33rd Annual

Spring Undergraduate Research & Creativity Symposium

April 23-24, 2024

NC STATE

Office of Undergraduate Research

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2024 Spring Symposium Schedule

Tuesday, April 23, 2024	
Oral Session 1 (O1)	10:00-10:45
Poster Session 1 (P1)	11:00-12:00
Oral Session 2 (O2)	12:30-1:15
Poster Session 2 (P2)	1:30-2:30

Wednesday, April 24, 2024	
Poster Session 3 (P3)	10:00-11:00
Oral Session 3 (O3)	11:15-12:15*
Oral Session 4 (O4)	12:30-1:15
Poster Session 4 (P4)	1:30-2:30
Poster Session 5 (P5)	2:45-3:45

*One oral session room will end at 12:00, the other at 12:15.

Presenter Index

(Alphabetically by Last Name)

Lead Presenter	Co-Presenter(s)	Session	Room/ Poster	Mentor(s)	Project Title
Almira Ahmed (College of Agriculture and Life Sciences)		P2	1	Dr. Tom Hooper (University College Dublin) Christine Coffey (University College Dublin)	Phosphorus-Based Cations as Main Group Catalysts
Taha Ahmed (College of Engineering)		P2	2	Dr. Veeraraghava Raju Hasti (College of Engineering)	Airfoil Shape Optimization Using Conditional Wasserstein Generative Adversarial Networks
Lilly Ahrens (College of Sciences)		P2	3	Dr. John Blondin (College of Sciences)	Stellar Wind Turbulence and its Effects on Hoyle-Lyttleton Accretion
Omer Akhtar (College of Agriculture and Life Sciences)		P2	4	Dr. Yoshiaki Tsuji (College of Sciences)	Modulation of Iron Metabolism and Cancer Cell Proliferation by the Sulforaphane Family Isothiocyanates
Gabriella Alexander (College of Sciences)		P5	1	Dr. Kelly Meiklejohn (College of Veterinary Medicine)	Investigating Relationships Between Antibody Repertoire and Country of Residence
Adrian Aligwekwe (College of Engineering)		P5	2	Dr. Ashley Brown (College of Engineering) Grant Scull (UNC-CH)	Ex vivo Analysis of Cell Migration in Partial ACL Tear Wound Model
Anika Anandpura (College of Sciences)		P3	1	Dr. Hong Wang (College of Sciences)	Generation of the Double Holliday Junction DNA Substrate for Single-Molecule Imaging

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Maggie Anthony (College of Agriculture and Life Sciences)	**Anshika Gutta** (College of Engineering)	P3	2	Dr. Natalie Cooke (College of Agriculture and Life Sciences) Christina Chapman (College of Agriculture and Life Sciences)	Analyzing Undergraduate Students' Career Decision Self-Efficacy Prior to a Career Development Intervention
Gracie Athus (College of Sciences)		P1	1	Dr. Rolanda Lister (Vanderbilt University)	Evaluating Folate Supplementation in the Attenuation of Cardiac Hypertrophy in Murine Offspring of Diabetic Dams
Nhaturie Atkinson (College of Humanities and Social Sciences)		O3	3210-1	Dr. Caren Cooper (College of Natural Resources)	Examining the Behavior of Animals Behaviors During a Solar Eclipse
Gina Austin (College of Sciences)		P4	1	Ms. Bess Smith (College of Sciences) Dr. Jung-Ying Tzeng (College of Sciences) Dr. Cathrine Hoyo (College of Sciences)	Sex Differences in PFAS Levels and Associations with Liver Health in Couples
Morgan Ayscue (College of Agriculture and Life Sciences)	**Cecilia Nottingham** (College of Natural Resources)	P4	2	Dr. Angela Allen (College of Natural Resources)	Analyzing the Trash Trout's Impact: A Continual Walnut Creek Watershed Study
Aidan Baker (College of Natural Resources)	**Eh Taw Boe** (College of Agriculture and Life Sciences)	P2	5	Dr. Erin McKenney (College of Agriculture and Life Sciences)	The Importance of Zoological Parks in Wildlife Preservation

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Sydney Baker (College of Sciences)		P3	3	Dr. Rodolphe Barrangou (College of Agriculture and Life Sciences) Kalani Gast (College of Agriculture and Life Sciences)	Developing CRISPR-Cas12a Genome Editing Tools for Lactobacillus acidophilus
Jacob Baker (College of Agriculture and Life Sciences)	**Claire Rice** (College of Agriculture and Life Sciences) **Haley Sparks** (College of Agriculture and Life Sciences)	P3	4	Dr. Virginia Stage (College of Agriculture and Life Sciences)	Skin Carotenoid Levels among Eastern North Carolina Head Start Children (3-5 years)
Olivia Ball (College of Humanities and Social Sciences)		O2	3221-1	Dr. Virginia Riel (College of Humanities and Social Sciences)	“An Absolute Nightmare”: How Students Experience and Manage Housing Insecurity
Phil Bankaitis (College of Sciences)		P4	3	Dr. Tatyana Smirnova (College of Sciences)	Role of Nanoparticle Additives in Radical-Driven Degradation of Oil Lubricants: Spin-Trapping EPR
Kayla Beckwith (College of Natural Resources)		P1	2	Dr. Hannah Levenson (College of Agriculture and Life Sciences)	Seasonality of Multiple Leptopilina Species in Southeastern United States Blackberries
Sierra Begley (College of Sciences)		P4	4	Dr. Linda Hanley-Bowdoin (College of Agriculture and Life Sciences) Mary Dallas (College of Agriculture and Life Sciences)	The Effects of SEGS-1 on EACMV Infection in a Resistant Cassava Cultivar

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Thomas Benthall (College of Engineering) **Ciana Moore** (College of Engineering) **Austin Sides** (College of Engineering) **Spencer Blanchard** (College of Engineering)		P2	6	Dr. Nam Dinh (College of Engineering) Dr. Paridhi Athe (College of Engineering) Dr. Linyu Lin (Idaho National Laboratory)	Enhancing Nearly Autonomous Management And Control System with GPT
Sophie Biancofiore (College of Humanities and Social Sciences)		P1	3	Dr. Ian Hughes (College of Humanities and Social Sciences)	The Effects of Identity Related Questioning on Asexual Individuals Well-Being
Benjamin Black (College of Engineering)		P4	5	Dr. Jong Eun Ryu (College of Engineering) Dr. Sipan Liu (College of Engineering)	Development of Scalable Manufacturing Processes to Improve Solar Panel Efficiency
Sophie Blankenship (College of Humanities and Social Sciences)		P4	6	Dr. Dru McGill (College of Humanities and Social Sciences)	Evaluating the Ephemera: Cataloging a Donated Collection at Körner's Folly
Amanda Blasy (College of Sciences)		P4	7	Ms. Bess Smith (College of Sciences) Dr. Cathrine Hoy (College of Sciences) Dr. David Skaar (College of Sciences)	Linkages Between Imprint Control Regions and Hepatocellular Carcinoma in the ACE Study
Claire Boles (College of Agriculture and Life Sciences)		P3	5	Dr. Trino Ascencio-Ibanez (College of Agriculture and Life Sciences)	Confirming the First Mastrevirus in a North American Maize Sample

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Alana Boone (College of Agriculture and Life Sciences)		P4	8	Dr. Eric van Heugten (College of Agriculture and Life Sciences)	Benefits of a yeast-based trace-mineral source on growth performance of weaned pigs
Christina Bourne (College of Sciences)		P3	6	Dr. Elisa Crisci (College of Veterinary Medicine) John Byrne (College of Veterinary Medicine)	In vitro analysis of Selenium-treated porcine alveolar macrophages upon PRRSV-2 infection
Sean Brown (College of Sciences)		P1	4	Dr. Stephanie Thomas (College of Veterinary Medicine) Dr. Casey Theriot (College of Veterinary Medicine)	Clostridioides difficile Toxins Alter Host Bile Acid Synthesis Pathway Gene Expression
Kirstin Brown (College of Agriculture and Life Sciences)	**Maddie Brenner** (College of Agriculture and Life Sciences) **Lucy Caldwell** (College of Agriculture and Life Sciences) **Abdullah-Ahmed Abdelkader** (College of Agriculture and Life Sciences) **Jonathan Gallagher** (College of Agriculture and Life Sciences)	P5	3	Mr. Peter Rizzo (Novonesis) Dr. Fernanda Santos (College of Agriculture and Life Sciences)	Enzyme Solutions for Improved Oat Milk
Megan Bryenton (College of Agriculture and Life Sciences)	**Grace Erickson** (College of Agriculture and Life Sciences)	P3	7	Dr. Trino Ascencio-Ibáñez (College of Agriculture and Life Sciences)	Single Stranded DNA Discovery in Fecal Matter From House Pets

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Eliza Buhrman (College of Agriculture and Life Sciences)	**Bobbi Foster** (College of Engineering)	P3	8	Dr. Gregory Buhrman (College of Engineering) Dr. Gabriel Harris (College of Agriculture and Life Sciences) Dr. Cyndell Gracieux-Singleton, (College of Engineering)	The Dark Side of Dark Chocolate: Quantitation of Toxic Heavy Metals in Dark Chocolate by ICP-MS
Thanh Thuy Bui (College of Engineering)		P4	9	Dr. Praveen Kolar (College of Engineering)	Use of Coffee Chaff-Derived Biochar for the Adsorptive Mitigation of Methylene Blue
Sophia Burgess (College of Sciences)		P5	4	Dr. Johnathan Lindsey (College of Sciences)	Radiopharmaceutical Treatment Strategy for Glioblastoma
Jared Caddell (College of Sciences)		P2	7	Dr. Fiona Wang (College of Education)	Discrepancies Between Senior Entrepreneurs and Younger Audiences
Gray Calaway (College of Engineering)		P5	5	Dr. Julio Terán (College of Engineering) Dr. Olgha Qaqish (College of Engineering)	Effects of Multiple Polymer Degradation Pathways within Compost Conditions
Meggie Cangu (College of Sciences)		P5	6	Dr. Xingcheng Lin (College of Sciences)	Exploring Molecular Dynamics: Leveraging Visual Molecular Dynamics for Simulation Analysis
Gabriel Castro (College of Sciences)		P5	7	Dr. Yi Xiao (College of Sciences)	Screening the Optical Properties of Dyes for Application in Aptamer-Based Dye-Displacement Assays.

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Ashlynn Chaney (College of Agriculture and Life Sciences)		P1	5	Dr. Tara Clarke (College of Humanities and Social Sciences) Dr. Lydia Greene (Duke University)	Impacts of Cellulose Fiber Supplements on Gut Microbiomes of Captive Lemur Populations
Brenda Cristina Chavez (College of Engineering)		P1	6	Dr. Veronica Catete (College of Engineering) Madison Thomas (College of Engineering) Erynn Elmore (College of Engineering) Micaha Dean Hughes (College of Education)	Cybersecurity Pedagogy: Exploration Of Effective Teaching Methods For Engaging Middle School Learners
Mansi Chawla (College of Sciences)		P2	8	Dr. Imara Perera (College of Agriculture and Life Sciences) Ms. Aurora Toennisson	Investigating Plant Growth Promotion by Azospirillum Microbes
Mrunmayi Chawnekar (College of Agriculture and Life Sciences) **Ethan Johnson** (College of Agriculture and Life Sciences) **Aidan McElligott** (College of Agriculture and Life Sciences) **Lottie Pate** (College of Agriculture and Life Sciences) **Sarah Williams** (College of Agriculture and Life Sciences)		P2	9	Dr. Fernanda Santos (College of Agriculture and Life Sciences) Dr. Lynette Johnston (College of Agriculture and Life Sciences) Carl Hollifield (College of Agriculture and Life Sciences)	Evaluating the Efficacy of SSOPs of a Dairy Plant

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Katherine Cherry (College of Sciences)		P2	10	Dr. Catherine Davis (College of Sciences)	Planktic Foraminiferal Response to the 2014-2015 Marine Heatwave in the Santa Barbara Basin
Seeva Cherukuri (College of Engineering)		P1	7	Dr. Sarah Shelton (College of Engineering)	Microfluidic Organ-on-Chip Models: Investigating Capillary Network Formation and Metastatic Processes
Esme Chiara (College of Sciences)		P3	9	Jennie Fagen (College of Agriculture and Life Sciences)	Improving the Production of 19 Xanthomonas citri pv. citri Bacteriophages
Isaac Cho (College of Sciences)		P2	11	Dr. Jun Ohata (College of Sciences) Mohammad Nuruzzaman (College of Sciences)	Nonaqueous Bioconjugation in Fluoroalcohol and Solvent-Free Medium
Christian Choto (College of Sciences)	**Priyanka Amalean** (College of Sciences) **Alyssa Weeks** (College of Natural Resources)	P4	10	Dr. Skylar Hopkins (College of Agriculture and Life Sciences)	Parasite Biodiversity in Snake Species Native to North Carolina
Brooke Church (College of Sciences)		P1	8	Dr. Reade Roberts (College of Sciences)	Genetic Sex Determination: Mapping Within Malawi Sand Cichlids
Rex Colvard (College of Engineering)		P5	8	Dr. Michael Dickey (College of Engineering) Dr. Peter Fedkiw (College of Engineering)	Utilizing Liquid Metal and Red Phosphorus in Energy Storage Technology
Andrew Combs (College of Engineering)		P5	9	Dr. Ross Sozzani (College of Agriculture and Life Sciences)	Self Attention Graph Exporter for Causal Relationship Analysis in Biological Systems

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Erick Contreras (University College)	**Caroline Hilliard** (College of Humanities and Social Sciences) **Rena Lustig** (College of Humanities and Social Sciences) **Mariam Mohamed** (College of Humanities and Social Sciences)	P1	9	Samantha Rich (University College) Madalene Compton (University College) Ms. Cameron Torrey (College of Education) Ms. Sydney Russell (College of Education)	An Assessment of Students' On-Campus Employment Experiences within DASA
Lauren Conway (College of Natural Resources)	**Millie McInnes** (College of Natural Resources)	P2	12	Dr. Angela Allen (College of Natural Resources)	Qualitative Analysis to Existing Water Quality Monitoring
Natalie Coon (College of Engineering)	**Alexandra Peevy** (College of Engineering) **Nathaniel Rogalski** (College of Engineering)	P5	10	Dr. Steven Shannon (College of Engineering)	Design and Fabrication of a High Aspect Ratio Sensor for Semiconductor Manufacturing
KC Cooper (College of Veterinary Medicine)		P2	13	Dr. Casey Theriot (College of Veterinary Medicine) Sam McMillian (College of Sciences	Validation of Clostridium sporogenes and Genetically Modified Strain MF001 with Bile Acid Inducible (bai) Operon Knock In
Dalton Crocker (College of Sciences)		P4	11	Dr. Christopher Halweg (College of Sciences) Dr. Christopher Halweg (College of Sciences) Dr. Whitney Jones (College of Sciences)	Introducing 3D Printed Models to Improve Student Understanding of the Lac Operon
Victoria Crunkleton (College of Engineering)		P5	11	Dr. Yaroslava (College of Engineering)	Atomistic Approach to Analyze Metal-Coordinated Peptide Amphiphiles with Different Tail Architectures

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Raven Cummings (College of Agriculture and Life Sciences)	**Amelia Faust** (College of Natural Resources)	P2	14	Dr. Erin McKenney (College of Agriculture and Life Sciences)	Beach Erosion Impacts on the NC Coast
Kyle Curley (College of Engineering)		O2	3210-1	Dr. Ryan Sartor (College of Agriculture and Life Sciences) Ms. Kassidy Robinson (College of Agriculture and Life Sciences)	Lemna Gibba Image Segmentation and Analysis
Evan Dadson (College of Sciences)		P1	11	Dr. Chris Jones (College of Natural Resources)	PoPS Model Case Study: Forecasting the Spread of Citrus Black Spot
Laura Dale (College of Agriculture and Life Sciences)		P1	12	Dr. Colleen Doherty (College of Agriculture and Life Sciences) Ms. Edmaritz Hernandez Pagan (College of Agriculture and Life Sciences)	Exploring the Potential of Phytomining Rare Earth Elements to Promote Sustainability
Shania Dantes (College of Engineering)		P5	12	Dr. Sarah Shelton (College of Engineering)	Applications of Microfluidic Organ-on-chip Devices
Ashish Das (College of Sciences)		P1	13	Dr. Stepan Paul (College of Sciences)	Classifying Geodesics on Surfaces of Revolution with Constant Negative Gaussian Curvature
Atli Davidsson (College of Sciences)		P1	14	Dr. Thomas Theis (College of Sciences)	Pyruvate Hyperpolarization Advancement in Biocompatible Solvent via Reversible Exchange Signal Amplification

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Gianna Deucher (College of Engineering)		P1	15	Dr. Shawn Gomez (College of Engineering) Dr. Chinmaya Joisa (UNC-CH) Dr. Kevin Chen (UNC-CH)	Differentially Expressed Genes and Dysregulated Biological Pathways in Colonic Inertia
Juhi Dighe (College of Humanities and Social Sciences)		P2	15	Dr. Dmitri Mitin (College of Humanities and Social Sciences)	Perceptions of Political Efficacy/Social Exclusion Among Muslims and Hindus in India
Avery DiPasquale (College of Agriculture and Life Sciences)	**Taylor Moen** (College of Agriculture and Life Sciences)	P3	10	Dr. Natalie Cooke (College of Agriculture and Life Sciences) Ms. Christina Chapman (College of Agriculture and Life Sciences)	Exploring Students' Professional SMART Goals: Insights After Completing a Career Development Project
Landon Docherty (College of Sciences)		P1	16	Dr. Fatma Terzioglu (College of Sciences)	Investigation of Computational Methods for Inverse Problems in Imaging
Zachary Dubner (College of Agriculture and Life Sciences)		P4	12	Dr. Carlos Goller (College of Agriculture and Life Sciences)	Leveraging Bioinformatics Workflows to Uncover Novel Biological Characteristics and Comparative Genomics
Daniela Duker (College of Sciences)		P1	17	Dr. Erin Krupa College of Education	: Staying Organized as a Research Assistant
Brooke Dunkley (College of Engineering)		O4	3210-1	Dr. Jacqueline Cole (College of Engineering) Kyla Bosh (College of Engineering)	Brachial Plexus Birth Injury Effects on Biceps, Supraspinatus, and Subscapularis Muscle Composition

