inspired to build upon research performed by Holly McQuillan, a fashion student at the Swedish School of Textiles, who implemented CLO 3D into their fashion design process with the goal of creating zero waste products. When designing in CLO 3D, careful consideration for each of the pattern pieces is vital so that your design is able to fit the virtual model. Being informed on how the garment will be flat patterned in advance allows us to minimize the physical prototyping phase (reduce fabric waste) and make zero waste design more attainable. Through this method of garment creation, you eliminate waste by determining a near perfect fit, perfect surface design placement, and perfectly simple construction all thanks to CLO 3D software (as seen in the design process of this circle skirt).

The Implementation of Indigenous Land Practices

Author(s): **Kody Willingham**
Mentor(s): **Dr. Erin McKenney**
Poster: **63**

Many aspects of modern western society have left communities disconnected with the natural world. Many ecosystems around the world have thrived while stewarded by local indigenous communities using traditional ecological knowledge. Traditional Ecological Knowledge (TEK) is a collection of beliefs and practices about the relationship between people and their environment that have been passed down generations in many indigenous communities. Ecosystems that were developed using traditional ecological knowledge harbor some of the highest levels of biodiversity. Unfortunately, western societies do not always recognize the crucial role that indigenous communities have played in taking care of the land. The goal of this conservation campaign is to bolster awareness of the important role that indigenous communities and TEK play in conservation, placing native voices at the forefront of programs. To accomplish this goal, I conducted an extensive literature review and examined these issues from diverse perspectives. I hope to highlight the various fields, such as conservation, agriculture, and the public health sector, to effectively implement traditional management strategies. Government officials and farmers, stand to greatly benefit from TEK. A greater understanding and application of TEK will support higher levels of biodiversity and ultimately help restore ecosystems to precolonial health and functionality. For example, traditional management strategies can build sustainable crop yields which is especially important as we cope with increasing climate change. Furthermore, ethno-botany will provide the public a more diverse array of options for staying healthy. Implementing indigenous land practices is paramount for supporting communities in a changing world.

Establishment Patterns of Carolina Hemlock Ecosystems in the Southern Appalachians

Author(s): **Casey Wofford**
Mentor(s): **Dr. Jodi Forrester**
Poster: **64**

Carolina hemlock (Tsuga caroliniana) is an endemic species to the Appalachian Mountains that has vast ecological value because they are associated with ecosystem services such as nesting sites for birds, wildlife food, and winter shelter. The non-native, invasive hemlock woolly adelgid (Adelges tsugae), introduced to the eastern United States in the 1950's, has threatened the health and longevity of both

Carolina and eastern hemlock (Tsuga canadensis) since their introduction. Climate change may exacerbate this problem as warming temperatures may promote the adelgid population and infestations and alter hemlock habitat. Relative to eastern hemlock, less is known about the establishment and growth dynamics of Carolina hemlock. I used dendroecological methods to describe these patterns for five Carolina hemlock populations in North Carolina and Tennessee. We measured the composition and structure of each stand to summarize different species that Carolina hemlock occurs with. By aging the hemlock and the neighboring species in the stands, we could determine the order the species established. We measured growth increments to compare relative growth among years, species and individuals to describe the response to disturbances. Understanding the structure, composition, and establishment patterns within and across sites is important for determining if Carolina hemlock growth will be sustainable with a changing climate and an increase of the deadly hemlock woolly adelgid.

Native Yeast Isolation and Utilization in Beer Production

Author(s): **Brandon Woodley, Benjamin Heckmann, Riley Adams**
Mentor(s): **Dr. John Sheppard, Mr. Eric Gibble**
Poster: **65**

The overarching goal of this research is to isolate a local yeast strain from North Carolina to use in commercial brewing at the Goose and the Monkey Brewhouse. Starting off, samples were collected from different locations around the city of Raleigh and placed in liquid media in order to cultivate the microorganisms present on the surface of the samples. From these initial samples, agar plates supplemented with an antibiotic were streaked and from the colonies that grew, new plates were streaked with single colonies in order to create a pure culture. From the pure cultures, samples were observed under a microscope to look for budding and sent to Genewiz for further characterization of the suspected yeast growing in the pure cultures. Two samples were confirmed to be Saccharomyces cerevisiae, which is ideal for brewing applications. These samples underwent a small scale fermentation in maltose solution and measurements were taken of the pH, specific gravity, and ethanol content in order to determine if these yeast were viable for use in a small scale brew. Currently, two small scale batches of beer using these yeast are being developed in order to do sensory analysis.

Identification of Cyclopropanation Catalyzed by Fe/2OG Enzymes

Author(s): **Angela Yao**
Mentor(s): **Dr. Wei-Chen Chang, Mr. Lide Cha**
Poster: **66**

Natural products containing cyclopropyl groups exhibit potent biological activities due to the inherent rigidity of the ring structure. Two natural products with cyclopropane moiety, hormaomycins and belactosins, are found to show promising antibacterial activities and inhibitory effects against 20s proteasome, respectively. Mononuclear iron- and 2-oxoglutarate dependent (Fe/2OG) enzymes catalyze a variety of reactions including hydroxylation, desaturation, halogenation, epoxidation, and cyclization. HrmJ and BeIL, two Fe/2OG enzymes responsible for cyclopropanation, convert 6-nitro-L-norleucine into 3-(trans-2-nitrocyclopropyl)-L-alanine with opposite stereoconfiguration in the production of hormaomycin and belactosin A, respectively. We focus on HrmJ first, and we expressed and purified two annotated Fe/2OG enzymes, HrmJ-ssc and HrmI-aw, which are found to be a cyclopropanase catalyzing a stereodivergent cyclopropane ring and a hydroxylase, respectively. Our work provides insight into the uncharacterized biosynthetic pathways of natural products containing cyclopropyl groups, and it remains our interest to explore more possibilities with regio- and stereo-selective cyclopropanation.

Effect of Gust and Pitch on an Airfoil Lift Studied Using a Discrete Vortex Simulation

Author(s): **Nitin Chitrala**
Mentor(s): **Dr. Ashok Gopalarathnam, Mr. Yi Tsung Lee**
Room: **3210**

"Unsteady aerodynamics is the study of motion through a flow field whose properties change with time. Unsteady flow conditions can present many challenges to flight stability, ranging from slight discomfort to severe structural damage. Among these, gust has been extensively researched because small air vehicles such as micro-air vehicles (MAVs) and drones often operate in gusty conditions. Gust refers to a sudden change in velocity within the flow field. An airfoil encountering transverse gusts is known to experience highly unsteady loads. Previous studies have shown that airfoils entering a gust region experience additional induced velocity on the airfoil, changing the effective α, and increasing lift. In this paper, we first used a low-order framework based on Unsteady Thin Airfoil Theory and a Lumped Vortex Element (LVE) method with discrete vortex shedding to model a region of transverse gust. For comparison, we ran a second model in which we replaced the gust region with a pitching maneuver, where the airfoil started at α = 0, pitched up to the effective α caused by the previous gust region, and then pitched back down to α = 0.

The first part of this work deals with the simulation of flow fields. We used a low order model based on LVE in state variable form, which treats the airfoil as a collection of bound vortices concentrated along the camber-line of an airfoil. The second part of this work deals with comparison of load history between the two flow fields."

Engineering Education Systematic Literature Review

Author(s): **Nick Goodwin**
Mentor(s): **Dr. Olgha Qaqish**
Room: **3210**

The purpose of this presentation is to explain the systematic literature review of engineering education in regard to the several benefits provided by a 10-week summer Research Experience for Undergraduates (REU) for the Engineering Grand Challenges Scholars Program at NC State University. This literature review was performed to support the fact an REU is crucial to developing a community of practice, an engineering identity, and research self-efficacy for the research paper "The Grand Challenges Scholars Program Research Experience: A Great Opportunity to Cultivate Belonging in a Community of Practice". The specific aim of this project is to analyze resources as well as our findings to support the REU program will support the development of undergraduate students by building on their research self-efficacy, engineering identity, and providing a community of practice. An REU focuses on providing undergraduate students a glimpse into the world of engineering while building research self-efficacy, engineering identity, and a community of practice. These concepts were analyzed to determine how a. REU instills this into undergraduate students. The study qualifies the value of an REU to establish engineering success. Six research articles pertaining to how an REU established these concepts were examined, annotated, and summarized into evidence and data for the research paper. The process of this literature review will be broken down in the methodology section as to how we find the right sources, the key words used to find these sources, and how the key words play a role in the bigger picture of our research.

The Effect of Incorporating Decellularized ECM in Direct-write, Near-field Electrospun Gelatin Solution On Fiber Stiffness

Author(s): **Samantha Watson**
Mentor(s): **Dr. Matthew Fisher, Mr. Zachary G. Davis**
Room: **3210**

Tendinopathy is associated with altered tendon ECM compared to healthy tendons; yet, the causes of these changes remain unclear. In vitro tendon models offer an ability to control specific variables potentially involved in tendinopathy. This study analyzes how decellularized extracellular matrix (ECM) in gelatin solutions for direct-write, near-field electrospinning impacts fiber stiffness for tendon-mimetic scaffolds. Gelatin solutions (625mg/mL gelatin and ECM with 70%acetic acid) were

mixed at 0%, 10% and 30% ECM and the viscosity determined using a parallel plate rheometer. Gelatin-ECM solutions were direct-written in aligned patterns following an established protocol, imaged, and fiber diameter measured using ImageJ. Scaffolds were crosslinked with EDC:NHS for 24hrs following direct-writing. Fiber stiffness was measured using atomic force microscopy (n=4). Outliers were removed (ROUT5%), and one-way ANOVA with Tukey's test (α=.05) was used for statistical significance. Initial results show no difference in viscosity, stiffness, or fiber diameter with the introduction of 10%(21.1±2.09Pa-s, 8.25±3.50MPa, 4.62±0.64μm) or 30% (20.4±2.04Pa-s, 9.67±1.48MPa, 5.70±4.04μm) ECM compared to 0% (23.3±4.49Pa-s, 8.67±3.24MPa, 3.67±0.67μm). This shows the addition of ECM into a gelatin solution does not affect the ability to produce similar scaffolds while allowing the incorporation of the bioactive elements of ECM, although the 30% ECM showed variable fiber diameters. Future cellular response of tenocytes isolated from equine superficial digital flexor tendon for viability, orientation and aspect ratio, and protein and gene expression will be done.

Exploring the Cultural Differences in Respect Conditionality: A Comparison between US Mainstream and Chinese Culture

Author(s): **Amy Hu, Isra Siddiqui**
Mentor(s): **Dr. Amy Halberstadt, Ms. Xi Liu**
Room: **3221**

Respect is a fundamental concept, but when and to whom we give respect to (i.e., respect conditionality) are not well understood, particularly across different cultures. Previous studies suggest that the conditionality of respect in American college students may be influenced by the values of individualism and materialism prevalent in mainstream US culture (Twenge & Campbell, 2009). However, Chinese culture, with its roots deeply embedded in Confucianism, places greater emphasis on individuals contributing towards collective interests (Dai, 2020). Individuals valuing material possessions are also more likely to view respect as conditional and exchangeable (Kasser et al., 2007). US college students may practice more conditional respect (giving respect only when it is earned) than their Chinese counterparts who may tend to provide unconditional respect. These features are deemed central for students as predicted by the collectivist/individualism of their country of origin. Thus, we surveyed 220 US and 90 Chinese college students on whether they tend to choose conditional vs. unconditional respect and where they fall relative to mainstream culture values (on a 1-100 scale). Chi-square tests showed that US students report applying more conditional respect (75.89%), whereas Chinese students apply more unconditional respect (54.89%; $\chi 2$=11.85, p<.001). Results from independent t-tests indicated unconditional versus conditional respect is

associated with closeness to mainstream values in China but not to mainstream US values (China: t=2.18, p=0.032; US: t=0.54, p=0.591). Study limitations and future research will be discussed.

Context Matters: Respect Concepts are Embedded within Culture and Close Relationships

Author(s): **Jenny Huang, Karina Seebaluck, Summer Phommachieng**
Mentor(s): **Dr. Amy Halberstadt, Ms. Xi Liu**
Room: **3221**

"Respect is perceived as a central emotion and attitude that promotes close relationship success and functionality (Frei & Shaver, 2002; De Leersnyder et al., 2014). However, the ways in which we experience, understand, and express respect may be embedded in the overarching frames operating within culture (e.g., independent vs interdependent frames supporting personal and group goals) (Ho, 1986; Hsu, 1981; Li & Fischer, 2007; Wei, 2013). Thus, we explored the central features and feelings of respect within Chinese and US cultures and different types of close relationships. We surveyed 206 American and 185 Chinese college students about the structure of their respect concepts by asking about the centrality of features (e.g., acceptance, loyalty) and feelings (e.g., admiration, love) associated with respect using 1-7 ratings. Preliminary results with 2-way ANOVAs showed both US and Chinese students shared honesty and listening to others as central features of respect, but Chinese students associated behaving morally as a feature of respect more than US students ($F[1]=5.50$, $p=.02$). For feelings, both US and Chinese students emphasized trust in respect, but US students connected admiration ($F[1]=11.68$, $p<.001$) and gratitude ($F[1]=5.10$, $p=.03$) more and Chinese students connected humility more ($F[1]= 19.92$, $p<.001$). Also reported will be how respect is perceived in specific relationship types. Expanding our knowledge of how respect is conceptualized cross-culturally can help us understand emotion differences more broadly, and even help build and navigate relationships. "

A Response to Governmental Action Against Native Cultures Within the United States A Retelling of Cultural Genocide within the Catawba Nation

Author(s): **Courtney Morgan**
Mentor(s): **Ms. Bee Rinaldi**
Room: **3221**

Prior to their European introduction, the Catawba tribe was a formidable force within what is now the southeastern U.S. However, the Catawba along with many other Indigenous groups within the area were and continue to be undermined by the eurocentric government that formed around them. In colonial America, the Catawba maintained a primarily positive relationship with settlers as they mutually benefited from trade. However, with increased interaction came the spread of foreign disease among the Catawba and a majority of the population died from illness. Tensions between Catawba and their European counterparts began to rise until they reached a tipping point in 1830 with the Indian Removal Act, thus sparking the Indian Removal Era: a time marked by westward expansion, the Trail of Tears and Indian Assimilation Schools. While schools like The Carlisle Indian Assimilation School in Pennsylvania were dismantled in 1918, native individuals were not awarded the right to vote until 1962. In 1978, the Indian Child Welfare Act (ICWA) was passed to keep native children in the foster care system within an indigenous environment as a means of cultural preservation. However, systemically, there is a problem being that there are significantly higher rates of native children in the foster care system as opposed to their white counterparts. Furthermore, ICWA was challenged in the supreme court in November, 2022 on account of its preference for native foster parents. Interlaced with Catawba stories and history, this autoethnography showcases governmental action against the cultural welfare of Native tribes in America.

Staged Science: How I used research to bridge theatre and science

Author(s): **Gaven Bell**
Mentor(s): **Ms. Mia Self**
Room: **3222**

Too often we view STEM and art as separate entities, but there is a lot that we can learn by combining them. One reason people enjoy the humanities is that it helps them conceptualize themselves and their connection to the world around them. Science and research can offer this as well. In this presentation, I will discuss how I applied my undergraduate research experience in biology to write an award-winning one-act play, Muse. Muse is a contemporary rendition of the Orpheus and Eurydice

myth that explores the relationship between art and science as Finn, a postdoc in microbiology, grieves and processes the loss of his wife Eurydice, an artist. After winning the 2022 Creative Artist Award for Theatre, I spent a year revising and developing the script before it premiered at University Theatre at the end of March. Through this process, I applied my research knowledge to write my characters and learn the concepts discussed in the play. This presentation will take you along my creative journey and show how the arts and science can intersect.

Creativity: Toward a Steadily Formed Young-Adult Identity

Author(s): **Olivia Howell**
Mentor(s): **Dr. Christian Doll**
Room: **3222**

Exposure to creative experiences during college aids in forming young people's conceptions of success, and the construction of their identities during the transition from young adulthood to full adulthood. Further anthropological exploration is needed to observe how and why the complex merging of creativity and future career undertakings happens as well as to understand the conditions that are required for this fusion, this exploratory research begins by looking at young adults through the lens of Victor Turner's liminality, and uses it to conceptualize their positionality between two places: studenthood and full-fledged adulthood. At this transitional time, college can both enhance and create barriers to the realization of certain creative identities (as people who utilize what their university has to offer) that remain throughout young-adulthood Through this research, the lives of people that consider themselves to be creative within the Digital Media Lab space at NC State University were interviewed and asked about their experiences inhabiting this position in society, how they cope with it, and what success looks like for them personally.

Textile Product Development Using Wool from Heritage Sheep Breeds

Author(s): **Anna Stuffelbeam**
Mentor(s): **Dr. Traci Lamar**
Room: **3222**

"US wool production has declined dramatically since the introduction of synthetic fibers which resulted in a much lower demand for wool fiber. Of the wool produced, the diversity of breeds has also declined. According to the livestock conservancy, in the US the top four sheep breeds (Suffolk, Dorset, Hampshire, and Rambouillet)

account for about 75% of registrations each year. The remaining 25% of sheep registered each year come from 42 other breeds.
Wool is a natural, renewable fiber with unique and valuable characteristics. It is strong, durable, elastic, warm, absorbent, naturally moisture wicking, odor resistant and flame resistant. Centuries of breeding and selection for fiber qualities are reflected in today's extraordinary range of fleece types, textures, and colors. Yet many of these amazing breeds are now endangered or threatened. Some of the breeds have fewer than 200 registered animals in the US and fewer than 2000 globally.
The goal of this research is to highlight the many uses of wool from the unique breeds of sheep through a collection of textile products that will be integrated into my senior textile collection. Using wool from sheep breeds on the Livestock Conservancy list of Critical and Threatened species, this creative exploration will culminate in samples and end products suitable to each breed that highlight unique fiber characteristics.
Textile technologies used for this project will include Dornier jacquard loom, Lillstina floor loom, 16 harness compu-dobby loom, Shima Seiki knitting machine, and Dubied hand knitting machine."

Breast Cancer Treatment Accessibility: Making a Decision

Author(s): **Coley Kida**
Mentor(s): **Dr. Catherine Showalter, Dr. Holly Hurlburt**
Room: **3285**

Over 350,000 Americans are estimated to be diagnosed with breast cancer in 2023, with 12% (~42,000) receiving no treatment (American Cancer Society, 2023). Breast cancer patients face quite a few difficulties during the treatment decision process. Different treatments include surgery, radiation, chemotherapy, hormone therapy, and targeted therapies. Not only do patients have to decide on the treatment itself, but they also have to consider the accessibility of those treatments. Accessibility includes patient knowledge of the disease and medical practices, associated costs and patient economic status, geographical location of facilities and the patient, and the patient's support system. This project aims to assess what factors influence a patient's choice of treatment or nontreatment. We reviewed scholarly articles on breast cancer treatment (BCT) as it relates to accessibility and what influences the patient's decision-making process. Previous studies have looked at accessibility barriers that patients independently tried to navigate, such as seeking more knowledge (e.g., finding sources) and if the knowledge gained influenced their decision (Walsh et al., 2010). From the review of accessibility factors and treatment, we conclude that more research is needed on how and why breast cancer patients pick their treatments and the influence of accessibility on that decision. Ultimately, it

is crucial for healthcare providers to consider accessibility when discussing treatment options with breast cancer patients to help them make informed decisions that suit their unique circumstances.

Developing Protein Modification Method for Cancer Treatment

Author(s): **Bryce Medlock**
Mentor(s): **Dr. Jun Ohata, Mr. Seiya Ishizawa**
Room: **3285**

Cancer is commonly caused by a mutation/absence of amino acids found in an ordinary human's deoxyribonucleic acid (DNA) that can cause uncontrolled cell growth and division of abnormal cells. Chemotherapy is commonly known as a treatment option for cancer however, instead of targeting only sick cells, it destroys both sick and healthy cells around it, proving detrimental to one's health. Therefore, the Ohata lab proposes to develop a hybrid drug by attaching a toxic chemotherapy drug to a protein through chemical modification processes. I worked on the chemical modification of a model peptide luteinizing hormone-releasing hormone (LHRH), using a new chemistry labeled tryptophan amino acid residue. Currently, in order to make sure a linkage between the modification is stable, I am using liquid chromatograph-mass spectrometry (LCMS) to determine if the linkage is strong enough to undergo certain conditions such as ammonium bicarbonate (NH4)HCO3, ammonium carbonate (NH4)2CO3, and acetic acid (AcOH). This experiment will allow the justification if the linkage is strong enough to carry the modified amino acid through the human body and break at the time needed once it reaches a contaminated/mutated cell.

Understanding Paw Preference Associated with Brachial Plexus Birth Injury

Author(s): **Steven Thompson**
Mentor(s): **Dr. Jacqueline Cole, Dr. Katherine Saul, Ms. Kyla Bosh**
Room: **3285**

Brachial plexus birth injury (BPBI) is a perinatal neuromuscular injury that can cause permanent arm defects. Spontaneous limb usage has not been studied with this rodent model, and previous animal studies of post-injury limb use only employed adventitious motions that do not provide insight to intrinsic limb usage. Clinically, extrinsic motor and sensory assessments of the upper limb are utilized to examine degree of arm impairment. Intrinsic limb usage is an important aspect of assessing BPBI, as it provides insight to how the injured limb will be used during functional

tasks of daily living. On postnatal day 3-6, Sprague Dawley rat pups underwent surgical neurectomy (postganglionic or preganglionic) to excise C5-C6 nerve roots or sham surgery. At 3, 4, 6, 8, 12, and 16 weeks post-injury, functional forepaw usage was examined using the cylinder test, in which limb preference (injured limb, uninjured limb, or both limbs) was quantified for forelimb push-off, resting against the cylinder wall, and landing during rearing in the cylinder. Preliminary results of this ongoing study showed that after week 8, rats with preganglionic injury use their injured limb more than rats with postganglionic injury. In both injury groups, when resting against the wall, use of the injured limb is preferred least. Both injury groups use their injured limb most during landing motions and least during vertical rest. This study is the first to determine spontaneous forelimb usage following BPBI and may provide insight into early functional limb impairments in clinical patients.

Association between Body Iron Status and Biological Aging

Author(s): **Sahana Ramamurthy**
Mentor(s): **Dr. Ann Von Holle, Dr. Clarice Weinberg**
Room: **3210**

"Blood iron status is associated with cellular senescence and aging as evidenced by decreased telomere length but has not been assessed by newer blood DNA methylation (DNAm)-based biomarkers of biological aging that are specifically designed to assess disease and mortality risk. Here we assess associations between body iron status and 3 DNAm-based measures of biological aging.

We used a random sample from the U.S.-based Sister Study (n=1,260), with baseline serum iron measures (ferritin, iron, transferrin saturation) and 3 methylation-based biological aging metrics (GrimAgeAccel, PhenoAgeAccel, DunedinPace). We estimated associations with linear regression models including outcomes of biological age acceleration or pace of aging and serum iron measures as exposures, each in separate regression models for each aging metric. Confounders in adjusted models included smoking, alcohol, menopause status, and education.

The adjusted associations (95% CI) between biological aging measures and ferritin were positive (DunedinPACE: 0.01, (0.002, 0.01); PhenoAgeAccel: 0.26 (-0.14, 0.65); GrimAgeAccel: 0.15 (-0.02, 0.32)). However, there were inverse associations between the biological aging outcomes and serum iron (DunedinPACE: -0.01, (-0.02, 0.00); PhenoAgeAccel: -1.25 (-4.11, 1.24); GrimAgeAccel: -0.64 (-2.13, -0.37)) and transferrin saturation (DunedinPACE: -0.004, (-0.01, 0.01); PhenoAgeAccel: -0.72 (-1.53, 0.10); GrimAgeAccel: -0.55 (-0.90, -0.19)).

We did not find consistent support for the hypothesis that higher iron stores cause acceleration of biological aging. Ferritin is regarded as the most stable biomarker available for iron stores and showed positive associations. However, the evidence for negative associations with serum iron and percent transferrin saturation does not support the hypothesis."

The Psychological Effects of Dancing in a Studio Environment on Adolescents

Author(s): **Asa Thurnau**
Mentor(s): **Professor Autumn Belk**
Room: **3210**

Dance in studio environments has been a part of many young lives, some taking the art into adolescence. Adolescence is a time of grow and transition, and dance studios play a role into developing young bodies and minds. However, dancers are struggling with mental health and eating disorders more and more frequently as they continue dancing. The purpose of the research was to find the reasons dance studio environments can cultivate unhealthy mindsets and what can be done to aid dancers and their teachers. Through interviews, dancers disclosed the harsh realities of their dance upbringings, but also how much hope is available through dance. Ultimately, it was found that dancers need recognition of the unhealthy ideas sometimes perpetuated in studio environments and conversations with teachers need to take place. Teachers must also examine the unhealthy practices in their dance upbringing and actively fight to create a supportive environment for adolescents.

Preserving the Past for the Future: Digitizing 40+ Years of Research Data Collected from Burgundy, France

Author(s): **Lia Willcoxon**
Mentor(s): **Dr. Seth Murray, Dr. Scott Madry**
Room: **3210**

This presentation details the creation of a digital archive project that aims to preserve and make accessible more than forty years of research data on rural land use collected in Burgundy, France. This long-term, interdisciplinary research project has accumulated a vast amount of valuable and unique data of different forms and types, including archival documents, aerial photographs dating back to World War Two, audio and video recordings of ethnographic interviews, remotely-sense land use data, and historic cadastral and cartographic information. However, due to the age and the format of some of these materials, as well as the retirement of scholars who amassed the collection, there is now a risk of data deterioration and loss. Our presentation explains how to create a digital archive through a series of calculated steps, and a thoughtful and collaborative process for preserving the project's materials, hereby making them accessible to future researchers. The process involves a comprehensive inventory and assessment of the materials, followed by a detailed strategy for digitization and storage in a secure digital repository. The project is now

wrapping up the planning and strategizing phase, which has lasted seven months. The project will next develop an online platform in tandem with two institutional libraries in order to facilitate users' access to the digital archive using a digital finding aid. This presentation will present the undergraduate researcher's experience of the challenges and opportunities of this digital archive project, and discuss the importance of this project for preserving valuable historical materials for future generations.

Moral Enhancement Technologies and ASD: Ethical Gentrification of a Population

Author(s): **Jordan Birkner**
Mentor(s): **Dr. Gary Comstock**
Room: **3221**

"In this paper, I question the benefits of potential Moral Enhancement Technologies proposed for those with Autism Spectrum Disorder. Considering my own experiences as diagnosed with ASD, I do not believe that there is substantial research proving any significant deficits in moral decision-making between autistic and non-autistic populations. However, even if it is assumed that there is a natural immorality associated with autism, I argue that technologies proposed in therapeutic, medical, and engineering strategies are not only insufficient for moral enhancements, but actively harmful for those diagnosed with ASD.

Objections to these claims can be seen in potential results and implications for potential technologies. Moral enhancements are a controversial philosophical topic, but if potential methods of such are discussed in potentially developed and perfected future forms, it can be understood that a target population of this technological utilization would be seen for those with ASD. Those with autism have faced numerous societal misperceptions through history, including that of a lack of empathy and difficulty with what Kohlberg deemed "post-conventional morality". If technologies are able to standardize "Theory of Mind", consistently higher moral judgments throughout society have potential to be observed.

I rebut each mentioned support for categories of moral enhancement technologies through analyzing potential results and harms impacting the ASD population, including deleterious impacts on resources and independence. I conclude that each potentially beneficial strategy of moral enhancement technologies for those with ASD are incomparable to the impending harms to persons upon implementation."

Ralinguistics: Conversations, Data and Analysis

Author(s): **Francesca Kyanda**
Mentor(s): **Dr. Robin Dodsworth**
Room: **3221**

The Raleigh Language Study is a long-term project that investigates linguistic variation and change. Over the course of 14 years of data collection, the project has revealed social patterning in the ways that language varies and continuously changes in Raleigh; for example, the shift away from Southern vowel pronunciations reflects and reinforces socioeconomic structures and ethnic segregation. Data collection involves recording lengthy conversations with people in Raleigh, and these conversations are transcribed to enable automated analysis of speech features. Transcription of the recordings is accomplished via an automated tool that works well but makes several kinds of unpredictable errors. For that reason, the transcripts have to be corrected by humans. The transcript correction process is described in detail with a focus on the types of errors and the current process for correction using Praat, an acoustic analysis program. The work of editing is done by transcribers, who listen to the files and make the necessary corrections to the transcriptions taken by the software. One essential correction is to differentiate between the speakers. This is done by isolating the speakers in separate tiers of the program and taking note of their differences in volume and pitch.

Reviving Tom Parker's Life Work

Author(s): **Jude Vanne**
Mentor(s): **Dr. Kathryn Grossman**
Room: **3221**

"Tom Parker, a dedicated and long-term employee of North Carolina State University died unexpectedly in the fall of 2021. Shortly after his death, the supervision of the lab he had developed was taken over by Dr. Kathryn Grossman and Dr. Tate Paulette. Under their supervision, the previously employed students continued their work for the rest of the year. At the beginning of the 2023 academic year, a couple more students, including me, were hired to turn Parker's lab into a space for researchers and students to learn about his great collection. Through various projects, such as the Limes Arabicus Project, the Roman Aqaba Project, and the Petra North Ridge Project, Tom Parker and his team curated one of the biggest and most well-documented university-held collections of Roman and Nabatean pottery in the U.S. However, this collection is widely unknown at NC State. In addition to our goal of

making the lab a functional space for hands-on learning, we are also hoping to spread awareness of Parker's life and work."

Estrous cycle regulation of amygdala activation following threat conditioning in C57Bl/6j mice

Author(s): **Gaven Bell**
Mentor(s): **Dr. Elizabeth Lucas, Ms.Kristen Adcock Binion, Dr. Nina Baumgartner**
Room: **3285**

Women are more likely to develop anxiety disorders than men and tend to have more severe symptoms. The development of anxiety disorders is associated with dysregulation of threat memory, but research investigating threat memory in mice seldom includes female subjects. This study seeks to clarify how sex differences, specifically those resulting from the ovarian cycle, influence the acquisition and regulation of threat memory. We investigated neuronal activation in the amygdala (lateral (LA), basal (BA), and central (CEA)) of male and female mice in the high (proestrus) or low (diestrus) hormone phase of the ovarian cycle following threat conditioning compared to naive control animals. We expected greater amygdalar neuronal activation in female mice than males, and a difference between proestrus and diestrus females, after threat conditioning. Following a threat conditioning paradigm, we quantified neuronal activation in amygdala subnuclei by staining for c-fos protein expression, a post-mortem marker. Females exposed to threat conditioning (trained) showed greater neuronal activation within the CEA than trained males. This result was driven by activation within the capsular CEA, indicating that it may play a larger role in threat expression regulation than previously understood. Trained proestrus females showed greater neuronal activation within the lateral CEA than trained diestrus females. Within the LA, diestrus females showed greater neuronal activation than proestrus females. The estrous cycle effect indicates an endocrine component to anxiety disorders which could explain the differences in the prevalence of anxiety disorders between males and females, as well as have implications for future treatment options.

Facile Synthesis of 1,4,2-Oxothiazols via MnO2 Cyclization

Author(s): **Ben Cipriano**
Mentor(s): **Dr. Joshua Pierce, Mr. Alejandro Valdes Pena**
Room: **3285**

"1,4,2-Oxothiazoles are a unique class of heterocycle comprising three different heteroatoms, nitrogen, oxygen, and sulfur, within its five-membered ring. 1,4,2-oxothiazoles constitute a promising scaffold for the development of bioactive molecules with potential applications in human and animal health. Recently, glucose-based spiro-1,4,2-oxathiazoles have been reported as anti-hyperglycemic agents in rats, and it was determined that they exerted their activity via glycogen phosphorylase inhibition which has application in the context of type 2 diabetes. Currently, there are very few methods for the synthesis of these heterocycles, the most effective of which rely on either unstable thiocarbonyls, high temperatures, and long reaction times. Herein, we have developed a facile, cheap, scalable, and mild cyclization procedure which is mediated by manganese dioxide (MnO2). Furthermore, we have enabled an experimental procedure that allowed us to perform the key 1,4,2-oxothiazol cyclization step using flow chemistry, by using a MnO2 column at room temperature, in mere minutes, which has the potential to be applied to industrial use. By doing so, we have not only expanded upon the current literature for the synthesis of these compounds but have also aided in the search for further methods of selective C-H oxidation."

Intercalation of Tetramethylammonium Bromide into Chromium Chloride: An Investigation of Electronic Property Modification

Author(s): **Andrew Igdal**
Mentor(s): **Dr. Daniel Dougherty**
Room: **3285**

In this study, we aimed to explore the intercalation of tetramethylammonium bromide (TMAB) into metal halides, specifically RuCl3 and CrCl3, to investigate potential alterations in their electronic properties. While RuCl3 already exhibits memristance behavior and intercalation could modify its properties, our focus turned to the less defined properties of CrCl3 and possible intercalation. The project involved exposing CrCl3-coated silicon wafers to TMAB dissolved in acetonitrile using ultra-sonification and direct solvent heating. Diffuse Reflectance Spectroscopy (DRS) was used to confirm the absence of TMAB intercalation in CrCl3. This outcome demonstrated that the electrochemical mechanism for doping is likely correct, as results were consistent with expectations based on the difference in reduction

potentials between Cr^{3+} and Ru^{3+}. The positive standard reduction potential of Ru^{3+} compared to the negative for Cr^{3+} indicates that the reduction of $RuCl_3$ is more thermodynamically favored than that of $CrCl_3$. In conclusion, our investigation provides valuable insights into the electrochemical mechanism for doping by demonstrating that $CrCl_3$ is not a suitable candidate for TMAB intercalation, likely due to the difference in reduction potentials. This finding highlights the need for further exploration of other metal halides and intercalation methods to modify electronic properties and develop new materials with desirable characteristics.

Polymer modifications to optimize nanosensor output for analyte detection

Author(s): **Sofia Abello**
Mentor(s): **Dr. Januka Budhathoki-Uprety**
Poster: **1**

"Potassium ion plays a major role in biological processes such as activating nerve impulses and regulating heart, muscle, and kidney functions. Physiological imbalances of potassium electrolyte levels can lead to detrimental effects on the body. Elevated potassium ion levels, known as hyperkalemia, can cause neurological, muscular, and cardiovascular dysfunctions. Mild cases exhibit nausea and muscle weakness, while severe cases include muscle paralysis and cardiac arrhythmia. Therefore, monitoring physiological potassium ion levels is crucial for mitigating life-threatening effects. Currently, potassium ion level is determined by analyzing blood samples through electrochemical measurement with ion-selective electrodes combined with an electrocardiogram. However, this can be inconvenient and could delay treatment for at-risk patients.Thus, new technologies that enable real-time monitoring of potassium ions are needed, which could allow for timely interventions in facilitating treatment for hyperkalemia.Optical detection technologies are emerging in biomedical sectors. Advances in this field could enable the early detection of hyperkalemia.
Single-walled carbon nanotubes (SWCNTs) are a class of nanomaterials with unique photophysical properties. Their non-photobleaching near-infrared fluorescence, high sensitivity and stability is ideal for use in developing implantable and wearable sensors. Here, we functionalized SWCNTs surface to develop an optical nanosensor for the detection of potassium ions by using an FDA-approved polymer that is used for hyperkalemia treatment. We found that this nanosensor detects potassium ions in solution. We further optimized the sensor response by modifying the polymer on the nanotube surface that enabled the detection of potassium ions within the clinically relevant range. "

Virtual Reality In Mental Health

Author(s): **Sabah Afroz**
Mentor(s): **Professor Mary Estrada**
Poster: **2**

The immersive nature of VR not only challenges the distinction between reality and imagination but also holds the potential to revolutionize the way we treat psychological conditions. Research has shown that VR can be used to treat mental health concerns such as anxiety, depression, and PTSD, by exposing patients to controlled simulations of traumatic experiences. It allows the patients to process and overcome their emotions in a safe and controlled environment. (Research conducted by Brain Injury and PTSD Treatment Hub in 2021 stated that exposure therapy helps decrease the intensity of the stress to situations, thoughts, or memories that provoke fear or anxiety) - citation. The implementation of mental health is significantly beneficial for various different demographics amongst the population of students attending North Carolina State University, although some might prefer it more than others. The NCSU catalog website states that it currently has more than 35,000 students enrolled, and the university campus is experiencing rapid growth of mental health concerns among students. According to the NCSU counseling data, nearly 1 in every 6 students seek mental health services and there is an increasing severity in those who do. The university does not have enough mental health counselors on site to provide for all of its students in need as a student can get one bi-weekly appointment for up to 12 free counseling sessions. Implementing VR technology at NCSU campus health will open access to a vast amount of opportunities for currently enrolled students for treating their mental health concerns.