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Kenyon Dunlap (College of Sciences)		P2	16	Dr. Vincent Lindsay (College of Sciences) Joshua Hobbs (College of Sciences)	Rearrangement of Unique Bis(cyclopropyl) Ethers Derived from Cyclopropanones into Biologically Relevant Spirocyclic Derivatives
Lauren Dunlap (College of Engineering) **Mary Hoult** (College of Engineering) **Nethra Vasudevan** (College of Engineering)		P4	13	Dr. Thomas LaBean (College of Engineering) Dr Nikolay Frick, (College of Engineering)	Electromagnetically Aligning Ni@Au Core-Shell Microparticles for Enhanced Efficiency of Electronic Connections
Ryan Eavenson College of Education		P2	17	Dr. Lingfeng He (College of Engineering)	Accelerating Qualification of New Materials for Molten Salt Reactors: an Experimental Design Approach
Susan Edelstein (College of Sciences)		P4	14	Dr. Arianna Soldati (College of Sciences)	Investigating the Irregularity of Rhyolitic Columnar Joint Formation via the Devil's Honeycomb
Rachel Edwards (College of Sciences)	**Willamina Ingle** (College of Sciences)	P5	13	Dr. Michael Sikes (College of Sciences) Ms. Lisa Metzger (College of Agriculture and Life Sciences)	Upstream Stimulatory Factor's Impact on Etoposide Resistance

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Adam Ehmke (College of Sciences)	**Sydney Gardner** (College of Sciences) **Alexander Parillo** (College of Sciences) **Vi Greene** (College of Sciences) **Francis Vial** (College of Sciences)	P3	11	Dr. Lisa Paciulli (College of Sciences) Dr. Adam Hartstone-Rose (College of Sciences)	Exploring Demodex Mites on Captive Lemurs
Kareem El Saleh (College of Sciences)		P1	18	Dr. Jane Hoppin (College of Sciences) Sarah Colley (College of Sciences)	Elevated PFAS Levels: Insights from the GenX Exposure Study
Ashlynn Eurey (College of Agriculture and Life Sciences)	**Dani Huston** (College of Agriculture and Life Sciences) **Alexandra Casiano Rivera** (College of Natural Resources) **Grace Kayler** (College of Sciences)	P3	12	Dr. Shweta Trivedi (College of Agriculture and Life Sciences) Dr. Marnie Metzler (College of Veterinary Medicine) Ms. Sarah Kinlaw (College of Veterinary Medicine) Ms. Sina Mahs, (College of Veterinary Medicine)	A Lab Animal Research Study- Can Old Dogs Learn New Tricks?
Jackson Evans (College of Agriculture and Life Sciences)		P1	19	Dr. Sanjay Shah (College of Agriculture and Life Sciences)	Retrofitting Tachometer and Bluetooth Display for Poultry House Exhaust Fan Efficiency Analysis
Rushi Faldu (College of Engineering)		P1	20	Dr. Xincheng Lin (College of Sciences)	Dimension Reduction in Protein Folding Analysis by Bayesian Inference Method

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Rachel Falkowski (Wilson College of Textiles)		P5	14	Dr. Tova Williams (Wilson College of Textiles) Michele Schmidt (Wilson College of Textiles)	Modifying Carminic Acid to Enhance its Hydrophobicity for Waterless Textile Dyeing
Brady Farlow (College of Agriculture and Life Sciences)		P4	15	Dr. Asher Hudson (College of Agriculture and Life Sciences) Dr. Peter Balint-Kurti (College of Agriculture and Life Sciences)	Maize Hybrid Heterotic Effects in flg22 Response via ROS and Gene Expression
Chloe Farrell (College of Natural Resources)	**Angela Hernandez Garcia** (College of Sciences) **Lauren Sims** (College of Sciences)	P2	18	Dr. Erin McKenney (College of Agriculture and Life Sciences)	Power in the Pollinators
Joshua Farrelly (College of Engineering)		P5	15	Dr. Jacqueline Cole (College of Engineering) Kyla Bosh (College of Engineering)	Brachial Plexus Birth Injury Effects on Biceps, Supraspinatus, and Subscapularis Spindle Morphology
Edward Ferreira (College of Engineering)		P3	13	Dr. Sajjad Bigham (College of Engineering)	Design of High Flux Solar Simulator

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Anna Fertin (College of Humanities and Social Sciences)	**Noora Moghazi** (College of Humanities and Social Sciences) **Dipali Shrivastava** (College of Humanities and Social Sciences)	P5	16	Dr. Daniel Gruehn (College of Humanities and Social Sciences) Caitlin Reynolds (College of Humanities and Social Sciences) Jen Fredette (College of Humanities and Social Sciences)	Critical Thinking in College: Credit Hours Matter
Jordyn Fishkin (College of Agriculture and Life Sciences)		P2	19	Dr. Michael B. Goshe (College of Agriculture and Life Sciences)	Developing a Spectroscopic Assay to Measure Disulfide Bond Changes During Protein Aggregation
Peyton Fitts (College of Sciences)		P3	14	Dr. Catherine Davis (College of Sciences)	Reanalyzing Shelled Zooplankton Samples to Test Effectiveness of Commonly Used Preservation Methods
Natalie Flack (College of Sciences)		P5	17	Dr. Kelly Meiklejohn (College of Veterinary Medicine) Teresa M Tiedge (College of Veterinary Medicine)	Probabilistic Genotyping Software Analysis using Mixed Canine STR Profiles
Sarah Fletcher (College of Sciences)		P4	16	Dr. John Meitzen (College of Sciences)	Identification of Mast Cells in the Female and Male Rat Nucleus Accumbens.
Garett Fox (College of Engineering)		P2	20	Dr. Lucie Guertault (College of Agriculture and Life Sciences) Dr. Celso Castro-Bolinaga (College of Agriculture and Life Sciences)	Upgrading the AutoJET Device to Automate Jet Erosion Tests

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Tatiana Frontera (College of Natural Resources)	**Graham Royal** (College of Sciences) **John Hendrix** (College of Agriculture and Life Sciences)	P2	21	Dr. Erin McKenney (College of Agriculture and Life Sciences)	Roots to Ruins: Navigating the Path of Deforestation
Casey Fry (College of Humanities and Social Sciences)		P1	21	Dr. Tate Paulette (College of Humanities and Social Sciences) Dr. Kathryn Grossman (College of Humanities and Social Sciences)	Roman Archaeology Lab
Lindsey Frye (College of Agriculture and Life Sciences)		P3	15	Dr. Andrew Weaver (College of Agriculture and Life Sciences)	Veterinary Internship at a Spay and Neuter Nonprofit
Olivia Fulcher (College of Natural Resources)	**Lauren Conway** (College of Natural Resources) & (College of Sciences) **Alyssa Paull** (College of Natural Resources) **Bryce Carleton** (College of Natural Resources)	P4	17	Dr. Elizabeth Guthrie Nichols (College of Natural Resources)	Is PFAS Present in Rocky Branch Creek Near Lee Residence Hall?
Mataeus Funderburk (College of Sciences)		P3	16	Dr. Seema Sheth (College of Agriculture and Life Sciences) Dr. William Morris (Duke University) Dr. Natalie Kerr (Duke University) Aeran Coughlin (Duke University)	Salinity Tolerance of Dionaea muscipula in the Context of Saltwater Intrusion

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Shiva Gadireddy (College of Engineering)		P2	22	Dr. Tiffany Barnes (College of Engineering) Ms. Heidi Reichert (College of Engineering) Benyamin Tabarsi (College of Engineering)	Integrating LLMs into Computing Education: a Systematic Literature Review
Mary Gallaher (College of Engineering)		P3	17	Dr. Jason Forman (University of Virginia) Corina Espelien (University of Virginia) Ruyun Jin (University of Virginia)	Seat Belt Counseling Prevalence from National Survey Data 2009-2015
Mikael Gallego (College of Sciences)		O1	3210-1	Dr. William Ditto (College of Sciences) Dr. John Lindner (College of Sciences)	Disorder Taming Chaos in Coupled Pendulum Arrays
Meredythe Galliher (College of Humanities and Social Sciences)		P3	18	Dr. Sarah Ascienzo (College of Humanities and Social Sciences)	Black Women's Mental Health Study: Sis, are You OK?
Carter Gamble (College of Engineering)		P5	18	Dr. Jacqueline Cole (College of Engineering)	Validation of Flow Parameters in a Bone-Vascular Microdevice.
Karla Garcia (College of Sciences)		P5	19	Dr. Richard Venditti (College of Natural Resources) Autumn Reynolds (College of Natural Resources)	Fractionation of OCC as a Pretreatment to Oxygen Delignification
Kevin Garcia-Diaz (College of Natural Resources)		P5	20	Dr. Richard Venditti (College of Natural Resources)	Biodegradation and Composting Assessment of Biobased Materials

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Natalie Garrett (College of Natural Resources)	**Gianna Colonna** (College of Sciences)	P2	23	Dr. Erin McKenney (College of Agriculture and Life Sciences)	Urban Sprawl
Sophia Gay (College of Agriculture and Life Sciences)		P5	21	Dr. Justin Whitehill (College of Natural Resources) Angela Chiang (College of Natural Resources)	Assessing Conifer Seed Viability and Gene Isolation for Autoluminescent Christmas Tree Development
Embla Georgesdottir (College of Natural Resources)	**Dana Sanderson** (College of Natural Resources) **Adam Ernest** (College of Natural Resources) **Jack Wagner** (College of Natural Resources)	P4	19	Dr. Elizabeth Guthrie Nichols (College of Natural Resources)	PFAS Quantification in Rocky Branch Creek between Gorman Street and Varsity Drive.
Justin Gilleland (College of Agriculture and Life Sciences)		P5	22	Dr. Deepti Salvi (College of Agriculture and Life Sciences) Urvi Shah (College of Agriculture and Life Science)	Microbial Inactivation by Atmospheric Pressure Plasma and Quality Effects on Shell Eggs
Jeff Gillette (College of Agriculture and Life Sciences)	**Joseph Harrington** (College of Agriculture and Life Sciences) **Sam Broadwell** (College of Agriculture and Life Sciences) **Olivia Gordon** (College of Agriculture and Life Sciences) **Chloe Wilder** (College of Agriculture and Life Sciences)	P2	24	Armindo Gaspar (Novonesis) Dr. Fernanda Santos (College of Life Sciences)	Malting With Enzyme Assisted Brewing

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Luke Gladden (College of Natural Resources)		P1	22	Dr. Angela Allen (College of Natural Resources)	Observation of Trash Impact on Local Waterways Through Experimental Data
Chloe Glynn (College of Sciences)	**Rachel Culbertson** (College of Sciences)	P3	19	Dr. Lisa Paciulli (College of Sciences) Jeni Smithson (College of Sciences) Jade McLain (College of Sciences) David Watts (Federal Law Enforcement Training Centers)	Captive Aye-aye (Daubentonia madagascariensis) Mother Vocalizations After Giving Birth
Drake Gomez (College of Humanities and Social Sciences)		P1	23	Dr. Maura Nsonwu (College of Humanities and Social Sciences)	No Crying in Sports: The Playbook of Athlete Trafficking
Valeria Gonzalez Perez (College of Sciences)		P3	20	Dr. Roland Kays (College of Natural Resources)	The Aggressive Coyote, Examining Coyote Aggressive Behavior Towards Humans and Pets
Reshma Goud (College of Agriculture and Life Sciences)		P3	21	Dr. Trino Ascencio-Ibáñez (College of Agriculture and Life Sciences)	Completing the Puzzle: Genome Sequencing of Tomato Lanai
Laura Graham (College of Natural Resources)	**Kayla Ruff** (College of Natural Resources)	P4	20	Dr. Lara (College of Natural Resources)	Assessment of Native and Introduced Species on Rocky Branch Greenway

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Alex Graham (College of Engineering)	**Jacob Mast** (College of Engineering) **Aaliyah Zuniga** (College of Engineering)	P4	21	Dr. Maria Avramova (College of Engineering) Dr. Kostadin Ivanov (College of Engineering) Baxter Durham (Westinghouse Electric Company) Blaine Taylor (Westinghouse Electric Company)	Thermal Power Uprate Fuel Management Studies for a Westinghouse 4-Loop PWR
Dylan Gretok (College of Engineering)		O1	3221-1	Dr. Jay Cheng (College of Engineering)	Direct Transesterification of Ethanol Impregnated Microalgae Under Microwave Mediated Supercritical CO2 Conditions
Lucy Grindstaff (College of Engineering)		P2	25	Dr. Andrew Lee (College of Engineering)	Collecting Strain Data from Composite Tape Springs
Allison Guild (College of Humanities and Social Sciences)		P3	22	Dr. Ian Hughes (College of Humanities and Social Sciences)	How Employee Contact with Nature during the Workday Influences Work Outcomes
Sarah Gullion (Wilson College of Textiles)	**Youssef Kozman** (Wilson College of Textiles)	P3	23	Dr. Xiaomeng Fang (Wilson College of Textiles) Robert Seevers (Wilson College of Textiles)	Development of a Biomimetic Soft Robotic Tongue Actuated by Fiber-shaped Pneumatic Muscles
Emma Hailey (College of Agriculture and Life Sciences)	**Sydney Minch** (College of Agriculture and Life Sciences) **Moriah Williams** (College of Agriculture and Life Sciences)	P3	24	Dr. Suzanne Leonard (College of Agriculture and Life Sciences)	Exploratory Analysis of Feeding and Drinking Behavior in Relation to Weight Gain for Newly Weaned Pigs

Lead Presenter	Co-Presenter(s)	Session	Room/ Poster	Mentor(s)	Project Title
Emma Hailey (College of Agriculture and Life Sciences)	**Sophia Jodka** (College of Sciences) **Madison Manzo** (College of Agriculture and Life Sciences) Diana Dabdub	P3	25	Dr. Shweta Trivedi (College of Agriculture and Life Sciences)	Identifying Prevalent Myths regarding Veterinary Admissions among Pre-Veterinary Track Students
Suzannah Hale (College of Agriculture and Life Sciences)		P5	23	Helena Jolly (College of Agriculture and Life Sciences) Zachary Everson (College of Agriculture and Life Sciences)	Mealybug Crawler Emergence Following Imidacloprid Application
Omia Haroon (College of Humanities and Social Sciences)		P1	24	Dr. Jennifer Carroll (College of Humanities and Social Sciences)	Structures, Stress, and Success: Primary Care Practitioners' Perceptions of Obesity
Garrett Harris (College of Agriculture and Life Sciences)		P1	25	Dr. Driss Elhanafi (College of Engineering)	Establishment of Yeast Surface Display System for the Identification of Oversecreting Mutants
Allison Haynes (College of Agriculture and Life Sciences)		P1	26	Dr. Colleen Doherty (College of Agriculture and Life Sciences) Dr. Kanjana Laosuntisuk (College of Agriculture and Life Sciences)	Physiological Responses to Rare Earth Elements in Pokeweed
Isabella Heckman (College of Sciences)	**Diya Patel** (College of Sciences)	P4	22	Dr. Jonathan Olson (College of Sciences) Bella Condo (College of Sciences)	Helicobacter pylori VacA toxin may be the Cause of Gastric Cancer

Lead Presenter	Co-Presenter(s)	Session	Room/ Poster	Mentor(s)	Project Title
Sarah Helderman (College of Humanities and Social Sciences)	**Caroline Hilliard** (College of Humanities and Social Sciences)	P1	27	Dr. Laura Widman (College of Humanities and Social Sciences)	Using Facebook to Recruit and Facilitate Parent Advisory Groups: Lessons Learned
Maeve Hennessy (College of Humanities and Social Sciences)		P4	23	Dr. Haddy Njie (College of Humanities and Social Sciences)	Gambian Girl Power - An Intervention for Girls' Education and Empowerment
Ransom Hill (College of Sciences)		P2	26	Dr. Yi Xiao (College of Sciences)	Screening of Organic Dyes for use in Colorimetric Point-of-Care Aptamer Based Sensors
Breyton Hill (College of Agriculture and Life Sciences)		P4	24	Dr. Anna Stepanova (College of Agriculture and Life Sciences) Katie Vollen (College of Agriculture and Life Sciences)	Developing a CRISPR/Cas12a Mediated Gene Targeting protocol in Arabidopsis
Veronica Hill (College of Agriculture and Life Sciences)		P4	25	Dr. Tom Makris (College of Agriculture and Life Sciences) Hannah Gering (College of Agriculture and Life Sciences)	An Investigation into the Mechanism of the Cytochrome P450, CYP121
Jason Hoffman (College of Engineering)		P5	24	Dr. Kenneth Granlund (College of Engineering)	On-axis comparison of Conventional Beamforming for Phased Microphone Arrays
Alsey Hopkins (College of Humanities and Social Sciences)		O2	3221-2	Dr. Holly Hurlburt (College of Humanities and Social Sciences)	Napoleon the Machiavellian

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Lilyanna Hopkins (College of Sciences)		P1	28	Dr. Shobhan Gaddmeedhi (College of Sciences) Dr. Siyuan Su (College of Sciences)	Circadian Clock Disruption, Climate Change and Arsenic on Cardiovascular Toxicity
Ainsley Horton (College of Agriculture and Life Sciences)		P1	29	Dr. Colleen Doherty (College of Agriculture and Life Sciences) Blake Horton College of Agriculture and Life Sciences)	Cold Promoter Cloning: Cloning, incorporating, and validating the E2 construct
Cole Howard (College of Engineering)	**Joshua Yagozinski** (College of Engineering)	P4	26	Dr. Jason Hou (College of Engineering)	Combined Lattice Physics Fuel Management Optimization for Boiling Water Reactors
Chris Howard (College of Sciences)		P5	25	Dr. Caroline Proulx (College of Sciences) Molly Carter (College of Sciences)	Formation of N1, N2-Dialkylated Azapeptide Atropisomers via Sequential Alkylations of Azapeptides
Brian Hua (College of Engineering)		P5	26	Dr. Jacqueline Cole (College of Engineering) Kyla Bosh (College of Engineering)	Alterations to Shoulder Muscles following Brachial Plexus Birth Injury
Ben Hutchins (College of Natural Resources)	**Chase Bond** (Exploratory Studies)	P2	27	Dr. Erin McKenney (College of Agriculture and Life Sciences)	Water Pollution
Sarah Isenhour (College of Humanities and Social Sciences)		P1	30	Dr. Michaela DeSoucey (College of Humanities and Social Sciences)	“Dear Tripadvisor Member”: Analyzing Tripadvisor reviews of UNESCO Sites of Conscience

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Sarah Isenhour (College of Humanities and Social Sciences)	**Colin Mayhorn** (College of Humanities and Social Sciences) **Caroline Wilbourne** (College of Humanities and Social Sciences) **Devon Oepen** (College of Humanities and Social Sciences)	P5	27	Dr. Anna Maria Behler (College of Humanities and Social Sciences)	Cognitive Effort and Attitudes About Artificial Intelligence (AI)
Alexandra Istishin (College of Sciences)		P4	27	Dr. Xinxia Peng (College of Veterinary Medicine) Kristen John (College of Sciences)	Development of Human Long Noncoding RNA Knockdown Cell Lines using CRISPRi
Yume Iwakura (College of Sciences)		P4	28	Dr. Jun Ohata (College of Sciences) Seiya Ishizawa (College of Sciences)	Serine-Selective Labeling for Antibody Drug Conjugate Applications
Saurav Jain (College of Engineering)		P1	31	Dr. Gregory Mckenna (College of Engineering) Dr. Kyle Camarda (University of Kansas)	Simulation of a Chemical Plant to Produce H2O2 using ASPEN Plus
Nithya Janapati (College of Engineering)		P3	26	Dr. Bita Akram (College of Engineering)	Integrating AI Core Concepts with K-12 STEM Education
Morgan Jeter (College of Agriculture and Life Sciences)		O3	3210-2	Dr. Breanna Sheahan (College of Veterinary Medicine) Dr. Lilly Haywood, (College of Veterinary Medicine)	Comparing PER1 and SLC5A7 expression in Rectal Tissue from Horses with Colitis and Healthy Horses

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Hannah Jewett College of Sciences) & (College of Agriculture and Life Sciences) **Giannah Dowen** (College of Sciences) & (College of Agriculture and Life Sciences)		P3	27	Dr. Michael Goshe (College of Agriculture and Life Sciences)	Exploring the Progression and Prevention of Alzheimer's Disease: Amyloid-β & Tau Protein Aggregation
Alexa Jimenez (College of Engineering)		P3	28	Dr. Hayley Flores (College of Engineering)	Optimized Cryopreservation Process for E. coli Cell Bank Generation
Sydney Johnson (College of Agriculture and Life Sciences)		P3	29	Dr. Suzanne Goodell (College of Agriculture and Life Sciences) Aygul Akhmadullina (College of Agriculture and Life Sciences)	The Rollercoaster of Conflict in a Caregivers of Autistic Children Facebook Group
Alex Johnson (College of Sciences)		P4	29	Dr. Kasey Wagoner (College of Sciences)	Effects of Various Forces, Environment, and Launch Angles on Batted Baseball Trajectories
Kelis Johnson (College of Humanities and Social Sciences)		P4	30	Dr. Ami Zota (Columbia University) Dr. Lariah Edwards (Columbia University)	Unveiling Social Health Factors in Natural Hair Care for Women of Color
Kanak Joshi (College of Engineering)		P4	31	Dr. Hangjie Ji (College of Sciences)	Diffusion Probabilistic Models for Droplet Coalescence

Lead Presenter	Co-Presenter(s)	Session	Room/ Poster	Mentor(s)	Project Title
Emily Joyner (College of Sciences)		P4	32	Dr. Jun Ohata (College of Sciences)	Structure-Reactivity Relationship Study for Tryptophan Modification in Hexafluoroisopropanol
Alina Jugan (College of Engineering)	**Caden Sekelsky** (College of Engineering) **Jake Mikouchi-Lopez** (College of Engineering)	P4	33	Dr. Maria Avramova (College of Engineering) Dr. Kostadin Ivanov (College of Engineering)	Analysis of Thermal Uprates for a 2-Loop Pressurized Water Reactor
Veronika Juylova (College of Sciences)	**Benjamin Hanestad** (College of Sciences)	P3	30	Dr. Jim Kneller (College of Sciences)	Galactic Supernova Neutrino Burst Signals with PUSH and SNEWPY
Karen Kaiser (College of Sciences)		P1	64	Dr. Jennifer Baltzegar (College of Sciences)	Comparing Different DNA Preservation Methods
Gouri A. Kallambella (College of Sciences)		P5	29	Dr. Kelly Lynn Mulvey (College of Humanities and Social Sciences)	Children's Peer Conflicts: A Participatory Science Observational Study
Arushee Kamra (College of Engineering)		P1	32	Dr. Amanda Ziegler (College of Veterinary Medicine) Halle J. Lutz (College of Veterinary Medicine) Madison Caldwell (College of Veterinary Medicine) Dr. Ashley C. Brown (College of Engineering)	Determining the Efficacy of IPEC-J2-Derived Exosomes on Intestinal Epithelial Wound Healing

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Arushee Kamra (College of Engineering)		P5	30	Dr. Ashley C. Brown (College of Engineering) Halle J. Lutz (College of Veterinary Medicine)	In Vivo Efficacy of Fibrin-Specific Nanogels in a Rat Model of Sepsis-Induced DIC
Maria Kanton (College of Agriculture and Life Sciences)		P2	28	Dr. Shaomin Tian (UNC-CH) Dr. Jillian Perry (UNC-CH)	In Situ Detection of Virus-Specific Immunity in the Skin Using 3D-Printed Microneedle Patches
Vennela Katta (College of Agriculture and Life Sciences)		P4	34	Dr.Robert Rose (College of Agriculture and Life Sciences)	Mutating OGC to increase carbon fixation and reduce atmospheric CO2
Sanjana Kedla (College of Humanities and Social Sciences)		P3	31	Dr. Christopher Mayhorn (College of Humanities and Social Sciences) Douglas Jonidis (College of Humanities and Social Sciences)	Exploring the Psychological Implications of Prolonged Generative AI Reliance for Emotional Support
Alianna Kendall-Brooks (College of Humanities and Social Sciences)		P4	35	Dr. Mark Nance (College of Humanities and Social Sciences)	Global De-risking in the Pacific Islands
Devon Kennedy (College of Engineering)	**John Fortich** (College of Engineering) **Paarth Patel** (College of Engineering) **Nitesh Kanamarlapudi** (College of Engineering)	P1	33	Dr. Tiffany Barnes (College of Engineering) Yasitha Nisansala (College of Engineering)	Co-op vs. Solo Play in Block-based Educational Programming Games: A Comparative Analysis

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Yearim Kim (College of Sciences)		P5	31	Dr. Mike Sano (College of Engineering) Robert Williamson (College of Engineering)	Reversible Electroporation in the Treatment of Cancer Cells In Vitro and In Vivo
Annabelle Kim (College of Sciences) & (College of Veterinary Medicine)		P5	32	Dr. Mike Sano (College of Veterinary Medicine)	Effects of Electroporation Phenomena with 3D cell cultures
Josephine Kinsey (College of Natural Resources)		P4	36	Dr. Elizabeth Nichols (College of Natural Resources)	How NCSU Can Improve Lab Safety for Students and Staff
Catherine Kirch (College of Natural Resources)	**Bella McInnes** (College of Natural Resources)	P4	37	Dr. Daniel Saloni (College of Natural Resources)	Utilizing the Extrusion Process to Create Recycled 3D Printer Filament.
Hannah Kirk (Wilson College of Textiles)		P4	38	Dr. Bryan Ormond (Wilson College of Textiles) Dr. Arash Kasebi (Wilson College of Textiles)	Impact of Residual Surfactants on Flammability Characteristics of Firefighter Outer Shell Fabrics
Ben Kirschner (College of Agriculture and Life Sciences)		P3	32	Dr. Sujan Dawadi (College of Agriculture and Life Sciences) Dr. Steve Frank (College of Agriculture and Life Sciences)	Tree Canopy Influence on Arthropod Predators in Understory Turf Landscapes
Lauren Kohler (College of Engineering)	**Nolan Ritchie** (College of Engineering) **Noah Etter** (College of Engineering)	P2	29	Dr. Mihai Diaconeasa (College of Engineering)	Systems Analysis of Probabilistic Risk Assessment on NCSU Research Nuclear Reactor PULSTAR

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Anuja Koirala (College of Sciences)		P4	39	Dr. Jun Ohata (College of Sciences) Seiya Ishizawa (College of Sciences)	Peptide Modification in Acidic, Biomolecule-Compatible Media
Steven Krahe (College of Humanities and Social Sciences)		P3	33	Dr. Sarah Ascienzo (College of Humanities and Social Sciences)	How Far has Personality Science Come? Personality's Statistical Relationship with Job Performance
Jason Kreger (College of Agriculture and Life Sciences)		P1	34	Dr. Tara Clarke (College of Humanities and Social Sciences)	Female Dominance or Power? An Examination of Intersexual Dyadic Interactions in Ring-tailed Lemurs (Lemur catta) Applying the Power Framework
Francesca Kyanda (College of Humanities and Social Sciences)		O4	3221-1	Dr. Kate Norwalk (College of Humanities and Social Sciences)	Hacking The System: Insights into Middle School Social Dynamics Management
Brooke La Fuente (College of Natural Resources)		P3	34	Dr. Megan Lupek (College of Natural Resources)	Environmental Science Classes: A Solution for Eco-Anxiety or are we all Doomed?
Reilly LaRoche (Poole College of Management)	**Keaton Lamb** (College of Humanities and Social Sciences) **Kayla Stewart** (College of Humanities and Social Sciences) **Allison Guild** (College of Humanities and Social Sciences)	P1	35	Ian Hughes (College of Humanities and Social Sciences)	Morning Quality Time with Pets: Effects During and After Work
Owen LaVenture (College of Natural Resources)	**Nicolás Galvez** (College of Agriculture and Life Sciences)	P2	30	Dr. Erin McKenney (College of Agriculture and Life Sciences)	Energy Grid Ideas for a Changing Future

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Peter Lawing (College of Sciences)		O4	3210-2	Dr. Jonathan Lindsey (College of Sciences) Dr. Yi Xiao (College of Sciences)	Use of Aptamer Targeting Agents for Radiopharmaceutical Treatment of Colon Cancer
Anna Lawrence (College of Engineering)		P1	36	Dr. Fanxing Li (College of Engineering) Hilal Bektas (College of Engineering)	High-Throughput Study of Perovskite Oxides for Chemical Looping Air Separation
Robbie Leske (College of Sciences)		P5	33	Dr. Daniel Dougherty (College of Sciences)	Structure and Optical Properties of CrCl3 Thin Films
Joseph Lewis (College of Sciences)		P5	34	Dr. Seth Kullman (College of Sciences) Morgan Barnes (College of Sciences)	Increased Endocannabinoid Tone Modulates Zebrafish Adiposity and Development
Julia Linville (College of Sciences)		P3	35	Dr. Chistopher Gorman (College of Sciences) Juliana O'Brien, (College of Sciences)	Optimization of PAMAM Dendrimer Amino Acid Hybrid Molecule Synthesis
Jude Lomax (Poole College of Management)	**Muhser Thayousoe** (Poole College of Management)	P2	31	Dr. Joseph Brazel (Poole College of Management) Dr. Carly Burd (Poole College of Management)	Quality Control in Accounting Research
Wil Mabe (College of Sciences)		P4	40	Dr. Ryan Paerl (College of Sciences)	Comparative Analysis of Marine Bacteria to B1 and its Vitamers
Allen MacMillan (College of Sciences)		P5	35	Dr. Vincent Lindsay (College of Sciences) Joanna Muir (College of Sciences)	Synthesis of Spiro[2.3]hexan-4-ones using Diphenylcyclopropyl Sulfonium Salts and 1-sulfonylcyclopropanols as Cyclopropanone Equivalents

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Jess Maier (College of Natural Resources)		P2	32	Dr. Jodi Forrester (College of Natural Resources) Morgan Arteman (College of Natural Resources)	Canopy Gaps Provide Structural Diversity and Promote Early Successional Vegetation
Joseph Majual (College of Sciences)		P2	33	Dr. Javier Lopez (College of Veterinary Medicine)	The Presence and Role of Cadps in Peptidergic Nociceptors Innervating Mice Skin
Jadyn Mann (College of Humanities and Social Sciences)		P2	34	Dr. Tate Paulette (College of Humanities and Social Sciences)	The Transformation of the Roman Archaeology Lab
Mary Pinyan (College of Natural Resources)		O3	3221-1	Dr. Cassio Ussi-Monti (College of Natural Resources) Dr. Joeseph Roise (College of Natural Resources)	Evaluating the Accuracy of Longleaf Pine Growth and Yield Models in NC
Kennedy Martin-Jones (College of Humanities and Social Sciences)	**Nico Oriani** (Humanities and Social Sciences) **Tayler Cox** (Humanities and Social Sciences) **Ava Weddle** (Humanities and Social Sciences)	P5	36	Dr. Anna Maria Behler (College of Humanities and Social Sciences)	Aggression in Animated Children's Media
Alejandra Martinez (College of Agriculture and Life Sciences)		P2	35	Dr. Luke Gatiboni (College of Agriculture and Life Sciences) Mr. Dionata Filipi (College of Agriculture and Life Sciences)	Critical Soil Test Value of Phosphorus for Corn in North Carolina

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Khing Masaya-anon (College of Agriculture and Life Sciences)		O2	3210-2	Dr. Praveen Kolar (College of Agriculture and Life Sciences)	Pine-Bark Biochar Anode for Wastewater Treatment and Electricity in Microbial Fuel Cell
Benjamin Massey (College of Natural Resources)	**Mary Claire Wise** (College of Natural Resources) **Carter Macklin** (College of Natural Resources) **Christopher Myers** (College of Natural Resources)	P4	41	Dr. Elizabeth Nichols (College of Natural Resources)	Determining PFAS in Surface Water on NCSU's Centennial Campus
Nicolas Mastrovito (College of Agriculture and Life Sciences)		P3	36	Dr. Trino Ascencio-Ibáñez (College of Agriculture and Life Sciences)	Systemic or Cell Autonomous? ARR7 Downregulation by Geminivirus Infection in Arabidopsis
Karlyn Matheson (College of Agriculture and Life Sciences)		P3	37	Dr. Natalie Cooke (College of Agriculture and Life Sciences) Christina Chapman (College of Agriculture and Life Sciences) Dr. Suzie Goodell (College of Agriculture and Life Sciences)	Evaluating Nutrition Undergraduate Students' Career Readiness Using a Course-Development Learning Project
Nish Mathur (College of Sciences)		P1	37	Dr. Casey M. Theriot (College of Veterinary Medicine) Samantha Kisthardt (College of Agriculture and Life Sciences)	Primary and Secondary Bile Acids Affect C. difficile and Commensal Clostridia Differently.