PRESTO-Tango assay for the detection of pain signaling neuropeptides

Author(s): **Mary Aiesi**
Mentor(s): **Dr. E. Javier Lopez Soto**
Poster: **3**

Nociceptors are key peripheral sensory neurons that allow for detection of potentially dangerous and infectious agents. Following injury or inflammation, nociceptors innervating the skin release a variety of neuropeptides, including CGRP, substance P, and glutamate, that drive neuronal sensitization and hypersensitivity. Studying how, when and what neuropeptides are being released in response to harmful stimuli is key to further understanding the signaling cascade that triggers pain in mammals. Here, we aim to adapt a previously developed cell assay, PRESTO-Tango, for the detection and quantification of neuropeptides involved in pain signaling.

PRESTO-Tango is an open-source resource developed by Richard Axel, Gilad Barnea and Bryan L Roth's laboratories. This method relies on engineered receptors linked to a transcription factor and their ability to recruit a protease that, only following receptor activation, releases the transcription factor to induce expression of a reporter gene. We will establish the best conditions for PRESTO-Tango assay to measure neuropeptides derived from mouse skin explants following exposure to different harmful agents. By adapting this cellular assay to detect the release of neuropeptides in vivo, we hope to identify new targets involved in the early signaling cascade that drive neuronal sensitization and hypersensitivity.

Effects of Biochar on Catalytic Treatment of Graywater

Author(s): **Emanuel Aponte**
Mentor(s): **Dr. Praveen Kolar**
Poster: **4**

"The research goal is to convert agricultural waste into a valuable and useful byproduct by making biochar. Biochar is the product of the thermochemical conversion of biomass in an absence of oxygen. On its own, pristine biochar demonstrates weak reactivity; however, it can be modified to adopt different properties.
The main objectives of this research is synthesizing biochar from peanut hull and testing biochar's absorbance properties for greywater treatment. To make biochar, dry biomass is placed in a furnace under inert conditions. This is so minimal combustion occurs and a minimal amount of ash is formed, while still forming biochar. After making biochar, it can be used as is (pristine biochar) or mixed with urea. This mixture can be placed in a furnace under inert condition to make nitrogen doped biochar, which tends to exhibit better absorbance properties. This is one of many modifications that can be made with biochar.
As previously stated, the other objective is to test biochar for greywater treatment. One way is using adsorption columns loaded with biochar. The data of this process, after interpretation, would yield what mass of impurities was adsorbed and thus how effective that biochar was. It then becomes a matter of testing out different chemicals with biochar, the same chemical with biochar from different biomasses, and even the ratio of said chemicals and biochar. This objective seems impossible, but once achieved, we will have discovered one of the best and cheapest ways to treat greywater!"

Examining the chemotactic responses of marine bacteria to vitamin B1 and its vitamers

Author(s): **Maddy Arena**
Mentor(s): **Dr. Ryan Paerl**
Poster: **5**

The growth and activities of marine microbes drive essential elemental cycling, support food webs, and impact the health of ocean ecosystems. Chemotaxis is presumably key in promoting microbial interactions and microbial activities - e.g. particle degradation, and algicidal activity - yet we do not yet fully understand what compounds are chemoattractants. B vitamins are intracellularly produced and needed by most cells to survive, thus we hypothesized they may be potent chemoattractants. To test this hypothesis we used in situ chemotaxis assay (ISCA) well plates to observe bacterial and phytoplankton attraction to vitamin B1, fragments of vitamin B1 (called vitamers) and B12, as well as well-known chemoattractants glucose and amino acids. This project utilized both laboratory and on-site incubation of Bogue Sound microbes and tracked the abundances of cells using flow cytometry. Based on collections from 2-hour field incubations using 8 prominent estuarine chemoattractants for well treatments, Bouge Sound microbes appear to populate in conditions with higher than average traces of vitamin B1, HET, AmMP, and HMP, with treated wells averaging higher than a negative control with p values < 0.0005. We successfully expanded on previously established methods for in-situ chemotaxis assays using modified field incubation from previously established methods.

Characterization of Porous, Mineralized Collagen-Chitosan Scaffolds for use in a Bone-On-Chip Platform

Author(s): **Kathryn Benedict**
Mentor(s): **Dr. Jacqueline Cole, Ms. Sandra Stangeland-Molo**
Poster: **6**

A primary component of bone-on-chip platforms is a scaffold that mimics the cancellous bone microenvironment and provides support for cells. Cancellous bone is primarily composed of type I collagen and hydroxyapatite mineral with important components of porosity and protein mineralization. To address both properties, scaffolds were freeze-dried with both collagen and chitosan in weight % ratios of 10:0, 8:2, and 6:4. They were then carbodiimide-crosslinked for 8 hours to retain the porous structure using 98% ethanol as solvent, and mineralized in either modified simulated body fluid (mSBF) or polymer-induced liquid precursor (PILP). Mineralized

scaffold properties were characterized with thermogravimetric analysis (TGA), Fourier-transform infrared spectroscopy (FTIR), energy dispersive spectroscopy (EDS), and scanning electron microscopy (SEM). TGA: Scaffolds had average mineral deposition of 20-40%, compared to 65% on average for bone, with PILP trending higher for 8:2 and 6:4 formulations. FTIR: Scaffolds exhibited characteristic peaks for collagen (Amides I and II), and the C-H peak for chitosan in the 8:2 and 6:4 formulations. EDS: Scaffolds were composed mainly of carbon, sodium, chloride, calcium, and phosphorus. Average Ca/P ratios, an indicator of bone apatite quality, were 1.5 and above (benchmark ratio for bone is 1.67). SEM: Scaffold porosity ranged 40-55%, with further optimization hopefully increasing porosity. Next steps will be to finalize characterization and perform biocompatibility assays with osteoblast-lineage cells to assess the best formulation for the platform to study changes in the bone microenvironment that may contribute to fractures following stroke.

Color Change of a Cucumber-Mint Beverage

Author(s): **Molly Bennett, Ananya Badhri, Hannah Polizzi**
Mentor(s): **Homayoon Ershadi, Dr. Fernanda Santos**
Poster: **7**

A natural sports drink company located in Raleigh, NC is looking to expand and scale up production of its main and original product. In accordance with this expansion, an experiment was conducted to determine the root causes of batch inconsistency regarding a color change of the product. The main objective of this study is to test the parameters of temperature and hold time within the hot-fill bottling process. This will be done by determining at what time the pre-filled cucumber mint beverage loses its original color while maintaining a constant temperature over a span of 3 hours. The experiment will be conducted by holding the sample at a temperature ranging from 170°F to 200°F for 3 hours, taking a sample every fifteen minutes, and using a colorimeter to determine a change in color. The experiment will contribute to the company's goal of improving batch consistency and product quality in terms of the color of the cucumber-mint beverage, as well as any future research on the degradation of color using similar products.

Chromosome Doubling Trials of Albizia

Author(s): **Andrew Berley**
Mentor(s): **Dr. Hsuan Chen**
Poster: **8**

Chromosome doubling is a technique used in horticulture to discover new phenotypes in traditional horticulture crops. These novel phenotypes can generate renewed market interest in an otherwise jaded crop. This experiment utilizes Oryzalin, a common herbicide, to induce polyploidy in plants. During the cell process, Oryzalin inhibits the formation of spindle fibers. These fibers are essential for chromosome migration to the poles during cell replication. This interruption leaves the non-divided cells as autopolyploids that contain a duplicated genome. A greater concentration of individual genes in cells can often lead to an increase in gene products and thus heightened phenotypic responses. The effect of Oryzalin was explored in two cultivars of Albizia julibrissin: 'Summer Chocolate' and 'Ishii Weeping' at several different concentrations over varying time periods. The goal was to determine the optimal treatment conditions to produce the most stable tetraploids in each cultivar. Methods used in this experiment treated plants with 0-300μM of Oryzalin over a period of 4 days. Plants were germinated and treated at the apical meristem before the emergence of the first true leaves. After treatment, plants were allowed to grow out and recover from the treatment. After several weeks, the plants were tested for ploidy utilizing a flow cytometer. Results showed that the 300μM concentration had the most efficacy and a transformation of 6.6% and 1.6% mixoploid generation in 'Ishii Weeping' and 'Summer Chocolate', respectively. Ultimately, Oryzalin has a promising ability to increase ploidy in plants, but further research should be performed to increase the efficacy.

ARoSClinical Data Server Project

Author(s): **Thomas Bernabe-Bacilio**
Mentor(s): **Dr. Edgar Lobaton, Mr. Jeffrey Barahona**
Poster: **9**

When using numerous devices for a study, one has to be able to communicate with the devices to ensure that the participants are following the required protocol. For this project, we have developed a server to communicate with devices used for a study on adolescents with asthma and provide an interface for study administration. The user interface was implemented with the development of the ARoSClinical application which allows participants to supply data input to then later be analyzed by medical personnel. Our lab has developed a debugging pipeline for tracking

errors from the phones. This was achieved by implementing code in Swift to track the behavior of the ARoSClinical application's behavior, creating a backend api for receiving phone logs, and writing code to manage database entries of log files. The log messages provide us with a continuous record of the application's behavior and allows us to carefully identify where a problem has occurred. The three different log levels appropriate for our purposes are errors, warnings, and fatal errors. When creating log messages, there has to be precise information provided so we can filter and find specific logs. Aside from having log levels, basic information is also supplied to the user. The name of the file, function name, line number of where the log was called is outputted to the console, in addition to a brief description that precisely describes what occurred. The results of these efforts has allowed the ARoSClinical study to operate efficiently and maintain a well-structured environment.

Fuel Management and Reload Cycle Length Optimization for a Westinghouse 2-Loop PWR

Author(s): **Zachary Bevans, Jesse Hines**
Mentor(s): **Dr. Maria Avramova, Dr. Kostadin Ivanov**
Poster: **10**

Plagued by immense capital costs, electric utility companies look to make nuclear power production more economically competitive through finding the optimum cycle length that minimizes fuel costs and loss of revenue during outages. In this work, three core loading patterns (LPs) for a 121 assembly, 1677 MWth Westinghouse 2-loop pressurized water reactor were designed such that the energy requirements for a 12-month, 24-month, and an optimized, intermediate fuel cycle length were safely met to determine most economically optimal reload cycle regime. To develop these loading patterns, Westinghouse's Advanced Nodal Code (ANC9) was used to simulate nuclear reactor core depletion until the cycle length, enthalpy rise hot channel factor (FΔH), and peak pin exposure meet design requirements through arranging fresh and burned assemblies in the core. In depth safety analyses were then conducted to ensure safety under normal and transient operation for each LP. The cost of operation for each equilibrium design was then determined by calculating the cost of fuel and outages costs over a 20-year operating period. From the cost of equilibrium operation, an optimum fuel cycle length was found. Future work can include improving core design to reduce fuel costs and increase safety and thermal margins for each loading pattern.

Using Statistical Learning Methods to Accelerate Model Parameter Sensitivity Experiments

Author(s): **Shamik Bhattacharya**
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Poster: **11**

"Understanding the likely consequences of climate change requires better representation of ecosystems in land models coupled with Earth system models. Numerous land model simulations are needed to quantify the sensitivity of model predictions to parameters, but running such simulations over every grid cell is computationally prohibitive. Thus, we applied cluster analysis to determine global ecoregions, areas that are nearly homogeneous with respect to climate and carbon characteristics. We clustered grid cells from a historical land-model simulation to identify ecoregions at multiple levels of division and a representative grid cell for each region to use for parameter perturbation experiments designed to understand the sensitivity of vegetation productivity to model parameters. We produced maps of the resulting ecoregions with the representative grid cells indicated. We further evaluated the bias introduced by the simplification at different levels of division to inform the selection of ecoregion maps for future simulation experiments. "

Examining the effect of an academic intervention on graduation rate

Author(s): **Austin Bridger, Tyson King, Silas Huckins**
Mentor(s): **Dr. Emily Griffith, Dr Stephany Dunstan**
Poster: **12**

Academic Interventions are programs specifically intended to improve academic performance in undergraduate programs, but little research has established positive academic outcomes such as GPA and retention rates at the public institution of interest while accounting for covariates. This study aims to investigate the impact of a certain undergraduate academic intervention program on graduation rates while accounting for relevant covariates. We will use logistic regression and t-tests on a census of such non-disclosed intervention at a large research institution to evaluate correlations between graduation rates and intervention participation. The findings from this study will provide valuable insights into the effectiveness of the intervention program and contribute to the development of evidence-based strategies to improve graduation rates in undergraduate education.

Application of Tuning Forks in Measuring Viscosity and Density of Molten Salt Systems

Author(s): **Ryan Charrette, Harrison Storms, Declan Miller, Madison Turmon**
Mentor(s): **Dr. Alexander Bataller**
Poster: **13**

New developments and interests in next generation nuclear power production have brought about a reinterest in molten salt reactors (MSRs). Resilient and economical instrumentation need to be developed for monitoring critical fluid properties such as density and viscosity of the fuel-coolant mixture. Acoustic systems have been tested for measuring material properties and have been demonstrated in radiation environments before. Thus, the objective of this effort is to demonstrate the use of a measurement system designed around a tuning fork in determining viscosity and density of a molten nitrate salt in a laboratory setting. By minimizing fluid flow and assuming that the fundamental vibrational mode of the tuning fork is dependent only on geometry and the medium, a set of equations is solved for using various media to calibrate the system. Next, an experiment is to be conducted in which the density and viscosity of molten potassium nitrate are measured to evaluate the system.

Repetitive Transcranial Magnetic Stimulation and and Its Efficacy in Treating Major Depressive Disorder: A Scoping Review

Author(s): **Ari D'Alessandro**
Mentor(s): **Dr. Veljko Dubljevic, Mr. Ronald Dempsey**
Poster: **14**

"Repetitive Transcranial Magnetic Stimulation (rTMS) has gained popularity over the last two decades as a form of non-invasive brain stimulation treatment for certain psychiatric disorders. Particularly, patients who suffer from Major Depressive Disorder (MDD) are turning to rTMS to help alleviate symptoms that have not been managed effectively with other forms of treatment such as pharmaceuticals, cognitive-behavioral therapy, or other forms of brain stimulation such as Electroconvulsive Therapy (ECT). These patients are typically referred to as having Treatment Resistant Depression (TRD) and are a frequent target population of current experimental studies and clinical literature. As rTMS may substantially enhance the capacity of psychiatrists and psychologists alike to deliver augmentative interventions, a discussion of the potential promise and pitfalls of this technology is timely. For these reasons, we developed a protocol for a scoping review to map the nature and extent of research evidence, identify existing gaps in knowledge, and

discuss the ethical implications and societal costs of using rTMS as alternative treatment options for MDD, as well as highlight the relevance of rTMS to the public. We will search for control trials and reviews involving rTMS for treating depression in three electronic databases, including PubMed, Web of Science, and PhilPapers, from publication up to January 2023. We will further define efficacy in the treatment of depressive symptoms, the difference between pretreatment (baseline) and post-treatment as the primary outcomes through the inclusion of ethical considerations and societal costs. "

Innovation in Medicine through Sustainability in Biotechnology: Synthesis of a Biochar-based Magnetic Core Shell Nanoprobe

Author(s): **Atharv Dixit**
Mentor(s): **Dr. Praveen Kolar**
Poster: **15**

"This project lies in the intersection of agricultural waste management, sustainability, and medicine. It delves into innovation in medicine and biotechnology through sustainability by integrating bioprocess engineering focused on creating a magnetic core shell nanoprobe derived from biochar used for novel applications in various medical and biological systems including targeted drug delivery and tumor ablation by stepping into sustainability in oncology. The nanoprobe consists of a highly magnetic core material made from biochar, coated with a thin shell of tissue compatible material.
The aim is to quantify the engineering properties of the nanoprobe and to show how various biochar treatments and tissue compatible coatings affect the overall functioning of the nanoprobe. This variability allows for the nanoprobe to be used for tremendous applications in medicine. It can be used in targeted magnetic drug delivery systems by infusing the drug into the nanoprobe and guiding it to the targeted site using an external magnetic source.
This project will be implemented in five phases including biochar synthesis, biochar magnetization, tissue-compatible coating for biocompatibility, testing, and imaging to observe physical and chemical properties.
The purpose of this project is to design and engineer a system of sustainable processes that will ultimately provide all the engineering properties required for the biochar-based nanoprobe to function optimally in a wide range of medical and biological systems.
The hope is to also show possibilities of innovation in medicine through sustainability and advance novel treatments to help patients in need."

Binding Interactions of E. coli DNA Repair Protein RadD

Author(s): **Sam Doak**
Mentor(s): **Dr. Stefanie Chen**
Poster: **16**

Ionizing radiation causes damage to DNA by inducing lethal double-strand breaks in gut bacteria such as E. coli, leading to vomiting and indigestion. Studying the largely unknown radiation repair pathways of E. coli can allow further insight into engineering more radiation-resistant bacteria to help people who are exposed to large doses of ionizing radiation, such as cancer patients and astronauts. In pursuit of this goal, the behavior of the enigmatic E. coli DNA repair protein RadD was explored. Various methods, including electrophoretic mobility shift assay (EMSA), biolayer interferometry (BLI), and atomic force microscopy (AFM) were used to further examine the known interactions of RadD with single-stranded DNA, the DNA repair coordinating protein SSB, and ATP. Through EMSA, unusual activity regarding RadD's inability to bind DNA in the presence of ATP was observed. This behavior is not characteristic of Superfamily 2 helicases, the family of proteins in which RadD bioinformatically belongs, which typically use ATP while binding to DNA to perform their helicase activity. BLI was used to determine the strength of the binding interaction between SSB and RadD in the presence of ATP. Finally, the existence of RadD-DNA aggregates in vitro was confirmed through a variety of techniques; however, the formation and function of these structures in vivo will require further exploration. This research sheds light on the complexity of the mechanism behind radiation DNA repair in E. coli.

The Impact of Student Success Programs on Transfer Rates between Colleges

Author(s): **Nishant Dodla, Tyler Southward, Jenna Christensen**
Mentor(s): **Dr. Emily Griffith, Dr. Stephany Dunstan**
Poster: **17**

The purpose of this study is to examine the effect of an intervention program on student transfer rates out of the college in which they began their undergraduate career. The bulk of the literature related to our study focuses on the respective relationships between GPA, intervention programs, and intra-college transfer rates independently, while our research aims to explore their intersection by examining the relationship between all three in tandem. To achieve this, we will use a logistic regression model to examine the likelihood of a student transferring out of the college in which they matriculated based on their involvement in the intervention program and GPA. In addition, we plan to use ANOVA to compare mean transfer

rates between colleges in order to reveal trends in which colleges students are more or less likely to transfer out of. Our results can be used to help inform policy decisions related to the intervention program, transfer rates between colleges, and student success at the university.

Effects of Brachial Plexus Birth Injury on Composition of Biceps, Supraspinatus, & Subscapularis Muscles

Author(s): **Brooke Dunkley**
Mentor(s): **Dr. Jacqueline Cole, Dr. Katherine R. Saul, Ms. Kayla B. Bosh**
Poster: **18**

"Brachial plexus birth injury (BPBI) is a common nerve injury in newborns that occurs when the nerves in the shoulder are damaged during a difficult birth. BPBI can cause lifelong paralysis, reduced range of motion, and musculoskeletal deformities. Deficits vary by location of injury relative to the dorsal root ganglion, but the effect on underlying muscle composition is unknown. We hypothesize diminished muscle growth following BPBI is related to increased collagen content, or fibrosis, causing impaired muscle function.
Sprague Dawley rats underwent surgery on one forelimb at 3-6 days postnatally: preganglionic neurectomy (n=3), postganglionic neurectomy (n=4), forelimb disarticulation (n=6), or sham (n=3). The contralateral limb served as a control. Biceps, subscapularis, and supraspinatus muscles were dissected at 4, 8, or 16 weeks post-injury, snap-frozen, cryosectioned longitudinally, and stained using Masson's trichrome. Muscle sections were imaged and analyzed as a ratio of collagen (blue) to muscle tissue (red). Limb comparisons were made using paired t-tests, and group comparisons for injured/uninjured limb ratios were performed with Kruskal Wallis tests (α=0.05).
Results indicate that fibrosis is greater in the injured than uninjured biceps following postganglionic neurectomy (p=0.0417). In the preganglionic group, there was a tendency for increased fibrosis in all muscles and biceps tended to have greater collagen content than disarticulation and sham groups. Analyses are ongoing to understand the progression of altered muscle composition following BPBI. This study is the first to characterize fibrosis progression of the supraspinatus, subscapularis, and biceps muscles after BPBI, which may inform treatment planning."

CAFO Lagoon Breach Impact On Nutrients and Metals in Soils

Author(s): **Mindy Dunn, Drew Bresingham, Luke Goodin, Darius Ledbetter**
Mentor(s): **Dr. Elizabeth Guthrie Nichols**
Poster: **19**

Early in 2023, an inactive hog lagoon was breached up-gradient and adjacent to a riparian forest managed by the College of Natural Resources Foundation. Lagoon water and sludge flushed along an ephemeral, first order stream, across a 5 meter flood plain, and into a perennial tributary to Swift Creek in Johnston County. As of March 2023, the lagoon continues to release liquids during storm events. Soil/sludge samples were collected following the IRTC incremental composite sampling method along the lagoon breach runoff and at a distance for a reference soil. The samples were tested for aluminum, calcium, copper, magnesium, manganese, molybdenum, nickel, phosphorus, potassium, sodium, and zinc using USEPA Method 200.7. Samples were kept sealed in doubled plastic bags, stored at 4℃, and submitted to Waters Agricultural Laboratories, Inc. within 24 hours of collection. Samples were tested for acidity, base saturation, cation exchange capacity (Method 9080), pH, soluble salts, sulfur, nitrate-nitrogen (Method 350.1), ammonia (Method 350.1), and humic matter. The reference soil showed significantly lower concentrations of listed quantified parameters compared to lagoon impacted soil/sludge samples.

Enclosure usage of a captive postpartum mother aye-aye lemur (Daubentonia madagascariensis)

Author(s): **Adam Ehmke, Rebecca Olson, Tiffany Brocco**
Mentor(s): **Dr. Lisa Paciulli, Mr. David Q. Watts**
Poster: **20**

Animal habitat usage optimizes areas used for foraging and resting, while avoiding areas of danger. For example, wild aye-ayes (Daubentonia madagascariensis) use lower elevations to forage, and higher elevations to rest and avoid predators (Andriamasimanana 1994). Feistner and Ashbourne (1994) found that captive mother aye-ayes spend half of their time with their infants, but did not specify where in the enclosure. In this study, a Duke Lemur Center (DLC) mother aye-aye was observed to determine if she would have similar habitat use to wild counterparts. It was hypothesized that the mother aye-aye would spend at least 40% of her time in the nest with her infant. With Duke IACUC approval, Pelco IMM12027-1S cameras were hidden in a captive aye-aye enclosure. Video-footage of the aye-aye's behaviors was coded using 2.5 minute instantaneous focal animal sampling (Martin & Bateman, 2007). Behavior, type of interaction, and time spent in an area was noted. The results

showed that the mother aye-aye spent 29% of her time with the infant. Since the time spent with the infant was <40%, the hypothesis was rejected. When not with the infant, the mother aye-aye traveled around the enclosure and auto-groomed in the branches farthest from the nest. Limitations of this study include the small sample size (n=1) and a short observation period of (n=3 days). Research on mother aye-aye habitat usage postpartum is important as it can be used to identify areas of comfort and aid in husbandry efforts.

Ethical Issues Pertaining to Neuromarketing Research

Author(s): **Macy Ferrell**
Mentor(s): **Dr. Veljko Dubljevic**
Poster: **21**

Neuromarketing is an emerging field dedicated to analyzing marketing strategies and consumer behaviors with the aid of neuroscience, with the goal of personalizing marketing to consumers.The human subjects data collected by researchers is variable, examples include measures of sensory perception, attention, emotional engagement, reaction time, and unconscious reactions (Cherubino et al., 2019). Neuromarketing generally makes use of methodologies commonly employed in neuroscience, including brain imaging techniques (fMRI & EEG) and physiological measures (heart rate measures & facial coding). Critics of neuromarketing have called into question the quality of data collected in prior neuromarketing efforts: in particular, due to concerns about experimental methodology, and the skill level of neuromarketing researchers. Scholars and the general public alike have also voiced numerous ethical concerns regarding potential misuse of neuromarketing information gathered from consumers. Within this review, recent normative and empirical works examining the ethics of neuromarketing were analyzed using searches performed on PhilPapers, Web of Science, and PubMed. Results were then exported into Covidence for review of inclusion/exclusion criteria. A randomly selected sample of collected works was used to evaluate major ethical concerns surrounding neuromarketing research, including: privacy and confidentiality, policy and regulation, as well as use for political campaigns. Analysis of these existing ethical concerns can be utilized to improve the quality and acceptability of neuromarketing research. Further improvements can be made by addressing areas that require greater ethical considerations. Through this analysis, key ethical issues will be outlined and discussed to determine the status of neuromarketing.

Effect of dyes on polymer properties

Author(s): **Ariel Gomez Arellano**
Mentor(s): **Dr. Januka Budhathoki-Uprety, Ms. Meghan Lord**
Poster: **22**

In recent years, there have been many developments in the world of polymers, one such being synthetic helical polymers called polycarbodiimides. These polymers are characterized by having a repeating amidine structure with two tunable pendant groups that are highly customizable. However, aromatic helical polycarbodiimides often exhibit a tendency to become brittle in bulk materials that could pose challenges for real-world applications. Plasticizers are often added into polymers to modulate their mechanical and thermal behaviors and expand their applications. We recently reported that polycarbodiimides can form stable complexes with anionic dyes. This research investigates the formation of polymer-dye complexes and its effects on polymer properties. The main research focus is to study whether anionic dyes act as plasticizers for polycarbodiimides to significantly impact the solubility, thermal and mechanical properties of the polymer. Findings from this research could open a wider range of applications of polycarbodiimides in various fields.

Verifying Quality of Joint Reaction Forces Obtained from Musculoskeletal Models for Contact Finite Element Analysis of the Rat Shoulder Following BPBI

Author(s): **Rose Hansen**
Mentor(s): **Dr. Jacqueline Cole, Dr. Katherine Saul, Mr. Jason Cox**
Poster: **23**

Brachial plexus birth injury (BPBI) is one of the most common nerve injuries in children with detrimental effects on bone at the glenohumeral joint, differing by injury location. Postganglionic (Post) injury primarily causes joint dysplasia, while preganglionic (Pre) injury primarily causes trabecular bone deterioration. Though altered joint mechanics likely influence both forms of bone pathology, current biomechanical explanations are incomplete, as they stem from computational modeling studies that did not fully account for trabecular bone. In this study, a novel method is developed enabling contact forces estimated through musculoskeletal modeling (MSM) to serve as controls for finite element analysis (FEA) of subject-specific glenohumeral joint models that fully incorporate trabecular bone. To achieve this, micro-computed tomography (micro-CT) images of rat glenohumeral joints were segmented into humeri and scapulae in 3D Slicer, transformed using marker-based registration such that the spatial configuration of each segment matched the passive configuration of an accompanying specimen-specific MSM in

OpenSim. Next, glenohumeral JRFs from passive OpenSim forward dynamics simulations were converted to displacements and applied to the micro-CT humeri segments to confirm the JRFs caused joint contact. Finally, the transformed images were meshed using voxel-to-element substitution, creating a set of FE models with specimen-specific tissue architecture, material properties, and boundary conditions representing passive joint loading. Whereas prior modeling studies of bone following BPBI used models that approximated trabecular bone as a solid, homogeneous material, our novel approach enables new insights into Post and Pre injury effects on bone with a specific focus on underlying trabecular bone mechanics.

Understanding the Mechanism of the HOPS Complex During Vacuole Fusion in Stomatal Guard Cells

Author(s): **Grace Herring**
Mentor(s): **Dr. Marcela Rojas-Pierce, Ms. Anne-Marie Pullen**
Poster: **24**

Stomata are pores present on the leaves of plants that are critical for facilitating gas exchange. When stomata are open, the vacuoles of the guard cells surrounding them are fused; when they are closed, the vacuoles are fragmented. The process of vacuole fusion is thought to be well-understood in yeast, but not completely in plants. There is an unknown reaction that occurs involving the protein complex HOPS, in which it dissociates from vacuole membranes that are about to fuse. It is hypothesized that CBL-interacting protein kinase 23 (CIPK23) is involved in phosphorylation of HOPS subunits which may result in HOPS dissociation from vacuole membranes, allowing the fusion process to continue. Arabidopsis thaliana lines with a cipk23-3 mutation were identified, and WT and mutant lines were transformed via Agrobacterium with GFP-tagged HOPS protein subunits VPS39 and VPS41. The goal of this project was to visualize the localization of VPS39-GFP or VPS41-GFP in guard cells and compare between wild-type and cipk23-3 lines. This was done by imaging roots and stomatal peels. The peels were subjected to closing and opening assays, then subsequently dyed with a vacuole membrane dye (LysoTracker Red) and imaged on a confocal microscope. We expected to see a stronger overlap of signal between VPS39/41-GFP and LysoTracker as well as more fragmentation in open stomata in cipk23-3 mutant plants. While there was evidence of stronger signal overlap in roots of cipk23-3 lines also dyed with LysoTracker, the results from stomatal peels were less conclusive.

High-Throughput Characterization of Aptamers for Cocaine Detection

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Mentor(s): **Dr. Yi Xiao, Mr. Juan Cannora, Mr. Obtin Alkhamis**
Poster: **25**

Cocaine is a commonly abused substance that has consistently ranked among the most abused illicit substances in the United States. Since 2015, cocaine has seen a resurgence in popularity and was the third most commonly seized substance in 2022. Current on-site detection methods for cocaine rely primarily on immunoassay techniques based on antibodies. Although antibodies have excellent specificity, they are costly, have short shelf lives, and are subject to significant batch to batch variation. Aptamers are single-stranded oligonucleotides isolated through in vitro methods that bind specific targets with high affinity. They are advantageous for sensing purposes because they are more cost effective, highly stable, and have minimal batch to batch variation. Using a well-designed selection approach, aptamers are able to bind to a single target with high specificity. Herein, a total of 30 cocaine aptamers identified via a prior selection experiment were characterized using an exonuclease-based assay. Aptamers incapable of binding to a ligand are rapidly degraded by the exonucleases into mononucleotides, while aptamers that can bind resist digestion in a manner proportional to their affinity for the ligand. The digestion process can be conveniently monitored by sampling aliquots of the reaction mixture and staining with the DNA-binding dye, SYBR Gold. Of the 30 aptamers, six displayed excellent binding affinity and were chosen for specificity characterization, of which only two aptamers were found to be ideal for the development of sensors for on-site cocaine detection.

Lead Contamination Risk Across Regions of North Carolina

Author(s): **Samuel Holdsclaw, Trevor Phelps**
Mentor(s): **Dr. Dani Lin Hunter, Dr. Caren Cooper**
Poster: **26**

Lead poisoning can have damaging health effects. Exposure can be from drinking water that has been transported through leaded infrastructure. Many older homes still unknowingly have lead plumbing. Crowd the Tap is a participatory science program that aims to crowdsource the location of any remaining leaded plumbing infrastructure. We recruited 61 study participants across a rural-urban geographic gradient of North Carolina to assess their risk of leaded water. This was accomplished through a preliminary screening which identified risk based on a screening tool that prompted questions on age of homes, type of pipes, and water aesthetics. Of the 6

rural households, 4 were found to be at risk for lead contamination. Of the 15 suburban households, 3 were found to be at risk, and 11 of 39 urban households were found to be at risk. In those who were found to be at risk we conducted in-home lead testing and had their water tested in the lab (n=23). The home testing process is assessing the efficacy of a novel and affordable method to obtain accurate results on drinking water lead level. We will compare the results of in-home lead tests to laboratory testing to determine if this method is effective.. Ultimately, our research will help members of the public gain information about the quality of their drinking water quicker, and at a lower cost than prior methods, allowing them to make more informed decisions and gain peace of mind about their drinking water.

Material Quantification of Molten Salts via Glow Discharge Electrolysis

Author(s): **Alina Jugan**
Mentor(s): **Dr. Alexander Bataller**
Poster: **27**

Molten salt reactors (MSRs) are an advanced class of nuclear reactors in which the fuel and/or coolant is composed of a molten alkali-halide salt eutectic. Benefits of these reactors include high operating temperatures (~500-700 °C), greater thermal-to-electric conversion efficiency, atmospheric pressure operation, and a potential for a closed fuel cycle through online reprocessing. The goal of the reported research is to validate a new method of molten salt quantification that is designed for online monitoring within a probe-type geometry. As a liquid-fueled reactor, MSRs present unique challenges for accurate material quantification and accountancy that traditional conventional light water reactors do not encounter. Here we report on experiments utilizing glow discharge electrolysis (GDE) for real-time material quantification in molten salts. Our implementation of GDE features plasma generation of conductive liquids using a high voltage, steady-state electric discharge on the surface of the liquid while in a flowing helium gas environment. This low-temperature plasma produces exceptionally narrow line emission, from which elements can be identified and quantified using atomic emission spectroscopy. Due to the facile room-temperature operation, GDE was benchmarked and optimized in saturated saline solutions. This research will first investigate GDE performance in saline solutions, followed by chloride-based eutectics, specifically, LiCl-KCl and LiCl-KCl-$CeCl_3$.

In Situ Detection of Virus-Specific Immunity in the Skin Using 3D-Printed Microneedle Patches

Author(s): **Maria Kanton**
Mentor(s): **Dr. Jillian Perry, Dr. Shaomin Tian**
Poster: **28**

Skin interstitial fluid (ISF) contains about 85% of the proteins present in serum and can serve as an excellent source of biomarkers for health monitoring purposes. However, ISF is difficult to collect, with available sampling methods being painful, time-consuming, and low-yield. Microneedles (MNs) are durable, painless, and self-applicable, making them a suitable tool for in vivo sampling and in situ capture of target biomarkers. We have previously shown our capability of making polymeric MNs of various lengths and geometries using CLIP (Continuous Liquid Interface Production) 3D-printing technology. In this project, we aimed to establish a 3D-printed MN-based approach for in situ detection of virus infection and immunity, as a point-of-care diagnostic tool to improve immune surveillance of Zika disease, a mosquito-transmitted, single-stranded RNA flavivirus that causes birth defects in pregnant women in the tropical/subtropical areas. Herein, biocompatible MNs were 3D-printed via photopolymerization of KeySplint Hard (KSH) dental resin and poly(ethylene glycol) dimethacrylate resin. Hydrophobic KSH MNs showed a water contact angle of >90° and supported association of capturing molecules, herein a model antigen ovalbumin (OVA). We demonstrated that this MN platform can efficiently differentiate non-immune and immune sera in response to OVA in both in vitro assays and in vivo in mice. Current efforts focus on testing Zika envelop protein-specific antibodies, and further improvement of detection sensitivity using highly sensitive fluorescent quantum dots. This work can help address the immediate needs in point-of-care sampling and early detection of viral infections.