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Robert McCann (College of Agriculture and Life Sciences)		P1	38	Dr. Ryan Sartor (College of Agriculture and Life Sciences)	Lemna gibba Spectral Fingerprinting
Kania McClees (College of Humanities and Social Sciences)		P2	36	Dr. Issac Woods (College of Humanities and Social Sciences)	HipHop and the Effects on School-based Intervention
Ruth McGee (College of Agriculture and Life Sciences)		P3	38	Dr. Wei-Chen Chang (College of Sciences)	Testing the Unusual Multi-step Reaction of AsqJ and Homologous Enzymes
Millie McInnes (College of Natural Resources)	**Caroline Ruppel** (College of Natural Resources) **James Gartin** (College of Natural Resources) **Shelton Bocook** (College of Natural Resources)	P4	42	Dr. Elizabeth Guthrie Nichols (College of Natural Resources)	PFAS Analysis of Surface Waters on Centennial Campus near the College of Textiles
Georgia McKay (College of Humanities and Social Sciences)		P3	39	Dr. Sarah Ascienzo (College of Humanities and Social Sciences)	Secondary Traumatic Stress and Self Compassion in Mental Health Workers
Grace McNair (College of Sciences)		P2	37	Dr. Leslie A. Sombers (College of Sciences) Kalynn M. Turner (College of Sciences) Jenna M. Berger (College of Sciences)	Evolving the Electrode: Long-term, Real-time, Co-detection of Dopamine and Glucose

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Paige Meisner (College of Agriculture and Life Sciences)		P3	40	Dr. Lin Xi (College of Agriculture and Life Sciences) Dr. Feng Wang (College of Agriculture and Life Sciences)	Modifying Acetyl-CoA Carboxylase and Malonyl-CoA Decarboxylase Protein Expression Alters Fatty Acid Oxidation
Tia Meredith (College of Agriculture and Life Sciences)	**Rahaf Elaklouk** (College of Agriculture and Life Sciences) **Charis Harcum** (College of Agriculture and Life Sciences) **George Tyler** (College of Agriculture and Life Sciences)	P3	41	Ms. Megan Watson (College of Agriculture and Life Sciences) Dr. Fernanda Santos (College of Agriculture and Life Sciences) Dr. MaryAnne Drake (College of Agriculture and Life Sciences) Carl Hollifield (College of Agriculture and Life Sciences)	Children's Perception of Milk and the Different Heat Treatments of Milk in the School Lunch Program
Brandon Middlebrough (College of Sciences)		P3	42	Dr. Maricar Aguilos (College of Natural Resources) Dr. John King (College of Natural Resources)	Wetlands are Shifting Inevitably: What are the Drivers of this Ecological Shift?
Cary Miller (College of Agriculture and Life Sciences)		P1	39	Dr. Jody Gookin (College of Veterinary Medicine) Jennifer Holmes (College of Veterinary Medicine)	Validating the Analytical Sensitivity of PCR for Diagnosis of Feline T.foetus Infection
Abby Moreland-Holsomback (College of Agriculture and Life Sciences)		P2	38	Dr. Jicai Jiang (College of Agriculture and Life Sciences) NC	Chromosomal Analysis of Genetic Correlation and Multivariate Regional Heritability Mapping in Swine Performance Traits

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Emma Morgan (College of Sciences)		P1	40	Dr. Robert Smart (College of Sciences) John Witherspoon (College of Sciences)	Genetic Susceptibility to Multistage Chemical Carcinogenesis in C57BL/6 Substrains
Joslene Morgan (College of Agriculture and Life Sciences)		P2	39	Dr. Melanie Simpson (College of Agriculture and Life Sciences) Emily Allego (College of Agriculture and Life Sciences)	Investigation of UDP-Glucose Dehydrogenase Protein Interactions in Prostate Cancer
William Morris (College of Sciences)		P3	43	Dr. Brian Space (College of Sciences) Matthew Mostrom (College of Sciences)	Demonstrating the Relevance of Many-Body VDW Effects in Molecular Simulation
Rachel Morris (College of Engineering)		P3	44	Dr. Matthew Fisher (College of Engineering) Margaret Easson (College of Engineering)	Biochemical and Histological Evaluation of Meniscus Following ACL Injury in Porcine Models
Seth Morton (College of Humanities and Social Sciences)		P5	37	Dr. Steven Greene (College of Humanities and Social Sciences)	Criminal Justice Policy Responses Toward the Opioid Epidemic
Aditi Mudireddy (College of Agriculture and Life Sciences)		P4	43	Dr. Thomas M Makris (College of Agriculture and Life Sciences) Sydney S. Skirboll (College of Agriculture and Life Sciences) Han N. Phan (College of Agriculture and Life Sciences)	Structure and Regulation of the Diiron N-oxygenase HrmI

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Siri Mudunuri (College of Engineering)		P4	44	Dr. Alexey Gulyuk (College of Engineering) Dr. Yaroslava Yingling (College of Engineering)	Machine Learning Assisted Detection and Analysis of Plant Cellulose Synthase Proteins
Xue Mullane (College of Humanities and Social Sciences)	**Lauren Richards** (College of Humanities and Social Sciences)	P1	41	Dr. Laura Widman (College of Humanities and Social Sciences) Jordyn McCrimmon (College of Humanities and Social Sciences)	Sexual Consent Self-Efficacy among Youth who Identify as LGBTQ+
Ashley Mullen (College of Agriculture and Life Sciences)		P5	38	Dr. Arion Kennedy (College of Agriculture and Life Sciences)	Impact of Fructose Metabolism on Phospholipids in Immortalized Kupffer Cells
Satya Munugoti (College of Humanities and Social Sciences)		P2	40	Dr. Laura Widman (College of Humanities and Social Sciences) Dr. Jim Yocom (College of Humanities and Social Sciences)	Gender Differences in Parental Communication on Adolescent Sexual Health
Alex Murillo (College of Engineering)	**Aidan Flanagan** (College of Engineering) **Bryce Davis** (College of Engineering)	P2	41	Dr. John Zino (College of Engineering) Patrick Walther (GE Hitachi) Dr. Dale McCants, (GE Hitachi) Dr. David Holler (College of Engineering)	Enhancing Heat Transfer Using Natural Circulation Cooling
Avery Murray (College of Engineering)		P4	45	Mr. Zhenyuan Yu (College of Engineering) Dr. Helen (He) Huang (College of Engineering)	Hip Angle-Step Width Connection for Enhancing Lower Limb Rehabilitation Systems

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Emma Myer-Medina (Wilson College of Textiles)		P2	42	Dr. Thomas Schroeder (Wilson College of Textiles)	Development of Highly Entangled Hydrogel Yarns via Photopolymerization
Emma Myer-Medina (University College)	**Abhinav Thakur** (Green Level High School)	P4	46	Rose Krebs (University College) Mr. Brian Mathis (University College)	Ten Years of Feed the Pack's Impact on Alleviating Food Insecurity
Alexandra Neale (College of Agriculture and Life Sciences)	**Maggie Anthony** (College of Agriculture and Life Sciences) **Jordan Holcomb** (College of Agriculture and Life Sciences)	P3	45	Dr. Fernanda Santos (College of Agriculture and Life Sciences) Rebekah Brown (College of Agriculture and Life Sciences)	Preliminary Assessment of Heavy Metals in Market-Facing Sweetpotato Products
Paige Neiman (College of Natural Resources)		P4	47	Dr. Kimberly Bush (College of Natural Resources) Ashley Correa (College of Natural Resources)	Women In Sport Leadership Summit: Addressing Barriers in the Women's Sport Industry
Daniel Nevius (College of Engineering)	**Devin Bradshaw** (College of Engineering) **Robbie Leary** (College of Engineering)	O1	3221-2	Dr. Scott Palmtag (College of Engineering) Steven Mirsky (NuScale Power)	Development of NuScale Power Fission Product Removal System Shielding Design for Microreactors
Donovan Ngum (College of Engineering)	**Nazar Rush** (College of Engineering)	P5	39	Dr. James Braun (College of Engineering)	Development and Testing of a High-Throughput 90% Hydrogen Peroxide Catalyst Bed
Munish Nidadavolu (College of Engineering)		P2	43	Dr. Santosh Mishra (College of Veterinary Medicine) Dr. Josh Wheeler (College of Veterinary Medicine)	Characterization and Identification of Periostin in Normal and Eczematous Skin

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Jake Norton (College of Sciences)		O3	3210-3	Dr. Adrian Smith (College of Sciences)	Larval Locomotory Behavior of the Cat Flea (Ctenocephalides felis)
Annabelle Nunnally (College of Sciences)		P5	40	Dr. Antonio Planchart (College of Sciences) Laura Montes (College of Sciences)	Effect of TDP-43 Knockouts on Gene Expression and Motor Function in Zebrafish
Odeh, Juman (College of Sciences)		P1	42	Dr. Christa Baker (College of Sciences) Emma Droste (College of Sciences)	Finding the Sweet Spot: How Different Variables Affect Male Drosophila's Courtship Behavior
Rebecca Olson (College of Sciences)		O1	3210-2	Dr. Lisa Paciulli (College of Sciences)	Maternal Aye-aye (Daubentonia madagascariensis) Anxiety Peripartum
Salma Osman (College of Sciences)		P3	46	Dr. Trino Ascencio-Ibáñez (College of Agriculture and Life Sciences)	Exploring Small Molecule Inhibition: A strategy for Enhancing Resistance Against Viral Infection
Josh Ott (College of Sciences)		P1	43	Dr. Vladimir Skokov (College of Sciences) Dr. Thomas Schäfer (College of Sciences) Dr. Chandrodoy Chattopadhyay (College of Sciences)	Nonequilibrium Dynamics of Model H
Justin Overman (College of Engineering)		P3	47	Dr. Alexander Bataller (College of Engineering)	Measuring Thermal Conductivity of Liquid Metal Utilizing Fiber Optic FDTR

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Lily Palmer (College of Humanities and Social Sciences)	**Rachel Bellamy** (College of Humanities and Social Sciences) **Mariam Sanjak** (College of Humanities and Social Sciences) **Brooke Wilson** (College of Humanities and Social Sciences) **Christopher Kha** (College of Humanities and Social Sciences)	P5	41	Dr. Kelly Lynn Mulvey (College of Humanities and Social Sciences) Christina Marlow (College of Humanities and Social Sciences)	Investigating Children's Reasoning About Rule-Breaker's Emotions
Fedora Parra (College of Sciences)		P2	44	Dr. Katherine D'Amico-Willman (College of Agriculture and Life Sciences)	Assessing XapΦ1 Bacteriophage Viability Under Different Storage Conditions
Anant Patel (College of Engineering)		O4	3221-2	Dr. Samira Mirbagher Ajorpaz (College of Engineering)	Using Large Language Models to Learn and Improve from Microarchitecture Design and Attacks
Astha Patel (College of Agriculture and Life Sciences)		P2	45	Dr. Melanie Simpson (College of Agriculture and Life Sciences) Linlin (Lily) Ma (College of Agriculture and Life Sciences)	Validation of UGDH Phosphorylation by ERK2 in Prostate Tumor Cells
Kripa Patel (College of Sciences)	**Ava Smith** (College of Sciences) **Matthew Clayton** (College of Sciences) **Maya Moll** (College of Agriculture and Life Sciences)	P2	46	Bradley Scholten (College of Sciences)	Assessing Livestock Farms as Sources for Antibiotic Resistant Bacteria in Songbirds

Lead Presenter	Co-Presenter(s)	Session	Room/ Poster	Mentor(s)	Project Title
Claire Patrick (College of Agriculture and Life Sciences)		P5	42	Dr. Jean Ristaino (College of Agriculture and Life Sciences) Amanda Mainello-Land (College of Agriculture and Life Sciences)	Recent Migration Pattern Analysis of Phytophthora ramorum in Ireland
Emma Payne (College of Sciences)		P5	43	Dr. Christa Baker (College of Sciences) Dr. Alexandra Venuto (College of Sciences) Emma Droste (College of Sciences)	Decoding the Matrix: Investigating Synaptic Connections involved in Acoustic Communication using Drosophila
Haley Pearce (Poole College of Management)		O2	3221-3	Dr. Fiona Wang (College of Humanities and Social Sciences)	Resource Accessibility & Awareness for University Students
Emelia Pearson (College of Agriculture and Life Sciences)		P4	48	Dr. Maxwell Scott (College of Agriculture and Life Sciences) Dr. Akihiko Yamamoto (College of Agriculture and Life Sciences)	Expression of Female Lethality Utilizing the SxlPe-Gal4/UAS System in Drosophila melanogaster
Jonah Peckham (College of Sciences)		P5	44	Dr. Emily Lynch (NC Zoo) Dr. Jenny Campbell (College of Sciences)	Social Contexts and Rates of Glass-Hitting by Western Lowland Gorillas (Gorilla gorilla gorilla) at the North Carolina Zoo
Kermit Pennington (College of Sciences)		P3	48	Dr. Patricia Estes (College of Sciences)	The TORiffic Simulation: A Look at the Relationship Between TOR and Sim.

Lead Presenter	Co-Presenter(s)	Session	Room/ Poster	Mentor(s)	Project Title
Gretchen M. Perez Castillo (College of Sciences)		P4	49	Dr. Linda Hanley-Bowdoin (College of Agriculture and Life Sciences) Mary M. Dallas (College of Agriculture and Life Sciences)	The Use of Multispectral Imaging for Early Detection of CMD/CBSD in Infected Cassava Plants
Madelyn Perry (University College)	**Hunter Palmer** (College of Natural Resources) **Alejandra Flores** (College of Natural Resources)	P2	47	Dr. Erin McKenney (College of Agriculture and Life Sciences)	Impact on Migratory Bird Species
Madigan Petri (Wilson College of Textiles)		P2	48	Dr. Tova Williams (Wilson College of Textiles)	Slicing Sugars: Enzymatic Deglycosylation of Weld Dyestuff to Enhance Textile Dyeing Sustainability
Emily Phillips (College of Sciences)		P2	49	Dr. Leslie Sombers (College of Sciences) Dr. Chathuri De Alwis (College of Sciences)	Electroanalytical Co-Detection of Histamine and Serotonin Exocytosis Events from Single Mast Cells
Maddie Pietras (College of Agriculture and Life Sciences)	**Ashley Kim** (College of Agriculture and Life Sciences)	P3	49	Dr. Trino Ascencio-Ibáñez (College of Agriculture and Life Sciences)	Single-cell transcriptomics of Geminiviruses Infected Cells
Anna Pollock (College of Sciences)		P4	50	Dr. Amy Grunden (College of Agriculture and Life Sciences) Jabeen Ahmad (College of Agriculture and Life Sciences)	Evaluation of the Effect of Pseudomonas on Wheat Exposed to Salt Stress
Sydney Pollock (College of Natural Resources)		P4	51	Dr. Jennifer Richmond-Bryant (College of Natural Resources)	Analysis of Particulate Matter Data and Chemical Classes Burned in Colfax, Louisiana

Lead Presenter	Co-Presenter(s)	Session	Room/ Poster	Mentor(s)	Project Title
Sydney Pollock (College of Natural Resources)	**Trey Mumma** (College of Natural Resources) **Nathan Archer** (College of Natural Resources) **Thor Iverson** (College of Natural Resources)	P5	45	Dr. Elizabeth Guthrie Nichols (College of Natural Resources)	Presence of PFAS in Rocky Branch Creek Surface Waters near Dail Softball Stadium & Derr Track and Soccer Field
Alyssa Pope (College of Sciences)		P5	46	Deaja Sanders (College of Agriculture and Life Sciences) Dr. Amy Grunden (College of Agriculture and Life Sciences)	Characterization of Polyethylene Terephthalate-hydrolyzing Enzymes from Bacillus subtilis Isolated from Worn Polyester
Bailey Popson (College of Sciences)		P5	47	Dr. Kelly Meiklejohn (College of Veterinary Medicine) Melissa Scheible (College of Veterinary Medicine)	Utilizing Hybridization Capture to Sequence the Mitochondrial Genomes of Australian Blowflies (Diptera: Calliphoridae)
Jeff Powell (College of Sciences)		P1	44	Dr. Brian Space (College of Sciences) Dr. Adam Hogan (College of Sciences)	Many Body Van der Waals Interactions on GPUs
Sahana Ramamurthy (College of Engineering)		P1	45	Dr. E Javier Lopez Soto (College of Veterinary Medicine) Quiana Mosley (College of Veterinary Medicine)	Finding Cell-Specific Therapeutic Targets in Pain Sensing Neurons
Roshan Rana (College of Sciences)		P1	46	Dr. Alex I. Smirnov (College of Sciences) Dr. Tatyana Smirnova (College of Sciences) Maxim A. Voinov (College of Sciences)	Spin-labeling EPR Methods for Measurements at Nanoscale Interfaces

Lead Presenter	Co-Presenter(s)	Session	Room/ Poster	Mentor(s)	Project Title
Adrianna Ras (Poole College of Management)		P5	48	Dr. Nathan Goldman (Poole College of Management)	The Effects of Uncertain Tax Disclosures on Firms
Oliver Rasey (College of Agriculture and Life Sciences)		P1	47	Dr. Josh Strable (College of Agriculture and Life Sciences) Dr. Alejandro Aragón Raygoza (College of Agriculture and Life Sciences)	Maize Germination Responses to the Hormone Ethylene
Kurt Ray (College of Agriculture and Life Sciences)		P4	52	Dr. Asher Hudson (College of Agriculture and Life Sciences)	Maize Immune Response to Chitin and Live Microbes
Olivia Reece (College of Sciences)	**Paige Meadows** (College of Natural Resources) **Mckaila McMillan** (College of Humanities and Social Science)	P4	53	Dr. Lara Pacifici (College of Natural Resources)	Affect of Human Presence on Wildlife Biodiversity
Daniel Richard (College of Agriculture and Life Sciences)		P1	48	Dr. Arion Kennedy (College of Agriculture and Life Sciences)	Exploring Potential Roles of UDP-Glucose in Fructose-Treated Kupffer Cells
Kevin Ritter (College of Natural Resources)	**Ryann Stemmer** (University College)	P2	50	Dr. Erin McKenney (College of Agriculture and Life Sciences)	Stop The Invasion: The Spotted Lanternfly
Chloe Roberts (College of Natural Resources)		O3	3221-2	Dr. Rebecca Irwin (College of Agriculture and Life Sciences) Erin Eichenberger (College of Agriculture and Life Sciences)	The Effect of Light and Leaf Litter on the Germination of Seeds in the Smooth Coneflower, Echinacea laevigata

Lead Presenter	Co-Presenter(s)	Session	Room/ Poster	Mentor(s)	Project Title
Akieliah Robinson (College of Agriculture and Life Sciences)		P3	50	Dr. Mallory Choudoir (College of Agriculture and Life Sciences) Madaris Serrano Perez (College of Agriculture and Life Sciences)	Uncovering Agricultural Microbiomes: Isolating Microbes from NC's Center for Environmental Farming System Soil
Nicholas Rojas (College of Sciences)		P1	49	Dr. Ian Williamson (College of Veterinary Medicine)	Contribution of Increase in Fructose Metabolism towards Metabolic Diseases
Nicole Garcia (College of Natural Resources)	**Elena Kellt** (College of Natural Resources)	P3	51	Dr. Stephanie Jeffries (College of Natural Resources)	Campus Tree Tours Connect the NC State Community with Nature and Value of Trees
Kaya Rosselle (College of Agriculture and Life Sciences)		O1	3210-3	Dr. Stephanie Jeffries (College of Natural Resources)	Dominant Seed Dispersal Modes of Invasive Plants in a Restored Urban Stream
Kaya Rosselle (College of Agriculture and Life Sciences)		P1	50	Dr. Lisa (College of Agriculture and Life Sciences)	Aye-aye (Daubentonia madgascariensis) Infant Nursing During the First Days of Life
Gabriel Ruiz (College of Engineering)	**Andrea Basuroski** (College of Engineering) **Sebastian Hurtado** (College of Engineering)	P1	51	Dr. Andre Mazzoleni (College of Engineering)	Development and Experimental Analysis of Helical Driven Propulsion for Multi-Terrain and Amphibious Vehicles
Elijah Rushing (College of Engineering)	**Amy Whitley** (College of Engineering)	P4	54	Dr. Mihai Diaconeasa (College of Engineering)	A Quantification of Event Sequence Frequencies of the EBR-II using Inverse Estimation

Lead Presenter	Co-Presenter(s)	Session	Room/ Poster	Mentor(s)	Project Title
Bella Russ (College of Sciences)		P4	55	Dr. Ryan Paerl (College of Sciences)	Impact of Dissolved Organic and Inorganic Nitrogen Compounds on Bloom Forming Cyanobacteria
Sabrina Ryan (College of Humanities and Social Sciences)		P3	52	Dr. Laura Widman (College of Humanities and Social Sciences) Aaron Lankster (College of Humanities and Social Sciences)	Using Brief Animated Videos as a Sexual Education Medium for Parents and Children
Pushkar Sai (College of Sciences)	**Felix Smith** (College of Sciences)	P2	51	Dr. Carlos C. Goller (College of Sciences)	Bioinformatics in Wildlife and Hog Waste: Bacterial Analysis for Ecosystem Health
Nicolas Salazar (College of Sciences)		P5	49	Dr. Daniel Dougherty (College of Sciences)	Development of Statistical Break Junction Measurements for Single Molecule Conductance Quantification
Snehanshu Samanta (College of Engineering)		P4	56	Dr. Erin Krupa (College of Education) Katie Burkett (College of Education)	Nature of Peer Feedback Among Mathematics Teachers During Instructional Rounds
Arianne San Buenaventura (College of Sciences)		P1	52	Dr. Christopher B. Gorman (College of Sciences) Juliana O'Brien (College of Sciences)	Synthesis of a Novel Fluorescent Peptidic Dendrimers
Jayson Sanchez (College of Agriculture and Life Sciences)		P3	53	Dr. Trino Ascencio-Ibanez (College of Agriculture and Life Sciences)	High Throughput Virus Silencing Vectors for Core Cell Cycle Genes in A. thaliana
Kerneep Sandhu (College of Engineering)		P2	52	Dr. Okan Pala (College of Engineering)	Quantification of the Relationship between a Transportation-based Predictor Variable and Urban Development

Lead Presenter	Co-Presenter(s)	Session	Room/ Poster	Mentor(s)	Project Title
Isabel K. Chang (College of Agriculture and Life Sciences) **Kyleah B. Cox** (College of Agriculture and Life Sciences) **Marissa C. Santaniello** (College of Agriculture and Life Sciences)		P3	54	Dr. Frank Siewerdt (College of Agriculture and Life Sciences)	Milking the System: The Challenge of Getting Dairy Subsidies Right
Patricia Scholle (College of Humanities and Social Sciences)		P3	55	Dr. Sarah Ascienzo (College of Humanities and Social Sciences)	The Relationship Between Child Abuse and Homeschooling
Carter Schrag (College of Sciences)		O3	3221-3	Dr. Matthew Breen (College of Veterinary Medicine) Dr. Rachael Thomas (College of Veterinary Medicine)	Determining Novel Biomarkers for Detection of Canine Prostatic Carcinoma
Valeryia Serada (College of Agriculture and Life Sciences)		P1	53	Dr. Dmitry Kurouski (Texas A&M University)	Lipids Uniquely Change Rates of Lysozyme Aggregation and Toxicity of Amyloid Fibrils
Surbhi Sharma (College of Humanities and Social Sciences)		P5	51	Dr. Jessica Liao (College of Humanities and Social Sciences)	U.S.-ROK-Japan Trilateral Cooperation: Green Initiative Implementation in the Indo-Pacific
Max Shipp (College of Engineering)		P2	53	Dr. Katherine Saul (College of Engineering) Christopher Jadelis (College of Engineering)	Evaluation of Variable Loading Tasks for Optimization of a Wrist Musculoskeletal Model

Lead Presenter	Co-Presenter(s)	Session	Room/ Poster	Mentor(s)	Project Title
Elena Shipp (College of Sciences)		P5	52	Dr. James Martin (College of Sciences) Tyler Knapp (College of Sciences)	Development of the Transition Zone Theory for Nucleation in Oligoacenes
Madison Sholes (College of Sciences)	**Clara Kintner** (College of Sciences)	P1	54	Dr. Astrid Schnetzer (College of Sciences)	Algal Toxins in Fish Across the Albemarle Sound, NC, 2019 to 2023
Zach Sides (College of Sciences)		P5	53	Dr. Seth Kullman (College of Sciences)	Negative Effects of Vitamin D Deficiency and Possible Endocannabinoid System Involvement
Naveena Sivakumar (College of Sciences)		P2	54	Dr. Shobhan Gaddameedhi (College of Sciences) Gillian K Szabo, (College of Sciences)	Influence of Circadian Disruption on Cell Line Cytoxicity and Murine Hepatotoxicity
Chase Smith (College of Agriculture and Life Sciences)		P1	55	Dr. John van Zanten (College of Engineering)	Investigating Ultrafiltration Membrane Performance for Green Fluorescent Protein Solutions
Henry Smith College of Education		P5	54	Dr. Kelly Mulvey (College of Humanities and Social Sciences) Christina Marlow (College of Humanities and Social Sciences)	Unlocking Math Success: How Attitudes, Mindsets, & Career Interest Shape Teen Expectations
David Speckhart (Wilson College of Textiles)		P4	57	Dr. Nelson R. Vinueza (Wilson College of Textiles)	Digitization of historical Dyes from the Max Weaver Dye Library
Divya Srinivasan (College of Engineering)		O1	3221-3	Dr Anupam Das (College of Engineering) Mr. Aafaq Sabir (College of Engineering)	Exploring Different Clustering Algorithms for Categorizing Data

Lead Presenter	Co-Presenter(s)	Session	Room/ Poster	Mentor(s)	Project Title
Morgan Starnes (College of Natural Resources)	**Sophia Cunningham** (College of Natural Resources) **Coy Turnage** (College of Natural Resources) **Meredith Motamen** (College of Natural Resources)	P4	58	Dr. Elizabeth Guthrie Nichols (College of Natural Resources)	Presence of PFAS in Rocky Branch Creek behind Carmichael Gymnasium
Justin Stegeman (College of Sciences)		P3	56	Dr. Stefanie Chen (College of Agriculture and Life Sciences)	Constitution of Clusters: Colocalization of Bacterial RadD and SSB Proteins in DNA Repair
Ryan Sterner (College of Humanities and Social Sciences)		P5	55	Dr. Veljko Dubljevic (College of Humanities and Social Sciences) Dr. Dario Cecchini (College of Humanities and Social Sciences)	Universal Grammar Theory: An Unsatisfactory Account of the Origin of Moral Judgment
Isaiah Stevens (College of Sciences)		O4	3221-3	Dr. Kelly Lynn Mulvey (College of Humanities and Social Sciences)	STEM Identity: A Mathematical Approach
Kayla Stewart (College of Humanities and Social Sciences)	**Allison Guild** (College of Humanities and Social Sciences) **Reilly LaRoche** (Poole College of Management) **Keaton Lamb** (College of Humanities and Social Sciences)	P1	56	Dr. Ian Hughes (College of Humanities and Social Sciences)	Working Hard, Feeling Guilty: The Behavioral Implications of Guilt at Work

Lead Presenter	Co-Presenter(s)	Session	Room/ Poster	Mentor(s)	Project Title
Julia Storch (College of Sciences)		P1	57	Dr. Ashley Brown (College of Engineering) Dr. Nooshin Zandi (College of Engineering)	Hemostatic Fibrin Knob Triggered Microgels for Promoting Clot Formation in Neonates
Olivia Suker (College of Sciences)		P3	57	Dr. Benoit Jacquet (College of Sciences)	The Impact of a Free Walk In Acute Care Clinic in Wake County
Christopher Summers (College of Engineering)		P5	56	Huaiyu (College of Engineering)	High Performance PMN-PT Based 1-3 Composite Transducer for Clot Characterization with Multi-frequencies
Hannah Sumner (College of Sciences)	**Ben Gagnard** (College of Humanities and Social Sciences)	P3	58	Dr. Yingchen He (College of Humanities and Social Sciences) Patrick Seebold (College of Humanities and Social Sciences)	Effects of Looming & Stationary Sounds on Visual Orientation & Contrast Performance
Khadeeja Ali Syeda (College of Humanities and Social Sciences)	**Sophie Biancofiore** (College of Humanities and Social Sciences) **Sandhya Purohit** (College of Humanities and Social Sciences) **Kylie Radford** (College of Humanities and Social Sciences)	P5	57	Dr. Kelly Lynn Mulvey (College of Humanities and Social Sciences)	Befriending Immigrant Peers: Role of Direct and Indirect School Contact
Sarah Taboada (College of Agriculture and Life Sciences)		P1	58	Dr. Gavin Williams (College of Sciences) Jared Cossin (College of Sciences)	Improving the Activity of PcAcsA with Affordable CoA Alternatives

Lead Presenter	Co-Presenter(s)	Session	Room/ Poster	Mentor(s)	Project Title
Caden Tacosik (College of Agriculture and Life Sciences)	**Mollie Ruinsky** (College of Agriculture and Life Sciences) **Tyler Hill** (College of Agriculture and Life Sciences) **Melanie Bacon** (College of Agriculture and Life Sciences) **Daniel Li** (College of Agriculture and Life Sciences)	P1	59	Dr. Matthew Allan (USDA) Dr. Fernanda Santos (College of Agriculture and Life Sciences)	Effects of Enzymatic Treatments on Sweetpotato (NCDM04-0001) French Fry Textures
Katie Taran (College of Engineering)		O2	3210-3	Dr. Jacqueline Cole (College of Engineering)	Effect of Brachial Plexus Birth Injury on Postnatal Bone Development
Andrew Taylor (College of Engineering)	**Ryan Dukes** (College of Engineering) **Emma Stults** (College of Engineering)	P5	58	Dr Kenneth Granlund (College of Engineering)	Coaxial Turbine Blade Design
Ashley Telli (College of Humanities and Social Sciences)	**Olivia Mitchell** (College of Humanities and Social Sciences)	P5	59	Dr. Paige Averett (College of Humanities and Social Sciences)	Systematic Literature Review of the Recent Research on Bisexual Women and Depression

Lead Presenter	Co-Presenter(s)	Session	Room/ Poster	Mentor(s)	Project Title
Luke Shawn Thomas (College of Agriculture and Life Sciences)	**Addison Detig** (College of Agriculture and Life Sciences) **Donald Miller** (College of Agriculture and Life Sciences) **Justin Gilleland** (College of Agriculture and Life Sciences) **Amara Samoura** (College of Agriculture and Life Sciences)	P4	59	Indumathi Palaniswamy (Novonesis)	Enzymatic Treatment for Enhanced Plant-based Yogurt Mouthfeel and Texture
Alexiah Thompson (College of Sciences)		P5	60	Ms. Helena Jolly (College of Agriculture and Life Sciences) Ms. Helena Jolly (College of Agriculture and Life Sciences) Dr. Steve Frank (College of Agriculture and Life Sciences)	Exploring Potential Augmentative Biological Control of Chinese Wax Scales (Ceroplastes sinensis)
Susannah Throckmorton (College of Humanities and Social Sciences)	**Allison Martinko** (College of Humanities and Social Sciences)	P5	61	Dr. Daniel Gruehn (College of Humanities and Social Sciences) Taylor Leonard (College of Humanities and Social Sciences)	Cued Memory: The Impact of Images/Pictograms during Encoding on Word Recall
Lauren Todd (College of Sciences)		P2	55	Dr. Hannah Levenson (College of Agriculture and Life Sciences)	A Survey of Beneficial Insects in Southeastern US Sesame (Sesamum indicum) Fields

Lead Presenter	Co-Presenter(s)	Session	Room/ Poster	Mentor(s)	Project Title
Camden Toumbleston (College of Sciences)		P3	59	Dr. Nicholas Barber (College of Humanities and Social Sciences)	A Philosophical Account of Fun: Neo-Aristotelian Redundancy
Sara Trimech (College of Engineering)		P4	60	Dr. Saad Khan (College of Engineering) Muhammed Ziauddin Ahmad Ebrahim (College of Engineering)	Fabrication of Nanofibrous Aerogels for Multifunctional Applications
Tanya Upadhyay (College of Sciences)		O4	3210-3	Dr. Jessica Gluck (Wilson College of Textiles)	Recapitulating the Microenvironment of the Heart Using Decellularized Extracellular Matrix Derived Hydrogel
Crista Belen Villasenor-Reyes (Wilson College of Textiles)	**Wil Mabe** (College of Sciences) **Clark Axtell** (College of Natural Resources)	P2	56	Dr. Erin McKenney (College of Agriculture and Life Sciences)	The Detrimental Effects of Feral Cats
Farrah Waddell (College of Sciences)	**Tristin Troy** (College of Sciences)	P3	60	Dr. Lin Walker (College of Agriculture and Life Sciences) Mary Mendoza (College of Agriculture and Life Sciences) Yabaiz Tahir (College of Agriculture and Life Sciences)	Minimum Inhibitory Concentration of Peroxyacetic Acid Against Salmonella Enteritidis

Lead Presenter	Co-Presenter(s)	Session	Room/ Poster	Mentor(s)	Project Title
Meghan Wall (College of Agriculture and Life Sciences)	**Madison Burden** (College of Agriculture and Life Sciences)	P3	61	Dr. Shweta Trivedi (College of Agriculture and Life Sciences) Dr. Charlotte Meli (College of Agriculture and Life Sciences)	The Impact of Enclothed Cognition on Animal Science Students in the Anatomy Lab
Catherine Walter (College of Engineering)		P1	60	Dr. Katherine Saul (College of Engineering) Morgan Dalman (College of Engineering)	Finite Element Modeling of Cartilage Wear in the Glenohumeral Joint
Samantha Watson (College of Engineering)		O3	3210-4	Dr. Matthew Fisher (College of Engineering)	Comparison of AFM and Tensile Testing Methods on Mechanical Properties of Equine Superficial Digital Flexor Tendons
Riley Westman (College of Natural Resources)		P3	62	Dr. Katherine Martin (College of Natural Resources)	Environmental Drivers of Wetland Macroinvertebrate Communities in Wake County, NC
Riley Westman (College of Natural Resources)		P5	62	Dr. Katherine Martin (College of Natural Resources) Dr. Marcelo Ardon (College of Natural Resources) Joyce Gaffney (City of Raleigh)	Differences in Aquatic Macroinvertebrate Communities Among Urban and Forested Watersheds
Ellen White (College of Agriculture and Life Sciences)		P4	61	Felicia Shepard (College of Sciences)	Genomic Exploration of Challenging-to-Culture Blueberry Varieties
Ellen White (College of Agriculture and Life Sciences)		P5	63	Dr. Hudson Ashrafi (College of Agriculture and Life Sciences)	PCR-Marker Development for Genotyping Vaccinium spp.

Lead Presenter	Co-Presenter(s)	Session	Room/ Poster	Mentor(s)	Project Title
Evelynn Wilcox (College of Engineering)		P2	57	Dr. Celso Castro-Bolinaga (College of Engineering)	Use of Remote Sensing to Understand Shoreline Migration after Extreme Events
Rebecca Williams (College of Engineering)		P2	58	Dr. Tim Vadas (University of Connecticut) Dr. Nafis Fuad, (University of Connecticut) Dr. Alexandra Hain (University of Connecticut)	Chronic Cu65 Toxicity Evaluations of the Species Hyalella Azteca
Chloe Williams (College of Agriculture and Life Sciences)		P2	59	Dr. Jeffrey Dunne (College of Agriculture and Life Sciences) Dr. Ryan Andres (College of Agriculture and Life Sciences) Andrew Oakley (College of Agriculture and Life Sciences)	Chemical Inhibition of Self-pollination in Peanut (Arachis hypogaea) to Improve Out-Crossing Efficiency
Hali Harwood (College of Agriculture and Life Sciences)		P4	62	Dr. Melanie Simpson (College of Agriculture and Life Sciences) Dr. Brenna Zimmer (College of Agriculture and Life Sciences)	Mutation of UGDH Aspartate 379 Eliminates Enzyme Activity and Induces Developmental Dysfunction
Pierce Willoughby (College of Agriculture and Life Sciences)		P3	63	Dr. Trino Ascencio-Ibáñez (College of Agriculture and Life Sciences)	The Geminivius: How does it Affect Arabidopsis thaliana with Varying Ploidy?
Joshua Yagozinski (College of Engineering)	**Cole Howard** (College of Engineering)	P1	61	Dr. Jason Hou (College of Engineering)	Combined Lattice Physics Fuel Management Optimization for BWRs

Lead Presenter	Co-Presenter(s)	Session	Room/ Poster	Mentor(s)	Project Title
Sara Yamadi (College of Humanities and Social Sciences)		P2	60	Dr. Virginia Riel (College of Humanities and Social Sciences)	Examining Elite Leisure Scenes in Global Cities
Owen York (College of Engineering)		P2	61	Dr. Lucian Lucia (College of Natural Resources)	Proanthocyanidin Content in North Carolina-Obtained Pine Bark Extract Offers Promise of Local Pycnogenol Manufacturing
Liz Yow (College of Sciences)		P1	62	Dr. Stefanie Chen (College of Sciences)	Timecourse of FV3 Infection of Various Ectothermic Species
Abdullah Zaben (College of Agriculture and Life Sciences)		P1	63	Dr. David Skaar (College of Sciences)	ICR 3: A Potential Epigenetic Signature of Hepatocellular Carcinoma
Dominic Zecca (College of Natural Resources)	**Andrea Putri** (College of Natural Resources)	P4	63	Dr. Angela Allen (College of Natural Resources) Dr. Solomon Ghezehei (College of Natural Resources)	Preliminary Comparisons of Water Quality Between Waterways Within the Walnut Creek Watershed
Gilad Zeif (College of Agriculture and Life Sciences)	**Abby Todd** (College of Agriculture and Life Sciences) **Meredith Moss** (College of Agriculture and Life Sciences) **Heidi Min** (College of Agriculture and Life Sciences)	P3	64	Dr. Shweta Trivedi (College of Agriculture and Life Sciences) Dr. Charlotte Meli (College of Agriculture and Life Sciences)	Assessment of Stress in undergraduate Anatomy-Lab using Salivary Amylase & DASS-21

Lead Presenter	Co-Presenter(s)	Session	Room/ Poster	Mentor(s)	Project Title
Peiqi Zhang (Wilson College of Textiles)		P2	62	Dr. Xiaomeng Fang (Wilson College of Textiles) Sen Zhang (Wilson College of Textiles)	Magnet-driven Origami Soft Robotics
Jason Zhang (College of Engineering)		P5	64	Dr. Jacqueline Cole (College of Engineering) Vivian M. Mota (College of Engineering) Kyla B. Bosh, (College of Engineering) Dr. Katherine R. Saul (College of Engineering)	Evolution of Changes to Glenohumeral Macrostructure Following Brachial Plexus Birth Injury

ABSTRACTS

ORAL SESSION 1 (O1) | TUESDAY, APRIL 23 | 10:00 a.m. – 10:45 a.m.