Effects of Developmental Exposure to BMAA and MCLR on Adult Zebrafish

Author(s): **Victoria Kapps**
Mentor(s): **Dr. Kurt Marsden, Ms. Melody Hancock**
Poster: **29**

Cyanobacteria produced in algal blooms release harmful toxins (i.e., cyanotoxins) into the environment, some of which are associated with neurodegenerative diseases. Scientists suspect cyanotoxin β-methylamino-L-alanine (BMAA) as an etiology of Amyotrophic Lateral Sclerosis (ALS), and the co-occurring cyanotoxin microcystin leucine and arginine (MCLR) is notably linked to dementia. While cyanotoxin-exposure studies have uncovered perturbations to behavior and

canonical pathways implicated in neurodegeneration, analysis of co-exposure is limited. Martin et al. (2020) explored larval zebrafish exposure to BMAA/MCLR, displaying no significant mortality, morphological defects, or altered locomotion. However, BMAA or MCLR exposure increased acoustic startle response (ASR) of larval zebrafish by at least 40%. Interestingly, BMAA/MCLR co-exposure enhanced larval zebrafish ASR by an additional 40%. Neurodegeneration progresses and is potentially exacerbated overtime, yet whether effects of developmental exposure to BMAA/MCLR persist in adulthood is unknown. To test this, an ASR assay, using a 500 Hz tone at three intensity levels (-24dBFS, -6dBFS, and 0dBFS), will be administered to adult zebrafish developmentally exposed to BMAA, MCLR, or a BMAA/MCLR mixture, and controls. Presence of increased swim-speed and swim-distance in response to stimuli, indicative of ASR, will be used to assess potential sensory/motor defects. Considering the irreversible nature of neurodegeneration, increased ASR in zebrafish due to developmental BMAA/MCLR exposure is hypothesized to persist in adulthood. Further proteomic analysis may disclose pathways of interest regarding persistent, cyanotoxin-induced defects. This study will enrich understanding of long-term effects developmental exposure to BMAA/MCLR has on sensory/motor systems, revealing the extent to which neurotoxins may impact neurodegenerative disorders.

Reversible Electroporation for Treatment of Tumor Cells

Author(s): **Claire Kim**
Mentor(s): **Dr. Mike Sano, Mr. Robert Williamson**
Poster: **30**

"Electroporation is the process of opening up the pores of cell membranes using electrical pulses and allowing movement of DNA and chemotherapeutic drugs into cells, making electroporation a treatment option for cancer. However, high amounts of pulses may induce muscle stimulations when treated in vivo. To avoid these side effects, our experiment focuses on sending microseconds of pulses to allow more customization when delivering treatments. Unlike previous irreversible electroporation trials, our experiment focuses on reversible electroporation because it not only removes tumor cells, but also helps with the recovery of the cells.
Our high-throughput experiment uses a pulse generator that emits electrical pulses to HEK 293 cells through an electrical probe. The cells are treated with different doses, waveforms and rates of the pulses. The goal of the experiment is to find the most optimal treatment on the cells that creates the largest transfection region, where there is a mixture of both live and dead cells. PI was used as a transfection agent. The transfection regions are shown through microscopic images after treatment, where a radius of dead and live cells form around the center of the well

plate where the electrical probe has been placed. The electric fields at these transfection thresholds would then be measured through computational modeling. When translating the experiment to clinical trials, the results of the experiment tells at what dose, waveform and rate of electrical pulses is the most effective at killing tumor cells while also minimizing the risk of killing surrounding healthy cells."

Development of a Crystal Nucleation Model using Oligoacenes

Author(s): **Tyler Knapp, Elena Shippman**
Mentor(s): **Dr. James Martin**
Poster: **31**

"Crystal nucleation is the initiating process to construct a crystal lattice. Understanding the mechanism by which nucleation occurs is extremely important for diverse applications from earth systems to advanced technologies. Nevertheless, classical theories for nucleation frequently do not adequately model the observed processes. In the Martin group's investigation of crystal growth, we have found that classical assumptions of nucleation by independent particles need to be replaced with an understanding of cooperativity. This led to the development of Transition Zone Theory of crystal growth (TZTc). The hypotheses of this work is that a TZTnuc may also more effectively describe the processes of nucleation.
Here we report experimental studies of the nucleation of crystaline oligoacenes (naphthalene and anthracene) from quenching their respective melts to a specific isotherm, Tiso. We observe the nucleation time to be significantly dependent on the conditions out of which the system was quenched and the Tiso. The maximum temperature at which nucleation can occur is frequently significantly below the materials melting point, dependent on sample history. This limiting temperature appears to be related to a glass-type transition. This limiting temperature is important to modify TZTc to TZTnuc. We further observe a statistical distribution of nucleation times that appears to correlate with the dimensionality of the nucleus (1D off of a surface, 3D intrinsic from melt). Research presented is part of a complex time, temperature and sample history data matrix, that is being used in our novel nucleation theory development."

A Rapid Review of the Cognitive Enhancing Capacity of Guanfacine

Author(s): **Seth Kodikara**
Mentor(s): **Dr. Veljko Dubljevic, Mr. Steven Peppers**
Poster: **32**

As public interest in pharmaceutical cognitive enhancement (CE) grows, research and attention has been primarily dedicated to stimulant medications, such as mixed amphetamine salts (trade name Adderall) and methylphenidate (trade name Ritalin.) Effective use of these drugs for the treatment of Attention deficit hyperactivity disorder (ADHD) has lead to widespread availability and subsequent abuse. Given risks associated with this - including addiction and dependency, adverse cardiac events, and psychosis - demand has grown for research into nonstimulant drug alternatives. One potentially cognitive enhancing drug receiving such attention is Guanfacine (trade name Intuniv.) Guanfacine stimulates alpha-2A adrenergic receptors to enhance noradrenaline neurotransmission. Its efficacy in treating ADHD is well-studied but less is known about its ability to function as a cognitive enhancer in neurotypical and otherwise cognitively uninhibited individuals. To answer this question, literature reviews were conducted in the PsycInfo, PubMed, and Web of Science databases. Results were screened to identify studies conducted on healthy adult humans investigating the effects of Guanfacine on one or more cognitive enhancement parameters. In total, seven such studies were identified, as well as one systematic review disincluded for redundancy. All studies were nonlongitudinal with significant variance in dosage methods. Four studies reported mild sedation and reduced alertness with one observing no effect. Two reported improvements in working memory, though one failed to replicate this result. Nine other direct parameters were investigated by various studies and no consistent changes were observed. Further work is needed to standardize measurement of CE and replicate previously observed results.

Targeting the NTS1R Receptor for Radiopharmaceutical Treatment of Cancer

Author(s): **Peter Lawing**
Mentor(s): **Dr. Jonathan Lindsey**
Poster: **33**

Cancer is a disease that affects millions of people every year. The lethality of cancer comes from metastasis, where cancerous cells from one part of the body spread into another region. The best tool for destroying the diversity of cells within tumors is radiation therapy, but external beam radiation is often not applicable for treating metastatic cancer due to collateral damage to healthy tissue. Conversely,

radiopharmaceuticals can in principle be used to deliver radiation directly to the cancer cells in the body. The molecular design of a radiopharmaceutical drug includes a targeting agent and a radionuclide carrier. The targeting agent is a molecule with high affinity for cancer cells, often by binding to an overexpressed membrane receptor. One such receptor is the neurotensin receptor type 1 (NTS1R), for which the agonist is neurotensin, a tridecapeptide (i.e.,13 amino acids). Neurotensin itself is not a practical targeting agent because it is rapidly degraded in blood by proteolytic enzymes. However, in 2022 Schindler et al. reported a modified version of the C-terminal fragment of neurotensin (NT(8-13)) that increased the serum lifespan from less than 10 minutes to greater than 24 hours. My project focuses on the synthesis of this targeting agent in the Lindsey lab, followed by attachment to a radionuclide carrier. Subsequent efforts will include testing the solubility and stability of these compounds in cold form and conducting in vivo cell and animal studies with radiolabeled forms in collaboration with pharmaceutical scientists at suitable medical research facilities in the Southeastern United States.

Turbulence Dissipation During Impingement on Porous Media

Author(s): **Steven Lin**
Mentor(s): **Mr. Vishal Srikanth, Dr. Andrey Kuznetsov**
Poster: **34**

The length and time scales of turbulent flow can be indirectly controlled by utilizing a porous medium. As a result, applying porous metamaterials onto a surface can alter the boundary layer and aerodynamics. The porous nature of the metamaterials may be able to delay separation or reduce drag because of the difference in turbulence behavior in clear and porous regions. For metamaterials to be effective in flow control, the structural design should be optimized by numerical modeling since experimental optimization studies are limited by cost and manufacturing considerations. At the interface between a porous medium and clear fluid, turbulence characteristics and macroscale structures can provide valuable insight into flow physics. As a result, physics-based model development will be accelerated. Regarding engineering applications, the ratio of metamaterials and plate/airfoil length scales prevents direct simulation of metamaterial geometry. Therefore, macroscopic models should be developed to reduce computational costs without compromising numerical accuracy. The research aims to understand Macroscale flow structures that are incident on porous media in the turbulent flow regime. The ongoing research will continue simulation to investigate mico-vortex properties and interfacial transport.

Synthesis and Applications of Graphene Aerogels

Author(s): **Sid Lohia**
Mentor(s): **Dr. Saad Khan**
Poster: **35**

Aerogels are synthetic semi-solid materials that are porous and have extremely low density. Aerogels made from graphene oxide have been found to be the lightest, yet also some of the strongest and most conductive. These qualities can lead to many different practical applications, some of which include compressed air filtration, micro-thrusters, and water filtration. Synthesizing these aerogels can be difficult, since the materials are so light that they are prone to collapsing on themselves as soon as they take physical shape. By utilizing a weak acid to reduce graphene oxide at just the right rate, self-assembled layers of reduced graphene oxide were assembled using an experimental freeze-drying method to create aerogels in the form of dark monoliths. These monoliths have extraordinary physical qualities that originate from the graphene oxide parent solution, but their conductive properties reach a completely different level that allows for ultra-fast air conductivity in controlled chemical explosions. These explosions can be controlled and repeated without deformation, which give rise to the practical applications mentioned above.

Investigating The Effect Of Interactive Map Comparison As a Facilitator of Multivocal Thinking In History Education

Author(s): **Kathryn Lu**
Mentor(s): **Dr. Noboru Matsuda, Dr. Xiaolin Duan**
Poster: **36**

"Maps have been a tool for countries to represent how they perceive their role in the world and thus offer insight into the ethnographic and geopolitical context of the map's creation. Comparing ancient to modern-day cartography could crystalize understanding of historical evolvement in spatial concepts and is thus often injected into historical education. The interactive map comparison tool we developed compares a 1402 Korean world map, Honil kangni yoktae kukto chido, to a modern-day world map side by side (Juxtaposition comparison method). Color coordination indicates the corresponding regions on both maps.
This tool is currently being tested with students in HI 263 - Asian History to 1800. Students are asked to write an essay to discuss how Ancient Korea interpreted its geopolitical role in the world while/after using our map comparison tool.

Data are collected through user click/hover tracking, student notes taken in our in-app notetaking component, and itemized rubric scores. We also collect user experience survey feedback and pre and post-essay questionnaire scores.
We hypothesize that this tool will help students improve their understanding of ancient and modern countries' perceptions of their roles in the world. We also propose to use the results from this research to improve the map tool and expand it into an online learning platform for ancient maps. This extrapolates to an improved understanding of the evolution of cartography from multiple cultural frameworks cultivating an appreciation of cultural diversity and thus fulfilling the educational goal of inclusion."

Effects of Plasma Activated Water (PAW) on Arabidopsis Stress Responses

Author(s): **Ta'Kia Lucas**
Mentor(s): **Dr. Marcela Rojas-Pierce, Dr. Katharina Stapelmann, Mr. Connor Robinson**
Poster: **37**

Plasma Activated Water (PAW) is an emerging technology that has applications to agriculture as an alternative to nitrate-based fertilizer. Nitrate fertilizers have a negative impact on the environment via runoff and can be costly. PAW is formed from non-thermal plasma, when energy is added to air molecules causing electrons to be stripped away. This results in fixation of nitrogen gas and some reactive oxygen species (ROS) from the atmosphere into water. PAW has been shown to enhance germination and promote plant growth. PAW has the potential to become an alternative to nitrate-based fertilizers and confer stress protection against abiotic stresses. Here, we investigated the effect of PAW-treatment on plants grown in soil. Measurements of fresh and dry biomass of roots and shoots showed that PAW performs similarly to nitrate fertilizers in soil. Furthermore, we tested the effect of PAW on plant stress resilience. PAW-treated plants showed greater overall root growth than controls when exposed to heat stresses but not cold. Finally, Arabidopsis was grown on media with PAW and stained with the fluorescent ROS marker DCF-DA. Using confocal microscopy, we found that PAW does induce accumulation of ROS in Arabidopsis roots. These results indicate that PAW may have the potential to improve the quality of crops and replace nitrogen fertilizers. Further research is needed to assess the effectiveness of PAW for conferring stress resilience.

Assessing the growth of Bacteroides thetaiotaomicron on different sources of dietary protein

Author(s): **Alissa Meyerhoffer**
Mentor(s): **Dr. Manuel Kleiner, Dr. J. Alfredo Blakeley-Ruiz**
Poster: **38**

The gut microbiota is composed of complex and diverse groups of microorganisms which play a major role in the metabolism and health of an individual. Diet alters the composition and function of the gut microbiota. In a prior study using mice, we found that introducing yeast or egg as the sole source of dietary protein led to an increase in the abundance of Bacteroides thetaiotaomicron (B. theta) at the expense of the rest of the microbiota. To confirm the growth of B. theta on these dietary protein sources, we designed an experiment to grow B. theta on a defined medium, with different dietary protein sources (casein, soy, yeast, and egg), and a glucose control. We then measured the proteome of B. theta under these conditions to better understand how B. theta grows on these protein sources. We found that B. theta grows in yeast, egg, and soy media, but not in casein media. We detected 3,183 B. theta protein groups in total and the proteomes of these samples clustered by carbon source. Specifically, the egg and mucin protein sources clustered most closely together and the glucose media clustered separately from the dietary protein media. Additionally, there are over 200 significant proteins between the yeast and egg dietary proteins, suggesting a shift in the mechanisms used for digesting yeast and egg proteins. These results, completed in vitro, reproduce an in vivo response to dietary protein by B. theta, confirming that B. theta feeds on specific dietary protein sources.

Cold and Microgravity Promoter Cloning

Author(s): **Aleya Mohamed**
Mentor(s): **Dr. Colleen Doherty, Dr. Kanjana Laosuntisuk**
Poster: **39**

Cis-elements are non-coding DNA regions that regulate the transcription of nearby genes. We care about cis-elements because they play a huge role in controlling gene expression and its regulation. The lab I am working in has developed a new way to help identify those elements. My project is to validate all of the candidate constructs that have been obtained for previous research. The approach I used is to perform an LR Recombination reaction for our desired entry and destination vectors, then I performed an E. coli heat shock transformation to insert our plasmid. Following the transformation, I did a colony PCR to screen for colonies and confirm that our desired

construct is present. Then, I ran gel electrophoresis to visualize and confirm the results from the PCR protocol. After confirming the PCR results, I inoculated two liquid cultures of the brightest DNA bands from the gel, and performed a QiAprep Spin Miniprep Kit procedure to isolate the plasmid DNA and calculated its concentration. If the plasmid yield was acceptable, then that construct was sent for sequencing. Then I performed a plant floral dip using agrobacterium to transform our plant, Arabidopsis. In summary, we are cloning the candidate promoter fragments so that we can put them in front of a promoter gene. We will use this to evaluate if these elements perform as expected. We have completed these steps and now have transformed plants to evaluate if these promoters are successful and to test the plant response.

Exploring Demodex Mites on Captive Lemurs (Class: Arachnida)

Author(s): **Allie Monahan**
Mentor(s): **Dr. Lisa Paciulli**
Poster: **40**

Mites (class Arachnida) are small, eight-legged arthropods that live on the hair of several species of mammals. Mites have been investigated in mammals regarding their possible role in disease development, but few studies have examined the proliferation of mites in non-human primates. Demodex mites have been found on lesser bush babies (Galago senegalensis), which belong to the same suborder as lemurs, Strepsirrhini. To study mite presence on Duke Lemur Center (DLC) lemurs, while lemurs were under sedation for routine health procedures, DLC veterinary staff plucked hair samples from six facial and eight limb regions of 45 lemurs from different genera and species. The hair samples were placed on slides and examined under compound light microscopes using 4X and 10X objective lenses. Potential mites, fleas, and insects were photographed and identified based on their morphologies. Two dust mites (Dermatophagoides farinae), nine potential mites, two potential arthropods, one potential worm, one unknown insect, and six fibers were found. On one lemur, multiple potential mites were found, and overall, at least one potential mite belonging to the genus Demodex was identified. Demodex mites are commonly found in domestic animals. In a few slides, there either weren't enough hairs or the hairs were too short to allow examination. Examining the presence of mites on lemurs will provide insight into the largely unstudied relationship between mites and lemurs, as well as identify if future steps should be taken to prevent mites from inhabiting the hair microbiome of captive nonhuman primates.

CAFO Lagoon Breach Effects on Nutrients and Metals in Surface Waters

Author(s): **Emma Mullins, Andrea Putri, Kyla Jenkins, Casey Bielefeld**
Mentor(s): **Dr. Elizabeth Guthrie Nichols**
Poster: **41**

Early in 2023, an inactive hog lagoon was breached up-gradient and adjacent to a riparian forest managed by the College of Natural Resources Foundation. Lagoon water and sludge flushed along an ephemeral, first order stream, across a 5 meter flood plain, and into a perennial tributary to Swift Creek in Johnston County. As of March 2023, the lagoon continues to release liquids during storm events. Lagoon runoff samples were collected from a swale located up-gradient of Swift Creek and down-gradient of the breached hog lagoon. Samples were taken at three locations in pre-cleaned HDPE bottles and kept cool while shipped to Waters Agricultural Laboratories Inc. (WAL) for pH, conductivity, total dissolved solids, nitrate, phosphorus, potassium, magnesium, calcium, chloride, sulfate, iron, boron, copper, zinc, sodium, and manganese analyses. WAL used USEPA Method 200.7 for detection of metals and trace elements in water by inductively coupled plasma-atomic emission spectrometry. WAL also determined conductivity and total dissolved solids measurements were low and did not indicate any serious problems with the water. The pH was determined to be relatively normal. Nitrate and phosphorus concentrations ranged from 26.25 ppm to 28.70 ppm nitrate and 16.55 ppm to 25.21 ppm phosphorus, which is high for agricultural waters. Elevated levels of iron, potassium, magnesium, and sulfate were also observed. These results indicate metals and nutrient contamination in lagoon runoff to a sensitive surface water tributary.

Fuel Management and Reload Cycle Length Optimization of a Westinghouse 4-Loop PWR

Author(s): **Wafaa Osman, Sadat Pollard, Vincent Wang, Julian Colvin**
Mentor(s): **Dr. Maria Avramova, Dr. Kostadin Ivanov, Dr. Baxter Durham, Dr. Blaine Taylor**
Poster: **42**

Nuclear reactor core design is a principal procedure for the efficient, safe, and economic function of the reactor. An important part of this design is the development of the core loading pattern (LP) layout, which must meet fuel cycle energy needs while also meeting all licensing criteria. Another is validating the loading pattern by conducting safety calculations based on nuclear thermal-hydraulic and fuel design criteria. Finally, an economic analysis can be

performed to ensure the LP developed is feasible for the running of this reactor. For the purpose of this work, the Westinghouse 4-loop Pressurized Water Reactor's specifications and characteristics will be utilized to develop and compare three reload core LPs that meet the design requirements set by Westinghouse by using their Advanced Nodal Code. The cycle lengths being compared are 12 months, 24 months, and an optimized (intermediate) length cycle dependent on equilibrium cycle conditions. A few safety calculation limits will be examined in this work: the enthalpy rise peaking factor and moderator temperature coefficient at all allowed operating conditions through the cycle, shutdown margin, and control rod ejection. Once the LPs meet the design criteria given, an economic analysis will be conducted based on current market values, focusing on fuel cycle costs, including outage costs and generated revenue over a period of 20 calendar years.

Toward Thermal Conductivity Measurements of Molten Salts using Spatial Domain Thermoreflectance

Author(s): **Justin Overman**
Mentor(s): **Dr. Alexander Bataller, Mr. Syed Rizvi**
Poster: **43**

Spatial domain thermoreflectance (SDTR) is a pump-probe technique for measuring thermal properties of many material systems. Our research utilizes SDTR to measure the thermal conductivity of high temperature molten salts for advanced nuclear applications including molten salt reactors. The SDTR technique operates by scanning a photothermal pump laser across a reflective probe laser focused onto an ultrathin metal transducer in contact with a target material, in our case, a molten salt. After photothermal heating, the reflection from the probe laser is recorded with balanced photodetection and recorded using a lock-in amplifier. Analysis of the heat transfer equations produces the target property measurement of thermal conductivity. The objective of my research was to integrate and automate the laser frequency, amplitude, and spatial modulation with the lock-in amplifier within a single LabVIEW code. After completing the LabVIEW code, the program and technique were validated on known room temperature liquids. Future work will include SDTR measurements on molten chloride salts within a high temperature optical furnace.

Social Justice Across School Professionals: a Keywords-in-Context Analysis of School Professional Organizations' Standards

Author(s): **Lily Palmer**
Mentor(s): **Dr. Isaac Woods**
Poster: **44**

Schools are composed of various school professionals who belong to professional associations that provide guidance for ethics, conduct, and professional standards for practice. While these professionals interact with each other to serve diverse youth populations, it is important to consider how these professional organizations emphasize social justice in their professional standards. Through "keyword-in-context" qualitative analysis, this study begins to examine common social justice themes that arise through professional standards for national organizations that represent school professionals. From analyzing the professional standards of eight organizations, the themes gathered were co-dependence of terms (i.e. justice, equity, and inclusion), advocacy, and individual accountability. In conclusion, these findings are discussed with recommendations for how school professionals can collaborate with each other and use the school setting as a way to enact change for a more just society.

Impact of COVID-19 on Masters Degree Completion Time

Author(s): **Anjali Patel, Jackson Bunte**
Mentor(s): **Dr. Emily Griffith, Dr. Stephany Dunstan**
Poster: **45**

"The COVID-19 pandemic was a critical time for students pursuing masters degrees at academic institutions. However, little research examines the impacts of the pandemic on time to complete their degrees due to how recent it occurred. We analyzed data from a large research institution to examine if graduate students during the pandemic took longer, on average, to graduate using multiple factors including GPA and number of credit hours taken and passed. We split the data into two groups; a control group consisting of students graduating prior to the start of the pandemic and a "COVID" group consisting of those that took classes at any point during the pandemic. Using multiple linear regression, we were able to better understand the downstream impacts of the pandemic on academic performance and quality of education within masters programs. Additionally, the data can help us better understand how educational institutions have adapted their methods to current and future students impacted by the pandemic. "

Analysis of aptamer exonuclease digestion products with urea-PAGE

Author(s): **Jacob Perry**
Mentor(s): **Dr. Yi Xiao, Dr. Juan Canoura, Mr. Obtin Alkhamis**
Poster: **46**

"Aptamers are nucleic acids isolated in vitro that bind specific molecules with high affinity and specificity. They can be used as bioreceptors to detect targets based on conformational changes that occur when the aptamer and target bind. Nucleases – enzymes that act on nucleic acids – can be used to adopt conformation changing capabilities in aptamers and to characterize aptamer binding profiles. When aptamers are digested with exonucleases, unbound aptamers are digested into mononucleotides while ligand-bound aptamers are only partially digested and inhibit enzyme kinetics in a manner proportional to their ligand affinity. The truncated products exhibit large target-induced conformational changes. To generate conformation-changing aptamers, three cocaine binding aptamers, NC48, NC179, and NC195, were digested with a mixture of exonuclease I (3' to 5' ssDNA exonuclease) and either exonuclease III (3' to 5' dsDNA exonuclease) or T5 exonuclease (5' to 3' dsDNA exonuclease). Urea polyacrylamide gel electrophoresis was used to identify the nucleotide length of digestion products. NC aptamers were digested by one or two nucleotides with T5 and Exo I in the presence of cocaine, while with Exo III and Exo I, the aptamers were truncated by three to five nucleotides. In parallel, a flunixin binding aptamer, FX40, was characterized using T5 and Exo I to determine its binding specificity for flunixin and four interferent molecules (neomycin, ciprofloxacin, quinine, and chlorpromazine). Digestion of FX40 in the presence of flunixin was almost entirely inhibited, while no interferent significantly hindered enzyme digestion, except for neomycin, indicating some cross-reactivity to this molecule. "

Student Intervention Analysis Based on First Generation Status

Author(s): **Carlos Petzold, Alexa Russell, Liam Stuart**
Mentor(s): **Dr. Emily Griffith, Dr. Stephany Dunstan**
Poster: **47**

The purpose of our analysis was to determine if an intensive academic intervention was effective in increasing student success. The research question we will be addressing is whether a university intervention leads to an impact on student GPA, using students not in the intervention as the control group. Extensive prior research suggests that first generation students enter college with a completely different set

of challenges and responsibilities than most. While the difference in the first generation college student experience is apparent, little is known regarding how their academic performance is affected. Thus, we will be looking at 1st and 2nd year GPA as our indicators for success, comparing raw GPA for students with first gen status and those without, noting any difference based on intervention participation. We are going to use SAS 9.4 to run a linear regression model to see if this student intervention has an impact on first and second year GPA based on a student's first generation status. We are going to control for race, rural status, and colleges within the university. Our results will be of interest to interventions at large research institutions. These results could influence how the support is provided to interventions at research institutions and which students may benefit the most from such interventions.

CAFO Lagoon Breach on E. coli and Coliform in Surface Waters

Author(s): **Alex Pezold, Paige Collins, Matthew Moore, Shrusti Patel, Alex Fucci**
Mentor(s): **Dr. Elizabeth Guthrie Nichols**
Poster: **48**

Early in 2023, an inactive hog lagoon was breached up-gradient and adjacent to a riparian forest managed by the College of Natural Resources Foundation. Lagoon water and sludge flushed along an ephemeral, first-order stream, across a 5-meter flood plain, and into a perennial tributary to Swift Creek in Johnston County. As of March 2023, the lagoon continues to release liquids during storm events. To evaluate E. coli and Coliform levels at runoff and surface water areas adjacent to the lagoon, we used a targeted sampling design to collect incremental composite samples of the creek and grab samples for the tributary to the creek. Four samples including one field duplicate were taken from the tributary creek. Four additional samples including one field blank were taken at the runoff directly from the hog lagoon that would filter into the tributary creek. Runoff and surface water composite samples for E. coli and Coliform were collected in 120 ml shrink-banded, sterile IDEXX bottles and incubated within two hours of collection. E. coli and total coliform were quantified using the IDEXX Quanti-tray system after 24 hours per standard IDEXX protocols. Detected concentrations of these analytes exceeded the regulatory standards in both the runoff and surface water samples at Lee Property.

Relationship Between Household Location and Risk of Lead Contamination in North Carolina

Author(s): **Deana Poteat, Amit Sen, Sophia Chamberlain**
Mentor(s): **Dr. Danielle Lin Hunter, Dr. Caren Cooper**
Poster: **49**

While lead pipes are rare today, it is estimated that about 1% of American homes have lead plumbing. Older homes commonly have copper or steel pipes that may have lead soldering, which often presents a risk of lead contamination in drinking water. Through Crowd the Tap, a participatory science project aimed at addressing possible lead contamination, we recruited members of our communities (Lincoln County areas, Surry County, and Wake/Durham Counties) to screen their homes by providing their home's age and the types of pipe materials in their homes. By comparing these communities, we were able to draw comparisons in lead plumbing distributions across Eastern, Central, and Western North Carolina. We recruited 30 households around Lincoln County, 21 households from Surry County, and 28 households from Wake and Durham Counties. We conducted at-home lead tests and sampled water for laboratory testing in any households labeled as high priority or households that opted into testing. Altogether, we sampled water from 9 households from around Lincoln County, 9 households from Surry County, and 0 households from Wake and Durham Counties. Data were compiled after all testing was completed and results from Eastern, Central, and Western North Carolina were compared. Preliminary results suggest households in Western NC have a higher chance of being categorized as high risk for lead contamination, though further sampling is needed to validate this. These results will be used to target communities in North Carolina that may need additional screening and/or testing for risk of lead contamination.

Redefining the Model for Chemical Absorption in Human Skin

Author(s): **Aly Prockter**
Mentor(s): **Ms. Jessica Stevens, Dr. Hein Tran**
Poster: **50**

As previously studied, human skin comes into contact with 85+ chemicals each day. To better understand the health effects chemicals have after touching an individual's skin, the compound's various molecular elements must be examined. Today, there is no inclusive mathematical model which fully determines the effect many chemicals have after external absorption. This large hole in scientific knowledge represents an opportunity to heighten understanding of materials which our bodies are commonly

subject to. In this study, the diffusion, permeability, and partition coefficients of a three-compartment human skin model were researched by testing the effects of 45+ chemical properties from 70+ chemicals which commonly underlie cosmetic and pharmaceutical products. Machine learning regression techniques were able to determine the most significant variables for each layer of the skin. These techniques produce multiple types of plots that were able to be used in future analysis. From these findings, we can conclude how future modeling can be better versed in the machine learning selected factors of highest importance and use them to make more accurate permeability predictions. Vapor pressure, for example, is one feature repeatedly selected for in our analysis, suggesting that its values have high relevance both compared to other properties and the model itself. Our database foundation has been very useful in organizing the variables in such a way that machine learning can highlight key chemical variables for consideration.

Methods to Delay Beta-carotene Degradation in Oven-Dried Orange-Fleshed Sweet Potatoes

Author(s): **Zoe Roberts, Leah Hohman, Mitchell Langston**
Mentor(s): **Dr. Matthew Allan, Dr. Fernanda Santos, Ms. Megan Watson**
Poster: **51**

Orange-fleshed sweet potatoes are a popular food source that can be used as a tool to combat malnourishment in at-risk populations because they are rich in many compounds, specifically beta-carotene, which is a Vitamin A precursor. The study aims to determine whether natural antioxidants found in sweet potato leaves could be as effective as synthetic antioxidants in the preservation of beta-carotene. Varying conditions (ethanol concentration, time, temperature, and variety) were used to determine the greatest efficacy of extraction, as well as the antioxidant activities of the extractions from sweet potato leaves. Results indicated that 50% ethanol, Purple Majesty variety, and conducting the extraction at ambient temperature produced the best result. This combination was used to extract antioxidants from sweet potato leaves and applied to sweet potato slices. Three other antioxidants (TBHQ, α-tocopherol, and ascorbyl palmitate) were also applied to sweet potato slices to compare against the leaf extracts concerning the effect on beta-carotene retention. These slices were blanched (to reduce enzymatic activity), coated in antioxidant treatment, and placed in a commercial dehydrator. They were then transferred to a 40℃ incubator for 4 weeks, with portions of each sample taken out weekly for analysis. These samples will be used to construct a degradation curve of beta-carotene through HPLC analysis. It is expected that each antioxidant treatment will have slower rates of beta-carotene degradation over time compared to the

control. This experiment will determine if antioxidants harnessed from sweet potato leaf extracts are comparable to commercially available antioxidants.

Aye-aye (Daubentonia madgascariensis) Infant Nursing During the First Days of Life

Author(s): **Kaya Rosselle**
Mentor(s): **Dr. Lisa Paciulli, Ms. Rebecca Olson, Ms. Tiffany Brocco**
Poster: **52**

"The first days of an infant's life are essential for ensuring that a mother will bond with and accept her newborn. For mammalian mothers, nursing is vital for forming these bonds (Maestripieri 2001). In this study, a mother-infant aye-aye (Daubentonia madagascariensis) pair were observed to determine whether the mother or infant initiated nursing. It was hypothesized that the mother aye-aye would initiate nursing bouts due to her strong maternal instincts. With Duke IACUC approval, Pelco IMM12027-1S cameras were placed in a Duke Lemur Center (DLC) mother-infant aye-aye enclosure. Behaviors in the resulting video footage were coded using all occurrence focal animal sampling (Martin & Bareman 2007), with special attention paid to instances of nursing. Videos where nursing was observed were re-watched to determine the duration and whether the mother or infant initiated and/or terminated nursing. All nursing bouts occurred within a one and a half hour time span, with each bout lasting between ten and 136 seconds. Also, the infant initiated nursing 100% of the time and terminated nursing 60% of the time. The hypothesis was rejected since all nursing bouts were initiated by the infant. Limitations of this study include a small sample size (n=1 pair) and behavioral obscurity. In the future, this research should be continued with a larger sample size and a longer data collection period. Seeing how nursing changes as the infant grows would be useful to expand upon the paucity of literature on infant aye-aye development. "

Factors influencing white-tailed deer birth-site selection along an urban-rural gradient

Author(s): **Frederick Russell**
Mentor(s): **Dr. Christopher Moorman, Dr. Nathan Hostetter, Ms. Mikiah Carver**
Poster: **53**

Birth-site selection by adult female white-tailed deer (Odocoileus virginianus) plays a significant role in neonatal survival. Female behavior around the time of parturition has been studied in wildland-rural areas but little research has examined birth-site

selection in more urbanized areas or examined how selection may differ between rural and urban locations. We identified predictors of white-tailed deer birth-site selection across an urban to rural gradient in Durham and Orange Counties in North Carolina. We identified four covariates to predict birth-site selection: percent impervious surface, distance to nearest road, distance to nearest home or building, and land cover type. We captured 19 female white-tailed deer and fitted each with a GPS collar and a vaginal implant transmitter (VIT). When a birthing event occurred and the VIT was expelled, we tracked to the VIT within hours of expulsion to determine birth site characteristics. We calculated covariate values at the birth sites and at random locations used by the female for 7-35 days prior to parturition. We used logistic regression to compare the covariate values between the birth sites and the sites used by the female prior to parturition. We expect to identify which of these covariates are the strongest predictors of birth-site selection as well as how they may differ between deer in rural and urban areas.

Morphing Wings In Supersonic Conditions

Author(s): **Hadie Sabbah**
Mentor(s): **Dr. Venkat Narayanaswamy**
Poster: **54**

"Shape-shifting wings, also known as morphing wings, are the new hope for more fuel efficient aircrafts. Fuel is becoming more and more expensive, and the need for more innovative methodology is needed. A major contribution to fuel consumption is the amount of drag developed from the wings of the aircraft. Many of the aircrafts are designed for a particular mission, which makes them less efficient in other missions. Therefore, morphing wings are a new highly researched subject to improve fuel efficiency and to reduce the amount of drag produced by the wings. However, morphing wings come with many obstacles such as structural rigidity, flight stability, and flow interference. Additionally, these obstacles are more radiate in supersonic conditions; thus, they must be more researched to eventually implement them in practical applications.
In this paper, the flow interference and flight stability of morphing wings will be investigated to determine the requirements to achieve successful flight conditions with morphing wings in supersonic conditions. "

Impact of CAFO Lagoon Breach on Nutrients in Surface Waters

Author(s): **Katie Savant, Kyle Scavo, Dominic Zecca, Harrison Skidmore**
Mentor(s): **Dr. Elizabeth Guthrie Nichols**
Poster: **55**

Early in 2023, an inactive hog lagoon was breached up-gradient and adjacent to a riparian forest managed by the College of Natural Resources Foundation. Lagoon water and sludge flushed along an ephemeral, first order stream, across a 5 meter flood plain, and into a perennial tributary to Swift Creek in Johnston County. As of March 2023, the lagoon continues to release liquids during storm events. Surface water was collected following the USGS Field Manual for integrated sampling across the creek. Five surface water samples were collected upgradient and downgradient of where the lagoon water entered Swift Creek. Samples were collected utilizing a scoop to grab a composite sample from across the creek at each point and placed in treated and preserved HDPE bottles. Creek waters were monitored for conductivity, pH, and dissolved oxygen with a YSI-Pro Meter. Samples were kept on ice until analysis by the Center of Applied and Aquatic Ecology; ammonia and nitrite/nitrate were quantified using USEPA Method 350.1 and 353.2, respectively. Total phosphorus was determined using USEPA Method 365.1. The dissolved oxygen above the swale was 12.26 mg/l and decreased to 9.84 mg/l below the swale. Sample 3 has the highest HACH concentrations of ammonia, and total phosphorus indicating that the analytes have been carried downstream from the swale entrance to Swift Creek. The downgradient concentrations of ammonia, nitrite/nitrate, and total phosphorus were not elevated from the upgradient concentrations.