Disorder Taming Chaos in Coupled Pendulum Arrays

Author(s): **Mikael Gallego**
Mentor(s): **Dr. William Ditto, Dr. John Lindner**
Poster: **3210-1**

Disordering coupled arrays of nonlinear elements can convert chaotic dynamics to periodic dynamics. The disorder-taming-chaos effect was originally demonstrated in arrays of torqued and damped coupled pendulums, the 'hydrogen atoms' of classical physics. We revisit this phenomenon with modern computation, averaging over initial conditions and numerically approximating largest Lyapunov exponents versus coupling and disorder, emphasizing the analogy with coupling and noise in spatiotemporal stochastic resonance. Analyzing the system over coupling provides insight into optimal parameter coordinates for similar systems exhibiting both chaotic and periodic behavior, in addition to offering the homogenization regime, at which point the dynamics are identical to that of a single pendulum. We provide an optimal disorder level for the system under various disorder types for maximizing signal-to-noise ratio, which has applications from ice ages to hair cells. We elucidate the mechanisms of disorder-taming-chaos with parameter space portraits locating the dynamics in islands of chaos within seas of periodicity.

Maternal Aye-aye (Daubentonia madagascariensis) Anxiety Peripartum

Author(s): **Rebecca Olson**
Mentor(s): **Dr. Lisa Paciulli**
Poster: **3210-2**

Mothers are anxious peripartum. Our previous pilot study of three hours per day for three days peripartum demonstrated that a mother aye-aye (Daubentonia madagascariensis) displayed anxiety behaviors such as repetitive, non-purposeful movements (stereotypies) (unpub). In this study, a mother aye-aye's anxiety behavior peripartum was assessed 24 hours before, the day of, and 24 hours after birthing an infant. It was hypothesized that anxiety behaviors would change over the three days. With IACUC approval, Pelco IMM12027-1S cameras were placed in a Duke Lemur Center (DLC) aye-aye mother's enclosure and nest to record her activity the three days peripartum. The resulting videos were watched and continuous focal animal sampling was used to note the time, duration, and type of repetitive behavior such as scratching or grooming. Data were analyzed using a Kruskal-Wallis Test and Chi squared test. Results showed that the day before birth, the mother repeatedly

constructed and deconstructed nests significantly more than the other two days (n=162x), while on the birth day, the mother auto-scratched and examined her genitalia significantly more (n=37x, n=27x, respectively). The day after birth, the mother was hyper-alert significantly more times (n=19x). Therefore, the hypothesis was supported as the mother exhibited signs of behavioral anxiety and her behaviors changed over the three-day period. Limitations included the small sample size (n=1). This study is the first to examine maternal anxiety in aye-ayes over three complete days peripartum. The results yield insight into maternal behaviors exhibited by the rare and difficult-to-see aye-ayes.

Dominant Seed Dispersal Modes of Invasive Plants in a Restored Urban Stream

Author(s): **Kaya Rosselle**
Mentor(s): **Dr. Stephanie Jeffries**
Poster: **3210-3**

Restoration projects are commonly devastated by invasive plants post-construction. However, research on modes of seed dispersal that facilitate the efficient invasion of these areas is limited. This study hopes to apply what's known about dispersal modes to invasive species to better understand how to mitigate these impacts in restoration projects. This study was conducted along Rocky Branch, a 1.1-mile-long, restored, first-order urban stream in Raleigh, NC. Restoration efforts consisted of three phases where existing vegetation was removed, natural stream channel design was constructed, and the stream corridor was re-planted. Today, Rocky Branch is an established closed canopy stream that is inhabited by wildlife. Following restoration, there has been limited maintenance of invasive species so many invasive species have since populated. From this study I hoped to learn if there is a dominant mode of seed dispersal for invasive plants across Rocky Branch, and if so, is this mode consistent across all three phases, which are 21, 17, and 13 years post-restoration. Methods consisted of sampling 10m wide sections every 30m, where stems were counted, and cover class for each stratum and invasive species were estimated. We discovered that of the 58 invasive species found, 24 dispersed their seeds via endozoochory (seed dispersal through ingestion and dropping of feces of vertebrates.) and accounted for 89% of invasive cover. In conclusion, we determined that species with endozoochory mode of dispersal are easily dispersed and tend to be very aggressive. These findings underscore importance of continuous invasive plant management following stream restoration.

Direct Transesterification of Ethanol Impregnated Microalgae Under Microwave Mediated Supercritical CO2 Conditions

Author(s): **Dylan Gretok**
Mentor(s): **Dr. Jay Cheng**
Poster: **3221-1**

The transportation sector accounts for a significant portion of anthropogenic air pollution and carbon dioxide emissions. Decarbonization action was taken by implementing ethanol into existing transportation markets; however, ethanol only accounts for a fraction of the fuel in market. The remaining portion of the market requires a unique solution in pursuit of decarbonization. This study analyzes a potential solution using a unique combination of known methods to convert microalgae to biodiesel in a direct transesterification chemical reaction. Conventional methods for microalgae to biodiesel conversions rely on a dewatering step, but dewatering is an expensive process. Supercritical fluid extraction methods involving CO2 have demonstrated potential for wet processing. While still relying on CO2 for supercritical fluid extraction of lipids, this study differs by analyzing the increased efficiency of combining several supplementary reaction mediums such as microwave assist, and extraction of biodiesel from lipids using ethanol impregnation. These combinations are theorized to be effective because no more than two variables are manipulated in each step of the two-step reaction. Microwaves are paired with supercritical ethanol to effectively weaken algae's rigid cell wall, hence enabling CO2 to easily obtain lipids. Then, upon lipid extraction ethanol simultaneously participates in a transesterification reaction to produce biodiesel. Each processing method holds merit, but by coupling these methods new efficiency maximums could be achieved. However, due to the dangers associated with the high pressures and high temperatures of supercritical processing, this study takes advantage of Aspen plus simulations to analyze reaction data and efficiency.

Development of NuScale Power Fission Product Removal System Shielding Design for Microreactors

Author(s): **Daniel Nevius, Devin Bradshaw, Robbie Leary**
Mentor(s): **Dr. Scott Palmtag, Steven Mirsky**
Poster: **3221-2**

Microreactors are small nuclear reactors that are designed to be easy to install and run with minimal human intervention. NuScale Power is developing a microreactor that utilizes liquid fuel, with a 10-year fuel cycle and design life of 40 years that operates at low pressures and high temperatures. Volatile and noble gas fission products are produced during operation and accumulate in a space above the core and are discharged to a separate fission product removal system. These fission products are a gamma radiation source that requires shielding over the design life of the reactor. The goal of this project is to develop a shield design that ensures a desirable external surface dose rate over the life cycle of the reactor. To develop this design, the gamma source term will be calculated, potential shielding materials will be

selected, and shields will be evaluated using the Monte Carlo neutron and photon transport code SERPENT.

Exploring Different Clustering Algorithms for Categorizing Data

Author(s): **Divya Srinivasan**
Mentor(s): **Dr. Anupam Das, Aafaq Sabir**
Poster: **3221-3**

With the exponential growth of voice-based virtual assistants like Amazon's Alexa, the need for effective organization and categorization of Alexa Skills has become increasingly crucial. This research project investigates various clustering algorithms to categorize Alexa Skills response text to identify the presence of different types of ads in them. By employing techniques such as K-means clustering, hierarchical clustering, DBSCAN, agglomerative clustering with Ward's method, and spectral clustering, we aim to uncover the underlying structures within the vast array of Alexa Skills. Each clustering algorithm offers unique characteristics suited for different types of data and cluster shapes, allowing us to explore diverse methodologies in categorizing Alexa Skills effectively.
Through experimentation and evaluation, we compared the performance of these clustering algorithms based on metrics such as silhouette coefficient, clustering accuracy, and computational efficiency. The findings of this study will contribute to advancing the understanding of clustering techniques in organizing complex and heterogeneous datasets, particularly in the context of voice-based virtual assistant ecosystems.
Our research aims to provide valuable insights into the suitability of different clustering algorithms for categorizing Alexa Skills data, empowering developers and users to navigate and discover relevant skills more effectively within the ever-expanding Alexa Skills marketplace.

Evaluating Folate Supplementation in the Attenuation of Cardiac Hypertrophy in Murine Offspring of Diabetic Dams

Author(s): **Gracie Athus**
Mentor(s): **Dr. Rolanda Lister**
Poster: **1**

Offspring of diabetic women are twice as likely to have cardiac disease including cardiomyopathy as adults. Left ventricular cardiac hypertrophy is associated with cardiac arrhythmias, diastolic dysfunction, and sudden cardiac deaths. Folate supplementation is recommended to pregnant mothers to reduce the incidence of structural heart disease. There is no recommendation of folate supplementation in post natal progeny that have been exposed to maternal hyperglycemia to prevent cardiac disease. Our objective was to determine folate's effect in offspring of diabetic dams with respect to their cardiac hypertrophy. We had two groups of female mice: the experimental group of mice were injected with streptozotocin and the control group were injected with saline. At week three, the mice pups from the offspring of diabetic mothers (ODM) and the offspring of control mothers (OCM) were weaned and fed either a standard chow or folate rich chow. Then, at week eight, echocardiograms from both groups of mice pups were taken to examine heart tissue. We found that folic acid supplementation postnatally does not resolve hypertrophy in offspring of diabetic dams compared to offspring of control dams that were not supplemented with a folate rich diet. In the offspring of control dams, folic acid supplementation increases posterior wall thickness and decreases cardiac output. Also, folic acid seems to be detrimental to offspring of control dams and does not seem to be beneficial to offspring of diabetic dams.

Seasonality of Multiple Leptopilina Species in Southeastern United States Blackberries

Author(s): **Kayla Beckwith**
Mentor(s): **Dr. Hannah Levenson**
Poster: **2**

The invasive fruit fly, Drosophila suzukii (spotted wing drosophila; SWD), was first detected in the United States (US) in California in 2008, and by 2010 made its way across the US to North Carolina (NC). SWD possesses a large, serrated ovipositor which is what makes it such a voracious pest causing millions of dollars in damage each year. One recent, promising management advancement is the use of parasitoid wasps for biological control. Recently, a new, introduced parasitoid species, Leptopilina japonica, was detected across North America,

including NC. SWD can be parasitized by L. japonica, which attacks the larval stage. So, L. japonica has the potential to aid in the control of SWD populations in the US.
To better understand populations of this new parasitoid species in NC, we placed liquid traps at the NCDA Piedmont Research Station in a blackberry field from November 2022 through November 2023. Parasitoids captured by these traps were identified to species. In total we collected 416 parasitoids from 6 different Leptopilina species, 2 of which we report for the first time in NC.
While several Leptopilina species have now been documented in NC, only L. japonica shows promise as a biological control agent for SWD. Understanding the population dynamics across the season of each of these species will be important for improving SWD management efforts.

The Effects of Identity Related Questioning on Asexual Individuals Well-Being

Author(s): **Sophie Biancofiore**
Mentor(s): **Dr. Ian Hughes**
Poster: **3**

Asexuality is a unique sexual identity in which individuals do not experience sexual attraction to others (AVEN, 2024). The Minority Stress Model posits that belonging to a minority identity group, such as asexuality, results in specific minority related stressors that affect a variety of outcomes. The current study looks at how identity-related exchanges, as a proximal stressor of the minority stress model, affects asexual individuals' well-being and functioning. Asexual participants (N = 271) were collected through Prolific and completed an online survey assessing how identity-related questioning from both family/friends (AQF) and strangers/acquaintances (AQA) affected various outcomes, including hostile behaviors, loneliness, self-alienation, cognitive resource depletion, and subjective well-being. We also tested for potential moderating effects of these relationships, focusing on trait level agreeableness— a personality trait integral to social exchanges (Denisse & Penke, 2008)— and sexual identity salience. We found that identity-related questioning from both friends and family, and strangers and acquaintances, were positively related to hostility, self-alienation, and loneliness, with some nuances between the two groups. We also found that agreeableness and identity salience levels did influence some of these relationships–though not in the direction we expected. Our findings suggest that identity-related interactions can be a source of stress for asexual individuals that impacts well-being. Future research should aim to find ways to negate these effects, and help more clearly define and support the directionality of our findings.

Clostridioides difficile Toxins Alter Host Bile Acid Synthesis Pathway Gene Expression

Author(s): **Sean Brown**
Mentor(s): **Dr. Stephanie Thomas, Dr. Casey Theriot**
Poster: **4**

Clostridioides difficile infection (CDI) is the leading cause of nosocomial infections in the United States, resulting in diarrhea to life-threatening colitis. C. difficile exotoxins TcdA and TcdB damage the host epithelial cell cytoskeleton and gut barrier integrity. Bile acids facilitate the absorption of fats and fat soluble vitamins in the intestine, and also influence the C. difficile lifecycle. The nuclear receptor farnesoid-X-receptor (FXR) is a key regulator of the bile acid synthesis pathway and maintains bile acid homeostasis. Using the Caco-2 cell line, an intestinal epithelial model, we investigated the impact of C. difficile toxins on host gene expression, particularly FXR. We extracted RNA from toxin-exposed Caco-2 cells for cDNA synthesis. qRT-PCR was performed to assess differential gene expression in our selected genes: FXR and FGF19, regulated by and an indicator of FXR activation, and GAPDH, the housekeeping gene acting as the control. Exposure to varying concentrations of TcdA, TcdB, and a combination of both ranging from 10 pM to 100 pM showed upregulation of FXR and FGF19 expression, particularly at higher toxin concentrations. Compared to the control, FXR had a 48.5-fold increase and FGF19 had a 4.3-fold increase in expression in response to TcdB, and the combination of TcdA and TcdB. This suggests that C. difficile potentially regulates host bile acid synthesis through toxin-mediated activation of FXR. Further research is needed to understand if toxin driven FXR upregulation can be translated to the host environment and if this change confers an advantage or disadvantage to C. difficile.

Impacts of Cellulose Fiber Supplements on Gut Microbiomes of Captive Lemur Populations

Author(s): **Ashlynn Chaney**
Mentor(s): **Dr. Tara Clarke, Dr. Lydia Greene**
Poster: **5**

This project examines the effects of a cellulose fiber supplement on the gut microbiomes of captive populations of three species of lemurs (Lemur catta, Varecia variegata, Propithecus coquereli). The 3 focal species all exhibit different feeding ecologies, as L. catta is an omnivorous species, V. variegata is a frugivorous species, and P. coquereli is a folivorous species. Consequently, their intestines vary in both the physical morphology and in the array of inhabiting microorganisms that aid in digestion. We collected and analyzed fecal samples from 11 lemurs fed both fiber supplements (powdered cellulose) and control supplements for 14 days in a crossover experimental design, with a washout period in between. From fecal samples, we extracted genomic DNA, sequenced a microbial marker gene (16S rRNA), and determined metrics of microbiome diversity, including species richness, Shannon entropy, and the Faith's phylogenetic diversity. We used Linear Mixed Models to compare microbiome

diversity within lemur species relative to experimental condition and sex, including individual lemur as a random term. We found no statistically significant differences between microbiome diversity in either L. catta or V. vareigata fed cellulose fiber versus control supplements. However, data from the folivorous P. coquereli demonstrated an increase in microbiome richness, evenness, and phylogenetic diversity in response to fiber supplements. If microbiome richness is beneficial in this system, our findings may indicate that increasing the amount of fiber in the diets of captive P. coquereli and other folivorous models can have positive consequences on the welfare of these endangered primates.

Cybersecurity Pedagogy: Exploration Of Effective Teaching Methods For Engaging Middle School Learners

Author(s): **Brenda Cristina Chavez**
Mentor(s): **Dr. Veronica Catete, Madison Thomas, Erynn Elmore, Micaha Dean Hughes**
Poster: **6**

In today's digitally interconnected world, equipping the next generation with 21st century skills, including digital literacy, is critical. This research investigates effective teaching methods for engaging middle school learners in cybersecurity topics during informal learning experiences. Despite the recognized significance of cybersecurity education, gaps persist in understanding the impact of different teaching methods on student engagement, particularly in short-term, non-traditional educational settings. This study aims to fill this critical gap by evaluating the immediate impact of various teaching methods, informing curriculum development, and offering practical recommendations. Building upon prior research in cybersecurity education, this study emphasizes the effective application of diverse learning methods within short-term lessons to address this notable oversight in educational research. Utilizing a mixed-methods approach, including pre-mid-post surveys, exit tickets, and observation protocols, this study aims to comprehensively explore the impact of teaching methods on student engagement in cybersecurity education. The anticipated outcomes include practical recommendations for educators and researchers to inform curriculum development and pedagogical practices in cybersecurity education K-12 programs.

Microfluidic Organ-on-Chip Models: Investigating Capillary Network Formation and Metastatic Processes

Author(s): **Seeva Cherukuri**
Mentor(s): **Dr. Sarah Shelton**
Poster: **7**

Microfluidic devices have revolutionized biomedical research by enabling precise manipulation of fluid systems at the micrometer scale. Given that many fundamental biological processes occur at the molecular and cellular level, microfluidics offer a powerful

tool for simulating complex biological microenvironments in vitro. This study aims to design organ-on-chip models with varying channel dimensions to investigate the influence of physical spacing on capillary network formation within tissue microenvironments. The engineering process involves 3D modeling and milling to create molds for the microfluidic devices, which are then filled with Polydimethylsiloxane (PDMS), cut into individual devices, and plasma bonded to glass coverslips. These devices are subsequently filled with a mixture of human endothelial cells and hydrogel, enabling the polymerization of the hydrogel to mimic the vascular extracellular matrix and facilitate capillary network formation. These microfluidic devices provide a foundation for the introduction of various cell types and the observation of cellular and tissue interactions in a controlled environment. We aim to introduce immune and cancer cells to observe metastatic processes within the device. Results from this research may provide insights into disease progression, therapy response, and metastatic outcomes by examining interactions between circulating cells and tissue.

Genetic Sex Determination: Mapping Within Malawi Sand Cichlids

Author(s): **Brooke Church**
Mentor(s): **Dr. Reade Roberts**
Poster: **8**

Cichlid fish have a large diversity that has been shaped by rapid evolution over the last 2 million years that presents challenges in understanding species relationships. A notable split between sand-dwelling and rock-dwelling species from Lake Malawi has been seen to have distinctive genetic differences. Sex determination systems have been identified in several rock cichlid species that are limited to 3 main SD systems, whereas only 4 species have been studied in sand species. This research explored the SD systems of three different cichlid species by using PCR and gel electrophoresis. The results found one rock species, Tropheops tropheops, to have a Chr 7 Y marker. A sand species, Otopharynx lithobates, does not have a Chr 5 or Chr 7 sex-associated marker but an incomplete presence of a B chromosome with both males and females. This is a newly shown genotype within the male species, as in all other species with a B chromosome, have been restricted to females. Therefore, the Otopharynx lithobates species must operate on a partial or completely different SD system. Another sand species, Copadichromis trewavasae, has a Chr 7 Y marker but does not completely explain sex determination. This research unveils previously unknown genetic markers in cichlids, particularly with the discovery of a novel genotype in the male species of Otopharynx lithobates.

An Assessment of Students' On-Campus Employment Experiences within DASA

Author(s): **Erick Contreras, Caroline Hilliard, Rena Lustig, Mariam Mohamed,**
Mentor(s): **Samantha Rich, Madalene Compton, Cameron Torrey, Sydney Russell**
Poster: **9**

The Division of Academic and Student Affairs (DASA) promotes students' overall wellbeing at NC State by supporting students academically, professionally, and personally. Wellness and Recreation, the Academic Success Center, Crafts Center, and University Housing are just a few of the departments that are a part of DASA. Many of these departments rely heavily on the employment of students. For example, Wellness and Recreation alone employs more than 900 students annually. In Spring 2024, the Pack Assessment Ambassadors conducted a qualitative study to gain insight into the experiences of undergraduate student employees in DASA. Based on past literature, campus employment has a positive impact on students' sense of belonging, opportunities for mentorship, and development of transferable skills. To further understand the impact of campus employment within DASA, several research questions were addressed, including: (1) what do students hope to get out of their on-campus employment, (2) how does on-campus employment prepare students for employment post-graduation, and (3) are students receiving mentorship and/or professional development in their positions? Ambassadors facilitated five focus groups of student employees with a total of nineteen participants – representing nine departments across DASA. The team transcribed focus group audio and analyzed responses using qualitative coding techniques, including thematic analysis methods. The findings will be shared at the Undergraduate Research Symposium and presented to DASA leadership in efforts to improve on-campus employment experiences

PoPS Model Case Study: Forecasting the Spread of Citrus Black Spot

Author(s): **Evan Dadson**
Mentor(s): **Dr. Chris Jones**
Poster: **11**

Citrus black spot, caused by the fungal pathogen Phyllosticta citricarpa, poses a threat to citrus populations in Florida. The PoPS (Pest or Pathogen Spread) model is an open-source, spatially explicit, and temporally dynamic model used to forecast where the disease is likely to spread. In Florida, the pathogen is spread by conidia found in the debris from infected trees. Important drivers of pathogen spread include the weather components of rainfall and temperature. The purpose of this project is to create host maps and weather inputs to calibrate the PoPS model and simulate the spread and dispersal of Citrus black spot. In addition to drivers of disease spread, treatment factors to control disease spread are considered as model inputs. This case study provides insight into the spread of Citrus black spot, and serves to demonstrate the importance of the PoPS modeling framework to aid agricultural stakeholders in decision making.

Exploring the Potential of Phytomining Rare Earth Elements to Promote Sustainability

Author(s): **Laura Dale**
Mentor(s): **Dr. Colleen Doherty, Edmaritz Hernandez Pagan**
Poster: **12**

Rare earth elements (REEs) are critical metals, essential to sustain a clean energy economy due to their widespread use in technology such as wind turbines and electronic devices. However, these elements are difficult to acquire due to their dispersed nature in the earth's crust, similar chemical properties, and co-occurrence with radioactive materials. This not only leads to an increased cost in traditional REE mining and purifying, but is also environmentally damaging. Phytomining may provide a mechanism for sustainable REE mining systems from secondary sources such as acid mine drainage, coal combustion, and industrial byproducts. This research utilizes two species that are considered hyperaccumulators of REE, Phytolacca and Lemna, to extract REE from waste products. In addition, we are evaluating the ability to enhance native REE accumulation in plants by using the bacterial REE-binding protein, Lanmodulin. To test this, the model plant, A. thaliana, has been transformed with Lanmodulin. The REE uptake in transformed A. thaliana, Phytolacca, and Lemna is measured using a novel, non-destructive, in vivo fluorescence method. The different fluorescent properties of REEs allow for identifying specific REE accumulation in plant tissue and provide insight into REE localization in plants. The spectrally predicted REE levels are confirmed in select samples via the reference standard ICP-MS, a destructive method. The bioengineered plant system will facilitate the recovery of targeted REEs from secondary REE resources, increasing the availability of these critical elements and repurposing industrial waste in an environmentally sustainable manner.

Classifying Geodesics on Surfaces of Revolution with Constant Negative Gaussian Curvature

Author(s): **Ashish Das**
Mentor(s): **Dr. Stepan Paul**
Poster: **13**

Surfaces of revolution are surfaces generated by revolving a curve about an axis. At a point on the surface, the Gaussian curvature is a measure of how a surface curves around that point. When Gaussian curvature is positive, the surface curves in the same direction around a point, resembling a dome. And if Gaussian curvature is negative, the surface curves in opposite directions around a point, resembling a saddle. If a surface has constant negative Gaussian curvature everywhere, then the entire surface will be saddle-like in shape. Geodesics are curves on the surface which only curve in the direction normal to the surface, and moreover, the shortest path between two points on a surface is always a geodesic. In this project, we provide a classification of the global behavior of geodesics on surfaces of revolution with constant negative Gaussian curvature. There are three classes of such surfaces: the

hyperboloid-shaped surface, the pseudosphere, and the cone-shaped surface. For each surface, we classify geodesics by their end behavior, number of self-intersections, and revolutions, which are determined by the angle of intersection of a geodesic with the singular boundary curves of the surface. We do this by constructing isometric mappings from the Poincare upper half-plane or Poincare disk to the surface, and then consider all possible geodesics on the domain. Furthermore, we also provide visualizations of geodesics on such surfaces using mathematical software.

Pyruvate Hyperpolarization Advancement in Biocompatible Solvent via Reversible Exchange Signal Amplification

Author(s): **Atli Davidsson**
Mentor(s): **Dr. Thomas Theis**
Poster: **14**

The hyperpolarization of 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). Recent advances have explored the effects of temperature cycling and the buildup of bound polarization at lower temperatures, followed by its release to free pyruvate at elevated temperatures, resulting in significantly increased polarization values.
This study investigates the impact of varying temperature cycling rates on the accumulation of free and bound polarization in pyruvate, as well as compare it to the constant temperature method. At higher temperatures, the system exhibits heightened free polarization but diminished bound polarization, while the reverse occurs at lower temperatures. The aim is to modulate temperature cycling rates and hopefully boost overall polarization values. Investigations into altering activation time, and temperature as well as pyruvate, and Imes concentrations were also conducted but yielded inconclusive outcomes.

Differentially Expressed Genes and Dysregulated Biological Pathways in Colonic Inertia

Author(s): **Gianna Deucher**
Mentor(s): **Dr. Shawn Gomez, Dr. Chinmaya Joisa, Dr. Kevin Chen**
Poster: **15**

Colonic inertia (CI) is characterized by inability of the colon to appropriately modify stool consistency and propel it through the digestive tract. This condition imposes a substantial burden on affected individuals, profoundly impacting their quality of life and necessitating comprehensive medical management strategies. While the exact pathophysiology of CI is not completely understood, research suggests an interplay of environmental factors, enteric nervous system (ENS) dysregulation, and depletion of interstitial cells of cajal (ICC). Understanding the pathophysiology of CI is important for development of effective therapeutic interventions to alleviate symptoms and enhance patient outcomes. Current treatments include lifestyle modifications, dietary changes, laxatives, prokinetics, and in unresponsive cases, colectomy. Due to the risks of colectomy, alternative treatment avenues are desirable. Histological analyses have implicated the involvement of smooth muscle, the enteric nervous system, and ICCs in CI pathogenesis. However, the specific genes and cell signaling pathways contributing to CI pathophysiology remain unidentified. In this study, differentially expressed genes and their associated pathways were identified between healthy patients and patients with colonic inertia. The top dysregulated pathways included the MAPK, NF-KB, and IL-17 pathways. The top ten DEGs have been connected previously to pathways involved in smooth muscle contraction and ENS signaling as well as pathways involved in inflammatory bowel disease and various cancers including colon cancer. Therefore, the greatest causes of CI may be due to dysfunctions in ENS signaling and smooth muscle contractions. These results could offer insights into the mechanisms underlying CI, potentially paving the way for new treatments.

Investigation of Computational Methods for Inverse Problems in Imaging

Author(s): **Landon Docherty**
Mentor(s): **Dr. Fatma Terzioglu**
Poster: **16**

The goal of the project is to study computational algorithms for solving inverse problems that commonly arise in the field of imaging science. The research is carried out through the study of specific examples including signal deconvolution and x-ray computed tomography. The solution methods are assessed by considering both the accuracy of results and ease of implementation using MATLAB software. The poster will present the project's major findings.

: Staying Organized as a Research Assistant

Author(s): **Daniela Duker**
Mentor(s): **Dr. Erin Krupa**
Poster: **17**

Being a Research Assistant is no easy task, especially as a student. Staying organized is very important, and it is very easy to get lost in a full schedule. I've especially experienced that this year as a third-year student. Trying to juggle my position as a research assistant, student, and volunteer, I often found myself ignoring one responsibility in order to focus on another. This made me even less organized and jeopardized my role in all these tasks. Realizing that I needed to create a schedule that allowed me to have time to do homework, work on my tasks as a research assistant, and attend my volunteer shifts, but also time for me to relax made it easier for me to thrive in all my environments. It was not easy, but I was able to formulate a schedule, designate workspaces, and use communication to help me stay organized and focused as a Research Assistant.

Elevated PFAS Levels: Insights from the GenX Exposure Study

Author(s): **Kareem El Saleh**
Mentor(s): **Dr. Jane Hoppin, Sarah Colley**
Poster: **18**

Background: PFAS (per- and polyfluoroalkyl substances) are common environmental contaminants found in the bodies of most people in the US. Certain individuals exhibit unusually high levels of PFAS, for reasons that are not fully understood yet. This study investigates human PFAS contamination, responding to the National Academies of Sciences, Engineering, and Medicine's (NASEM) call for extensive PFAS testing in the U.S.
Methods: Using data from the GenX Exposure Study, a prospective cohort study of >1000 people living in the Cape Fear River Basin on NC, we identified one individual with particularly high PFAS. Blood samples were collected for PFAS measurements in 2021 and 2023 and were compared with the median US levels defined by NHANES and with NASEM's guidelines.
Results: The sum of the subject's serum levels of PFAS, notably MeFOSAA, PFOS, and PFOA, exceeded NASEM's concern threshold of 20 ng/ml. In 2021, MeFOSAA serum concentration stood at 115.4 ng/mL—far above the NHANES-reported US average of 0.130 ng/mL in 2018. By 2023, while the MeFOSAA serum levels dropped to 14 ng/mL, they remained significantly elevated. Interestingly, while most PFAS levels decreased, PFOS levels rose from 56.2 ng/mL to 82 ng/mL. This increase, against the backdrop of declining MeFOSAA levels, suggests that MeFOSAA breakdown may contribute to elevated PFOS levels.
Discussion: The GenX Study highlights the complexity of PFAS exposure and metabolism, emphasizing the need for further research into individual PFAS compounds like MeFOSAA and their role in PFAS body burden.

Retrofitting Tachometer and Bluetooth Display for Poultry House Exhaust Fan Efficiency Analysis

Author(s): **Jackson Evans**
Mentor(s): **Dr. Sanjay Shah**
Poster: **19**

Farmers use ventilation fans in poultry houses for the welfare of the inhabitants. Belts in ventilation fans begin to stretch and slip after continued operation, losing speed and airflow rate. Loose belts can reduce fan airflow rates by 30 to 60% compared to optimal belt conditions. Currently, the farmer has to walk around the house and visually determine if a fan's speed is too low and that is very difficult, especially if the fan speed is slightly reduced. However, even a 5% reduction in fan speed can reduce airflow rate by the same amount. In very large payer poultry houses, fan speed can be monitored but that system is too espenixe to use or retrofit on typical chicken houses. The goal of this research is to design build and test a tachometer that can display fan speeds to notify diagnoses is needed for repairs, therefore giving smaller farms a cheaper option for efficiency analysis. If the belts are slipping or breaking, this will be indicated by low fan RPMs. To do this, an ESP32 Huzzah Bluetooth Microcontroller and Hall Effect sensor will be programmed to take RPM readings based on voltages pulses produced by magnets on the rotating fan shaft. These readings will be sent to a Raspberry Pi via Bluetooth and will be presented on a display. This could be an affordable and convenient way for farmers to know which among their dozen or so fans require maintenance and repairs without having to inspect all the fans visually.

Dimension Reduction in Protein Folding Analysis by Bayesian Inference Method

Author(s): **Rushi Faldu**
Mentor(s): **Dr. Xincheng Lin**
Poster: **20**

Protein folding is one of the most important yet difficult transitional processes, given the high-dimensional data involved in analyzing its dynamics. Applying dimensional reduction techniques is essential for simplifying the analysis of protein folding dynamics by identifying optimized collective variables that capture essential dynamics. Our group has used a Bayesian-inference-based method to identify transition states of protein folding by relating the equilibrated simulation data to its transition path ensemble. We have developed a series of Python-based functions to implement this method, which relies on an accurate capture of the two end states of the transition process. I have improved these functions over their previous versions to improve the accuracy in capturing the two end states. When applied to several protein-folding simulations, our new functions provide a more precise estimate of the transition state and yield a conditional probability useful for optimizing the collective variables. Ongoing efforts are underway to optimize the collective variable based on this Bayesian-inference-based objective function. Our work has significant implications for

studying various high-dimensional biomolecular dynamic processes, including optimizing drug delivery pathways and understanding RNA structural folding.

Roman Archaeology Lab

Author(s): **Casey Fry**
Mentor(s): **Dr. Tate Paulette, Dr. Kathryn Grossman**
Poster: **21**

The goal for this semester is to turn the Roman Archaeology lab into a classroom for students to get hands on experience with artifacts, such as bones, glass, coins, and pot sherds. The lab has an amazing collection and it would be a shame not to use it to teach the next generation of Archaeologists.

Observation of Trash Impact on Local Waterways Through Experimental Data

Author(s): **Luke Gladden**
Mentor(s): **Dr. Angela Allen**
Poster: **22**

Over time, trash and litter in local waterways can degrade the water quality and pose a risk to human and environmental health. Different types of trash break down at disparate rates and affect water in certain ways. Mechanisms such as a trash trout can be used to stop, prevent, and collect trash out of waterways, allowing us to both reduce trash in the water and to observe what types end up in our local waterways. Through an experimental and exploratory research approach, this project serves to study the impact of different types of trash on local waterways. We are utilizing styrofoam, paper products, and plastic to conduct an experiment on how their presence in the water affects the dissolved oxygen and specific conductivity levels. We will compare these impacts through both DI water as well as the local creek water. This research can help shed light on the characteristics and health status the local waterways may be under. It can help us identify how the assemblage of litter impacts the water in different ways. This can allow us to work to prevent further harm to human and environmental health. Future prospects to help assist this can include community education about recycling and waste, as well as the implementation of trash trouts.

No Crying in Sports: The Playbook of Athlete Trafficking

Author(s): **Drake Gomez**
Mentor(s): **Dr. Maura Nsonwu**
Poster: **23**

The global sports industry is expected to grow from $388.28 billion in 2020 to $440.77 billion in 2021 (Kumar & Bhalla, 2021). Projected to outpace global GDP, the sports industry is a lavishly oiled, complex machine that is entirely dependent on exceptionally talented individuals with the skills, drive, and discipline to chase their dreams (Kearney, 2011). Oftentimes, young, socially, and financially vulnerable athletes are targets for traffickers who hold the deceptive promise of wealth, fame, and opportunity. Traffickers, regularly going by the alias "recruiter," – exploit young athletes through force, fraud, and coercion for social and economic power (Busch-Armendariz et al., 2018; TVPA, section 103[8]).
There is a dearth of publications, information, and vocabulary surrounding the human trafficking of athletes despite its growing threat to human rights. Though the presenters have identified specific domestic and global legal cases surrounding the topic, they also recognize that the void of information perpetuates this growing and time-sensitive issue and seek to address it.
No Crying in Sports: The Playbook of Athlete Trafficking is a much-needed examination and discourse of this emerging social and public health problem. The presenters will seek to define trafficking within the global sports industry as a human rights violation, identify and explore the push and pull migration factors, and center this call-to-action as an international human rights issue by utilizing methodologies such as case study analysis and systems thinking maps.