Identifying Optimal Dyes for Aptamer-Based Dye Displacement Assays

Author(s): **Emma Scardina, Mario Hernandez**
Mentor(s): **Dr. Yi Xiao, Mr. Obtin Alkhamis**
Poster: **56**

Aptamers are short, single-stranded sequences of DNA or RNA which bind to specific molecules with high affinity. Aptamer-based dye displacement assays take advantage of the differing optical properties of a dye, depending on its molecular arrangement, to create a detectible absorbance change upon target addition. In the absence of target, the aptamer is complexed with the dye molecule in a monomeric form. When the target is added to the aptamer-dye complex solution, the target binds to the aptamer and displaces the dye into solution where it then aggregates. The monomer and aggregated form of the dye typically have different sets of optical spectra, which can be used to determine the concentration of target present.

Although aptamer-based dye displacement assays are sensitive, specific, and simple to operate, currently available dye molecules only provide limited color contrast (e.g., a purple-to-blue color change). To identify better dyes with improved contrast for such assays, we systematically studied the absorbance spectra of 10 different organic dye molecules in a variety of experimental conditions. Specifically, we analyzed the absorbance spectra of dyes in 100% DMSO and 20 mM Tris buffer (pH 7.4) containing 20 mM NaCl and 0.5 mM MgCl2 with various surfactants (SDS, Triton X-100, and Tween 20). One dye was identified with promising qualities for an aptamer-based dye displacement assay.

The Single-minded Gene Affects Feeding Behavior in Drosophila melanogaster

Author(s): **Gabrielle Schuh**
Mentor(s): **Dr. Patricia Estes**
Poster: **57**

Obesity is a widespread public health concern and controlling weight is a chronic issue for many people. The single-minded gene is important for the development of neurons within the hypothalamus of vertebrates and invertebrates, regulating food intake and energy homeostasis. Previous studies on the Single-minded1 gene have found that heterozygous Single-minded1 mutant mice are hyperphagic and obese, which may be due to a decrease in the number of neurons in the paraventricular nucleus of the hypothalamus. These neurons may be needed to interpret satiety signals after feeding, which may be conserved in both vertebrates and invertebrates. To test this hypothesis, we silenced single-minded neurons in Drosophila melanogaster and used the proboscis extension reflex assay to quantify feeding response after periods of starvation (0, 24, 48 or 72 hours). We expected flies with silenced single-minded neurons to extend their proboscis more often than wild type flies when offered food across all starvation period lengths. We found that flies with silenced single-minded neurons behaved as if starved, even when there was food available. These results indicate that flies with silenced single-minded neurons, similar to mice with Single-minded1 mutations, feed continually and that single-minded feeding mechanisms may be conserved across vertebrates and invertebrates. Future studies to understand the role of the single-minded gene and how it impacts energy balance in model organisms may translate to human medicine to identify possible treatments for obesity-related conditions and disease.

Impact Shape Sensing Using Triaxial Accelerometers

Author(s): **Robin Shin**
Mentor(s): **Dr. Mark Pankow**
Poster: **58**

This research makes use of an ADXL373 triaxial accelerometer to detect changes in acceleration in ballistics samples when exposed to a laboratory gas gun. The ultimate aim of this project is to develop a "net" of accelerometers communicating through SPI that can produce a more accurate measurement of deformation in laboratory samples when compared to traditional materials such as Roma Plastilina No. 1 and ballistic gelatin. The concept is currently being tested with 1 accelerometer, but will advance to several more once a 3d-printed protective shell for the accelerometer is developed and initial testing is complete.

Bio-Based Composites for Marine Hydrokinetic Energy Generation off the North Carolina Coast

Author(s): **Dylan Snarr**
Mentor(s): **Dr. Mark Pankow, Mr. Shahriar Chowdhury**
Poster: **59**

The North Carolina Renewable Ocean Energy Program is advancing the development, design, and implementation of renewable energy off the North Carolina coast. New engineering solutions are advancing research and collaboration to bring ocean energy technologies to the clean energy market. As a result, the demand for lightweight, stiff, and strong composite components in marine energy harvesting is increasing. The development of fully recyclable, bio-based, LCT and epoxy composites with natural flax fibers is being explored for application as marine turbine blades. Liquid crystal thermoset (LCT) combines the material properties of thermoplastics with the ease of manufacturability of thermosets to create composite parts that are easy to fabricate and test. This formulation has been advanced to an epoxy base. Sample fabrication with new epoxy formulation from UNC is being performed with equipment in the Mechanical and Aerospace Engineering Department at NC State. Current fabrication uses a heated compression press that applies constant pressure to two sandwiched steel plate molds, with fabric ply and epoxy layered between them, for 24 hours. Fracture toughness, flexural, and stiffness properties are tested on sample size pieces using ASTM standardized procedure for matrix composite materials. New fabrication methods and testing processes are being investigated and developed as the bio-based epoxy formulation advances. Their adaptability under extreme loading conditions, ease of manufacturability, and

high strength-to-weight ratio, makes fully recyclable composites a prime candidate for application in marine hydrokinetic energy generation off the North Carolina coast.

Development and Implementation of Distortion Generators in High Speed Flows

Author(s): **Shaan Stephen**
Mentor(s): **Dr. Venketeswaran Narayanaswamy**
Poster: **60**

"This paper presents a study on the development and implementation of distortion generators in high speed flows, with the goal of improving our understanding of transonic flows and enhancing the accuracy of computational fluid dynamics (CFD) software in modeling these flows. Transonic flight, characterized by speeds between subsonic and supersonic, is a challenging area of research due to phenomena such as airflow separation caused by shock waves, resulting in high levels of drag and instability. To gain a deeper understanding of transonic flows, a makeshift converging-diverging nozzle will be built to access flow speeds not accessible by the onsite supersonic wind tunnel. Vortex generators and other inserts will be placed in the flow field prior to the nozzle throat to induce distortions, and a scanivalve rig will be used to measure pressure readings of the flow at Mach 1.4 at the nozzle exit. These experimental results will then be compared to predictions made by CFD software, with adjustments made to improve accuracy."

Gait Impairment in a Rat Model of Brachial Plexus Birth Injury

Author(s): **Katie Taran**
Mentor(s): **Dr. Jacqueline Cole, Ms. Kyla Bosh**
Poster: **61**

"Brachial plexus birth injury (BPBI), a neuromuscular injury occurring during difficult births when the neck is excessively stretched, damages the brachial plexus nerve bundle and leads to shoulder and elbow impairment. Resulting musculoskeletal deformity occurs around the glenohumeral joint, which facilitates shoulder range of motion and gait movement. While previous studies have assessed gait impairments caused by BPBI once deformity is already established, our objective is to determine the timeline over which these impairments develop and their impact on shoulder growth and function.
Sprague Dawley rats were divided into 4 groups (postganglionic neurectomy, preganglionic neurectomy, forelimb disarticulation, or sham surgery) and received

surgery on one forelimb at postnatal days 3-6. Videos of walking (5m/min) and running (10m/min) gait were recorded per group at 3-, 4-, 6-, 8-, 12-, and 16-weeks post-surgery (n=2-35 per timepoint). Metrics including stride length, stride time, stance time, and duty factor were compared across groups with ANOVA and Tukey posthoc tests (α=0.05).
Preliminary results indicate that both postganglionic and preganglionic neurectomy groups spent more walking weight-bearing time on their injured limb than did the disarticulation group at 4 weeks. Walking and running duty factor was decreased for injured relative to uninjured limb for the neurectomy and disarticulation groups over time. Preganglionic neurectomy was similar to sham over time, which suggests enhanced functional limb recovery following preganglionic BPBI. Understanding when functional shoulder movements are altered following BPBI is critical for developing more targeted and timelier treatment strategies."

24-month Cycle Transition and Optimization for a 4-Loop PWR Core

Author(s): **Max Velasco, Luke Shuler, Matthew Nash, Jendayi Brown**
Mentor(s): **Dr. Scott Palmtag**
Poster: **62**

"Presented within is the analysis of a Westinghouse 4-loop Pressurized Water Reactor (PWR) core. The project is sponsored by the Duke Energy Corporation, for which they have provided a 18-month cycle from a core within their fleet. Like Duke Energy, utilities are increasingly seeking two-year cycles to decrease outage time, which comes with heavy losses of revenue. To extend cycle lengths, more excess reactivity is required at the beginning of cycle (BOC). Burnable poisons (BP) are required to suppress this initial excess reactivity provided through either the increase in assembly enrichment or the number of feed assemblies. Enrichment limits are set by the Nuclear Regulatory Commission (NRC) currently to 5% 235U by weight [1]. Being that many 18-month PWR cycles already rely on 4.95% fuel, the conventional 3 batch cores seen in those 18-month cycles will need to be reduced to 2 batches for a 24-month transition. Pin exposures are another cause for a 2-batch core. The current pin exposure limit set by the NRC is a rod average of 62 gigawatt-days per metric ton of uranium (GWd/MTU) [2]. Therefore, due to enrichment limits and pin exposure limits, an increased number of feed assemblies will be needed to maintain a 2-batch core and thus a 2-year cycle. The transition to a 2-batch core will require twice-burned fuel to be loaded into the transition cycle, which poses a challenge in adhering to the exposure limits. "

Three Women Navigating Sexual Identity, Compulsory Heterosexuality, and Hypersexuality: A Case Study Across Generations

Author(s): **Leslie Vespermann**
Mentor(s): **Dr. Paige Averett**
Poster: **63**

"Generations of queer and sexual minority women share the lived experience of growing up in the heteronormative environment, plagued by its patriarchal structure. Using queer theory as a framework, this research study explores the impact of living in a patriarchal society and its influence on the sexual identity, orientation, and behaviors of queer women. In addition, this research examines the prevalence of compulsory heterosexuality and hypersexuality in the experiences of queer and sexual minority women.
Utilizing a narrative framework this poster presents a case study of three women who identify as a lesbian, bisexual, and pansexual. Each of the women represent a different generation: a Baby Boomer (1940), a GenX'er (1969), and a GenZ'er (2000). The data from each of the three women will be analyzed by employing a constructivist framework. Preliminary findings in this research suggest that these queer women have shared experiences of sexual identity that were largely impacted by compulsory heterosexuality and hypersexuality.
This research aids us in developing a holistic understanding of the experiences queer women and sexual minority women through generations by weaving together the narratives of three women that demonstrate progression, struggle, similarities, differences, and changes."

Parental Education Inequality in Graduate Completion Rates

Author(s): **Ria Wadhavkar, Abhay Kothari, George Katsoulis**
Mentor(s): **Dr. Emily Griffith, Dr Stephany Dunstan**
Poster: **64**

We are interested in the role of higher education completion for parents and the association it has with their child's completion rate of graduate school. While research suggests there is evidence of the association with parental education and undergraduate education, little research has been done on the effect of parental education on post undergraduate education. We believe that parental higher education contributes to a growing inequality in socioeconomic status that is reflected in the child's completion of post undergraduate education. This study examines how an applicant's highest level of parental education affects their graduation rates, with cross examinations on under-represented minorities, gender

and age. We used data from a large undergraduate research institution that specifically looked at a parent's highest level of education, URM status, gender and age and the corresponding graduate school completion rate. We hope this study increases awareness of inequality in opportunity with educational institutions regarding underrepresented minorities, gender, and age.

Does GRE Score Relate To Graduate Student's Success

Author(s): **Joshua Wang, Gabe Milburn, Kevin Xu**
Mentor(s): **Dr. Emily Griffith, Dr Stephany Dunstan**
Poster: **65**

Predicting the success of graduate students based on their applications and prior achievements is suggested to be challenging in many previous studies. Scores on Graduate Record Examinations (GREs) are implied to be uninformative in this prediction process. Previous research has found that any one predictor for graduate success is inherently flawed, as other good signs may outweigh others and vice versa, although some evidence points to GREs being significant predictors for success in combination with other predictors that universities commonly use in admission processes. In this study, we will investigate whether GRE scores have any predictive value for graduate GPA and degree completion rate. We are using a census dataset of students in graduate programs at an American University. By utilizing selected variables, a general linear model (GLM) will be used in predicting GPA and a logistic model will be employed to predict completion rate. In addition, we will use other explanatory variables alongside GRE scores in our established model. Future research would be needed in order to look into low-performing students on GREs, as inherently, many students in this study were selected at least partially for high GRE scores.

Chirality Purification of Single-Walled Carbon Nanotubes for Nanosensor Development

Author(s): **Joey Zhao**
Mentor(s): **Dr. Januka Budhathoki-Uprety, Ms. Hannah Dewey**
Poster: **66**

A single-walled carbon nanotube (SWCNT) is a single sheet of rolled-up graphene with a diameter of around 1.5 nm. SWCNT-based materials have garnered significant interest in recent years as optical sensors due to their fluorescence in the near-infrared range, excellent photostability, and high sensitivity. However, the lack of

high-purity SWCNT samples has hindered their widespread use in industrial settings. This challenge arises primarily from the fact that commercial samples often consist of different SWCNT species (also called chiralities). The very close similarities of different nanotube species (chiralities) make it difficult to separate them. Different chiralities are created when carbon atoms in the rolled-up graphene sheet arrange in different spiral patterns, and the photophysical and electrical properties of these SWCNTs are heavily dependent on their chiralities. One promising purification technique is Aqueous Two-phase Extraction (ATPE), which enables the precise separation of specific SWCNTs of varying diameters. The ATPE method has shown to be a simple, reliable, and scalable process, making it a promising approach for obtaining pure samples of SWCNTs with a specific chirality. In this research, we are using the ATPE separation technique to obtain chirality-pure SWCNT to be used for the development of optical nanosensors. Such improvement will enable further detailed analysis of the fluorescence of individual chiralities and allow future research to maximize the potential of SWCNTs.

Unraveling the Mechanisms of Solution Crystal Growth: Insights from ZnCl2· R H2O System

Author(s): **Sydney Andersen**
Mentor(s): **Dr. Jim Martin**
Poster: **1**

Crystal growth is a fundamental process with numerous applications, including synthetic crystal formation, thermal energy storage, and natural phenomena such as cloud formation and geology. Previously, the Martin group developed Transition Zone Theory (TZT) which describes crystal growth out of pure phase melts. Our current work seeks to understand the mechanism(s) by which crystals grow out of solution. Presented here is research evaluating the growth rate of ZnCl2· R H2O (R=3) solutions as a function of water concentration, specifically between the congruently melting R = 3 hydrate and its eutectic at R = 4.1. For a series of compositions, crystal growth rates were measured for temperatures between the system's liquidus to -75°C (about 40 °C below the eutectic temperature). Analysis of the concentration and temperature dependent data reveals three distinct mechanisms for growth rate. Initial growth rates after nucleation demonstrate melt-like growth. Followed by “normal” growth of a regular associative mechanism for the bulk of the growth. Ending in a deceleration of growth rate as equilibrium is established between the solution and crystal. Furthermore, our new analysis methods are remarkably sensitive, allowing us to observe minute differences in crystal growth rates which correspond to different crystal faces of the unit cell, a phenomena predicted by TZT. The comprehensive time versus temperature & concentration crystal growth rate data is being integrated into a new transition zone theory of solution crystal growth, which can be generalized to describe diverse systems and fundamentally change our understanding of crystal growth.

NFTs for Trustless Donations

Author(s): **Noah Bowman**
Mentor(s): **Dr. Brandon McConnell**
Poster: **2**

Transparency is essential for donors to guarantee their gifts are used as intended while ensuring their requested level of privacy. However, current donation tracking systems are trust-driven and lack transparency. Blockchain technology, with its

transparent and immutable distributed ledger, could address these issues. By using non-fungible tokens (NFTs), blockchain technology could protect donor privacy while allowing organizations to verify donations and provide transparency in their use. The Ethereum blockchain offers standardized interfaces such as ERC-721 and ERC-1155 that allow for the creation and transfer of fungible and non-fungible tokens that represent donations. Additionally, decentralized data storage solutions like IPFS can be used to store information related to the donations on a decentralized network. This research introduces a novel blockchain-based design to enable charities and universities to provide donors with the transparency and privacy they need to feel confident in donating, encouraging more donors to support their causes.

Fabrication and Application of Hydrogel Fibers Containing EGaIn Liquid Metal Microdroplets

Author(s): **Angel Boyette**
Mentor(s): **Dr. Michael Dickey**
Poster: **3**

Hydrogels are complex polymers that are incredibly hydrophilic and experience swelling as more water is absorbed by the gel. Combining hydrogels and liquid metals, such as EGaIn offers the capability to produce flexible and stretchable electronics. Hydrogel based fibers containing EGaIn particles have previously been shown to be capable sensors for toxic gasses, such as Cl2. This is because a non-conductive oxidized layer naturally occurs on the surface of the fibers when exposed to ambient conditions, and sintering using such gasses can dissolve this layer and allow electricity to flow. However, the concentration of liquid metals in the fibers must be high (around 70% by weight) which limits the practicality of the creation and use of said fibers. Currently, electrical diaphoresis is being utilized in order to align the metal particles within the fibers to increase the contact between particles while maintaining a lower overall concentration of metal particles in the fibers. Previously, this technique has been shown to successfully align the particles in a way that is conductive over smaller lengths (1-5mm). Additionally, there are efforts being made to create hollow hydrogel fibers that can then be injected with EGaIn into the center to allow for a highly flexible and stretchable product that will also be conductive to electricity.

The Impact of a Social Media Stimulus on Electoral Reform Attitudes

Author(s): **Hannah Braun**
Mentor(s): **Dr. Steven Greene**
Poster: **4**

Ranked choice voting is an electoral reform with unique potential: it is easily implementable, has already been successful in several local and state elections, and doesn't possess the partisan polarization of other proposed reforms. In a hyperpolarized political landscape, this reform has the ability to foster bipartisanship and strengthen democracy. Social media's distinct role in political messaging and shaping public attitudes can, and should, be utilized to encourage understanding and support for ranked choice voting reform. Using persuasive political messaging, informed by the moral reframing approach, I aim to evaluate the extent to which a persuasive and informative video stimulus impacts knowledge and opinion on ranked choice voting. In January 2023 I will conduct a survey experiment in which participants will be exposed to a 60 second video stimulus on ranked choice voting reform, simulating content found on the social media platform TikTok. I hope to find proof of concept that this exposure can have a significant impact on short term electoral reform attitudes and support. I seek to better understand the potential influences of informing the public on ranked choice voting, as well as how social media platforms can be used to facilitate this attitude development.

How Does Culture And Major Alter How We Think About Colors?

Author(s): **Duru Caner**
Mentor(s): **Professor Mary Estrada**
Poster: **5**

Color to emotion association is a factor in our daily lives that alters how we live, perceive and feel. The emotions we feel when looking at different colors can change from person to person, and this difference may stem from contrasting cultural backgrounds and upbringings, as well as diverse areas of interest. Previous research has found that there are in fact a whole web of relationships between color, language, health, etc. and how our brain perceives it all. We already know that when the same color is talked about in different languages, different emotions are invoked. Research has shown that the color white is bad for healing, thus it is used less and less in hospitals, while blue and green turned out to be better colors for health. We used data from an anonymous survey whose respondents were from the selected demographic, who were students and North Carolina State University. Respondents were asked to state what college they were studying in, where they were from, and

then pick what emotion the certain color presented to them in an image invoked in them from a predetermined list of emotions. We found that while cultural differences created a contrast in what people felt when looking at certain colors, such as red or yellow, which created the most visible difference, there was little to no difference in the responses from people who were from different majors. With our findings, things like decor can be used to manipulate people to feel a certain emotion.

Feral Hog Impacts in the US

Author(s): **Brenna Carter, Austin Wolf**
Mentor(s): **Dr. Erin McKenney**
Poster: **6**

Invasive feral hogs currently inhabit 35 states in the U.S., where they cause irreversible damage to local ecosystems and economies. Feral hogs root the soil, destroying vegetation and crop fields, and spread disease to wildlife, livestock, and pets. Each year in the United states, feral hogs cause an estimated 1.5 billion dollars in damage. Many private and government organizations work to control feral hog populations through the use of GPS monitoring, trapping, toxins, culling, and hunting; however, these efforts have been unsuccessful. Early sexual maturity of sows, large litter sizes, and a lack of natural predators allow these pigs to reproduce exponentially. In addition, the general public tends to oppose the control measures implemented by private landowners and government organizations. The lack of knowledge in urban populations about the effects feral hogs have on rural communities, and the predominant moral objection towards lethal control, are the greatest obstacles to controlling feral hog populations. The goal of this project is to educate the public about the impacts that feral hogs have on the ecosystem and agriculture, so private and government organizations will have the support needed to control feral hog populations. To accomplish this goal, we synthesized fifteen peer reviewed articles on the history, habits, and control methods of feral hogs to create a presentation to inform the public. With proper education, we believe that there could be more support to expand research and control methods for invasive feral hog populations, leading to less destruction of agriculture and natural ecosystems.

Investigating the Effects of the Word Repetition Exercise on Inhibition and Switching Efficiency

Author(s): **Caleb Carwell**
Mentor(s): **Dr. Chris Mayhorn**
Poster: **7**

The word repetition exercise is a commonly used and time-efficient technique used by anxious individuals to avoid troublesome thoughts. While effective, it is unclear why this exercise works and what cognitive processes are involved. Such insight could help clinicians determine which patients would benefit from the word repetition task by highlighting which cognitive processes are necessary for the exercise to be effective. For example, if the word repetition exercise relies on attentional processes, the clinician may avoid recommending it to a patient with severe ADHD. Because the word repetition exercise is administered with the intention of shifting focus away from troublesome thoughts, the present study investigated if the word repetition task targets two attentional control processes, inhibition and task-switching, as processes of change. Using a mixed methods pre- and post-test model, the present study measured the reaction times for the Stroop task and number-letter task in anxious college students (n = 13) before and after the administration of the word repetition exercise. The comparison group (n = 13) was instructed to read an article, lasting 5-7 minutes, instead of the word-repetition task. Results, discussions, and significant limitations are included in the following review.

Self-Healing Liquid Metal Lithium-Ion Battery

Author(s): **Rex Colvard**
Mentor(s): **Dr. Michael Dickey, Mr. Zach Park, Dr. Peter Fedkiw**
Poster: **8**

This poster will report progress toward improving the overall life span of batteries by applying the “self-healing” mechanism of liquid metals. The liquid metal is eutectic of gallium and indium commonly referred to as EGaIn. Batteries are already ubiquitous in our world today and the need for batteries with longer cycle lives and greater energy densities is urgently needed. The International Energy Agency (IEA) projects that the annual demand for electric vehicle (EV) batteries will increase over 7 times over the next 10 years. Liquid metal is extremely useful for battery electrodes because of its fluidity and self-healing ability. This self-healing ability may serve as a liquid buffer as cracks form on the anode material’s surface, which would typically reduce the capacity of the battery. These cracks are due to the volume expansion and contraction as lithium ions enter and leave the anode during charging and

discharging. Our research is focused on demonstrating and understanding this "self-healing" mechanism in Li-ion Batteries. Toward this goal, I have fabricated and performed electrochemical characterizations of electrodes that utilize EGaIn nanoparticles.

Reinstating Controlled Burns

Author(s): **Sara Dawson, Gabriel Chapman**
Mentor(s): **Dr. Erin McKenney**
Poster: **9**

Wildfires in the Western United States have gained notoriety in recent days, burning wide swathes of land, destroying property, and displacing wildlife. Thousands of people suffer from wildfire-related loss of habitable land and changes in air quality. However, fire is a necessary event in forest habitats throughout the West Coast, clearing debris and improving the overall health of these environments. For hundreds of years, the fire regimes of forests were managed by indigenous peoples through the practice of prescribed burning. However, since colonization began in the 1700s, these critical fires have been suppressed. The loss of traditional forest management, combined with climate change increasing the frequency of extreme weather events, has resulted in wildfires becoming far more extreme and destructive over time. To address the urgent need for effective forest management strategies, we have conducted a literature review to present relevant resources in a way that is accessible to the wider audience outside of the scientific community. Our goal is to inform any interested party, be they scientists, policymakers, or interested citizens, about current research on the role of fire in West Coast forest ecosystems so that they can become involved in conversations and decisions regarding these practices. We hope that by making the existing literature more accessible, we can influence the public to become more considerate of the traditional role of fire in West Coast forest management.

Identifying Landslide Hazards to the Pacific Northwest Regional Power Grid

Author(s): **Abigail Dayton**
Mentor(s): **Dr. Karl Wegmann**
Poster: **10**

Landslides threaten human life and infrastructure, resulting in thousands of lives lost annually and billions of dollars in damages worldwide. Heavy precipitation and earthquakes are the two most common landslide-triggering mechanisms.

Washington State incurs an alarming number of landslides yearly, the most out of any U.S. state. While they do not always cause the same amounts of damage, the risk to infrastructure is a great point of interest and a growing hazard in the Pacific Northwest. This research focuses on the risk to regional power grids, such as those from the Bonneville Power Administration (BPA), and the co-occurrence of high-voltage power line towers on known landslides. Future reactivation of one or more of these landslides could threaten the regional power grid. Using Google Earth Pro and transmission line paths from the BPA, we mapped individual electrical towers within the Columbia River corridor of Washington and Oregon and compared their locations to landslides mapped by the Washington State Geologic Survey.The mapping efforts have identified ancient and active landslides that may pose a risk to the regional electrical grid. Results so far have identified several towers that are co-located on previous landslide zones with the potential to become active again, and many are adjacent to known landslides that could expand in size upon reactivation.

As a Research Assistant I Have Much to Offer and Much to Gain

Author(s): **Daniela Duker**
Mentor(s): **Dr. Erin Krupa**
Poster: **11**

When it comes to doing research, no position is a small position. Each member brings their own contributions to the team and has something to offer in relation to the research being done. As for me, I am a Research Assistant. I organize data, review websites for typos, transcribe videos, edit transcripts, and participate in Math Field Days. What I do in addition to what my mentors and team members do allow for research to be done on making math more engaging and understandable for middle and high school students. The work I do has also allowed me to improve on many skills like data analysis, communication, and time management. As a Research Assistant I contribute to a larger project and purpose but I also contribute to myself as a student and researcher.

TPhP on Caudal Fin Regeneration

Author(s): **Jessika Foland**
Mentor(s): **Dr. Seth Kullman**
Poster: **12**

"Triphenyl phosphate (TPhP) is an organophosphate endocrine disruptor that is suggested to cause neurodevelopmental issues, obesity, and puberty onset. This disruptor is one of many that is found in great concentration in the environment because of its incorporation in furniture, clothes, and plastics; TPhP is added to these materials due to its ability to function as a flame retardant and as an additive for creating higher durability plastics. Part of the side effects of this addition involves the poor binding of TPhP to these materials, leading to the chemicals being released into the environment, resulting in putative exposures to human and marine life. In response, this project aims to generate a greater understanding of the effect of TPhP on growth and development using the medaka model. Since medaka (Oryzias latipes) are able to regenerate their caudal fin, fin clips were performed to analyze disruptions in regeneration potential following exposure to TPhP during larval growth. Here we demonstrate that TPhP negatively influences growth on the caudal fin without compromising the width of the tail, signifying that TPhP only affected the tail's ability to regrow, not the initial development of the tail. Therefore, this disturbance of development can suggest that TPhP inhibits osteogenesis and may be caused by the disruption of metabolic capacity."

Analysis of Grease Interceptor Design to Maximize Oil Separation: Impact of Coalescence Mechanism

Author(s): **Daniel Friday**
Mentor(s): **Dr. Joel Ducoste**
Poster: **13**

The lack of proper testing protocols surrounding passive flow-based grease interceptors (PFGI) has greatly contributed to the concentration of fat, oil, and grease (FOG) droplets present in the United States wastewater system. The testing of PFGI has been historically performed under favorable conditions, providing inaccurate results not indicative of the separation capabilities of retention-based grease interceptors (RGI). This study improved upon the testing scenarios of PFGI by including coalescence of FOG droplets in the testing scenarios. Furthermore, this study assessed the FOG separation capabilities of various retention-based grease interceptors compared to passive flow-based grease interceptors by altering each model’s internal geometry through the use of Sketchup’s 3D modeling software. The

various designs were assessed using CHAM Phoenics computational fluid dynamics software to simulate the flow of a distribution of FOG droplet sizes through the interceptor for a 1 minute hydraulic residence time. The ultimate goal of this study was to identify potential design patterns that yielded a greater separation of FOG droplets while also taking into account coalescence of FOG droplets in a non-idealized testing environment. Through the analysis of various designs, simulation results show that certain RGI design characteristics perform separation of smaller diameter FOG droplets more effectively than other designs due to the specific geometric properties of their inlet and outlet conditions and baffle wall.

An Analysis of Tactile Teaching Tool's effects on GN 312 Students' Understanding of Illumina Sequencing

Author(s): **Rishika Gaddam**
Mentor(s): **Dr. Claire Gordy**
Poster: **14**

Illumina sequencing is a significant topic taught in undergraduate biology and genetics courses nationwide. At North Carolina State University, this concept is taught to students in GN 312 and GN 421/521 in an introductory format. The topic was formerly taught via a video designed by Illumina or in a typical lecture-style. These teaching methods were seen to be challenging to students to grasp a long-term understanding of illumina-based high throughput sequencing. It would involve overwhelming amounts of new terminology and processes that would be difficult to visualize and recollect. A tactile teaching tool was designed to effectively enrich student involvement and learning by incorporating visual and tactile learning styles. This tactile teaching tool allowed us to be more inclusive of diverse learning styles. To examine the tactile tool's effectiveness, students in the online section of GN 312 were assigned to watch the new video and students in the hybrid section of GN 312 were assigned to watch the video prior to their in-person class utilizing the model. Students in both sections were given a pre and post assessment for the video and students in the hybrid section were given another post assessment following the activity using the tactile tool. The assessments measured student understanding of key concepts and the change between the two teaching styles. Overall, there was an increase in students' understanding in certain concepts of illumina-based high throughput sequencing when utilizing the tool compared to watching the video, while there was no change in other key concepts.

Developing Bioluminescent Fraser Fir Christmas Trees: A Proof of Concept

Author(s): **Alex Gaines**
Mentor(s): **Dr. Justin Whitehill, Mr. Yannick Farve, Ms. Angela Chiang**
Poster: **15**

Conifers have exceptionally large genomes and long lifespans, constraining genetic improvement efforts. Fraser fir (Abies fraseri) is endemic to western NC and the premier Christmas tree species in the US. Fraser fir is known as the "Perfect Christmas tree" due to its festive aroma, elite needle retention, and soft needles. My research project aims to develop a transgenic Fraser fir with autoluminescence and will serve as a proof of concept for future transformation experiments in conifers. Fraser fir transformation will be mediated by Agrobacterium tumefaciens to deliver four fungal genes into Fraser fir somatic embryogenic (SE) lines. SE tissue culture methods allow for clonal propagation of conifers and enable scientists to preserve valuable genetics. SE trees are clones of a single elite tree and can be propagated ad infinitum and used to produce full size trees. SE tissues can be used for rapid genetic improvements through genome editing and transformation. The genes of interest to be used for this project encode the fungal luciferase pathway (FLP). FLP converts caffeic acid – an intermediate in lignin biosynthesis – to luciferin 3-hydroxyhispidin, which luciferase processes to emit light. The FLP genes will be synthesized and cloned into a holding vector for sequence verification. Following verification, genes will be transferred into a gateway transformation vector and used to generate Fraser fir transformants. Different strains of Agrobacterium and different clonal lines of Fraser fir may be tested to refine standard operating procedures. Successful transformants' will be preserved long-term using cryopreservation.

Evaluate various stages of inoculation on shell eggs and role of plasma technology in shell egg surface sanitization

Author(s): **Justin Gilleland**
Mentor(s): **Dr. Deepti Salvi, Ms. Urvi Shah**
Poster: **16**

Shell eggs are considered potentially hazardous foods, requiring temperature control because they support the growth of pathogen Salmonella Enteritidis. Our current goal is to evaluate the recovery of bacteria from shell egg surface at various inoculation stages. The surface of shell eggs were inoculated with surrogate Klebsiella aerogenes at the following 3 stages: unwashed eggs, eggs washed with 40 – 46 C tap water (15 s), and eggs washed with 40 – 46 C tap water (15 s) followed by soaking in ethanol for 60 s. For each stage, eggs were stored at 4 C for 1 h, 24 h, and

48 h. Bacteria from eggs were recovered by hand massaging in buffered peptone water for 60 s, followed by dilution and plating on tryptic soy agar. After 3 replications, the results will be statistically evaluated to determine if there is a difference in bacterial attachment at various stages. An extension of this project is the investigation of novel plasma technology. Previous research has shown that the reactive species generated by cold plasma are effective in inactivating various microorganisms found in food. Plasma can be used directly on food or indirectly by generating plasma-activated water (PAW) or plasma-activated mist (PAM). We have conducted preliminary studies to determine efficacy of plasma jet, PAW, and PAM in eliminating Salmonella Typhimurium and Klebsiella aerogenes on shell egg surface. Results indicate higher exposure time leads to higher microbial inactivation. Further studies are needed to confirm this and optimize the plasma system for shell eggs.

Working on the Paciulli Lab Mother Aye-Aye Lemur (Daubentonia madagascariensis) Anxiety Project

Author(s): **Chloe Glynn**
Mentor(s): **Dr. Lisa Paciulli, Ms. Rebecca Olson, Mr. Adam Ehmke, Ms. Allie Monahan, Mr. David Q. Watts**
Poster: **17**

Anxiety is a negative psychological state caused by stress. It may manifest in animals through repetitive movements known as stereotypies. In mothers, anxiety may be induced by triggers such as birthing and infant health. The Paciulli Lab's Maternal Anxiety Project involves observing anxiety-related behaviors in a mother aye-aye (Daubentonia madagascariensis), hypothesizing that these behaviors would change over time. With Duke Blanket IACUC approval, Pelco IMM12027-1S cameras recorded the behavior of an aye-aye mother in her enclosure at the Duke Lemur Center. Using continuous focal animal sampling, anxious behaviors such as excessive grooming were identified peripartum, and then again one month after birth. The time, duration, and type of behavior were recorded for each observation. The results showed that the day before giving birth, the mother repeatedly constructed and deconstructed nests three times more than any other behavior. On the day of birth, she frequently groomed and scratched (n=80, n=62, respectively), and the day after birth she was hyper-vigilant / alert (n=12). The data support the hypothesis as the types of anxiety-related behaviors the mother displayed changed over the three days. Although limitations include a small sample size (n=1) and potentially abnormal birthing behavior in captivity, this is the first study to examine maternal anxiety in aye-ayes. In the future, the Maternal Anxiety Project will assess how anxious behaviors continue to change as the infant ages.

Stamped Intervention: Impacts on Student and Teacher Critical Reflection

Author(s): **Caroline Grant, Brooke Wilson, Ambrose McNally**
Mentor(s): **Dr. Kelly Mulvey, Ms. Jackie Cerda-Smith**
Poster: **19**

" Race and racism are topics often left to discuss in history classes based on the perspective of white men (Peters, 2015). Interventions aimed to amplify marginalized voices - the other perspective - offer the unique opportunity to create a better understanding of history among school-aged children, and to change the way that students and teachers feel and think about race and racism. A public high school in North Carolina implemented a school-wide intervention aimed at understanding racism during the fall of 2020 when school was online. Students and teachers read and discussed the book Stamped: Racism, Antiracism, and You (Reynolds & Kendi, 2020) on a weekly basis. These discussions were held during a non-academic period in which small groups of students and one-two staff members met to talk about real and current issues. This study involved semi-structured individual interviews with students (n = 15) and teachers (n = 7) regarding their experiences with the Stamped Intervention. These interviews were transcribed and coded for how the intervention impacted students' and teachers' awareness of social inequality (i.e., critical reflection). Three major impacted areas within critical reflection were identified: history, race and racism, and themselves. Further details and the educational implications supported by this study will be discussed.
Michael A. Peters (2015) Why is My Curriculum White?, Educational Philosophy and Theory, 47:7, 641-646, DOI: 10.1080/00131857.2015.1037227
Reynolds, J., & Kendi, I. X. (2020). Stamped: Racism, Antiracism, and You. Little, Brown and Company. "

Coquerel's Sifaka (Propithecus coquereli) mothers' behavior toward female offspring as they mature

Author(s): **Maddie Greenway**
Mentor(s): **Dr. Lisa Paciulli**
Poster: **20**

Mother-infant bonds are crucial for offspring survival. As offspring age, mothers typically spend less time with offspring. In this study, two Coquerel's sifaka (Propithecus coquereli) pairs were observed at the Duke Lemur Center (DLC) to examine how their mothers' behavior changes toward female offspring as they mature. It was hypothesized that as offspring age mothers would interact less with

and become more distant from their offspring. Three-minute instantaneous focal animal sampling was used to record interactions between mothers, Lupicina and Pompeia, and their daughters. Nearest neighbor identity and distance from mother and offspring were also recorded. Data were compared to Monahan (2022) to identify differences in behavior and nearest neighbor proximity from when the offspring were younger and now, when they are older. Results showed that Lupicina spent slightly more time close to her daughter as her daughter aged from one month (52%) to eight months (60%). Pompeia, however, spent less time in close proximity to her daughter as she aged (one month =84%, six months 73%). The time Lupicina spent grooming her daughter did not change over time, while the time Pompeia spent grooming her daughter decreased from 18% to 5%. Thus, the hypothesis was supported for Pompeia, since she spent less time with her daughter, but was rejected for Lupicina who spent more time with her daughter. Limitations such as small sample size (n=2 pairs) and cold weather may have impacted the results. This research can help husbandry staff better understand mother-infant bonds in lemurs.

Diminished Reality and Training: A Pilot Study

Author(s): **Ebernoe Guzman-Bonilla, Imani Bynum**
Mentor(s): **Dr. Anne McLaughlin, Ms. Imani Murph**
Poster: **21**

Diminished reality is a computer-aided mixed reality that removes real-world physical objects from the users' visual perception (Cheng et al., 2022). We believe that combining theories of learning and Diminished Reality(DR) may lead to effective training that promotes long term retention and sustained performance when the supports present during training are available. Participants in our pilot study were asked to assemble a medical ventilator in a VR environment while assigned to 1 of 3 conditions: Full DR, No DR/Control, and a Scaffolded/Faded DR. The type of DR experienced in our acquisition trial is our independent measure while the dependent measure of interests is the number of errors. The aim of our pilot study is to understand how controlling distractions via DR can affect retention and transfer. Alongside how the type of DR given may help overcome individual differences in performance on a complex task. We expect our results to indicate that participants who had matching conditions, such as Control or Full DR, will demonstrate worse results than the Faded DR condition. The reason being that Faded DR is expected to train users to overcome distractions and scaffold learners into improving long term retention and promote skill transfer. This pilot study will help guide the main study by providing helpful feedback so we may optimize and make necessary changes to our research methods.

Multilayer Biomimetic Electronic Skin for Active Wound Healing

Author(s): **Terry Han**
Mentor(s): **Dr. Brian Diekman, Dr. Wubin Bai**
Poster: **22**

"Human skin is a highly complex organ that provides various functions including protection, thermoregulation, and sensory input. The development of electronic skin (e-skin) has garnered significant interest due to its potential to mimic human skin and provide augmented sensations. Moreover, e-skin has the potential to contribute to areas such as wound healing. Skin wound management is a crucial concern in clinical care, especially for skins with impaired healing ability due to chronic illness or external injuries. Current drug-based therapies have limited efficacy or can cause severe side effects. Electrical stimulation has been studied as an effective approach with biosafety to improve chronic wound healing. However, there is significant variation in the type and parameters of electrical stimulation used in different studies.
This research project aims to build a multilayer e-skin device that will be applied directly over the wound site that can promote active skin wound healing. The e-skin device would consist of a biomimetic epidermal layer that adopts the soft mechanical texture of the epidermis to allow conformal lamination and bonding to the epidermis layer of the skin. The epidermal layer would be designed in biocompatible, waterproof forms that are easily disinfected for clinical applications. Microscale sensors and strain sensors would be incorporated into the e-skin membrane to monitor time-dynamic temperature, thermal conductivity, and wound size to assess the healing process. Additionally, the e-skin device would include electrodes for electric stimulation and metal nanoparticles for enhanced electrical conductivity and antibacterial properties."

Utilizing a Water Table for the Analysis of Compressible, Supersonic Flow

Author(s): **Mason Hooks, Jeffrey Whitenack**
Mentor(s): **Dr. Kenneth Granlund**
Poster: **23**

The study of compressible, supersonic aerodynamic flow is critical to the success of modern transportation. However, it is widely expensive and difficult to set up experiments. A cost efficient technology to study supersonic flow is the water table. This device runs a sheet of water over a glass table whilst passing through obstacles or wedges in the path. This route deviation creates hydraulic jumps. These jumps

resemble the behavior of an oblique shock. This phenomena can be studied to learn more about aerodynamics as well as serve as a teaching tool. With other technologies, it is difficult to display shockwaves and other aerodynamic properties. The water table allows for quick and easy understanding of these properties by watching the hydraulic jumps, or ripples for short, in the flow. This methodology can also be applied to various studies. Objects such as cavities, airfoils, and cones could also be used. The water table is a viable option to study and teach aerodynamics at any level.

Mapping sources of Variations in Charge Tunneling Using Meta Data

Author(s): **Sky Kanoy**
Mentor(s): **Dr. Martin Thuo**
Poster: **24**

With the growing field of microelectronics and the rising desire for smaller and smaller electronics, examining the behavior and variance at this scale is of increasing importance. Herein, we use data collected over years on charge tunneling through Self-Assembled Monolayers (SAMS) and highlight trends in their variances. Variations at this scale matter greatly because the current used are on the scale pico-amps to femto-amps. The data that has been analyzed thus far shows interesting behavior at low voltages and suggests that careful consideration of the junction geometry and measurement techniques is needed to create coherence in the field. This talk discusses this in detail.

Relationship between Reading and Loneliness

Author(s): **Viosa Koliqi**
Mentor(s): **Dr. Daniel Gruehn**
Poster: **25**

Reading is a large part of everyone's lives, whether it is for work, school, teaching, research, or leisure purposes. Reading has been thought to stimulate mental functioning, such as imagination, empathy and theory of mind, and to promote persons' satisfaction with life. However, sedentary leisure activities, such as reading, have been associated with loneliness and less positive affect. In the present study, we are investigating the links between loneliness and leisure reading in college students. In two studies, we asked students (Study 1: N = 378; Study 2: N = 359) from NC State University to report how lonely they feel, how much they like to read, how much time they have spent reading, and how many books they have read. In

addition, as a performance measure of their reading habits, we asked participants to indicate authors they recognize from a list of authors. Using structural equation modeling to examine the associations, we found a largely consistent pattern with past findings that people who are lonely tend to read more books and tend to spend more time reading. People who liked to read and spent more time reading, recognized more authors. However, the number of books did not predict successful recognition of authors. The findings highlight how loneliness might be a motivator for increased reading habits. Future research may examine the causal mechanisms between loneliness, reading, and leisure activities more generally.

Characterizing the Role of The AGC Kinase RPS6KA2 in Castration-Resistant Prostate Cancer

Author(s): **Sophie Korenek**
Mentor(s): **Melanie Korenek, Dr. Brenna Zimmer, Ms. Linlin Ma**
Poster: **26**

Over 80% of prostate cancers treated with androgen deprivation therapy eventually progress to castration resistant prostate cancer (CRPC), a state in which dysregulated androgen metabolism allows cancerous cells to survive without androgens. The loss of regulated steroid elimination from prostate tumor cells and an increase in the levels of UDP-glucose dehydrogenase (UGDH) are hallmarks of CRPC. UGDH catalyzes the conversion of UDP-glucose to UDP-glucuronate, which is used for hyaluronan production, steroid elimination, and proteoglycan biosynthesis. We propose that the fate of UDP-glucuronate is shifted to favor oncogenic growth and altered steroid elimination through the phosphorylation of UGDH by the AGC kinase RSK3. We aimed to co-transfect LNCaP33 cells – a cell line derived from a lymph node metastasis of androgen-dependent prostate cancer – with a plasmid encoding a BirA2-UGDH fusion protein and an overexpression plasmid for RSK3 to demonstrate that BirA2-UGDH is phosphorylated by RSK3. Fluorescent western blot analysis indicated successful BirA2-UGDH transfection, but further experimentation is needed to provide evidence for transfection with the RSK3 overexpression plasmid.

Exploration of the Twine TS-1800 Machine through Novelty Embroidery Application

Author(s): **Shayleigh Larsen**
Mentor(s): **Dr. Traci Lamar**
Poster: **27**

Textile dyeing can be a remarkably unsustainable process, consuming roughly 37 million Olympic swimming pools worth of water a year and contributing to 20% of global water pollution (Chen 2021). With these numbers in mind, each year more sustainable methods for the textile dyeing processes are released into the industry, and in 2019 The Twine TS-1800 machine debuted at the International Textile Machinery Association in Barcelona. This machine is a fully waterless, digital thread and yarn dyeing system that suits a wide range of applications, freeing the user from the limitations of the traditional supply chain while helping to create a more sustainable future. The goal of my research aims to use the Twine TS-1800 machine at the Wilson College of Textiles and focus on dyeing polyester embroidery floss and using it on a Tajima TMFX-C1501 machine to test gradations, design, and overall compatibility of Twine thread versus Madeira and Sulky, two of the leading brands for embroidery thread. This research would be helpful in the development of understanding if this machine would be competitive with industry standards for embroidery floss. If the Twine floss can match the quality and design application of industry floss, this technology could help replace some of the less sustainable practices within the embroidery floss supply chain.

Utilizing Neural Networks on Biological data

Author(s): **Brandon Le**
Mentor(s): **Dr. Ryan Sartor, Dr. Colleen Doherty**
Poster: **28**

Current research on RNA sequencing data often lacks a recorded time of day, despite time being a significant factor in RNA sequencing results. The objective of this study is to predict the time of day using gene expression data obtained from RNA sequencing by employing machine learning techniques. This study employs a deep learning approach to analyze RNA sequencing data through the use of a neural network with supervised learning applied to biological data. The input data is preprocessed and normalized, and a model is trained using the TensorFlow library. The model output predicts the time of day, represented as a value between 0-23, denoting each hour of the day for each sample. The performance of the model is assessed using the mean squared error (MSE) loss function and its prediction accuracy, derived from cross-validated results. A comparative analysis is conducted

with a random forest model, revealing similar accuracy levels in predicting the time of day. This study demonstrates the potential of machine learning and deep learning approaches in predicting the time of day based on RNA sequencing data, offering valuable insights for future research in the field.

Correlation between Breastfeeding and Post-Partum Depression

Author(s): **Honiah Locklear**
Mentor(s): **Dr. April Fogleman**
Poster: **29**

I would like to conduct research on how breastfeeding helps to lower post-partum depression in women. I would work with surrounding counties to collect data on women who breastfeed vs. those who do not. I would like to conduct surveys on around 150-200 women who have had a history with post partum depression.I would like to ask them about their experience with breastfeeding and if they noticed a change in their mental health afterwards. I would then conduct the data given from therapist, doctors, lacation consultants, and more to develop a poster that would detail and explain how breastfeeding affects post-partum depression.

A Mixed Methods Research Synthesis of the Content Published on Multi-Tiered Systems of Support

Author(s): **Carmela Mangini**
Mentor(s): **Dr. Scott Stage**
Poster: **30**

With the passage of the Individuals with Disabilities Education Improvement Act (IDEA, 2004) and Every Student Succeeds Act (ESSA, 2015), state departments of public instruction were encouraged to use Multi-Tiered Systems of Support (MTSS; Berkeley et al. 2020; Jimerson et al., 2016). MTSS is a proactive tool in which students are screened and evidence-based intervention practices are implemented in order to assist students with an array of academic, behavioral, social, and emotional problems. MTSS consists of Tier 1 school-wide academic, social, emotional, and behavioral programs for all students. At Tier 2, schools provide small groups, standardized academic interventions, or targeted behavioral and mental health supports using validated intervention programs to support students identified as at-risk. Tier 3 includes intensive intervention for students not responding to Tier 2 (Center on MTSS, 2023). However, there are no systematic reviews or meta-analyses

of the literature regarding MTSS. This poster presents the research process using a mixed methods research synthesis of 178 articles, 141 dissertations/theses, and 151 books or book chapters found on PsycINFO. This literature is being analyzed using a qualitative content discourse analysis that will later be quantified using meta-themes. The meta-themes discussed within these publications are related to how school personnel can achieve MTSS. Pinpointing common themes in MTSS is the first step in creating a system that will help to more efficiently aid students who struggle and need the proper resources and interventions to succeed.

The Impact of Zero Transfer Credits on the Progress Toward International Students' Degrees

Author(s): **Arnav Mathur**
Mentor(s): **Professor Mary Estrada**
Poster: **31**

"This study explores the impact of zero transfer credits on the progress toward degrees for international students studying in the United States. Unlike American students who can earn up to 60 college credits in high school, international students typically come with zero transfer credits, which can delay their graduation date and make it difficult for them to get into desired classes. The report highlights the various challenges that international students face, such as increased expenditure of time, limited degree options, and financial burdens. However, it also acknowledges that retaking high school classes can lead to a higher GPA. The study aims to examine the effect of zero transfer credits on international students' progress toward their degrees in multiple aspects.
The study was conducted using an online survey distributed to some international students at North Carolina State University. The questionnaire had 15 questions and asked respondents about their transferred credits, AP/IB exams, scholarships, degree specializations, retaken classes, etc. The survey had 26 respondents and 85% of the respondents had less than five transfer credits. Moreover, only four respondents took the AP Exams/IB curriculum. The study concludes that students who had fewer transfer credits had a relatively higher GPA in their freshman year, as they retake most of their classes during that time, but they might have to stay for another semester, leading to financial difficulties or a limited degree plan without any specialization or minors."

Cryogenic Preservation of the Lemnaceae Species Lemna gibba

Author(s): **Patrick McArthur**
Mentor(s): **Dr. Ryan Sartor, Dr. Colleen Doherty, Ms. Alice Chesley**
Poster: **32**

The Lemnaceae (commonly known as Duckweeds) are a family of plants with large agricultural potential. This family consists of 36 species but no attempt has ever been made to domesticate or improve any species through selective breeding. The process of selective breeding has been used to generate every plant and animal variety that exists in our modern agricultural systems and will be essential for turning Lemnaceae into an economically viable crop. A modern breeding program requires the means to store germplasm for long periods of time (decades or more). While L. gibba seeds can be generated, it is unclear how long they can remain viable and it is known that they will die upon desiccation. For production purposes, Lemnaceae biomass is generated entirely through clonal propagation, therefore advantages also exist for being able to preserve vegetative tissue along with heterozygous genomes without having to go through meiosis to generate seeds. Currently, Lemnaceae researchers maintain live clones in a continuously growing state which requires large amounts of labor. This method of maintaining germplasm would inhibit a variety improvement program that would require the ability to store thousands of varieties for long amounts of time. Here we present a method for cryogenic preservation of vegetative tissue in L. gibba through flash freezing. The method is relatively easy and requires no special equipment. This work will be essential for Lemancea breeding programs and will also be a useful tool for other areas of research.

Estimating the Behavior of Long Tethers For Energy Generating Kites

Author(s): **Hanna McDaniel**
Mentor(s): **Dr. Ashok Gopalarathnam, Mr. Michael Jenkins, Mr. Jacob Fine**
Poster: **33**

Kites can be used to extract energy from ocean currents and wind when flown in cross-flow figure-eight patterns. Research on these energy-generating kites has been conducted by renewable energy groups here at North Carolina State University for several years. some time. The challenge with cross-flow kites is finding a simple and computationally efficient way to model the motion of the tether. This is important in model calculations to accurately estimate the aerodynamic behavior of

the kite without running a computationally taxing model. A simplified tether motion model is being developed using data from a high-order dynamic model of the cross-flow kite. The tether path geometry and motion are estimated for a series of tether lengths and a single figure-eight maneuver and then compared to the actual path geometries and motion. The geometry estimations appear to lose accuracy as the tether length increases, but the tether motion of the estimation and the actual data appear to remain similar. The simplified tether motion estimations can also be used to estimate the total tether drag acting on the kite. Since tether drag is a big contributor to the total drag acting on the kite, being able to quickly estimate the behavior of the tether may allow us to make appropriate changes to the kite-tether system to maximize energy generation in the future. Such models will also be useful for kite geometry and path optimization.

Synthetic Strategies To Access Higher Azaacenes

Author(s): **Sarah McKee**
Mentor(s): **Dr. Chris Gorman, Dr. Ivan Cockman**
Poster: **34**

Organic-based electronics are predicted to reach a staggering market value of 160 billion USD by 2027. With such a lucrative market value, the development of organic semiconducting materials has become attractive. Acenes, containing nitrogen heteroatoms (azaacenes), are a class of compounds that have attracted considerable attention in this realm of research. However, there are challenges related the synthesis of these compounds including high instability and low solubility. Not only have 5-ringed systems been explored, but 4-ringed, 7-ringed, and even 9-ringed azaacenes have been in development. This research focuses on an efficient, two-step approach toward the synthesis of azapentacene compounds. Based on the successful two-step approach, efforts have been ongoing to synthesize unique precursor compounds to expand on the scope of research within this project. Beyond the synthesis, project goals include the characterization of structure-function relationships and evaluation of these materials for thin-film device applications.

Novel Experimental Procedure in Virtual Reality Task Can Help Account for Effects from Past VR Experience

Author(s): **Eleanor McNamee, Demi Stamatakos**
Mentor(s): **Dr. Anne McLaughlin, Mr. Frank Lodge**
Poster: **35**

Virtual reality is a burgeoning method to test the effectiveness of diminished and augmented reality as cognitive or attentional aids. Experimental tasks used to test cognitive ability are often subject to learning and order effects which can skew results. This may be compounded by the recency of virtual reality and its novelty to participants. The current NASA funded study replicated an emergency situation aboard the International Space Station. Participants were immersed in the ISS virtual reality environment and tasked with assembling a medical ventilator using voice-commands across three scenes, with three experimental conditions applied. We were interested in how task performance changed throughout the scenes, perhaps through learning effects bolstering performance or through learned helplessness lowering performance. Participants were graduate students at NC State with varying degrees of experience with virtual reality. We also sought to examine how previous experience with augmented reality would affect performance in each scene. The current analysis suggests that our novel environment and task may reduce the impact of previous VR experience on task performance. Neither learning effects nor learned helplessness seemed to have a significant effect on task performance. These data demonstrate the importance of developing novel tasks, splitting experiments into discrete parts, and incorporating a tutorial process into experimental protocol. The current study suggests that future VR experiments should include tutorials, novel environments, and recruitment of participants with varying levels of VR experience. Being able to control for these possible confounds will help researchers focus on the experimental conditions and increase content validity.

Illegal Wildlife Trade and Poaching in Asia

Author(s): **Jayden Meggett, Sofie Yingling**
Mentor(s): **Dr. Erin McKenney**
Poster: **36**

Animal species around the world are captured, killed, and traded, regardless of whether they are listed as endangered or threatened. This industry is one of the main contributors to the loss of global biodiversity and habitats, and also impacts developing economies and communities across Asia. Organizations like CITES, or the

Convention on International Trade in Endangered Species of Wild Fauna and Flora, have been created to address the gap in conservation efficacy. However, existing laws and regulations such as banning certain hunting materials and blocking trade routes are insufficient to actually solve this problem. Our goal is to offer potential conservation strategies to spread awareness and change cultural attitudes towards animal trading and the conservation of wildlife. To accomplish this goal, we conducted an extensive literature review to examine this issue from diverse perspectives. For example, we propose alternative strategies to help combat poaching by providing better economic opportunities to developing communities and changing their cultural behaviors. In addition, we want to help spread community awareness by hosting events and campaigns to provide an understanding on wildlife trafficking and trade. By spreading awareness and changing cultural attitudes towards poaching, we can increase biodiversity and help conserve endangered or threatened species around the world.

Correcting a History of Poor Urban Planning and Design for Improved Community Health

Author(s): **Madelyn Milazzo**
Mentor(s): **Dr. Ayse Ercumen**
Poster: **37**

"In 2014, Melody Goodman, assistant professor at Washington University in St. Louis, gave a speech at her alma mater, the Harvard School of Public Health, with an impactful statement: “Your zip code is a better predictor of your health than your genetic code.” Our built environment, which consists of features that have been constructed and modified by humanity (buildings, neighborhood layouts, houses, landfill infrastructure, etc.), has a tangible and significant impact on the health outcomes of communities. This project aims to find which features of the built environment are impacting which communities in the United States through a multi-disciplinary literature review and evaluation of chronic disease rates, specifically diabetes, in Durham, North Carolina. The findings from the literature review indicate that historical racist and discriminatory urban planning practices, such as redlining and blockbusting, have contributed to the creation of inequities in the built environment in the United States. This manifests in conditions like unsuitable housing conditions, lack of access to nutrient-dense foods in stores, and increased exposure to toxicants due to close proximity to waste (among other things). The findings from this project indicate that there is a relationship between the built environment and rates of diabetes in people living in Census Tract 23, a predominantly Black area of Durham. This is significant in that it shows that our health can be contingent on the environment we live, play, and work in. Changes to

policy, urban design, and health-initiatives in communities can mitigate the outcomes of poor environmental health conditions. "

Structural and kinetic studies of Chlamydia Associating with Death Domains (CADD)

Author(s): **Kay Millikan**
Mentor(s): **Dr. Thomas Makris, Mr. Han Phan**
Poster: **38**

"The Chlamydia Associating with Death Domains (CADD) enzyme from the human pathogen Chlamydiae trachomatis is structurally classified as a heme oxygenase-like diiron oxidase (HDO) and catalyzes the formation of the folate precursor para-aminobenzoic acid (pABA). This pathway differs from the canonical pathway used by most bacteria that assembles pABA from chorismic acid in a multi-step fashion. Folate is imperative for the formation of amino acids and nucleotides and, therefore, the overall survival and proliferation of C. trachomatis and other bacteria. It is postulated that CADD forms pABA via a self-sacrificial radical transfer reaction in which the enzyme cleaves its own L-tyrosine (Tyr27) and converts this amino acid to pABA. Inaddition, our recent studies indicate that the activity of CADD in C. trachomatis is optimized with a heterobimetallic cofactor consisting of Fe and Mn in a 1:1 ratio instead of the diiron core used by other characterized HDOs. The purpose of my investigation is to determine the metal dependence and mechanisms of CADD orthologs found in other chlamydiae (C. suis), another intracellular bacterial pathogen (Wolbachia pipientis), and an ammonia-oxidizing extracellular bacterium (Nitrosomonas ureae). The structure of the N. ureae ortholog was solved to a resolution of 1.7 Å and reveals a radical transfer pathway that substantially differs from other orthologs. The implications of this alteration on the metal-dependence and mechanism of CADD's suicidal pABA formation were explored. A further understanding of the pABA reaction will inform the development of therapeutics for C. trachomatis infection."

Investigating Genetics Students' Understanding of Illumina Sequencing Using a 3D Virtual Tour and Case Study

Author(s): **Molly Mizenko**
Mentor(s): **Dr. Claire Gordy**
Poster: **39**

As the implications and accessibility of Illumina sequencing continue to expand, more undergraduate genetics courses are introducing this technology into the curriculum. At North Carolina State University (NCSU), students enrolled in the elementary genetics laboratory course, GN312, learn about this DNA sequencing method as it applies to an assigned project on identifying microbial communities. Equipped with minimal or no prior understanding of Illumina sequencing, students struggle to grasp this concept because the existing educational tools are geared toward an audience already familiar with the technology. A 3D virtual tour of the Genome Science Lab at NCSU, paired with an interruptive case study that followed a student's research project, was created to increase student understanding of Illumina sequencing. Individuals enrolled in in-person GN 312 lab sections were assigned the tour and case study, while individuals enrolled in the online section were not. The level of understanding was assessed via pre- and post-assessments, and analyzed by calculating the difference between group means compared to the data's variability (effect size) utilizing the statistical measure Cohen's d. Students from the in-person group that were assigned the tour and case study were found to have a higher average learning gain and an overall greater increase in understanding of Illumina sequencing than students in the online group, reflective of the higher effect size. This demonstrates the potential for use of this educational tool in the future to improve student understanding, not only in genetics courses but in a variety of laboratory settings as well.

Growth of CrCl3 Films in a High Vacuum Tube Furnace

Author(s): **Juan Morales Zapata**
Mentor(s): **Dr. Daniel Dougherty, Ms. Samanvitha Sridhar, Mr. Gaurab Thapa, Mr. Ario Khansari**
Poster: **40**

"Growth of chromium trichloride (CrCl3) films has much promise for research due to their applications in electrical technologies, but reliable growth for CrCl3 thin films is needed. Previous growth methods, such as exfoliation of thin layers from bulk crystals and Molecular Beam Epitaxy, have proven to be inconsistent and difficult. However, we found that growth in a dynamically-pumped tube furnace results in

thin film deposition on an SiO2 substrate. To ensure films were grown, multiple SiO2 substrates were placed in a narrow area at the edges of the tube, where condensation was allowed. Furnace heating rate was chosen to minimize decomposition at intermediate temperatures while ramping to the desired sublimation temperature. The structure and properties of the thin films were characterized using Diffuse Reflectance Spectroscopy (DRS) and Atomic Force Microscopy (AFM). Bulk crystal and thin film spectra were compared using DRS. The two spectra showed similar energy peaks, indicating grown films were mainly composed of CrCl3. AFM scans show grown films had large surface roughness due to nucleation and 3D growth of independent of micron-scale domains that evidently do not coalesce."

Novel Antimicrobial Edible Coating against Salmonella: Optimizing UV-C Light Absorbance

Author(s): **Hazeen Naikzada**
Mentor(s): **Dr. Deepti Salvi**
Poster: **41**

"Salmonellosis is a food borne illness that is caused by a microorganism called Salmonella. The Salmonella bacteria has been around for quite some time and it has always been a challenge to fight against its prevalence. There are several ways to fight against the bacteria; one of which is the use of an antimicrobial edible coating on the food to prevent it from getting contaminated with the Salmonella bacteria. Our project is to make a novel edible coating for poultry that has good antimicrobial properties. To do so, we have progressed to developing a solution using gallic acid and chitosan. Chitosan is a linear polysaccharide that has good film foaming properties and is also an excellent carrier of bioactive compounds. Gallic acid is a natural preservative present in plants that has good antimicrobial, antioxidant, anti-inflammatory, and anti-carcinogenic properties. It is also a very good photosensitizer. Photosensitization is a process of generating reactive oxygen species that can be detrimental to bacteria upon UV treating photosensitizer compounds. More reactive oxygen species are generated if the photosensitizer compound absorbs more UV light. In this study, we compared the absorbance levels of gallic acid before and after adding to chitosan. Our hypothesis is that UV treating only gallic acid will give the solution a higher rate of absorbance as compared to UV treating the whole solution. Higher the absorbance the better the antimicrobial properties through photosensitization."

Exploring the Impacts of Growth Conditions on the Structure and Superconducting Properties of Lanthanum Oxide

Author(s): **Sam Nechyba**
Mentor(s): **Dr. Divine Kumah**
Poster: **42**

Recently, it has been shown that thin films of rock salt structured Lanthanum Oxide (LaO) superconducts at a temperature of around 5K. We found the superconducting transition for LaO to range from 3.5K to 5.5K. We grew thin LaO films on a SrTiO3 substrate using the method of Molecular Beam Epitaxy (MBE). We grew the films at partial pressures of oxygen between 10^-8 and 10^-9 Torr. Using x-ray diffraction (XRD) and x-ray reflectivity (XRR) scans, we were able to determine the structure, thickness, and density of the LaO films. We found that the best way to grow these films was on an SrTiO3 substrate with a BaBiO3 layer below the LaO. Understanding the mechanisms behind superconduction in LaO is important in the search for new materials that superconduct.

Decreased Intestinal Peptide Hormones Found in Horses Hospitalized for Equine Colic

Author(s): **Kate Nierle**
Mentor(s): **Dr. Katarzyna Dembek**
Poster: **43**

There is little research attempting to explain the relationship between horses with gastrointestinal (GI) disorders and their corresponding endocrine function. It is important to analyze effects of damage to the intestines, like decreased function, motility and blood flow. Enteroendocrine (EEC) cells of the GI tract secrete specific peptide hormones (incretins) linked to gastric function. Damage to EEC due to equine colic can inhibit incretins, thus decreasing necessary regulatory functions. Low levels of incretins hinder pancreatic function, intestinal motility and feedback mechanisms. Our goal is to determine the relationship between a horse's gastrointestinal health and their intestinal hormone secretion and to determine the association between incretin concentration and severity of disease and survival in horses presented for evaluation of colic. The incretins studied were GIP, GLP-1 and GLP-2, each relating to digestion and insulin function. We hypothesize horses presented for colic will have lower concentrations of incretins compared to healthy controls, and they will also be more likely to die compared to those with normal incretin concentrations. Hormonal replacement therapy might improve recovery from equine colic and overall health. The objective of performing this research is to

provide insight to gastrointestinal disease in horses and its relation to the endocrine system, leading to better treatment of GI disease. Specifically, it uses GIP as an indication of gastric motility, as it was lower in horses with colic after 24 hours of hospitalization. Our results also suggest that GLP-1 can be a clinical marker of non-survival in horses presented for colic.

Re-polymerization of double-network hydrogels by liquid metal particles

Author(s): **Zacharia Nyambega**
Mentor(s): **Dr. Michael Dickey, Dr. Sooik Im**
Poster: **44**

"Hydrogels are soft substances made from 3-D networks of interlinked polymers. They can absorb water while maintaining their structure. This unique property comes with many applications, such as soft electronics and drug delivery.
Radical activation is often an important initiation step for generating the polymers needed for hydrogels; this step can be dangerous and energy-intensive (e.g., UV-light, high-heat). Our group discovered that Eutectic Gallium Indium (EGaIn), liquid metal particles, can be used to create polymers by initiating radicalization easily with minimal safety hazards because it is non-toxic at room temperature and forms radicals through a simple sonication process. Furthermore, hydrogels made using EGaIn can be easily fine-tuned for strength and hardness using acrylamide monomer (AM). This research investigated the impact of AM concentration on hydrogel stretchability and toughness.
Two samples of the EGaIn hydrogels were reacted with 5.64 g acrylamide (AM) and 8.52 g AM respectively and another third sample used as a control experiment was reacted with HCL and water. An Instron Extensometer was used to test their strength. Preliminary results obtained showed that the 5.64 g gel had a high stretchability tolerance and was tough followed by the 8.52 g gel and the sample with HCL and water had low tensile strength. Further research is going on to determine the suitable condition to make the gels stronger when stretched mechanically."

The characterization of a partial mixed infection of two tomato begomoviruses

Author(s): **Emely Pacheco**
Mentor(s): **Ms. Anna Dye, Dr. Trino Ascencio-Ibàñez, Dr. George Kennedy, Dr. Linda Hanley-Bowdoin**
Poster: **45**

Begomoviruses pose a major threat to agriculture and food production causing damage globally to a variety of plants. They are single-stranded DNA viruses transmitted by the silverleaf whitefly (Bemisia tabaci) and are prevalent in tropical and subtropical regions. Mixed viral infections in plants can affect various aspects of the plant's growth, development, and overall health. Two begomoviruses, Tomato Yellow Leaf Curl Virus (TYLCV) and Tomato Mottle Virus (ToMoV) show a synergistic interaction when infecting the same plant. ToMoV, has two DNA components which are required for systemic infection, while TYLCV has a single DNA component. When in a coinfection, TYLCV and ToMoV DNA-A can create a systemic infection of both viruses without the DNA-B component of ToMoV. We have coined the term “Partial mixed infection” to characterize the coinfection of ToMoV DNA-A and TYLCV without ToMoV DNA-B. This study seeks to further characterize the existence of the partial mixed infection without the ToMoV DNA-B using by infecting tomato plants (cv. Lanai) with infectious clones and measuring viral titers and symptom development over a time course experiment. The titers of each component were measured at 7-, 14-, 21-, 28-, and 35 days post-inoculation to see changes over time. The symptoms of the partial mixed infection were also characterized and compared to single infections and the full mixed infection. The results of this study help explain a new phenomenon of the modular nature of multipartite viruses and the interaction between viruses.

Investigating CNN Methodologies for Identifying Fungal Plant Pathogens

Author(s): **Manav Patel**
Mentor(s): **Dr. Orlando Arguello-Miranda**
Poster: **46**

"Fungi can play a double-edged sword role in agriculture by causing plant diseases or by promoting plant growth through symbiotic interactions. Identifying isolated fungi as pathogens or symbionts often involves time-consuming methods such as microscopic examination and culturing or the use of costly techniques like PCR, which requires trained personnel. An alternative, and still under-explored, method to classify isolated fungal organisms is the use of recently developed convolutional neural networks algorithms (CNNs) for image classification, which can be cheap, fast,

transferable to mobile devices, and require minimal personnel training. However, most CNN approaches for fungal classification focus on images of spores and fruiting bodies, neglecting the use of mycelium, which is a more common feature of fungi in the environment.
In this research proposal, we aim to evaluate CNN-based detection methods to differentiate between mycorrhizal and pathogenic isolated fungi solely based on their coarse morphological mycelium features. We will acquire hundreds of microscopy and cell phone-acquired mycelium images of two mycorrhizae (Hebeloma sp. and Paxillus sp.) and pathogenic (Verticillium sp. and Septoria sp.) isolated cultures. The resulting image dataset will be used to train CNN with different architectures which will be tested for accuracy on a validation image data set that also contains images of infectious or symbiotic mycelium growing on plant roots.
Outcomes: This research will contribute to the development of automated methods for the identification of fungal-plant interactions, which will be valuable for agricultural applications and could potentially reveal general features of symbiotic and pathogenic fungal organisms. "

Examination of Veterinary Student Beliefs Regarding Their Education in Safety Culture

Author(s): **Trevor Patten**
Mentor(s): **Dr. Anne McLaughlin**
Poster: **47**

“Safety in complex systems is created by people through practice—at all levels of an organization” (Dekker, 2002). In our project, we investigated veterinary students' perspectives on how they receive education in safety culture, whether they were trained in reporting errors, and their beliefs about the safety culture and efficacy at their schools. A positive safety culture builds institutional knowledge through the reporting of medical errors. To understand the beliefs of students in veterinary medicine, we examined narrative survey responses from 78 students at 13 different veterinary programs. These narratives were coded for whether they contained information about reporting experience. Raters achieved a Cohen’s kappa of .78 and disagreements between coders were discussed and agreed upon. We extracted themes from these codes to describe students’ beliefs about error reporting. We found 23.1% of respondents had positive beliefs about reporting, 39.7% had negative beliefs about reporting, 17.9% had both positive and negative beliefs, and 19.2% had neither positive nor negative beliefs. These initial responses identified mixed beliefs concerning safety culture and reporting medical errors in veterinary medicine programs and may reflect the emerging nature of patient safety in veterinary medicine.

Investigating the Relationship Between Proteins and Vitamin B1: Does Protein Binding Impact Vitamin Acquisition in Model Marine Bacteria?

Author(s): **Bailey Pelt**
Mentor(s): **Dr. Ryan Paerl**
Poster: **48**

Vitamin B1, thiamin, is a micronutrient that all organisms need since it serves as a cofactor for enzymes in the metabolism pathways of cells (carbon conversion, amino acid synthesis, etc.) Marine plankton, algae, and bacteria assimilate vitamin B1 from their surrounding seawater environment by transporters. Binding proteins are macronutrients found in dissolved sweater and can impact nutrient uptake in cells, as they can bind different molecules together (proteins and thiamin). We hypothesized that if vitamin B1 binds with protein in the surrounding environment, then the vitamin B1 may be inaccessible for uptake which negatively impacts cell growth. To test this hypothesis bioassays were done with a mutant Vibrio strain that cannot produce its own vitamin B1 in two seawater treatments. One treatment was filtered seawater that has no proteins present in the environment (<10kD filter) and the other was seawater that was filtered to only remove any large particulates (0.2 µm filtered). To these treatments the vitamin B1 concentrations that were added varied; five different concentrations were used and the range was from 0-200 microliters. The results of the study showed similarities in growth patterns with the variance in vitamin B1 concentration across both treatments, growth was lower when the vitamin B1 added was small. It appears that growth may have been higher in the treatment with no free proteins in the seawater, which is consistent with the hypothesis presented.

Age-Related Differences in Children's Reasoning and Justification of Rule-Breaking

Author(s): **Fiona Prestemon, Miles Eustis, Gouri Kallambella, Carinah Townsend**
Mentor(s): **Dr. Kelly Lynn Mulvey, Ms. Christina Marlow**
Poster: **49**

"Moral development is a core milestone in childhood development. Prior literature from social domain theory reported children find moral transgressions more wrong than conventional violations (Yoo & Smetana, 2022). Further, research found younger children had similar reasoning to all transgressions while older children displayed more nuanced reasoning (Hardecker et al., 2016). We examined possible age-related

differences in the type of justification made in response to a rule being broken. We recruited 108 children, aged 4-10 years old (Mage=7.336, 54% male). Participants were randomly assigned to various rule breaking scenarios and completed a semi-structured interview. Children's open-ended responses about rule violations were coded using social domain theory methods. A repeated measures ANOVA was run on the data to examine differences in usage of the broken rule (conventional) or apology-based (moral) justifications by age. There was not a significant difference in the type of justification between reasoning groups ($F(1,113) = 2.648$, $p = .106$). Results indicated that children of all age groups were more likely to use the broken rule justification than the apology/no apology justification ($F(1,113) = 6.981$, $p < .001$). Further, no significant differences were found in the use of apology/no apology reasoning due to age. Further probing of the interaction with pairwise comparisons showed that younger children were significantly more likely to use the broken rule/norm justification than older children ($p = .008$). These preliminary findings suggest future investigation on how age shapes moral reasoning and development is warranted. "

Inhibition of the pentose phosphate pathway leads to increased inflammation in fructose-treated Immortalized Kupffer Cells

Author(s): **Dan Richard**
Mentor(s): **Dr. Arion Kennedy, Ms. Mareca Lodge**
Poster: **50**

Nonalcoholic Fatty Liver Disease (NAFLD) is a metabolic disorder characterized by multiple progressive pathologies. NAFLD is hallmarked by lipid accumulation and hepatocyte ballooning and without intervention can progress to nonalcoholic steatohepatitis (NASH) where the liver becomes inflamed and fibrotic. If left untreated, this may progress to cirrhosis and liver failure. NAFLD affects between 20-30% of Western populations and strongly correlates with sedentary lifestyles, and unbalanced diets (Kudavalleri and John 2022). A link between increased fructose consumption and higher incidences of NAFLD has been suggested especially in the context of the increased presence of proinflammatory cytokines. Our experiments focus on determining the effects of fructose metabolism within immortalized Kupffer Cells (IMKC), a line of macrophages endogenous to the liver. Our data suggest that IMKCs shuttle fructose carbons through glycolysis and the Pentose Phosphate Pathway (PPP). We inhibited the PPP by using 6-aminonicotinamide (6AN) to inhibit 6-glucose phosphate dehydrogenase, the rate-limiting enzyme of the PPP. Our data indicates that inhibition of the PPP with a fructose treatment is associated with an increase in the pro-inflammatory markers interleukin 6 (Il6) and transmembrane glycoprotein nonmetastatic B (GPNMB) expression, compared to

glucose treatment in both in vitro and mouse models. Furthermore, using siRNA to knock down G6PDH augmented the fructose-induced expression of Il6 and Gpnmb. These results suggest that the PPP plays a shielding role in controlling fructose metabolism-related inflammation, though research is still being conducted in this area.

De-Risking in Foreign Embassies

Author(s): **Nicholas Ristaino**
Mentor(s): **Dr. Mark Nance**
Poster: **51**

"The continuous evolution of banking regulations has contributed to the de-risking of bank accounts in foreign embassies and missions in the United States. The dominant explanation for this trend is that due to bank regulators creating regulations that crack down on money laundering, it has led to an increase in the cost of doing risk analysis, which has caused banks to cut these accounts to save money and lower the amount of risk the bank takes on. This paper gathers data from different scholarly articles, news articles, and statements from government agencies, individuals, and banks to understand the conditions that lead to de-risking and the aftermath of a foreign bank account being de-risked. This study will help offer new insights into why banks in recent years have increased the number of accounts that have been de-risked and can offer further insight into the aftermath of countries that undergo this process. "

Identifying the most impactful factors of Informal STEM Learning Sites on student interest and understanding of STEM fields

Author(s): **Sarah Madeline Rodan**
Mentor(s): **Dr. Kelly Lynn Mulvey, Dr. Channing Matthews**
Poster: **52**

Previous research indicates that the amount of youth entering STEM fields is decreasing (ACT, 2018). This decrease may begin in secondary education, if there are limited opportunities for involvement, or a broader lack of interest in STEM topics (President's Council of Advisors on Science and Technology, 2010). To consider how earlier involvement in STEM programs impacts students' future investment in the fields, the present study analyzed 24 qualitative interviews with youth educators (ages 13 - 22 years, 18 female, 5 male, 1 nonbinary). This group was 62.5% White/European-American, 25% Black/African-American, 8.3% Asian/Asian-American,

and 4.2% Hispanic/Latino. Participants were volunteers in STEM youth educator programs at 3 types of Informal STEM Learning Sites (ISLS), and were interviewed regarding their experiences at their respective site. This qualitative analysis considered two questions: (1) what factors of an ISLS most impacted students' STEM skills and knowledge, and (2) how did these factors differ from a classroom or lecture-style setting? According to responses, an ISLS was most impactful because it provided a realistic insight into the workings of a STEM field, and gave direct access to a tangible community of experienced science professionals. The clearest difference between a classroom setting and an ISLS is that the ISLS required hands-on application of scientific concepts, creating a more dimensional understanding of ideas learned in academics. Schools may be able to enhance STEM learning and interest by encouraging students to participate in ISLS youth volunteer programs as a supplemental resource for STEM education.

Anime and Cross-cultural Adaptations of Ancient China in the Contemporary Japanese Imagination

Author(s): **Onyx Royal**
Mentor(s): **Dr. Amanda Kennell**
Poster: **53**

China and Japan have a long and complicated history of interaction ranging from Japan being a tributary state of China to Japan's horrific transgressions during its colonial period. This project analyzes the 2005 anime series, Saiunkoku Monogatari, based in a fictionalized version of ancient China's Ming Dynasty (1386-1644). Saiunkoku Monogatari, or in English, The Story of the Colorful Cloud Kingdom, began as a series of light novels by Sai Yukino. It was then adapted into manga (comics) and eventually an anime. The story follows Kou Shuurei, a poor young noblewoman who agrees to temporarily become the Emperor's consort in exchange for her true desire, a position within the government. On the surface, it is a simple romance for young girls, but it explores the convergence of feminism, tradition, politics, ethics, and morality.This project aims to distinguish, if possible, how this series relates to Ming China. Through analyzing and comparing various aspects of the anime, such as costume, architectural style, and governmental systems, I aim to analyze the cultural impacts of the Ming Dynasty and how these impacts are manifested in the contemporary Japanese Imagination. What does each costume indicate about the character and their rank within the court and how accurate are these costumes to historical hierarchies? Does Chinese-essence, from a female Japanese perspective, relate specifically to this dynasty, another dynasty, or merged to become one indistinguishable stereotype?

p-aminobenzoic acid synthesis and host-cell apoptosis by CADD from Chlamydia trachomatis

Author(s): **Pierson Rucker**
Mentor(s): **Dr. Thomas Makris, Ms. Sydney Skirboll, Mr. Han Phan**
Poster: **54**

Chlamydia protein associating with death domains, or CADD, is a protein native to the human pathogen Chlamydia trachomatis. CADD was originally found to associate with human death domains and cause apoptosis, but it has more recently been found to be involved in the biosynthesis of para-aminobenzoate (pABA) portion of folate. In order to synthesize pABA, CADD cleaves and converts one of its own tyrosine residues. We investigated the importance of radical transfer in this process through mutagenesis as well as the source of the amine group used to convert tyrosine to pABA. Due to CADD being a one-use enzyme that performs a post-translational modification on itself, we plan to investigate how this unique behavior may be implicated in CADD's downstream role in binding death domains. We suspect that the structure of CADD before and after modification may exhibit different binding, and plan to test protein-protein interactions between CADD and caspase-8 DED. Differences in binding affinity between the two states of CADD may indicate that its modification connects the life cycle of Chlamydia to the induction of human cell death.

Variety Determination of Duckweed by Spectral Fingerprinting

Author(s): **Srigouri Rudravaram**
Mentor(s): **Dr. Ryan Sartor, Ms. Alice Chesley**
Poster: **55**

Lemnaceae, also known as duckweeds are wild plants with huge agricultural potential. In order to realize this potential, this weed needs to be domesticated. Domesticated crops are optimized for growth in modern agricultural systems and bred to produce valuable agricultural products. This is how all of our crops have been developed in the past and what makes them vastly outperform their wild ancestors in terms of agricultural production. Another benefit of Lemnaceae as a crop is that it has a low carbon footprint. To generate improved varieties of the plant, the Sartor lab is implementing a selective breeding program using the species Lemna gibba. The only viable procedure for crossing Lemnaceae generates both self-pollinated and outcrossed varieties simultaneously. These outcrossed plants must be identified through a screening procedure. Simple low-cost genotyping can work for this

purpose but would require 10-20 different plants to be genotyped for each cross that was made. Even very low-cost genotyping procedures would quickly become prohibitively expensive and time consuming for a breeding program that requires hundreds or thousands of crosses per year. Spectral fingerprinting offers a potential alternative to traditional genotyping. Spectral fingerprints are generated using a UV-Vis scan of crude plant extracts in methanol and acetone. Here we show that a Random Forest machine learning model can accurately differentiate between multiple parent varieties of L. gibba using spectral fingerprints. These results show promise for the future implementation of spectral fingerprinting as a low-cost method for identifying outcrossed progeny from L. gibba crosses.

ISOLATING VECTOR-BORNE DISEASES IN MOSQUITOES

Author(s): **Yamini Saggurthi**
Mentor(s): **Ms. Isabella Livingston, Dr. Matthew Breen**
Poster: **56**

"Sea Lions native to the Galapagos are at risk of contracting Dirofilariasis, also known as canine heartworm disease, due to the transmission of the vector-borne pathogen, Dirofilaria immitis, through mosquitoes. As companion animals introduce additional vector-borne pathogens into new environments, the risk of transmission to native wildlife is of increasing concern, which poses a major threat to the Galapagos sea lions. To investigate the potential reservoir of these pathogens, I propose to use PCR methods, which include qPCR, RT-qPCR, and ddPCR, to detect the presence of vector-borne diseases of concern to the Galapagos: West Nile Virus, Chikungunya, Dengue, Elephantiasis. To accomplish this, mosquitoes belonging to the species' Culex quinquefasciatus and Aedes taeniorhynchus will be collected from the Galapagos and processed to recover DNA and RNA. These nucleic acids will be evaluated by PCR to identify the major pathogens of interest, as determined by veterinarians and researchers at the College of Veterinary Medicine and the Galapagos Science Center. This project aims to provide insights into the risk and transmission patterns of vector-borne diseases being spread from introduced companion animals to native wildlife. "

Disruption of Vitamin D receptor signaling impacts ASD risk gene expression

Author(s): **Callan Schroeder**
Mentor(s): **Dr. Seth Kullman, Ms. Morgan Ritter**
Poster: **57**

"Vitamin D3 (cholecalciferol) is a fat-soluble vitamin that has critical roles in many biological systems throughout the body. Cholecalciferol can be absorbed from the diet or created endogenously in the skin through UVB conversion of 7-dehydrocholesterol. Cholecalciferol is biologically inert and must undergo two metabolic hydroxylations to be converted to the active form, calcitriol. Calcitriol enacts signaling through the nuclear vitamin D receptor (VDR) which upon ligand binding heterodimerizes with retinoid X receptor (RXR). This complex then binds to vitamin D response elements (VDRE) to cause changes to gene expression. VDR is expressed in almost every cell type, including the brain. Evidence suggests vitamin D is important for neurodevelopment and brain health. Our lab is interested in the impact of early VDR signaling on brain development and function. Previous research has demonstrated a link between developmental Vitamin D deficiency (DVD) and the onset of autism spectrum disorder (ASD), a neuro-psychiatric condition that can have defects in sensory processing. Using a transgenic zebrafish model we have shown developmental VDR signaling disruption results in alterations in sensory processing. The etiology of deficits in sensory processing is unknown but is hypothesized to have genetic and environmental factors. We would like to further investigate the impact of DVD (environmental) on the expression of known ASD risk genes (genetic). Our research can help elucidate the links between developmental vitamin D, sensory processing, and neurobehavioral outcomes."

Phenology of Elm ZIgzag Sawfly in North Carolina

Author(s): **Delaney Serpan**
Mentor(s): **Dr. Kelly Oten**
Poster: **58**

Elm zigzag sawfly [Aproceros leucopoda (Hymenoptera: Argidae)] is an invasive insect native to eastern Asia. While elm zigzag sawfly (EZS) has been considered invasive throughout Europe for twenty years, it was documented in North America for the first time in 2020. In August of 2022, it was documented in Surry and Stokes County, North Carolina. In its larval form, EZS is a defoliator. Defoliation is typically an aesthetic issue; however, intense defoliation over an extended period of time can be detrimental to a tree's health. Insect development is closely related to temperature; when climates are warmer and maintain higher temperatures for longer periods of

times, insects can develop quicker and potentially have a higher number of generations in one season resulting in high population densities. EZS has been documented to have between one and six generations in nature and up to seven in lab settings.This study aims to document the phenology of elm zigzag sawfly in North Carolina. Due to North Carolina's climate, we hypothesize EZS will have a higher number of generations. To document the phenology, we are monitoring growing degree days (GDD base 50 F) and conducting regular site visits. Using four emergence traps across two sites, we are capturing adult emergence of EZS. Larvae will also be collected and aged using the distance between its eyes as a means to determine the instar. Adult emergence and subsequent life stages will be aligned with growing degree days and used to assess potential management options.

Analysis of suspended sediments upstream, within, and below the Rocky Branch beaver impoundment, NC State Campus, Raleigh, NC.

Author(s): **Chris Strang**
Mentor(s): **Dr. Karl Wegmann**
Poster: **59**

Beavers are one of a few species that significantly alter riparian environments. They dam up running water to create an area of flooding known as a "beaver pond." In doing so, they locally reduce stream velocity and sediment transport capacity. This experiment is designed to quantify the total suspended sediment above, in, and below the beaver pond established on Rocky Branch in autumn 2022. We hypothesize that during base-flow conditions, suspended sediment levels will be higher within and downstream from the pond due to biological activity (beavers, waterfowl, turtles) versus upstream receiving waters. In contrast, during higher discharge events when suspended sediment is ubiquitously high in this urban stream, suspended sediment will be decreased downstream of the beaver pond due to the settling effects of the pond. Water samples are collected in four locations: two upstream, one in, and one downstream of the beaver pond. Sample suspended sediment values are measured in turbidity units (NTUs) with a turbidimeter and concentrations (mg/L) by filtering 0.4 L through pre-weighed 1.6 µm glass-fiber filters. After filtration, the samples are dried for 24 hours and then reweighed. Finally, the CIELAB color value of the filter disk is calculated with a NIX-Pro color sensor. The samples from the beaver pond originally contained more suspended sediments than the upstream or downstream collection sites. However, as the beaver pond expanded, the samples from within the beaver pond contained less suspended sediments than downstream, with the downstream sample site remaining relatively unchanged.

Optimization of Perovskite Oxides for Thermochemical Energy Storage Using a High-Throughput Combinatorial Approach

Author(s): **Lauren Teague**
Mentor(s): **Dr. Fanxing Li, Dr. Runxia Cai**
Poster: **60**

Perovskite oxides are redox-active metal oxides employed in optimizing thermochemical energy storage (TCES) due to their compositional and structural flexibility, high activity, and cyclic stability. When evaluating TCES materials, former research has relied on empirical methods, which are time consuming or expernsive. To better utilize TCES, a more effective method of screening and optimizing perovskite oxides must be used. Here we employ a high-throughput combinatorial approach to screen and optimize perovskite oxides for applications in TCES. The most important factors when selecting TCES materials are oxygen capacity and reaction enthalpy, as they determine the TCES energy density. We perform high-throughput density functional theory (DFT) simulations with 2003 A/B-site doped $SrFeO_{3-\delta}$ species. We select and synthesize 61 of those materials: 45 with pure perovskite phases tested for oxygen capacities, and 20 measured for their standard oxidation enthalpy. The experimental results indicate that a high-throughput combinatorial approach effectively determines the oxygen capacity and a standard oxidation enthalpy of perovskite oxides. We use the experimental results and DFT simulations to develop an improved approach for predicting the oxygen capacity and standard oxygen enthalpy for the high-throughput combinatorial screening of perovskite oxides for TCES.

Conservation of Endemic Species in NC

Author(s): **Izzy Van Dyk, Elizabeth Mitchell**
Mentor(s): **Dr. Erin McKenney**
Poster: **61**

North Carolina is home to many endemic species, which define the unique ecology of our state. Endemic species are very sensitive species who require special conditions. As such, they are limited to small ranges that are continuously encroached upon and exploited for human use. These threats necessitate more protection for these unique species. However, many members of the public are either unaware of or hold negative views of some endemic species, which has caused setbacks to conservation efforts. This highlights the need to educate the public and spread awareness of endemic species' importance. To address this need,

we have created a poster synthesizing the relevant scientific literature to help inform the public. We have also designed a line of attractive stickers, which students can place on personal items or in public spaces to help spread our message. It's imperative that both the value of and the threats towards endemic species in North Carolina become public knowledge. By encouraging positive public change, we hope to ensure conservation and policy that take endemic species into consideration. By raising awareness of and advocating for North Carolina's endemic species, we can preserve the biodiversity and uniqueness of our state.

Building AMR Profiles of Campylobacter jejuni Isolates

Author(s): **Farrah Waddell**
Mentor(s): **Dr. Lin Walker, Ms. Mary Mendoza**
Poster: **62**

"Over time, the large-scale use of antibiotics in the poultry industry to prevent disease and promote growth in flocks has caused an emergence of antibiotic resistant Campylobacter species found in poultry populations (Häkkinen et al., 2022). There is a growing need to monitor and prevent antibiotic resistance among Campylobacter species. The purpose of this study is to verify and continue to build the AMR profiles of several Campylobacter jejuni cultures isolated from poultry and environmental swabs. C. jejuni cultures were plated and grown on MHA plates with exposure to antibiotics tetracycline (T) at 15 µg/mL, streptomycin (S) at 100 µg/mL, erythromycin (E) at 250 µg/mL, kanamycin (K) at 50 µg/mL, gentamicin (G) at 20 µg/mL, nalidixic acid (N) at 50 µg/mL, chloramphenicol (C) at 20 µg/mL, ampicillin (A) at 100 µg/mL, and rifampicin (R) at 100 µg/mL. The plates were incubated for 48 hours and then the observed growth was cross referenced with predetermined AMR profiles. After examining 17 C. jejuni strains, only one strain had the expected AMR profile of being resistant to tetracycline. Out of the 17 strains tested, all 17 were resistant to A, four were resistant to T, one was resistant to K and possibly sensitive to T, 10 were resistant to R, one was resistant to N, and one had a weak resistance/sensitivity to N. The process of verifying and building AMR profiles is beneficial to disease research in poultry as these strains can be used to challenge poultry. "

Foraminifera Distribution and Associated Fauna from Coastal Carolina Plankton Tows

Author(s): **Sara Wall**
Mentor(s): **Dr. Catherine Davis**
Poster: **63**

Foraminifera are single celled protozoans that can either be planktic or benthic. They are calcifiers, meaning that they form a shell that lasts even after cell death. Plankton tows are an amazing tool used in oceanography to examine the planktic microscopic life found in areas of the ocean. Ten samples were taken off the coasts of North and South Carolina from the Gulf Stream in fall of 2022. These samples were then analyzed in a wet lab and all foraminifera removed. Because this is an underrepresented area of observation, other observations such as size, color, and species of other fauna were documented and photographed; this includes but is not limited to fish larvae, multiple copepod species, crab larvae, echinoderm larvae, cephalopods, and cnidarians. The foraminifera were then sorted by species. The most abundant species were then separated from each other and counted. Preliminary conclusions about population in relationship to distance from coast and depth of samples are presented.

Evaluating Water Quality in Constructed Ponds and Wetlands on Centennial Campus

Author(s): **Riley Westman**
Mentor(s): **Dr. Katherine Martin**
Poster: **64**

Stormwater runoff occurs during rainstorms when rainfall travels over impervious surfaces, and it can carry pollutants to receiving water bodies. It is one of the main causes of impairment in aquatic ecosystems due to large inflow volumes and the potential to carry a variety of physical and chemical contaminants. Constructed ponds and wetlands can help ameliorate stormwater pollution and improve water quality in urban landscapes via increasing residence time of water in water bodies, promoting nutrient uptake by plants, and sedimentation of incoming suspended solids. However, some researchers have found that constructed aquatic ecosystems by themselves can't mitigate the negative water quality impacts of urbanization. Most studies have evaluated water quality exclusively in either constructed ponds or wetlands, or have compared constructed systems to natural systems. Our goal for this study was to determine which of two types of constructed systems on Centennial Campus has higher water quality, and to determine if the systems as a

whole meet the United States Environmental Protection Agency (EPA) criteria for water quality. We accomplished this by collecting in-situ water quality data using a YSI Multiparameter Instrument to measure temperature, dissolved oxygen, specific conductivity, pH, salinity, and oxidation-reduction potential (ORP) across four ponds and four wetlands. We found that only conductivity and ORP significantly differed between the two types of systems, and that the systems met EPA standards for dissolved oxygen and pH levels. Further research will need to incorporate additional water quality parameters, measured throughout the year, in each type of constructed system.

Overview of the NCSU Turfgrass Breeding and Genetics Program

Author(s): **Chloe Williams**
Mentor(s): **Dr. Susana Milla-Lewis**
Poster: **65**

"Turfgrass is important to the environment in a multitude of ways, including maintaining soil stability, reducing water waste, improving air quality, and providing a safe landscape for exercise and play. The NC State Turfgrass Breeding and Genetics Program, led by Dr. Susana Milla-Lewis, focuses on five different species: St. Augustinegrass, zoysiagrass, centipedegrass, bermudagrass, and tall fescue. The goal of the program is to develop cultivars of these species with superior agronomic performance and improved resistance to abiotic and biotic stresses. For this purpose breeding lines are evaluated in contrasting environmental conditions across North Carolina, such as the Upper Mountain Research Station(Laurel Springs), the Sandhills Research Station (Jackson Springs), and the Lake Wheeler Turf Field Lab (Raleigh) among others. Additionally, the program utilizes molecular markers, QTL mapping, and other molecular techniques to increase selection efficiency and . My role in the program is to assist in both laboratory and greenhouse tasks, including sampling material for performing DNA extraction, seed processing, propagation, and managing materials in the greenhouse. I also assist graduate students and staff members of the program with their individual projects. The tasks that I have performed contribute to the program's goals of producing better turfgrass varieties. Through working in the turfgrass program, I have learned valuable laboratory skills, as well as genetics and biotechnology applications. This hands-on experience has helped me apply concepts I have learned from my courses and provided me with knowledge I will utilize in my future educational and professional endeavors. "

Association of PM2.5 concentrations with burn events at an open-burn/open-detonation hazardous waste facility in Colfax, Louisiana

Author(s): **Sydney Pollock, Darius Ledbetter, Zach Trainor**
Mentor(s): **Dr. Jennifer Richmond-Bryant**
Poster: **66**

In Colfax, Louisiana, an open-burn/open-detonation hazardous waste thermal treatment facility emits numerous chemicals found in explosives. Residents of Colfax and the surrounding community have described severe health impacts including skin rashes, respiratory irritation, thyroid disease, and cardiovascular disease. In addition, residents have reported damages to their property as a result of the emissions. The goal of this research is to test for correlations between open-burning and air pollution concentrations, specifically particulate matter, found using air quality monitoring. Drawing a connection between the timing of the facility's emissions and the air pollution signal helps call attention to the potential impact of the facility on the community. This information allows for a better understanding of the negative health and economic consequences of the pollution and how the local Colfax community can defend themselves from further exposure. Using data modeling tools such as R, Excel, and GIS, we paired PM2.5 data records with the Clean Harbors facility burn logs to determine if there was a correlation between the emissions and the PM2.5 recordings from PurpleAir air quality monitors. Conclusions made using this research can inform efforts to restrict the practice of open-burning by providing information of the hazardous emissions and how such emissions negatively impact the health and property of residents in local communities to the public and legislators.

The Influence of Macromolecular Architecture on the Surface Properties of Linear Copolyesters

Author(s): **Keegan Bader**
Mentor(s): **Dr. Richard Spontak, Mr. Julio Teran**
Poster: **1**

"The need for durable, recyclable thermoplastic materials is increasing worldwide as the level of solid waste generated annually is becoming unsustainable. Current research aims to enhance the chemical and physical properties of thermoplastics to extend their lifetimes. Ongoing development of new aromatic copolyester chemistries (generically referred to here as PCTT) have had commercial success due to the excellent mechanical and thermal properties leading to long product lifetimes. Therefore, a more thorough understanding of these materials and their response to mechanical stress and material removal is warranted. This project examined the mechanical and chemical characteristics of PCTT films, along with an architecturally-modified form of linear PCTT designated Brush-PCTT. The tests performed during the course of this study have focused on determining the effect of molecular architecture on surface properties. Brush and linear PCTT were synthesized in-house by a polycondensation reaction. This synthesis was complemented with extensive microscopy characterization.
Results of nanoindentation determined that the Brush-PCTT possesses greater hardness and penetration resistance than its linear counterpart. Microscopy confirms that the Brush-PCTT is an amorphous polymer, since it is transparent and lacks any discernible surface topology. The brush modification reveals differences in physical properties while maintaining the chemical properties and transparency of the linear copolymer. While these differences must be analyzed further to determine their origin, the present findings confirm that altering polymer architecture alters physical response. In terms of thermoplastics, this result means plastics used by consumers might possess improved impact toughness and abrasion resistance due to modification of polymer architecture."

Use of Cold-Water Low-Bloom Fish Gelatin in Food Product Development

Author(s): **Ray Baek, Lanvy Lutz, Khalid Tejan-Sie**
Mentor(s): **Mr. Henry Havey, Dr. Fernanda Santos, Ms. Megan Watson**
Poster: **2**

Fish gelatin is characterized by a reduced content of proline and hydroxyproline, which are responsible for the formation of collagen-like triple helices due to the hydrogen bonding that occurs between the two amino acids. Due to the amino acids conformation, fish gelatin gels are less durable and have lower gelation and melting temperatures than mammalian gelatin. Fish gelatin is an emulsifier and very soluble in water, but some factors can affect the formation of the triple helix structures. Such factors might include the concentration of gelatin in a solution, which can increase bond formation, the presence of salts and sugars at varying concentrations which can affect the electrostatic bonds holding the structures together, and pH which can change the zeta potential and repel molecules away. The objective of this study is to determine how to use fish gelatin as a functional ingredient in food systems. Two significant experiments will be performed: gelatin bloom concentration tests and gel strength tests with the addition of sweeteners. After conducting the bloom test and determining which gelatin concentration is ideal for use, a sweetener sensory analysis test will be conducted. For that, sucrose, stevia, maple syrup, and honey at specific concentrations will be used, these set parameters will be used as the baseline for the sweetener structure effects test.

Creating Scalable Anthropometric Models of the Upper Arm for Medical Applications

Author(s): **Elias Balderrama**
Mentor(s): **Dr. Katherine Saul, Ms. Morgan Dalman**
Poster: **3**

"Variations in human anatomy can alter the loadings experienced by an individual's bone and muscle tissues. Furthermore, variations in loading within the upper limb can affect an individual's functionality. Identifying subject specific differences can be imperative in appropriately diagnosing and treating physical ailments as well as in developing new rehabilitative therapies for patients. Individuals can be represented by scaling a generic musculoskeletal model more quickly and easily than developing a fully subject-specific model. In order to create a fully subject specific model, MRI images would need to be collected, segmented, and reconstructed to measure the bone lengths and bone geometry directly, as well as, identify the active fiber volume

of each muscle. However, this process is time consuming and expensive. Thus, scaling a generic model can overcome these expenses.
The goal of this research was to investigate the applicability and viability of creating and using anthropometric scaling based on bone length to height and muscle volume to weight regressions. These mathematical regression models are derived from data for both men and women of varying age groups. The anatomical data was first analyzed to identify correlations between men and women of different age groups. Relationships between arm length and height, height and bone length, and weight and muscle volumes were all analyzed in an effort to identify correlations between these traits. A limitation of the research includes small sample sizes of less than fifteen subjects. In the future, more data for additional subjects will be needed to draw conclusions of correlation."

Navigating Student Housing: A Comparison of PWI and HBCU Students

Author(s): **Olivia Ball**
Mentor(s): **Dr. Virginia Riel**
Poster: **4**

"Having access to stable housing is a critical foundation for a variety of positive outcomes, including personal health, contentment, and increased access to other societal resources. Current sociological literature highlights how housing insecurity, which takes many forms, is a growing concern among families in the United States. Using these previous sociological findings, we investigate how housing circumstances, such as affordability and availability, contribute to the lives of undergraduate students in terms of mental health, academic success, and overall well being. By design, the study aims to shed light on and compare how undergraduate students from both historically Black universities (HBCUs) and predominantly white universities (PWIs) define housing insecurity and stability and confront the search for on-campus and off-campus housing. Additionally, the study investigates how intermediaries evaluate students in the housing search and how that plays a role in students' housing outcomes.
Qualitative data is being collected from 40 undergraduate college students that reside in two major cities in the United States. Each of the participants are currently enrolled in an HBCU or a PWI and reside in on-campus student housing or off-campus housing. We are evaluating how students encounter the search for housing post-COVID-19 in two expanding cities with rising housing costs, increasing student-targeted apartment complexes, and greater university enrollment rates. Analyzing the way that undergraduate students experience rapid changes in housing in two highly-populated cities creates a wider scope of understanding of

how students navigate and cope with the rise of housing insecurity in the United States. "

Composting Coupled with Gaseous CO2 Capture

Author(s): **Perry Berlin**
Mentor(s): **Dr. Joe Sagues, Mr. Ethan Woods**
Poster: **5**

Composting is an aerobic biochemical process which has been utilized for thousands of years to dispose of waste and recycle nutrients through the production of a soil amendment byproduct. While composting is viewed as a sustainable alternative to land filling waste streams, there is potential to extract more environmental and economic value from the process. For the first time, we have developed a method of composting which produces a concentrated stream of carbon dioxide for subsequent capture and sequestration with a relatively low capital and infrastructure intensity. In collaboration with NC State University's compost facility, we have composted food waste and other organic materials to develop a semi-continuous collection of gas containing 20 – 95% Carbon Dioxide using a novel closed reactor design. Relative to other carbon capture technologies, composting has the potential to be a low-cost option for organic waste disposal that permanently removes carbon from the atmosphere.

Investigating the Effects of Physical Contact in Animal Ambassador Programs on Visitors' Perceptions of Ambassador Animal Well-Being

Author(s): **Scott Brueshaber**
Mentor(s): **Dr. Jenny Campbell**
Poster: **6**

21st century zoos offer programs known as Animal Ambassador Encounters (AAE) which allow visitors to have an up-close and personal experience with live animals. AAEs are widely believed to facilitate learning and strengthen connections between wildlife and the public, thereby leading to more positive attitudes toward conservation and support for conservation action. However, the data that support that AAEs accomplish the intended goals are scarce and few studies seek the best practices have been published. These programs utilize a wide variety of taxa and are very diverse in their style and content. We are investigating the effects of physical contact in AAEs on visitors' perceptions of the well-being of the ambassador animals. We are surveying AAE participants at the North Carolina Zoo and the North Carolina

Museum of Natural Science on their perceptions of the well-being of the animals presented in the programs. Once data collection has concluded, we will test whether visitor's perceptions of well-being vary with the presence or absence of physical contact between animals and participants. The results of this study will help improve the effectiveness of education programs in zoos by informing us on the effects of AAEs on visitors' perceptions and helping to guide us in choosing the most effective presentation methods when conducting AAE programs.

Lightweight Paper Origami Robot Driven by Pneumatic Fiber Actuators

Author(s): **Anh Bui**
Mentor(s): **Dr. Xiaomeng Fang**
Poster: **7**

Origami actuators have great potential to provide unique and specific solutions to many scientific challenges, because they are lightweight, relatively inexpensive to produce, and can handle various energizing mechanisms. In the past, research works extensively used shape memory materials (SMM) for origami actuators due to their diminutive volume, and high power density. However because they are actuated by heating and cooling, SMM origami actuators cannot produce a quick response. Hence, this research explores an alternative which is using an ultrathin fiber-shaped pneumatic actuator to drive the origami robots. This fiber-shaped actuator is based on the McKibben technology, which is made out of a cylindrical elastomeric bladder wrapped by a braided sleeve that can contract when being inflated. We have attached these fiber actuators to two different origami structures: the oriceps and the origami tube. A gripper and a walking robot can be derived from the oriceps pattern. The gripper underwent load testing by using it to lift objects with different weights and shapes.The maximum load reached 1.3N. The walking robot, which is two units of the oriceps, is tested for its speed under different frequency of air pumped, and a maximum speed of 11.5mm/s was observed. Lastly, the origami tube, supposed to mimic the natural movement of worms, was tested for its speed and direction at different air pump frequencies. In conclusion, this research showcases the extensive capabilities of fiber-shaped pneumatic actuator-driven origami robotics with high responding speed and controlled motions.

Utilizing RNA-Sequencing Technology to Identify Gene Networks Responsible for Over-Proliferative Traits in Glycine max

Author(s): **Sahib Chandi**
Mentor(s): **Dr. Carly Sjogren**
Poster: **8**

A critical global challenge of the 21st century is protecting and expanding global food security in the face of pressures from climate change that pose challenges to agricultural yields. A crop of major importance and interest globally is Glycine max, commonly known as soybean, which provides a substantial amount of caloric energy globally through its high oil and protein composition. Here, RNA-sequencing technology was utilized to study the gene networks of meristem tissue compared to non-proliferative tissues from a Lee ascension of G. max grown in the lab. These data were then compared to that of other crop plant species. The goal of this project was to analyze genetically-encoded proliferative traits in G. max in order to provide more insight into the ways that the agricultural industry can target their advances in crop breeding and productivity. Furthermore, this project was a learning opportunity in the processes of sterile plant growth, plant tissue extraction, and RNA isolation.

Greenhouse gas reduction in composting and impacts on microbial communities

Author(s): **Christina Conrad, Bridget Monahan, George Tyler Jr.**
Mentor(s): **Dr. Carlos Goller, Dr. Mahmoud Sharara, Piysuh Patil**
Poster: **9**

Biochar has a variety of benefits for compost including aeration improvement, reduction of heavy metal contamination, and nitrogen conservation. However, this research seeks to examine how biochar reduces greenhouse gas emissions and how that can impact the microbial communities present in dairy-manure compost. Composting experimental units were set up that had dairy manure and wood chips. Additionally, half of them had biochar mixed in as well. Temperatures, weights, and gas emission measurements were recorded during the month-long composting process. Samples were taken from each experimental unit during the process, and we intend to extract DNA from each of them to do an analysis on the microbial communities. Results from this study can potentially help with future applications of sustainable composting.

Preliminary Study on the Wake of a Triangular Cylinder Bluff Bodies

Author(s): **Jack Dunham**
Mentor(s): **Dr. Matthew Bryant, Mr. Michael Hughes**
Poster: **10**

This project was a preliminary investigation into the vortex generation of a triangular bluff body. This investigation is building off of iSSRLs previous work involving the vortex shedding of a stationary rectangular cylinder and an oscillating circular cylinder with an attached splitter plate. The experimental setup is housed in the 10 in. x 10 in. test section of the iSSRL open return wind tunnel. The first set of experiments used a laser vibrometer to measure the frequency of vibrations experienced by the bluff body to gain insight into the vortex shedding frequency. Two different bluff bodies were tested in this configuration, one with a height of 9.5 inches while the other had a height of 5 inches. I hypothesized that the 9.5 inch bluff body would provide more insight into the shedding frequency of the triangular cylinder, since it would expose less of the support beam it was attached to. The contrary was true with the larger bluff body being more prone to locking into the natural frequency of the wind tunnel, tunnel support beams, and the bluff body support beam. The natural frequencies were observed through impulse ring down tests, and observing the vibration frequency of the wind tunnel and its supports. The second experiment involved implementing a flow visualization system into the wind tunnel and capturing the disturbances made by the bluff body with a high frame rate camera. Flow visualization will provide insight into the vortex shedding characteristics of a triangular bluff body.

Delftia and Comamonas Bacteria: Opportunistic Pathogens and Antibiotic Resistance

Author(s): **Jamie Earley**
Mentor(s): **Dr. Carlos Goller**
Poster: **11**

Delftia and Comamonas bacteria are typically not harmful to humans, but an uncontrolled infection can be fatal, particularly within immunocompromised patients. Past studies detected antibiotic resistance, and the resistance is evolving. For instance, an older study found D. tsuruhatensis was susceptible to amoxicillin-clavulanate, but a more recent study found that it was resistant to amoxicillin-clavulanate, suggesting advanced evolution of resistance genes in D. tsuruhatensis. Delftia bacteria were classified under the Comamonas genus until 1999, and are in the same family, Comamonadaceae. Since they are closely related, we were interested in gaining a better understanding of similarities/differences in their genomes, particularly related to antibiotic resistance genes. This research can

inform us on the threats of Delftia and Comamonas in treating infected patients and prepare us to better meet patients' needs. We used the Bacterial and Viral Bioinformatics Resource Center (BV-BRC) to conduct a pangenomic analysis of 14 D. acidovorans isolates, 1 D. tsuruhatensis isolate, 1 C. testosteroni isolate, and 1 C. terrigena isolate, which were sequenced using the MiGS sequencing service and in the Biotechnology Program. BV-BRC deemed each genome to be of good quality. The results indicated great similarity between the Delftia and Comamonas genomes, particularly related to genes conferring resistance via absence and protein altering of the bacterial cell wall. Future studies can build off this pan-genomic analysis by exposing the bacterial strains to different antibiotics to investigate how genetic similarity between the strains relates to resistance in the bacteria's phenotype.

Investigating trace metal concentrations in saltwater samples from coastal North Carolina.

Author(s): **Kathryn Eller**
Mentor(s): **Dr. Carli Arendt**
Poster: **12**

"This project examines the concentrations of trace metals found in coastal waters, specifically the Bogue Sound. The Bogue Sound experiences water fluxes from the Newport River and the Atlantic Ocean and is an element of the Intracoastal Waterway. By testing this, we can discover concentrations of trace metals (iron, zinc, copper, cadmium) in saltwater and correlate this data to other factors. These elements are necessary as trace nutrients, however, in abundance they will be toxic to organisms.
Through column chemistry, we find the percentage of trace metals present in the water, and are able to determine how these trace metals concentrations fluctuate with pH, dissolve oxygen, and salinity through the seasons."

The Ebony Metamorphosis: Understanding Nigrescence and Black Racial Consciousness

Author(s): **Ariana Frazier**
Mentor(s): **Dr. Kanton Reynolds**
Poster: **13**

Since inception, this country's most fundamental systems have relied on enforced notions of racial inequality and stratification. These racial separations are socially created and not inherent, therefore tactics used to reinforce this inequality often aim

to socially, economically, and morally degrade the minority racial groups into submission. As a result, Black people in America are forced to grapple with and define their identity as an oppressed group historically tied to a country that regards them as inferior. “Nigrescence” is a term that has been used by scholars since the late 1960s to describe the process Black Americans subconsciously undergo to develop a racial identity over time, especially from youth into adulthood. Defined as “the process of becoming Black”, the concept of Nigrescence has progressed into a multi-step model used to pinpoint experiences that can guide one’s perception of their racial identity. The purpose of this research is to identify the emergence of the Nigrescence model and its iterations, analyze the differences based on time period and location, and observe implications to psychological health of Black college students and academics in the present day. Dissecting these models will generate reflection on how Black individuals have determined their own identity during and prior to the so-called racial awakening happening in modern-day America and how healthy psychological functioning can be affected based on this self-definition.

Black Women’s Mental Health Study: Question 89

Author(s): **Meredythe Galliher**
Mentor(s): **Dr. Jocelyn Taliaferro**
Poster: **14**

Historically, in health services research Black women are underrepresented. Generalizations concerning women’s health based on non-Black samples have contributed to a lack of understanding when it comes to treatment and health services for Black women. This article is a part of a larger project in progress to explore the mental health, well-being, and coping mechanisms of Black women in the US throughout the dual pandemics of Covid-19 and anti-Black racism. An online survey was distributed across the United States to women over the age of 18 who identify as Black in December 2021. This article is focused on question 89 from the survey, “Is there anything else you would like us to know about how you are doing?” and the 1,004 respondents that provided a comment to this question. Participants reported concerns about mental health, financial worries, grief, somatic health, racism, support through religion and relationships, positivity and coping, and praise for the survey itself for asking about their well-being. Additional manuscripts examining well-being, coping mechanisms in relation to racism and mental health are in progress. Through qualitative and quantitative analysis we hope to further understand the coping mechanisms that were utilized by Black women during these high stress times and create a resource to advise in the creation of culturally appropriate evidence-based treatment.

Digital PCR for the Detection of Antibiotic Resistance Genes in Compost

Author(s): **Bridget Gigliotti**
Mentor(s): **Dr. Carlos Goller**
Poster: **15**

Overuse and misuse of antibiotics in human medicine and animal agriculture has led to widespread antibiotic resistance in livestock, hospitals, and the community. This misuse has accelerated the transfer and spread of resistant strains of bacteria, creating a serious global concern. Determination of antibiotic resistance genes is key to establish trends in antimicrobial resistance and to identify emerging pathogens in the environment, specifically in agriculture. tetM, vanA and blaCTX-M-1 are antibiotic resistance genes commonly present in microbes found in organic waste and compost samples. These genes can be detected using Digital PCR. Digital PCR (dPCR), while relatively new, is becoming more popular in identification of antimicrobial resistance genes (AMRs) due to its precision and accuracy. The antimicrobial resistance genes present in particular compost and organic waste samples will be detected through Digital PCR. Identifying these genes can affect the circulation of antibiotic-resistant organisms by showing their location and frequency and eventually providing guidance for livestock producers and produce growers on which manure composting method best reduces the load of antibiotics, antibiotic resistant bacteria, and antibiotic resistance genes. This study will offer insight into the automation dPCR as a useful resource for the wider scientific community to explore a multitude of questions about identifying and analyzing certain genes that have not previously been possible due to limitations in qPCR.

Characterization and Application of an Ice Nucleating Cold Stage

Author(s): **Cameron Gilbert**
Mentor(s): **Dr. Markus Petters, Mr. Sunandan Mahant**
Poster: **16**

This study uses an ice nucleation cold stage drop freezing arrays to characterize the ice nucleation properties of solutions and icephobic substrates. A collection of drops is placed on a surface and cooled until freezing is observed. We apply this technique to a suspension of .01% Arizona Test Dust, to find temperatures at which the suspended particles nucleate. Furthermore, we used this technique to characterize icephobic substrates to determine how well these substances inhibit freezing.

Development of an injectable hydrogel for local delivery of CAR-T cell therapy

Author(s): **Asher Hancock**
Mentor(s): **Dr. David Zaharoff, Ms. Siena Mantooth**
Poster: **17**

"Chimeric antigen receptor (CAR) T cell therapy is a promising new strategy to treat cancer. In this therapy, T cells are collected from patients and engineered to express specific receptors (chimeric antigen receptors) that recognize specific antigens on cancer cells [1]. Currently, seven CAR-T cell therapies are FDA-approved for certain blood cancers, such as leukemia, lymphoma, myeloma [2]. These cellular therapies are administered intravenously and have demonstrated significant efficacy in treating blood cancers. However, CAR-T cells exhibit poor activity against solid tumors, which is likely due to their inability to find, infiltrate, and expand within the immunosuppressive tumor microenvironment following systemic administration [3]. Localized injections may offer a solution, but several challenges preclude successful implementation, including the high shear stress of injections into dense tumor environments leading to cell death and lack of factors to promote CAR-T cell viability and activity within the tumor. In response to these challenges, we have engineered an injectable chitosan based hydrogel to deliver CAR-T cells. We are currently optimizing the cell delivery hydrogel system by tuning specific chemical components of the gel. We are measuring the hydrogel impact on cell viability. Current studies indicate the gel is nontoxic, and future efforts will include working to optimize gel and cell mixing techniques as we work to develop an injectable hydrogel that promotes CAR-T cell delivery into harsh tumor environments.

References:

[1] Grosskopf et al (2022) Science Advances
[2] Sengsayadeth et al (2021) EJHaem
[3] Labaneh et al (2018) Nat. Biomed."

Analysis of Synthetic Platelets Containing Fibrin Knob Peptides for Wound Healing

Author(s): **Manuella Harb**
Mentor(s): **Dr. Kimberly Nellenbach**
Poster: **18**

"Wound healing is critical as part of recovery after injury. Improper healing can lead to serious infections and complications which can drastically affect a patient's

outcome. Medical professionals take every precaution possible to avoid an infected wound. Even with these precautions, millions of patients suffer each year. It is important to be able to effectively and rapidly treat open wounds in order to avoid any infections or complications. The objective of this proposal is to test the effectiveness of synthetic platelets with surface B-knob peptides in wound healing. This will be achieved by analyzing the activity of human neonatal dermal fibroblasts in the presence of different concentrations of B-knob PLPs. This project will investigate the differences in cell activity such as attachment, proliferation, and migration in the presence/absence of various doses of B-knob PLPs compared to controls.
Platelets maintain hemostasis and interact with fibrin during the wound-healing process. When a wound occurs, platelets in the bloodstream are activated and aggregate to produce a hemostatic plug at the site of the damaged vasculature. Here, soluble fibrinogen polymerizes into an insoluble fibrin network via an enzyme cascade. This is done by the enzyme thrombin, which cleavages fibrinopeptide's A and B from fibrinogen. This process exposes the A and B knob peptide sequences that bind to holes A and B on other fibrinogen molecules, forming the fibrin network. The use of PLPs initiates clot formation, and subsequent clot retraction, and contains B-knob-like peptides to target hole B."

Reagan is it the Hostages or the Soviet Union?

Author(s): **Siham Hashi**
Mentor(s): **Dr. Kristen Alff**
Poster: **19**

"Forty two years after Ronald Reagan's presidency, journalists and White House officials are questioning his covert leadership style. Just recently, former Texas politician Ben Barnes confessed that he purposely delayed the release of fifty-eight U.S. Embassy hostages in Iran to help Regan's 1980 presidential campaign.
My paper focuses on another refugee scandal, arguing that Regan's presidency demonstrated a trend of scapegoating refugees. In it, I compare Regan's rhetoric with his actions with regards to US refugees in Lebanon 7 years after Barnes's Middle East tour. Specifically, I examine Reagan's later, most famous scandal, the Iran-Contra affair. I argue that Regan used public sympathy for US hostages to rally support after the Iran-contra affair leaked.
Using interviews, government documents, and the literature available, I found that the Iran-Contra affair was actually not about the hostages. First, the hostages were not released after the arms sales. Second, the US continued its relationship with Iran, even though the hostages were not addressed. Third, it is documented in diplomatic circles that Iran had little influence over the hostage situation.

I argue that even though the hostage release was Regan’s explanation for the Iran-Contra affair, a more pressing reason for the administration's secret arms sales was a perceived Soviet threat. Especially since Iran and the Soviet Union had begun new conversations of possible weapon sales to Iran immediately before 1987. So, America sold weapons to Iran, not because of the hostages, but to control the spread of Soviet influence in the Middle Eastern region. "

Data Collection of Isometric Upper Limb and Functional Tasks Movements for the Development and Use of Musculoskeletal Models

Author(s): **Taylor Hildreth**
Mentor(s): **Dr. Katherine Saul, Ms. Morgan Dalman**
Poster: **20**

"The development and use of musculoskeletal models can be a critical tool in informing injury and intervention impact at the glenohumeral joint. Due to upper limb task performance variations among patients, and movement differences changing the loading in muscle and bone tissues, it is important to model movement differences such as a variety of movements (isometric and functional tasks) and subject specific movement parameters (time, speed, strength, movement direction and limitations) when researching the impact of injury and intervention. The goal of this research was to collect and evaluate movement differences and muscle parameters among subjects. Max isometric torques were collected for shoulder abduction, elbow flexion, and internal rotation using a multi-joint dynamometer. Additionally, electromyography (EMG) was collected to use as a control bound for computational simulations. Seven dual-electrode surface EMG sensors were used to acquire muscle electrical signals. Lastly, a motion capture system was used to collect marker data used in simulations to reconstruct the kinematics of each individual's movement. EMG and marker data were collected across six separate movements (shoulder abduction, scapular abduction, and flexion, internal/external rotation, axilla wash and seated reach) on five human subjects. The next steps of the research are to analyze the movement differences and parameters across subjects using an upper limb musculoskeletal model to inform impact of patient specific models on the understanding of functional ability. "

Comparison of multiple routes of administration of bone marrow-derived equine mesenchymal stem cells for ophthalmologic applications

Author(s): **Chloe Hincher**
Mentor(s): **Dr. Lauren Schnabel, Dr. Kimberly Young**
Poster: **21**

"Fungal keratitis is a common condition affecting the cornea of the eye resulting from fungal infection after a corneal defect occurs. This condition occurs spontaneously in both horses and humans. Fungal keratitis is typically caused by Aspergillus spp. and Fusarium spp. In horses, current treatments include the regular use of topical antifungals over an extended period of time which is costly, requires patient compliance, and is time-consuming. This infection is painful and, if left untreated, can damage the eye resulting in vision loss or blindness secondary to fibrosis and inflammation. Commonly, the antifungal treatments are unsuccessful and an invasive surgical procedure such as keratectomy or enucleation may be required. Mesenchymal stem cells (MSCs) have previously shown many benefits including anti-inflammatory properties and encouragement of neovascularization. These have been applied as therapeutic agents in many diseases, including uncomplicated corneal ulceration. Beyond their innate beneficial paracrine properties, they also exhibit homing behavior to localize to the site of injury which makes them uniquely effective. This study aims to investigate the migration of bone marrow-derived equine mesenchymal stem cells (EqBM-MSC) in an ophthalmologic application,focusing primarily on subconjunctival, topical, and intravenous injections in an in vivo murine model both with and without induced corneal injury. This will be accomplished by labeling MSCs with GFP via lentiviral transduction before their application. Future directions will include studying the innate anti-fungal properties of EqBM-MSC and using genetic inserts to utilize their homing tendency as an anti-fungal drug delivery method."

Does Bee Heat Tolerance Depend on Body Size?

Author(s): **Emily Hitesman**
Mentor(s): **Dr. Elsa Youngsteadt**
Poster: **22**

The maximum temperature bees can withstand in their environment (CTmax) is key information for conservation biologists studying environmental impacts on pollinators. Pollinators are essential for agriculture and our ecosystems, and it is now crucial that we innovate ways to continue to conserve them in a changing environment. The variables that determine the heat tolerance of any given bee

remain ambiguous. Some studies have suggested that a bee's species is the sole predictor of its heat tolerance, while others find that the body size of individual bees further explains intra-specific variation in CTmax. However, it is still ambiguous whether a bee's individual size has a direct impact on its CTmax. It is generally accepted that larger bees heat up slower and are therefore more heat tolerant, and that smaller bees contrastingly tend to have more fluctuation in body temperature and are hence more susceptible to a changing environment. To determine whether body size predicts CTmax–within or between bee species–I observed 4 genera of bees of varying size from smallest being Halictus ligatus/poeyi to the largest being Eucera pruinosa, or squash bees. Each sample contained 16 to 39 individual bees, and each bee's ITD (intertegular distance) was measured as a proxy for body size. I will model CTmax as a function of species, body size, and their interaction. Understanding whether body size is an important indicator of CTmax will help scientists make more accurate predictions about the risk of heat stress in bees experiencing climate change.

Understanding Black Emerging Adults Purpose for Twitter Usage with Qualitative Methods Approach

Author(s): **Daija Holliday**
Mentor(s): **Dr. Vanessa Volpe**
Poster: **23**

In this century, social media has become a common tool for both leisure and learning, and this is especially true amongst individuals who fall into the category of emerging adulthood (the "in-between" ages). This study sought to better understand why Black emerging adults in particular used the social media application Twitter and what implications this may have about their own development. Utilizing data collected from the responses of 203 participants ranging from ages 19-29, qualitative content analysis (in-vivo coding) occurred in a cycle of phases by which coders independently and, later, collaboratively organized them into a comprehensive list. The data revealed that there were many commonalities among participant's reasons for using Twitter, some of which include relationships, identity exploration, independence, financial responsibility, recreation, and coping and wellness. It is imperative to consider the ways in which the intersection between age and race influences the responses produced by subjects to gain better perspective on how, at large, these facets play a role in social media utilization.

Examining the Impacts of Ae. aegypti and Ae. albopictus on Public Health

Author(s): **Karen Kaiser**
Mentor(s): **Dr. Jennifer Baltzegar**
Poster: **25**

I am currently working with Dr. Baltzegar on an active research in the lab to study the evolution of insecticide resistance in the mosquito, Aedes aegypti and Aedes albopictus, that spread zika, dengue, chikungunya, and yellow fever. With this, we analyze samples in the lab and perform testing such as PCR and mosquito rearing techniques while also looking into additional research on this topic to discover new research, or potential gaps, that exist on this issue. Many of the diseases these mosquitoes carry affect humans, but severe symptoms are seen within those living in poverty much more frequently than richer populations, who tend to have better access to healthcare in terms of receiving and affording the quality of care needed to treat these diseases. With this, the focus of my project will be to examine the impacts of Ae. aegypti and Ae. albopictus on human health, highlighting the disparities that exist based on factors such as social status and geographical location regarding treatments and access to healthcare.

The Importance of Field Safety Information in Universities

Author(s): **Erimi Kendrick**
Mentor(s): **Dr. Elizabeth Nichols**
Poster: **26**

Most, if not all, students in CNR are likely to experience a situation where they will need to conduct research outdoors. Many universities tend to highlight the importance of on-campus safety, but field safety is a topic that is often neglected. The lack of field safety training coupled with an increasing amount of international students that may not have as much experience outdoors could lead to an increase in safety issues. Overall, the outdoor environment can bring hazards that are dangerous for the people involved if they lack informational training. This project's goal was to create short, modular field training presentations for courses, undergraduate researchers, and graduate students. There are seven total presentations that give information about hazards regarding plants, wildlife/insects/snakes, weather, hunters, and communication. Some examples of important information provided in the presentations include poisonous plant ID, what to do in the case of a dangerous wildlife encounter, tips to prevent wildlife encounters, proper fieldwork clothing, and what to do if one lacks cell service. The current version of the presentations includes embedded quiz questions where the

person viewing the presentation can practice their knowledge. We are working towards getting the presentations available in different formats to suit the needs of the viewer, like providing a video recording instead.

Cassava Mosaic Disease

Author(s): **Hillary Kim**
Mentor(s): **Dr. Linda Hanley Bowdoin, Ms. Mary M. Dallas**
Poster: **27**

Cassava is a staple crop grown in Africa, due to its ability to grow in poor soil and drought conditions. Cassava Mosaic Disease (CMs) is caused by a group of single-stranded bipartite DNA begomoviruses that can cause significant tuberous root loss leading to a reduced cassava crop yield. Cassava mosaic begomoviruses (CMBs) can be transmitted by whiteflies and by propagation of infected cuttings (Kuria et al., 2017; Fongdong, 2017). In the early 1990s, a severe CMD pandemic occurred in east Africa, notably in the Lake Victoria regions of Uganda, Kenya and Tanzania, and caused significant crop loss and famine. To combat this pandemic, the International Institute of Tropical Agriculture (IITA) transferred a polygenic recessive resistance locus (CMD-1) from a wild relative of cassava, Manihot glazioviil, to cassava creating the TMS series. In our study, we conducted a series of experiments using an infectious CMB clone for EACMV-K401 to test the resistance of TMS30572 (CMD-1 cultivar). Previous manuscripts from our lab, show the addition of Sequences Enhancing Geminiviruses Symptoms (SEGS) increase the severity of CMD symptoms and can break resistance. It has also been shown that in an infection involving more than one CMB can result in synergy between the viruses, leading to an increase in symptom severity (Aimone et al., 2021). In this study, we asked whether the addition of SEGS-2 or a second virus (ACMV) to EAMCV-K401 results in synergy.

Demographic Analysis of Ethnicities and Rate of Completion of Biological Samples in a Large-Scale Research Study (STRIVE)

Author(s): **Jean Kim**
Mentor(s): **Dr. Catherine Hoyo, Ms. Bess Smith**
Poster: **28**

The Southern Liver Health Study (STRIVE) is a longitudinal study which aims to discover the causes of liver disease and cancer, specifically amongst ethnic and geographic minorities within North Carolina and Georgia. The study aims to explore the relationship between environmental contaminants and the risk of progression

from early-stage liver disease to hepatocellular carcinoma (HCC), the most common type of liver cancer. HCC, is one of few cancers with a rising incidence, disproportionately affects ethnic minorities and rural residents. The objective of the study is to create an early detection tool for liver cancer that is representative of all ethnic minorities and groups. Participants from the Open Door Clinic of Alamance County were recruited in efforts to include participants from all socioeconomic strata and all races and ethnicities. Including a diverse group of participants in the STRIVE study is crucial to the study aims due to the ubiquitous nature of environmental contaminants that disproportionately affect this population. Analyzing the demographics of participants currently enrolled in STRIVE, white participants have the overall highest completion rate of biological samples with 80.47% for blood, 89.84% for saliva, and 91.41% for urine. Comparatively, Hispanic participants have lower rates of completion for samples with 30.23% for blood, 79.07% saliva, and 81.40% for urine. The demographic analysis of ethnicities and rate of completion of biological samples will identify possible gaps within the genome database, ultimately allowing for the formation of a more comprehensive and universal liver cancer screening test.

Designing Immunosuppressive Peptides to Inhibit IκB Kinase Activation

Author(s): **Katy Klein**
Mentor(s): **Dr. Guozhou Xu**
Poster: **29**

"The IKK/NF-κB pathway has been shown to be associated with inflammatory and autoimmune disorders, as it regulates the expression of many pro-inflammatory genes in cells. Dysregulated inflammatory responses can cause excessive tissue damage, which induces the development of acute or chronic inflammatory diseases such as rheumatoid arthritis, diabetes and asthma. In addition, IKK/NF-kB-mediated inflammation is also important for the pathogenesis of other common human diseases such as diabetes and cancer. It is possible to treat autoimmune disorders and other common human diseases by inhibiting the NF-κB pathway selectively using synthesized immunosuppressive peptides.
The IKK kinase is an enzyme required for the activation of NF-κB pathway, as it propagates the body's cellular response to inflammation in the pro-inflammatory pathway. In Dr. Guozhou Xu's laboratory, we study the mechanism of IKK enzyme activation. Interestingly, it has been found that the Vaccinia virus (VACV) encodes a 17-kDa protein B14, which can interact directly with IKK to block the phosphorylation and activation of the IKKβ kinase in the IKK protein complex, to inhibit NF-κB signaling. By studying VACV's B14-mediated inhibition of IKKβ activation, we are

aiming to design a peptide to simulate how the B14 protein inhibits IKKβ kinase activation, thus creating a treatment for autoimmune diseases."

Effect of Simultaneous Music Presentation on Preschool Children's Executive Function Performance

Author(s): **Ruth Kraus**
Mentor(s): **Dr. Lynne Baker-Ward**
Poster: **30**

The development of executive functions is considered to be a major milestone for preschool-aged children (Veraksa et al., 2019). The influence of external stimuli on executive functions, such as background music, are still being discussed in regard to individuals of all ages, including preschool-aged children (Burkhard et al., 2018). The purpose of this study is to examine the effects of background music presentation on preschool-aged children's executive function performance. Participants are completing computerized assessments of executive functions (working memory, inhibitory control, and cognitive flexibility) through a software, Executive Function Touch (EF Touch). Each participant completes the same set of tasks twice in a pre-test post-test design with background music being randomly assigned to one trial of the tasks. Results for this study are ongoing as the research is still in the data collection stage.

Novel Peptoid-Based Macrodiscs for Structural Studies of Membrane Proteins

Author(s): **Addison Lane**
Mentor(s): **Dr. Alexander Nevzorov, Dr. Azamat Galiakhmetov**
Poster: **31**

Studying membrane proteins (MPs) in near-physiological environments without disruption of their native conformations will allow for a deeper understanding of their structure and possible functionality control. One example of the techniques used for MPs structure determination involves their reconstitution in robust, uniform, and magnetically orientable lipid mimetics for studies by oriented-sample (OS) solid-state (SS) nuclear magnetic resonance (NMR). Lipid mimetics represent an artificially made lipid membrane that mimics a protein's native environment as closely as possible. Examples of existing lipid mimetics include bicelles, peptide-based nanodisks, and styrene-maleic acid (SMA) lipoparticles. However, SMA samples are prone to issues with homogeneity, resulting in broader NMR lines. Although peptide-based nanodisks have also proved to be applicable for solution

NMR, they may not be stable enough under SS NMR conditions when loaded with higher amounts of the protein. Peptoid-based macrodiscs represent a novel magnetically alignable lipid mimetic applicable to OS NMR studies. Unlike bicelles, however, no detergents are used in peptoid-based macrodiscs and the latter exhibit superior OS NMR line widths. Future development of peptoid-based macrodiscs require more precise ways to control the disc diameter, size distribution, and varying the lipid compositions. Preliminary data of mixing DMPC lipids with negatively charged DMPG yields a better overall membrane alignment. However, when negatively charged lipids are introduced into the lipid mixture, isotropic peaks in 31P NMR are also present, thus indicating unaligned non-homogenous species. The effects of temperature, ionic strength, and peptoid concentration were investigated as possible strategies for improving homogeneity of the disc size distribution.

The prevention of infection of the Delftia acidovorans on the greater wax moth using anti-inflammatories

Author(s): **Kiara Malloy**
Mentor(s): **Dr. Carlos Goller, Dr. Claire Gordy**
Poster: **32**

The Galleria mellonella (greater wax moth) has a history of being used as a model organism for studying bacterial infections efficiently and inexpensively. G. mellonella has an innate immune system that allows the full extension of disease to be observed in several ways. Past experiments have tracked the worm's discoloration, cocoon formation, and activity level after injection of bacteria. In this study, we will test the effects of the Delftia acidovorans bacteria to simulate bacterial disease in immunocompromised infection cases. We are experimenting with Delftia acidovorans to learn how it may affect immunocompromised individuals and provide information for the appropriate treatment by applying natural anti-inflammatories. Our approach is to inject G. mellonella in a larvae state with the bacterium and not only watch the effects of infection but also to see if natural anti-inflammatory substances could lessen the impact of the infection. We will try to control or suppress disease by the Delftia acidovorans using natural anti-inflammatories such as green tea extract and turmeric. This area of research is essential because this bacterium can infect a group of people with compromised immune systems. This information is necessary for efficient treatment of often opportunistic Delftia infection. Therefore, more research needs to be done to cement understanding and attempt other possible solutions that can help treat the immunocompromised.

Muscle Contribution and Torque Generation During Dart Throwing Motion

Author(s): **Tyler Mason**
Mentor(s): **Dr. Katherine Saul, Ms. Morgan Dalman**
Poster: **33**

The Dart Throwing Motion (DTM) is a key motion to everyday life. Every time a drinking glass is picked up, a hammer is swung, or a dart is thrown, the wrist articulates in an oblique plane requiring both flexion and deviation. Prior research has focused on the planes through which the DTM acts, and the skeletal components of the motion; however, little is known about muscle forces acting on the wrist during the motion. The goal of this research was to build on existing knowledge of DTM, by evaluating the muscle demands needed to generate the motion and assess the moment generated about the wrist during the DTM. We used a motion capture system to record one subject performing a DTM. The marker data collected was post-processed and smoothed, then used in simulation to scale and perform inverse kinematics on an upper limb musculoskeletal model in OpenSim. The resulting marker location, muscle force, and muscle length data were used in a custom Matlab script to calculate the torque about the wrist in the oblique plane throughout the motion. Through the study, we found the moment to be almost constant throughout the DTM, with the largest deviation in moment occurring at the range of motion limits. As the oblique plane varies in orientation as a function of flexion and deviation of the wrist, further data collection may reveal coordinated muscle activity during a DTM and other coordinated wrist motions. Further research is planned to collect more data from more subjects.

Continuous Compliance Monitoring of Water Quality to Determine the Effects of Urbanization on Richland Creek

Author(s): **Chase McCrary, Lauren Conway**
Mentor(s): **Dr. Angela Allen, Dr. Elizabeth Nichols, Dr. Stephanie Jeffries**
Poster: **34**

This project aims to establish a long-term water quality compliance monitoring system to determine the degree to which urbanization is impacting physical and chemical indicators crucial to the health of Richland Creek and Schenck Forest. Continuous monitoring allows us to observe the changes in these indicators as commercial, residential, and transportation development expand in the surrounding area. The area of study consisted of two sites situated along Richland Creek where biweekly YSI and nutrient testing were conducted. The sites' data were compared to observe two trends: (1) the initial contrasts stemming from their different existing

degrees of urbanization, and (2) the changes in these contrasts due to their differing rates of increasing urbanization. Our goal is to influence city and community programs in Schenck Forest to protect water resources for the people who consume them and the ecosystems that depend on them. We hope this research can help establish a baseline for these indicators to inform future research around water quality, aquatic life, and human health in Richland Creek and the field as a whole.

God, It's Good: Exploring the Intersections of Ethnic Food and Health Culture

Author(s): **Jadyn McLean**
Mentor(s): **Ms. Rebecca Shisler**
Poster: **35**

Food is meaningful to everyone. We all have our favorite foods and family recipes. But one neglected aspect of eating and creating food is prejudiced ideas against ethnic dishes. When people think of underrepresented groups in America, they often neglect to explore just how the discriminatory nature of American society has impacted the cultural dishes of these groups. Diet culture also has a great impact on how individuals view food and health in America. The idea of what health should be and what foods are considered healthy is clouded with biased ideas of what is valued and understood by generally white American audiences. Exploring how these ideas intersect is crucial to not only understanding the history of racial and ethnic minorities in America but the history of the American diet. For this project, the food history of nonwhite racial and ethnic minorities is explored. This exploration was done through literature reviews of sociological surveys of immigrant populations and American minority groups as well as historical studies focusing on inequitable foundations of government entities such as the United States Department of Agriculture (USDA). Interviews with ethnic minorities and personal recipes are also included for anecdotal perspectives. Facts, anecdotes, visual design, and creative writing come together to create a magazine and presentation that is both educational and engaging for all audiences.

Comamonas and You; From infection to Bioremedication

Author(s): **Audrey McLeod, Emery Meyer**
Mentor(s): **Dr. Carlos Goller**
Poster: **36**

The genus "Comamonas" is a group of bacteria that can be both beneficial and harmful; from being opportunistic pathogens to breaking down chemicals such as

phenols, polycyclic aromatic hydrocarbons, and compounds found in plastic and lignin. We obtained two species, C. testosteroni and C. terrigena, from the USDA and cultured them on agar plates to view their growth. We characterized their growth using Biolog metabolism plates and sequenced their genomes with Nanopore long-read sequencing. Due to the presence of several intriguing genes in the C.testosteroni genome, we will test its pathogenicity in a wax worm model, We plan to use the Bactobox instrument to measure the concentration of live bacteria and perform dosing experiments. Furthermore, if C.testosteroni proves to be less pathogenic as previously thought, it could be a suitable candidate for bioremediation through degradation of plastics and lignin. With ever growing concerns about our climate and trash production, an organism that can naturally break down things like plastics would be crucial! Having C. terrigena be able to mitigate phenols and polycyclic aromatic hydrocarbons in the environment while C. testosteroni takes care of the plastic and lignin would be exceptionally great for efforts in bioremediation, so long they do not prove infectious, which can be confirmed out through co-culturing C. terrigena and C. testosteroni.

Identification of a Canine Hereditary Chromosomal Aberration using Chromosome Banding

Author(s): **Ansley Mills**
Mentor(s): **Dr. Matthew Breen, Dr. Rachael Thomas**
Poster: **37**

Several studies have demonstrated the healthcare benefits of genetic testing in humans, but it is not routinely used in veterinary medicine. By applying these techniques to dogs, their healthcare can be more individualized and thus more effective. This study demonstrated the use of cytogenetic techniques to characterize a chromosome aberration that was identified in a mother-daughter pair of domestic dogs. We proposed the use of cytogenetic techniques that would lead to a concise diagnosis of the type and location of a chromosomal aberration in these dogs as it does in humans. We used DAPI staining followed by observation using fluorescence microscopy to visualize the chromosomes. A chromosomal aberration was found and identified as a hereditary Robertsonian translocation between chromosomes 1 and 31. These findings provide knowledge regarding hereditary diseases in dogs and provide support for the use of dogs as a biomedical research model. By using chromosome banding, we identified the type of mutation and chromosomes involved in causing the abnormal phenotype which can later be confirmed with FISH.

Suicide in Black Autistic Youth

Author(s): **Amela Minerali**
Mentor(s): **Dr. Jamie Pearson, Ms. DeVoshia Mason Martin**
Poster: **38**

As of 2021, suicide is the leading cause of death in the United States overall and the second leading cause of death among ages 10-24. The lived experience of being both Black and autistic makes the likelihood of experiencing suicidality much more likely, but this group of individuals is greatly lacking representation in research and intervention practices. Therefore, we composed a literature review for a forthcoming research project that serves to better understand the risk and protective factors associated with suicidality in Black autistic youth. Being Black and autistic brings about a multitude of risk factors impacting suicidality, with high rates of depression and mood dysregulation being among the greatest risks concerning mental health, especially in Black youth. The prevalence of clinical depression among black autistic youth is 12% higher than that of White autistic youth, along with having more severe depressive symptoms. In addition to a greater likelihood of psychiatric comorbidities, diagnostic overshadowing, autistic burnout, and adverse childhood experiences are positively correlated with suicidality in autistic youth. Furthermore, there is much less literature discussing protective factors for suicide in Black autistic youth, but social and academic support showed the most promise in our review. Increasing a sense of belonging and resilience, along with making resources more accessible seems to be of the utmost importance in suicide prevention in Black and autistic youth. We hope that this literature may provide a foundational basis for us to study the specific needs of Black autistic youth regarding suicide prevention and intervention.

Optimizing the Degree of Substitution in Chitosan Nanoparticles for a Novel Fentanyl Overdose Vaccine

Author(s): **Anne Norris, Samantha Baxter**
Mentor(s): **Dr. David Zaharoff**
Poster: **39**

Drug overdose related deaths have been steadily increasing over the past few years. In 2020, the United States saw a 50% increase in such deaths, and 2021 brought another 30% increase. This surge is attributed to the proliferation of illegally manufactured opioids, namely fentanyl. Currently, the main treatment for fentanyl overdose is Naloxone, an emergency medication administered to block the effects of opioids. While effective, Naloxone is limited in that it must be administered between the time of overdose and death. An alternative therapy is a fentanyl substance abuse

vaccine (SAV), which would induce antibody production to prevent the psychoactive effects of fentanyl. This research is intended to support the development of such a vaccine using a chitosan carrier as an adjuvant for drug delivery. Chitosan nanoparticles are a promising drug carrier as they are more versatile and less toxic than traditional carrier proteins. Nitrophenol (NP) haptens were conjugated to chitosan nanoparticles (CS) to form a novel nitrophenol-chitosan (NP-CS) molecule. Multiple renditions of this conjugation investigate to determine the factors that would result in the ideal percentage of NP hapten attachment. Determining the factors that control this degree of substitution allows for dosage control in the resulting vaccine. This study has not yet been completed, but substantial progress has been made, and a future plan of action has been devised. Substantial headway prior to the synopsis is expected. A comprehensive summary will be provided of current and future work, the variables controlling degree of substitution, and their quantitative impacts.

Community Engagement for Wastewater reuse

Author(s): **Emely Pacheco**
Mentor(s): **Dr. Elizabeth Nichols**
Poster: **40**

My project focused on science communication. I worked on developing a fact sheet for engagement research with the City of Jacksonville and NC State. I read literature on best practices for fact sheet development and science communication to the public and used templates of recent communications from NC State to develop materials for the Water Reuse study. I decided to develop the fact sheet around several key elements such as “how to reconcile industry enthusiasm for new technologies with public skepticism about the safety of wastewater reuse.” I also wanted to show how over three years, engagement with community members decreased their concerns regarding the health implications of wastewater management by land application. In fact, the community expressed a preference for releasing treated wastewater onto managed agricultural or forest lands instead of surface waters as a result of project engagement and activities. The project engaged community stakeholders in a budgeting exercise wherein decisions were made about tradeoffs between technical research and public engagement in water reuse. Bridging the gap between stakeholders and wastewater management/education has powerful applications that can help expand wastewater reuse. My poster will demonstrate how I visualized these concepts for public engagement.

Genotyping Zebrafish for a Potentially Lethal TDP-43 and Tardbpl Double Knockout

Author(s): **Taylor Parker**
Mentor(s): **Dr. Antonio Planchart, Dr. Ryan Weeks, Mr. Alex Wall, Ms. Laura Montes**
Poster: **41**

Amyotrophic lateral sclerosis (ALS) and frontotemporal dementia (FTD) are characterized by the aggregation of TAR DNA Binding Protein (TARDBP, TDP-43) in affected neurons. Being a key player in mRNA processing, a tardbp mutation in most organisms would have lethal effects. However, the zebrafish model organism has two paralogs of the human TDP-43, tardbp and tardbp-like (tardbpl). When tardbp is knocked out, tardbpl is transcribed, bypassing the need for TDP-43. Using CRISPR, a mock-acetylation event was created at the lysine residue at site 151 in zebrafish tardbp, transforming it into glutamine. Since this is not a lethal mutation and doesn't accurately display ALS phenotypes, a cross was performed from two zebrafish with heterozygous mutations for both TDP-43 (K/Q) and tardbpl (+/-), yielding a group of mixed genotype F2 offspring. In order to determine the lethality of having a double knockout, many of the offspring were genotyped for the TDP-43 mutation using PCR and sanger sequencing, as well as for the tardbp mutation using PCR and restriction enzyme digests. Of the 100+ offspring genotyped, all nine genotypes were discovered except the double knockout. Genotyping efforts will be continued, but the current evidence suggests the double knockout is a lethal mutation. This is believed to occur in a similar fashion to the death of neurons in the human neurodegenerative TDP-43 proteinopathies.

Data-driven automated classification of pathogenic and mycorrhizal fungi

Author(s): **Manav Patel**
Mentor(s): **Dr. Orlando Arguello-Miranda**
Poster: **42**

"Fungi can play a double-edged sword role in agriculture by causing plant diseases or by promoting plant growth through symbiotic interactions. Identifying isolated fungi as pathogens or symbiont often involves time-consuming methods such as microscopic examination and culturing or the use of costly techniques such as PCR, which also requires trained personnel. An alternative yet under-explored method to classify isolated fungal organisms is the use of convolutional neural networks algorithms (CNN) for image classification, which can be cheap, fast, transferable to mobile devices, and require minimal personnel training. However, most CNN approaches for fungal classification focus on images of spores and fruiting bodies,

neglecting the use of mycelium, which is a more common feature of fungi in the environment.
In this research proposal, we aim to evaluate CNN-based detection methods to differentiate between mycorrhizal and pathogenic isolated fungi solely based on their coarse morphological mycelium features. We will acquire hundreds of microscopy and cell phone-acquired mycelium images of two mycorrhiza (Hebeloma sp. and Paxillus sp.) and pathogenic (Verticillium sp. and Septoria sp.) isolated cultures. The resulting image dataset will be used to train CNN with different architectures which will be tested for accuracy on a validation image data set that also contains images of infectious or symbiotic mycelium growing on plant roots.
The outcomes of this research will contribute to the development of automated methods for identification of fungal-plant interactions, which will be valuable for agricultural applications and could potentially reveal general features of symbiotic and pathogenic fungal organisms. "

GPU-Based Implementation of Many Body Van der Waals Interactions

Author(s): **Jeff Powell**
Mentor(s): **Dr. Brian Space, Dr. Adam Hogan**
Poster: **43**

This project aims to improve the computational modeling of Metal Organic Frameworks (MOFs) for gas separation applications using Graphics Processing Units (GPUs). MOFs are porous crystalline substances with potential for various industrial uses, including gas separation. Accurate simulation of MOFs and gas interactions is necessary for researchers to understand and improve their structures. However, simulating a wider range of forces can increase computational costs and reduce accuracy. GPUs can address this issue by enabling faster matrix diagonalization – a key operation for the interaction explored in this project – allowing for quicker calculations. The current approach for calculating van der Waals interactions may not accurately represent the system's interactions, and the existing code for many body van der Waals interactions is not optimized for quick hardware. This limits the ability to calculate many body van der Waals interactions, which could provide more accurate results than pairwise interactions. To address this limitation, this project focuses on improving the speed of many body van der Waals calculations to a point where they are feasible to run on large systems of atoms. The study's results will inform future research on the accuracy gain from using many body van der Waals interactions, improving computational modeling of MOFs and their applications in gas separation.

Using suspect-screening HRMS to assess organic chemical removal by low-cost point of use filters

Author(s): **Sarah Rachita**
Mentor(s): **Dr. Elizabeth Nichols, Dr. Ayse Ercumen, Ms. Hayden Rudd**
Poster: **44**

This project is part of a larger study to assess how point-of-use filters (POU) remove a broad range of organic chemicals from drinking water. Non-targeted and suspect-screening high resolution mass spectrometry (HRMS) allows for qualitative screening of water samples for diverse organic chemicals from perfluorinated alkyl substances (PFAS) to pharmaceuticals, plasticizers, pesticides and industrial chemicals such as solvents. I deployed DuPont POU tap filters in six different locations within a large municipal drinking water system. One location had two POU deployed at taps in close proximity. At approximately 150 gallons of use, I collected both a filtered and unfiltered sample from all locations in previously clean and baked amber jars. Samples were then extracted by solid phase extraction within 24 hours. Solvent extracts were eluted within two days and split for separate HRMS analyses by liquid chromatography (USEPA) and gas chromatography (Statera Environmental, Inc). The filter cartridges were collected and frozen for later extraction to determine what chemicals were retained on the filter. The filters removed a diversity of chemicals found in the municipal tap water system. The cohort of chemicals varied by location across the municipal system.

Importance of generation of wind power energy

Author(s): **Roshan Raju**
Mentor(s): **Dr. Mengmeng Zhu**
Poster: **45**

"Renewable energy is becoming an increasingly important topic as the world continues to face climate change and environmental degradation. It refers to the energy that is generated from sources that are replenished naturally, such as solar, wind, hydropower, geothermal, and biomass. Renewable energy has a variety of benefits, including reducing greenhouse gas emissions, decreasing dependence on fossil fuels, creating jobs, and improving energy security."

Improving Multifunctional Alginate Scaffolds for T-cell Engineering and Release (MASTER) for use in CAR-T Cell Cancer Therapeutics

Author(s): **Courtney Rogers**
Mentor(s): **Dr. Yevgeny Brudno, Ms. Sharda Pandit**
Poster: **46**

CAR-T cells are genetically engineered T-cells that target and kill cancer cells, including leukemia and lymphoma. CAR-T cell therapy involves a series of complex steps involving patient blood and an infusion. However, these methods are time-consuming and extremely expensive. Therefore, a novel T-cell seeding system was developed to mitigate these issues. The Multifunctional Alginate Scaffold for T-Cell Engineering and Release (MASTER) consists of a calcium crosslinked azide-modified alginate hydrogel, lyophilized to form a macroporous structure. This implantable system holds, activates, transduces, and releases tumor-reactive T-cells. Previously, we have demonstrated the efficacy of MASTER, but the transduction efficiency (transfer of genetic material) of the T-cells remains modest. This project focused on a series of in vitro studies to understand the kinetics of T-cell activation and proliferation to optimize the scaffold's transduction efficiency. The first study mapped the activation and proliferation of MASTER-seeded T-cells, which are important to ensuring cell transduction and viability. Then, we studied the transduction efficiency of MASTER to generate GFP-expressing T-cells. To improve transduction, we tested briefly pre-activated T-cells as opposed to exposing the T-cells to antibodies in the scaffold. Our results indicate the cells' ability to activate and proliferate, and we achieved a two-fold increase in transduction efficiency. Future studies will further improve transduction efficiency by manipulating antibody concentrations and optimizing the multiplicity of infection (MOI). Improvements to the MASTER scaffold system will advance CAR-T cell therapy and the way cancer treatment is administered to patients.

Effects of Habitat Management on Bee Pollination Efficiency in Urban Gardens

Author(s): **Oliver Roper**
Mentor(s): **Dr. Elsa Youngsteadt, Ms. Melina Keighron**
Poster: **47**

Urbanization alters natural landscapes and presents a major disturbance for wildlife. Urban bees are a group of wildlife species affected by growing urbanization but are relied upon for pollinating flowering plants. Within cities, there are pockets of green spaces, like community gardens, that provide numerous resources for urban pollinators. Understanding what promotes pollination within these community

gardens, despite increasing urbanization, is necessary to conserve ecosystem services and the diversity of urban pollinators. This project investigates factors that may predict the amount of pollen transferred between cucumber flowers in several garden sites in Raleigh, NC. While I expect pollen transfer to be positively correlated with bee visitation, some habitat features, like floral resources, may make these visits more or less efficient. By comparing visitation vs. pollination data with habitat data, I will determine if there are any relationships between variables like floral resources and urban pollination efficiencies. Data from the study sites include observations of bee visits to cucumber plants, number of pollen grains received, and habitat features of sites recorded alongside the visitation and pollen data. From this, I will model the number of pollen grains received as a function of bee visitations and habitat features, using AICc-based model selection to identify the best predictors. With a better understanding of what promotes pollination services in urban areas, urban gardeners can be more informed about how to improve their green spaces. Additionally, urban decision-makers can provide more bee friendly green spaces to build stronger urban ecosystems.

Impact of Impervious Surface on Tree Growth at NC State

Author(s): **Nicole Garcia**
Mentor(s): **Dr. Steph Jeffries**
Poster: **48**

Trees provide important benefits in urban environments, but also face challenges. They contribute many ecosystem services, such as cooling, carbon capture, and stormwater control. However, urban environments are hard places for trees to grow. For example, impervious surfaces can negatively affect trees due to their hard surfaces limiting water and nutrients and restricting root growth. Although the NC State campus has more than 10,000 trees, it also has various types of impervious surfaces. These include patios, decks, streets, parking areas, driveways, and sidewalks. We wanted to measure the effect of impervious surface on tree growth at NC State. We tagged more than 100 trees and measured their diameters at breast height (DBH) in 2019, 2021, and 2022 to estimate growth. In addition, we calculated the percentage of impervious surface surrounding each tree using the pace-to-plant method (Youngsteadt et al. 2016). We were surprised to discover no relationship between the percentage of impervious surface and the percent diameter growth over three years. Our observation is that there are many other factors that can impact tree health and growth such as disease, location, and tree management that might supersede the effects of impervious surface. These factors not only determine overall tree health and growth, but also help us understand how to better care for our trees on campus and promote sustainability.

Lunar Gardens? Evaluating Plant Growth Promotion by Space Flight Isolated Microbes

Author(s): **Gioia Salamido**
Mentor(s): **Dr. Imara Perera, Ms. Aurora Toennisson**
Poster: **49**

As space exploration moves towards space colonization, spaceflight and lunar environments will be challenging places for extraterrestrial plant production, due to the lack of essential resources and the presentation of additional stresses. The lunar terrain contains low levels of phosphorus and/or a form of insoluble phosphate which result in plant phosphate starvation. Previous research on microbes isolated from the International Space Station indicates that the microbes Pantoea agglomerans (Pa) and Bacillus subtilis (Bs) have potential plant growth promoting effects, including the ability to solubilize phosphate to allow for its uptake and utilization. In this experiment, these spaceflight isolated strains were each grown on Arabidopsis plants in lunar regolith simulant under both high and low phosphorus conditions. The experiment's two major objectives were to determine if specific microbes are beneficial for extracting phosphorus in difficult conditions akin to the lunar surface, and to determine if microbe interaction is dependent on a specific basal level of phosphorus. Under high phosphorus conditions, both Pa and Bs had a positive effect on plant growth over mock treatments (no microbe) suggesting their potential beneficial role in plant growth. No growth promotion was detected under low phosphate conditions suggesting the need for sufficient levels of phosphorus in order for the microbes to positively interact with plant growth. These findings can be applied to advancements in extraterrestrial plant production.

Rational Synthesis of Clausenamide and Pyrrolidine Dione Derivatives

Author(s): **Ryan Santiago**
Mentor(s): **Dr. Joshua Pierce**
Poster: **50**

"Increasing levels of bacterial resistance to antibiotics have been observed in recent years, leading to extensive research towards a wide range of viable solutions. In particular, the introduction of biologically active natural products shows significant potential as a solution to this ongoing crisis.
The Pierce Research Group has identified that pyrrolidinedione natural products possess significant antimicrobial activity, with derivatives of the natural product

clausenamide undergoing substantial testing regarding antibacterial and anti-biofilm activity within our antimicrobial subdivision. Unfortunately, previously tested compounds have suffered from poor aqueous solubility, limiting their ability to reach the intended biological target. This project is working to establish a new method of improving the biological activity of clausenamide derivative type compounds by increasing aqueous solubility while retaining potency.
A versatile multicomponent key reaction utilizing readily available precursors will enable a clausenamide-based library. Rational analogue generation aims to improve hydrophilicity and biological activity. To date, three separate active sites have undergone modification followed by testing against strains of Methicillin-resistant Staphylococcus aureus (MRSA) and Methicillin-sensitive Staphylococcus aureus (MSSA).
Preliminary data has provided a wealth of valuable information for future study, and future directions for this project involve increasing the scope of analogues to explore the relationship of a variety of biological factors regarding increasing hydrophilicity alongside further testing to determine the possibility of additional bacterial biofilm eradication."

Design and Development of a Microgravity Capable Drone Equipped with Payload

Author(s): **Izabella Sciora**
Mentor(s): **Dr. Venkateswaran Narayanaswamy, Mr. Abinash Sahoo**
Poster: **51**

The goal of this research project is to design and create a drone that is capable of carrying a payload of 3D Printed materials to and from Earth and space. Given the microgravity conditions in space, 3D Printing of thin sheets is more precise in space than 3D Printing extremely thin sheets of material on Earth. Developing a drone for the transportation of this material is more cost effective than financing a manned mission, however the task to create a drone with a reasonably small size while still containing a payload that is designed to effectively move through both the atmosphere and space must be completed. Since there is not a large supply of published material about a dual environment capable drone, this project is in its early stages of testing flames within a microgravity environment. The most cost effective way to test flames in a microgravity environment is by simulating this on Earth. The first steps of this project are to build a quadcopter that is able to do a controlled drop of a capsule containing a flame from a height allowing for about three seconds of data gathered while in the microgravity condition. This data will be used to analyze the most efficient fuel to use in a microgravity condition for the propulsion of the drone in space. The current stage of the project is manufacturing

the components for the quadcopter to drop the capsule, initially containing a ball for use in testing the video and sensor equipment.

Effect of Developmental Flame Retardant Exposure On Oxytocin Receptor Expression in the Rat Brain

Author(s): **Madeline Scott**
Mentor(s): **Dr. Heather Patisaul, Ms. Stacy Schkoda**
Poster: **52**

Flame retardants (FRs) are all around us– in furniture, on planes, and within the very bits of dust in our homes. A very common FR is FireMaster® 550 (FM550), a mixture of brominated and organophosphate FRs (BFRs and OPFRs). Previously, our group has shown, in two different rodent species, deficits in social behavior following perinatal exposure to FM550. The goal of my study was to examine the effects of FM550 and its BFR and OPFR components on oxytocin receptor (OTR) expression in four brain regions involved in social behavior. We hypothesized that developmental exposure would result in sex specifically disrupted OTR expression in the adult rat brain compared to controls. Dams were exposed through gestation and lactation to either 1000 µg BFR, 1000 µg OPFR, or 2000 µg FM550. Offspring were sacrificed and their brains prepared for analysis by autoradiography at three months of age. Optical density of OTR expression was measured and recorded using MCID software. In the nucleus accumbens, OPFR-exposed females showed a decrease in OTR expression, as opposed to the medial amygdala, where only OPFR-exposed males had a decrease. Both OPFR-exposed males and females had increased OTR expression in the BNST. Taken together, OTR expression overall appears to be more sensitive to disruption by the OPFRs as opposed to BFRs or the full FM550 mixture.

Utilization of Raw Barley and Exogenous Enzymes in Low-Fermentable Wort

Author(s): **Nikole Sena Carneiro, Zade Freij, Catherine Lawrence, Caidin Biggers**
Mentor(s): **Dr. Sebastian Wolfrum, Mr. Mark Stevens**
Poster: **53**

Consumer demand for nonalcoholic and low alcohol beers has been rising in recent years, but most options on the market lack body and flavor due to the processes they undergo to remove some or all of the alcohol after the completion of fermentation. This issue would be ameliorated by a low-fermentable wort because it would eliminate the need for these post-production steps that denature or otherwise negatively affect the flavor and aroma molecules in the product. The goal of this

research was to formulate a recipe for a low-fermentable wort to be used in brewing beers with low alcohol content. Different ratios of raw grain to malted grain in the brewing process were tested to create a wort that fits the target of low fermentable sugar content while retaining the flavors and body typically lost in nonalcoholic beer production. These ratios included 100% raw grain, 100% malted grain, 20:80 raw grain to malted grain, and 40:60 raw grain to malted grain. All batches were brewed with the same exogenous enzymes, yeast, process steps, conditions, and equipment, so the only variable was the grain bill. A control run was also conducted with 100% malted grain and no exogenous enzymes.

The Loss of CCAAT Enhancing Protein β (C/EBPβ) Activates Caspase-mediated Regulated Cell Death in Response to UVB induced DNA Damage

Author(s): **Ayushma Sharma**
Mentor(s): **Dr. Jonathan Hall, Ms. Emma E.Tobin, Ms. Sophia C. Gray**
Poster: **54**

Following DNA damage, cells must make the decision to repair the damage and continue proliferating, or induce apoptosis. Apoptosis is a regulated cell death pathway that is vital in preventing damaged cells from progressing into cancer cells. Apoptosis has two major mechanisms: intrinsic and extrinsic apoptosis. Intrinsic apoptosis is mediated by the mitochondria and is characterized by formation of the apoptosome and cleavage of caspase-9 and caspase-3. Extrinsic apoptosis is mediated by transmembrane death receptors and results in activation of caspase-8 and caspase-3. Caspases are a family of cysteine proteases who are essential in executing apoptosis. The basic leucine zipper transcription factor CCAAT enhancer/binding protein β (C/EBPβ) is a suppressor of skin tumorigenesis in response to UVB-induced DNA damage. When C/EBPβ knocked down keratinocytes were treated with UVB, we observed enhanced activation of caspase-8 and caspase-3. To test the involvement of the intrinsic and extrinsic apoptotic pathways in the enhanced cell death observed in C/EBPβ knocked down keratinocytes, we utilized pharmacological inhibitors to apoptosis. We observed that inhibiting proteins involved in mitochondrial stimulated apoptosis blocked the activation of caspase-3, which indicated involvement of intrinsic apoptosis. However, we also observed that inhibition of BID, a key component linking extrinsic and intrinsic apoptosis, also blocked caspase-3 activation. Future experiments will address how these two apoptotic pathways are being activated. Understanding the relationship between different cell death pathways in C/EBPβ deficient keratinocytes could aid in identifying targets to restore regulated cell death pathways and to treat cancer.

The Optimization of CPR1 and CPR2 Expression for Artemisinin Production

Author(s): **Eythan Suber**
Mentor(s): **Dr. De-Yu Xie, Ms. Bethany Mostert**
Poster: **55**

Artemisia annua is a medicinal herb that produces artemisinin, a powerful antimalarial medicine. However, the inconsistent yield of artemisinin content in plants has affected the availability of this life-saving drug. The goal of this project is to understand the interactions of key enzymes within the metabolic pathway to promote artemisinin production. Specifically, the project focuses on the interactions between cytochrome P450 reductase (CPR1), its homolog, CPR2, and a targeted P450 enzyme (CYP). This goal will be achieved by isolating genes and proteins of interest from A. annua leaves with various lab protocols. The genes will be expressed in Escherichia coli strain to purify recombinant proteins. The project uses the following experiments: PCR (DNA and RNA isolation), gel electrophoresis (DNA and RNA separations), and SDS-PAGE (protein separations). The resulting data shows the expression of these specific genes and proteins. Then, protein analysis characterizes the solubility of CYP and CPR, the result of which is useful for the next step of the project: determining subcellular conditions to optimize CYP expression in E. coli.

The Mass Rearing of Freshwater Diatoms for the Development of a Mayfly Diet

Author(s): **Nico Swanson Villares**
Mentor(s): **Dr. David Buchwalter**
Poster: **56**

Aquatic insects dominate the ecology of freshwater ecosystems and are widely used in monitoring programs to support the Clean Water Act. However, we have been dependent on collaborators to provide us with diatom-based biofilm as a food source. The mass rearing of freshwater diatoms was attempted in a large filtration system, and batches of diatom culture media were created. To assess the nutritional quality of newly reared freshwater diatoms, 18 N. triangulifer hatchlings were seeded in individual well plates, with 9 of them being fed diatoms reared under laboratory conditions, and 9 of them being fed diatoms obtained from the Stroud Water Research Center (SWRC). Biweekly measurements of each N. triangulifer hatchling's head width and body length were collected over 25 days of development. The mayfly hatchlings fed diatoms from the SWRC were observed to have an average body length growth rate of 40.79 μm/day, whereas hatchlings fed diatoms reared under laboratory conditions had an average body length growth rate 86.67 μm/day. Therefore, there is a possibility that diatoms mass-reared under laboratory conditions

in this trial were able to provide sufficient nutritional value to the growth of freshwater mayfly hatchlings. However, it is important to note that most of our previous trials indicated that diatoms from the SWRC were of a better nutritional quality than laboratory-grown diatoms, as mayflies fed from the SWRC exhibited better growth rates than the experimental group.

Economic Significance of Forestry in North Carolina Counties

Author(s): **Suzanne Teague**
Mentor(s): **Dr. Rajan Parajuli, Dr. Stephanie Chizmar, Dr. Robert Bardon**
Poster: **57**

"The forest sector in North Carolina is an essential renewable resource based industry that contributes to the overall stability and economic development of the state. The forest sector contributes to regional economies through the employment of thousands of North Carolinians, the creation of a sustainable supply of several forest based products, and the maintenance of the vast natural and aesthetic landscape that provides valuable ecosystem services. In this project, we estimated the economic contribution of the forestry and forest-based manufacturing industries in the 100 counties of North Carolina using an input-output model. We reported direct and total employment, labor income, value added, and industry output metrics for each county in North Carolina. Results from the economic contribution analysis reveal that in 2020, Catawba, Forsyth, Guilford, Mecklenburg, and Randolph county had the highest overall economic output in North Carolina. Catawba county had the largest total impact metrics in North Carolina with total employment of 16,105 people, labor income of $0.9 billion, value added of $1.2 billion, and industry output of $3.4 billion. These statistics are crucial to highlight the economic significance of the North Carolina forest sector in the local economies, specifically in the rural counties where the forest sector is the major economic engine with the top employer among manufacturing sectors.

Keywords: Forest Sector, Employment, Forestry, Landscape, Ecosystem Services, Input-output Model, Economic Significance, Rural, Manufacturing"

Grassroots Advocacy Against the Lack of Equitable Education in Rural North Carolina

Author(s): **Olivia Townsend**
Mentor(s): **Dr. Katherine Charron**
Poster: **58**

"This research project analyzes the legacies of separate and unequal education endured in North Carolina since the 1954 Brown v. Board of Education decision. Combining a case study of African American educational activism in Halifax County with an ongoing court case, Leandro v. The State of North Carolina, I ask how rural education has failed minority and lower-class children since the early 1980s.
In 1978, Halifax County School Board began negotiations to close the only school in Tillery, a majority Black community, and convert it into a sewing factory. Angered community residents responded by forming the Concerned Citizens of Tillery (CCT) and managed to keep the Tillery school open until 1981. That same year, the CCT gained non-profit status and secured grant money to revitalize a community center, transforming it into the Tillery Community Enrichment Center, planning to provide a reading and literacy program. The CCT continued advocating for the improved education of Halifax County's Black children and on behalf of its Black administrators.
Yet this rural northeastern county was not the only one struggling for educational equity. In 1994, plaintiffs filed suit in Leandro v. The State of North Carolina. They claimed while being taxed above average, their children were not receiving an equal education compared to neighboring school districts. Nearly thirty years later, Leandro remains unresolved. This research project integrates the history of deficient educational services within Halifax County and the Leandro case to explore the structural factors that continue to affect minority and lower-class individuals' educational experiences."

Investigating The Metal Binding Properties of Azapeptides

Author(s): **Meric Trombley**
Mentor(s): **Dr. Caroline Proulx, Mr. Maxwell Bowles**
Poster: **59**

Azapeptides are unnatural peptide mimics in which one or more α-carbon is substituted for a nitrogen. This substitution has been shown to improve protease stability, restrict the conformation of the peptide backbone, and perturb the pKa's of the surrounding nitrogen atoms (NH). In this work, we compare the metal binding properties of a natural peptide to its azapeptide analog. Using a library of metals (Fe,

Pt, Cu, Pd, Ni), the peptides binding abilities were tested under varying conditions including different solvents, different concentrations of the metal, and changing the amount of time allotted for the metal binding. Through this, we hypothesize that the azapeptide will show faster binding and better selectivity. With the growing interest in medicinal chemistry, we believe that these metalloazapeptide complexes may find future utility as therapeutics.

Response of Mushroom Fructification to Selected Forest Disturbances

Author(s): **Preston Truett**
Mentor(s): **Dr. Robert Jetton**
Poster: **60**

The goal of this project is to observe the fruiting response of fungi in selected forest disturbances. Mushroom formation relies on many factors, and it is known that forest disturbances influence mushroom production, especially mycorrhiza species. Mycorrhiza mushroom fruiting depends upon photosynthetically fixed carbon produced by its host tree, so the health of the tree may drive the production of mushrooms. Disruption of the flow of these carbohydrates to the mycelium has been proven to decrease and, in some cases, completely stop mushroom fructification. On the other hand, parasitic mushrooms may increase when forest disturbances arise. The rise of parasitic fungi can lead to an increase in forest decline and its ability to rebound from disturbances. Saprophytic fungi play a key role in nutrient recycling and humus formation in forest ecosystems and are vital players in the forest ecosystem. These three categories of fungi are critical in the overall inference about a forest's health. We want to observe the relationship of varying degrees of forest disturbances to measure the correlation between levels of productivity in the forest and the productivity of mushroom formation.

Web Accessibility: A Review of U.S. State and Territory COVID- 19 Websites for Visually-Impaired Users

Author(s): **Jennie Vo**
Mentor(s): **Mr. Dylan Hewitt, Dr. Yingchen He**
Poster: **61**

"The vast majority of health-related material was moved to digital platforms during the COVID-19pandemic in order to facilitate its widespread dissemination. However, many online health information pages are still unavailable to those who use assistive technology, such as screen readers and magnifiers. This study is a longitudinal

replication of a website accessibility study conducted in 2021 to compare if the sites have improved, declined, or stayed the same in terms of accessibility. Two automated accessibility checker tools, MAUVE++ and WAVE, are being used to assess the accessibility of all available U.S. state and territory COVID-19 websites. Each state and territory's home page, testing page, and vaccine page will be examined, and accessibility ratings will be determined by using two automated checker tools (MAUVE+ + and WAVE). The number of errors and the overall accessibility ratings will be compared between the current (2023) and archived (2021) versions of the sites. The takeaway is that many health-related materials have moved to digital platforms due to the COVID-19 pandemic, but the accessibility of online health information pages for those who use assistive technology is still a challenge. After conducting the research, suggestions will be provided to webmasters to improve their sites to become more accessible and appropriate."

Upper Arm Muscle Activation Variability in Stroke During Reaching Tasks

Author(s): **Carter Wang**
Mentor(s): **Dr. Katherine Saul, Mr. Christopher Jadelis**
Poster: **62**

"Introduction: Stroke injury is a leading cause of disability in the US [1]; impairment severity varies by lesion size, location, and patient age [2]. Evaluation of patient electromyography (EMG) has identified altered muscle activation during reaching tasks [3]; however, differences in muscle-specific activation times and amplitudes are understudied [4]. Identification of muscle-specific changes may yield insight into compensatory strategies post-stroke.
Objective: Evaluate variation in muscle excitation amplitude and time in stroke survivors compared to healthy individuals during reaching tasks.
Methods: A dataset of 12 healthy and 13 stroke subjects performing reaching tasks [3] was used for this study, with EMG of 8 shoulder and upper arm muscles for 9 pointing tasks. EMG was rectified and scaled to maximum voluntary contractions (MVC). Peak activation amplitudes and peak widths (muscle activation time) were identified and compared between healthy and stroke subjects for each task and muscle.
Results: Activation time was generally increased in stroke subjects. Specifically, the anterior deltoid, medial deltoid, and triceps, activation time was longer (mean difference=0.475, 0.254, and 0.740 sec, respectively). However, biceps activation time was shorter on average by 0.259 seconds compared to healthy. In most muscles, activation amplitudes were larger for healthy individuals with the exception of the posterior deltoid, pectoralis major, and infraspinatus.

Conclusions: These results demonstrate muscle-specific differences in muscle activation time and amplitude among stroke survivors varying by patient. These findings may help explain the development of compensatory strategies and may present opportunities for strengthening specific muscles."

The Continual Analysis of the Effects of Poor Infrastructure and Environmental Justice on the Hydrologic Systems of the Walnut Creek

Author(s): **Jada West**
Mentor(s): **Dr. Angela Allen**
Poster: **63**

"This research aims to determine how past inequalities in the Walnut Creek Wetland Center and surrounding vicinity have influenced land-use decisions, poor infrastructure, and an increase in inadequate water traits. Our area of study consists of weekly visits to different sites to determine the effects of local development on the water quality within Little Rock Creek. We currently measure chemical and physical parameters at four sites. Measurements using a YSI device and nitrate/nitrite strips are performed at all sites. And we measure bacteria at selected sites to assess changes based on upstream and downstream locations. Sewage pipes located in this area have begun to show signs of deterioration and the city of Raleigh is now paying attention to this issue. Due to this concern, we will test these parameters before, during, and after replacement to determine whether there has been a significant increase or decrease in parameter levels. We hypothesize that there will be an improvement in our parameters. Our research findings will hugely benefit the community surrounding the Walnut Creek Wetland Center area and Wake County as a whole. Throughout this project, individuals from the community and NC State University will be able to identify environmental stressors and possibly link them to inequalities occurring in similar communities. "

Parasitism and Disease in North American Snakes

Author(s): **Hannah Widdowson**
Mentor(s): **Dr. Skylar Hopkins**
Poster: **64**

Emerging infectious diseases are becoming more common in people, domestic species, and wildlife. However, emerging wildlife diseases may not be noticed until it is too late to stop their spread, because wildlife are difficult to survey. This is especially

true for snakes, which spend most of their time hiding from sight. Therefore, while working in the Sustainable Health Ecology Lab (SHEL), I worked on two projects to document the distributions of parasites and disease in North American snakes. In the first project, I helped to create baseline parasite data for snakes in North Carolina by dissecting roadkill snakes. This involved sampling snake skin for the fungal parasite that causes ophidiomycosis (also known as snake fungal disease) and examining all the internal organs for parasitic helminths and pentastomes. Through this work, I found several parasites inside native water snakes (Nerodia species). In the second project, I started a systematic literature review of published studies where wild snakes were surveyed for ophidiomycosis. I am collecting data about snake hosts (e.g., species, size), the fungus and disease (e.g., prevalence of infection, diagnostic tests), and the conditions where the survey occurred (e.g., season, survey location). Data collection is u still underway, but the goal is to create a database that all researchers can use to quickly search for published information about ophidiomycosis. By learning more about snake parasites and disease, we may also be better able to understand and predict infectious disease dynamics in other species, including humans.

RSK3 Turnover Time in Castration-Resistant Prostate Cancer Cells

Author(s): **Em Wilds**
Mentor(s): **Dr. Melanie Simpson**
Poster: **65**

"The RSK (ribosomal S6 kinase) family is a set of serine/threonine kinases that regulate a variety of cellular processes, including cell metabolism, replication, growth, and motility. RSK3 has been implicated as the kinase responsible for phosphorylating the essential enzyme UDP-glucose dehydrogenase (UGDH). UGDH is an enzyme that resides in the cytosol that is responsible for the conversion of UDP-glucose to UDP-glucuronate. In addition to the synthesis of PGs, UDP-glucuronate is also a requisite substrate for production of the extracellular matrix hyaluronan. The goal of this experiment was to determine the turnover time of the RSK3 in a variety of castration-resistant prostate cancer tumor lines. Cells were transiently transduced with three different lentiviral shRNA knockdown hairpins targeting different parts of the gene to determine which construct would produce the most effective knockdown of the protein. A scrambled shRNA hairpin was used as a control. Cells were harvested on day 3, day 5 and day 8. Total protein was quantified using a Bradford assay, equal protein was loaded onto SDS-PAGE gels and Western blot analysis of RSK3 and the housekeeping gene, tubulin, was conducted. Next, we performed densitometry to calculate the concentration change of the total RSK3 proteins with the values normalized to tubulin. It was found that there was a

time-lag between the knockdown of gene expression and a change in the concentration of RSK3 in the cytoplasm of the cell, which may indicate the importance of these RSK3 proteins in castration-resistant prostate cancer cells. "

Interpretation and Validation of Ethogram Behaviors in Research Canines

Author(s): **Margaret Ann Edel, Lexi Roof, Jess Schinsky, Alana Boone**
Mentor(s): **Dr. Marnie Metzler, Dr. Shweta Trivedi, Dr. Jenny Estes**
Poster: **66**

"Introduction: For many years, we as the veterinary science community have been trained to focus on the health and biological function of animals, but in the last 20 years we have seen trends towards behavior and natural behaviors as another important aspect of welfare. The location of this study, the Lab Animal Resources department at NC State University of Veterinary Medicine, regulated by IACUC, has upheld the five domains of welfare such as nutrition, environment, and health, behavior, and mental health for their stock of animals used in laboratory research. This study aims to identify the efficiency of the behaviors and mental health protocols used in the stock dog colony by creating and applying an ethogram. The ethogram will then be applied to data collection to identify the behaviors that show welfare concerns (stressors) in these canines, note their prevalence (# of times it occurs), and determine how positive reinforcement conditioning has an affect on these unwanted behaviors.
Methods: For 12 weeks, each dog was given an hour a week of positive reinforcement training aimed at improving their skills walking on the leash and other normal behaviors that would improve their future transition to household pets. After a month of enrichment, our team created an ethogram which categorized behaviors of the dogs when they were inside their kennel and outside in the play yard. This ethogram was then applied to a data collection sheet so we could easily mark the behaviors of the dogs."

Numbers By College

396 Unique Presenters

College of Agriculture and Life Sciences: 88
College of Education: 1
College of Engineering: 84
College of Humanities and Social Sciences: 58
College of Natural Resources: 55
Poole College of Management: 1
College of Sciences: 100
Wilson College of Textiles: 7
University College: 2