Structures, Stress, and Success: Primary Care Practitioners' Perceptions of Obesity

Author(s): **Omia Haroon**
Mentor(s): **Dr. Jennifer Carroll**
Poster: **24**

Obesity is classified as a disease of epidemic status in the United States and its many influences create a complex terrain for treatment. Primary care practitioners (PCPs) are the professionals assigned to screen, diagnose, and treat people with obesity and offer a unique perspective as the mediators between patients, their bodies, and the category of obesity. The purpose of this study is to explore PCPs' conceptualizations and understandings of obesity. I conducted semi-structured interviews with a convenience sample of eight PCPs in the state of North Carolina. Eligible participants were PCPs with a patient population. Participants were asked questions concerning their experiences; obesity's definition, diagnostic criteria, and treatments; obesity in their patient population; the etiology of obesity; and their general observations. Interviews were transcribed and analyzed using inductive coding. Initial results indicate that participants overwhelmingly attribute obesity and its prevalence to structural

issues and evolving social mandates. However, most of their reported guidance focused on individual behavioral change. All participants acknowledged the discretion needed when using BMI as a diagnostic tool, but most still necessitated its usage. Most participants emphasized successful treatment as a patient's positive perception of how they feel. Testimonies like these offer insight on the challenges and opportunities that providers face when treating obesity. Explanatory models, practitioners' perceived roles, and narratives surrounding obesity are all important domains to explore. Outlining these themes enables the development of questions for further and future research.

Establishment of Yeast Surface Display System for the Identification of Oversecreting Mutants

Author(s): **Garrett Harris**
Mentor(s): **Dr. Driss Elhanafi**
Poster: **25**

The methylotrophic yeast Pichia pastoris is a popular expression system used for the production of different types of recombinant proteins. Because P. pastoris secretes few of its own proteins, recombinant proteins can represent up to 80% of total extracellular protein which facilitates the downstream purification. For different reasons, P. Pastoris can exhibit limitations in its ability to secrete heterologous proteins. The objective of this project is the establishment and screening of a mutant library to identify genetic elements important for the over-secretion of recombinant proteins. First, we will establish a cell line that displays an antibody fragment with a tag peptide (V5). Such cell line will be subjected to mutagenesis and the possible oversecreting clones will be screened and isolated using the Fluorescence Activated Cell Sorting (FACS) technology. Newly identified clones will be assessed for their ability to over-secrete other recombinant proteins.

Physiological Responses to Rare Earth Elements in Pokeweed

Author(s): **Allison Haynes**
Mentor(s): **Dr. Colleen Doherty, Dr. Kanjana Laosuntisuk**
Poster: **26**

Rare earth elements (REEs) have been used in various industries, yet their mining and purification processes are constrained by environmental concerns from waste production in the mining and purification processes. Phytomining, employing plants for metal extraction, emerges as an eco-friendly solution for REE recovery, demonstrated notably in nickel production. Among candidate species, pokeweed (Phytolacca) stands out due to its resilience and capacity to accumulate REEs efficiently. Despite the significance of REEs, their impact on plant physiology remains underexplored. This study aims to elucidate the specificity of REE interactions with pokeweed, which is essential for tailoring phytomining approaches to target specific REEs. We propose that plants exhibit unique responses to

individual REEs. Through controlled experiments involving pokeweed seedlings subjected to various REE concentrations (Ce, Dy, Er, Gd, Nd, Pr, Eu, and Tb), we assess root growth and photosynthetic activity. Our findings reveal distinct effects of each REE on root length and photosynthetic rates, suggesting differential recognition by plants. Future investigations will delve into the molecular mechanisms underlying pokeweed's response to REEs, offering insights crucial for optimizing phytomining strategies.

Using Facebook to Recruit and Facilitate Parent Advisory Groups: Lessons Learned

Author(s): **Sarah Helderman, Caroline Hilliard**
Mentor(s): **Dr. Laura Widman**
Poster: **27**

This poster describes the advantages and challenges of recruiting a group of “parent advisors” to participate in a private Facebook group to give their thoughts on a new app our team is developing. This app is designed to facilitate discussions about sexual and relationship health between parents and 10-13-year-old children.
We recruited parent advisors through emails and snowball sampling. Those who were interested completed a screening survey to see if they were eligible to participate. We invited 24 parents to join the group (22 moms; 2 dads; 10 White; 6 Hispanic; 4 Black; 4 Asian). Participants were divided into two groups corresponding with their child's age: those with children 10 and 11 and those with children 12 and 13. Parents were required to comment on at least five posts a month to receive compensation ($50).
One of the biggest challenges in building the group was screening potential participants and ruling out those who either did not qualify for the study or were fake accounts. Our team learned how to identify fraudulent accounts by looking at their Facebook page for “red flags” (i.e., stock images, no friends, located outside the U.S.).
The biggest advantage of these groups has been the chance to connect with parents asynchronously for quick feedback. Parents have also provided valuable feedback on what their children would find most engaging and what age-appropriate language we should use.
Responses provided the app development team with valuable suggestions for improvement that ultimately contributed to a more marketable and quality product.

Circadian Clock Disruption, Climate Change and Arsenic on Cardiovascular Toxicity

Author(s): **Lilyanna Hopkins**
Mentor(s): **Dr. Shobhan Gaddmeedhi, Dr. Siyuan Su**
Poster: **28**

Cardiovascular diseases are a significant global health burden, with arsenic implicated in cardiac dysfunction. It is also known that climate change will increase arsenic contamination in the environment.
This study investigates the impact of circadian rhythm disturbance on arsenic-induced cardiomyocyte toxicity, utilizing BMAL1 knockout models. Arsenic contamination in drinking water poses a severe risk to heart health, affecting millions, with chronic exposure increasing cardiovascular disease risk by up to 50%. Additionally, chronic arsenic exposure is associated with a 60% higher incidence of skin cancer. Previous research studies on apoptosis and circadian regulation didn't research circadian disruption's role in arsenic toxicity. Given the widespread health implications of arsenic exposure and its increased levels by climate change, understanding circadian clock's role in arsenic toxicity may reveal mechanisms underlying arsenic-induced cardiovascular damage.
We found that in AC16 human cardiomyocytes, when challenged with arsenic stress, BMAL1 deficiency decreased cell survival compared with control cells, indicating BMAL1 protects cardiomyocytes from arsenic toxicity. Western-blot analysis showed the increases levels of apoptosis initiating and executing proteases, including caspase 3, caspase 9 and PARP in the absence of BMAL1 under arsenic treatment. Concurrently, we showed by Annexin V/DAPI apoptosis assay that BMAL1 ablation also increased cell apoptosis induced by arsenic, accompanied by the dissipation of mitochondrial membrane potential. Additionally, the reconstitution of BMAL1 protected knockout AC16 cells from arsenic-induced apoptosis with reduced caspase cleavage and increased survival. These findings stressed the urgency of addressing circadian disruption to curb cardiovascular risks from arsenic exposure, informing preventive and therapeutic strategies.

Cold Promoter Cloning: Cloning, incorporating, and validating the E2 construct

Author(s): **Ainsley Horton**
Mentor(s): **Dr. Colleen Doherty, Blake Horton**
Poster: **29**

This project investigates the cold responses of Arabidopsis thaliana by focusing on the cis-regulatory control of several different genes. Cold tolerance is vital to understand, given the rigid structure of plant cells. Inducing cold responses in plants can allow us to reduce the impacts of freezing temperatures, which can cause ice crystals leading to severe cellular damage. I am investigating the cis-regulatory elements controlling stress response using a luciferase reporter system and developing constructs to test the response to low temperatures. These constructs use cis-regulatory promoters that will allow for transcription

activation of target genes in the Arabidopsis genome. My research focuses on the E2 construct, a cold response promoter selected for further investigation as a candidate for further research. To make this construct accessible to the Arabidopsis genome, an LR reaction is conducted to transfer the candidate promoter (E2_pENTR) into a pFlash promoter. Once in pFlash, the plasmids are then integrated into E. coli. Once incorporated, the plasmids grown in E. coli can again be extracted and incorporated into GV3101 component cells through Agrobacterium Electroporation. Once a positive culture is obtained, the E2_pFlash in GV3101 is further cultured in liquid media to prepare for a floral dipping of Col-0 (wildtype) Arabidopsis thaliana. If successful, the floral dip allows the insertion of our target construct (E2) into the genome of Arabidopsis. Once a successful T2 is established, experiments will be performed to assess the functionality and response of the E2 construct in Arabidopsis thaliana.

“Dear Tripadvisor Member”: Analyzing Tripadvisor reviews of UNESCO Sites of Conscience

Author(s): **Sarah Isenhour**
Mentor(s): **Dr. Michaela DeSoucey**
Poster: **30**

The UNESCO World Heritage List (WHL) consists of 1,199 sites, ranging from cultural landscapes to historic sites that aim to celebrate their contribution to “outstanding universal value,” meaning they are deemed significant or important sites of shared heritage. Eighteen sites on the list, however, are deemed “sites of conscience,” or sites with history that is traumatic and painful. My thesis sought to uncover how people react to, experience, and evaluate the 18 UNESCO sites of conscience, using Tripadvisor reviews by visitors as my data. I bring together two previously disconnected veins of research here: one on how sites of conscience came to be established on the WHL, and the other on online evaluation of places. In coding and analyzing the reviews, I found that most reviewers described emotional and educational experiences, spoke at length about factors unrelated to the hurtful heritage of the site, assigned sites positive value and worth, and often used blatantly xenophobic language when reviewing sites in formerly colonized countries. These findings suggest that, with the exception of the xenophobic reviews, Tripadvisor users are engaging with these sites in a positive manner despite their history, but that Tripadvisor’s function as a travel advice platform causes the historic and global significance of these sites to be distorted or overshadowed in reviews of the mundane. This is important because it calls into question the overall ethics and appropriateness of evaluating sites of conscience on a website like Tripadvisor, and whether or not these sites should be protected against reviews.

Simulation of a Chemical Plant to Produce H2O2 using ASPEN Plus

Author(s): **Saurav Jain**
Mentor(s): **Dr. Gregory Mckenna, Dr. Kyle Camarda**
Poster: **31**

Due to the spread of COVID-19 around the world, the demand for Hydrogen peroxide (H2O2) is currently very high as it is a strong oxidizing agent used in disinfectants. However, currently, H2O2 is produced by the Anthraquinone process which involves a multistep method that requires a lot of energy, generates a lot of harmful wastes, and has a high production cost. Thus, there is a need for cleaner alternative methods for the production of H2O2. Our study aims to simulate a 100% renewable energy chemical process plant to produce H2O2 using ASPEN v10 Plus. This study uses the Loewenstein method using electrolysis and hydrolysis reactions to produce H2O2. The advantage of this method is that the Ammonium Bisulfate used in the reactions can be recycled and so, water is effectively the only reactant in the process. A working simulation of the process indicates process feasibility, and the results suggests that the simulation could produce a 6% solution of H2O2 at a volume of 570 tons annually. These results indicate that H2O2 could be produced at the same quantity compared to the current method of production in a 100% renewable way.

Determining the Efficacy of IPEC-J2-Derived Exosomes on Intestinal Epithelial Wound Healing

Author(s): **Arushee Kamra**
Mentor(s): **Dr. Amanda Ziegler, Halle J. Lutz, Madison Caldwell, Dr. Ashley C. Brown**
Poster: **32**

Intestinal ischemia/reperfusion (I/R) injury occurs when blood flow to a segment of the intestine is obstructed, often due to torsion, followed by the restoration of blood flow to the affected area. This damages the epithelium, which plays a crucial role in absorbing nutrients and water while providing a physical barrier to microbes. Intestinal I/R injury is a significant contributor to conditions like neonatal necrotizing enterocolitis (NEC), an inflammatory condition in newborns characterized by intestinal tissue damage and life-threatening complications, driving the need for innovative therapies. Exosomes, or extracellular vesicles that transport signaling molecules, have emerged as promising regenerative agents. This study explores the efficacy of exosomes derived from progenitor neonatal pig intestinal epithelial cells in promoting intestinal epithelial wound healing. We isolated IPEC-J2-derived exosomes with filtration and centrifugation and characterized them using nanoparticle tracking analysis. We will conduct an in vitro assessment of their impact on intestinal epithelial cell migration and proliferation with scratch assays and an ex vivo surgically-induced neonatal pig I/R injury model. We will quantify the trans-epithelial electrical resistance and mannitol flux values to quantify exosome-mediated effects. Our hypothesis is that exosomes will enhance cell migration and proliferation in vitro and improve barrier

integrity ex vivo. Successful completion of these aims will provide insights into a novel therapy for intestinal injuries, with implications extending to other organ systems affected by epithelial tissue damage. Understanding the regenerative mechanisms of IPEC-J2-derived exosomes could lead to interventions in skin, lung, and kidney regeneration.

Co-op vs. Solo Play in Block-based Educational Programming Games: A Comparative Analysis

Author(s): **Devon Kennedy, John Fortich, Paarth Patel, Nitesh Kanamarlapudi**
Mentor(s): **Dr. Tiffany Barnes, Yasitha Nisansala**
Poster: **33**

This study assesses the comparative effectiveness of cooperative multiplayer (co-op) and solo play modes in BOTs, a block-based 3-D platformer game designed to facilitate fundamental programming education. The objective is to determine which mode promotes better comprehension of programming concepts, specifically loops, and functions. A sample of 60 programming novices will participate in the study, undergoing pre- and post-assessments through block-based coding tests to measure learning outcomes. The game structure includes five tutorial levels to introduce basic mechanics, followed by two introductory levels common to all participants. The final three levels, tailored respectively for solo and co-op play, are designed to be comparable in difficulty and learning objectives but vary in execution to suit each mode. This setup will help measure learning outcomes, teamwork efficacy, and problem-solving capabilities, providing valuable insights for developing future educational programming tools.

Female Dominance or Power? An Examination of Intersexual Dyadic Interactions in Ring-tailed Lemurs (Lemur catta) Applying the Power Framework

Author(s): **Jason Kreger**
Mentor(s): **Dr. Tara Clarke**
Poster: **34**

Ring-tailed lemurs (Lemur catta), endemic to Madagascar, are listed as Endangered by the International Union for the Conservation of Nature (IUCN) RED LIST. This flagship species was the first species of lemur to be characterized as ‘female dominant’. The social dynamics of lemurs, particularly female dominance, has been a topic of intense research since the 1980s, yet there is still a lack of consensus on how to define, measure, analyze, or explain this phenomenon. Therefore, this study investigated intersexual dyadic social interactions among free-ranging ring-tailed lemurs on a finer scale by employing Lewis’ Power Framework which provides a ‘more inclusive concept of power and more precise terminology”. Data were collected at the Duke Lemur Center from June 5th-August 7th, 2023. Twenty-minute focal animal sampling of female ring-tailed lemurs (n=8) was conducted. Relying on our predetermined ethogram, all occurrences

of social behavior were also recorded, as well as their context. Results revealed that females, regardless of rank within their respective troop, initiated and won the majority of agnostic dyadic interactions with males by means of asymmetry in power. It seems the existing asymmetry in power likely contributed to the development of avoidance behaviors in males. Our work found female ring-tailed lemurs to be dominant to male lemurs in almost all contexts due to asymmetry in power. Future research on female dominance in lemurs could benefit from utilizing the Power Framework which allows for more precise examination of the complexities and nuances of dyadic social interactions.

Morning Quality Time with Pets: Effects During and After Work

Author(s): **Reilly LaRoche, Keaton Lamb, Kayla Stewart, Allison Guild**
Mentor(s): **Dr. Ian Hughes**
Poster: **35**

For decades, psychologists have explored dynamics within the realm of human-animal interaction. Organizational psychologists are no different; research has found that exchanges with pets and other animals have the potential to influence important work outcomes, such as performance, well-being, and satisfaction. Relatively little is understood, however, regarding the potential spillover effects of pet contact from the non-work to work context. To address this gap in the literature, the present research explores the daily spillover effects of morning quality time with pets on affective, behavioral, and cognitive outcomes for employees, both during and after the workday. An occupationally heterogenous daily diary sample of employed pet owners from the United Kingdom (NLevel 1 = 405, NLevel 2 = 81) was used to test these relationships. Using both within- and between-person correlations, it was revealed that morning quality time with pets was associated with reduced negative affect during the workday, and reduced incivility and withdrawal upon returning home from work.

High-Throughput Study of Perovskite Oxides for Chemical Looping Air Separation

Author(s): **Anna Lawrence**
Mentor(s): **Dr. Fanxing Li, Hilal Bektas**
Poster: **36**

Chemical looping air separation (CLAS) is a method that separates O2 from the air through a cyclic redox reaction of an oxide-based oxygen sorbent. It involves oxygen absorption from the air and desorption under vacuum or steam purge. CLAS can generate high-purity oxygen gas and is estimated to be substantially more efficient than current industry methods. High-purity oxygen is of critical importance both for the chemical industry, medical applications, and oxyfuel combustion-based CO2 capture from carbonaceous fuels. Perovskite oxides are promising oxygen sorbents for CLAS because of the ability to tune thermodynamic

properties through A- and B-site doping and because perovskite oxides can continually uptake and release oxygen without degradation. Based on predictions made from a density functional theory (DFT) simulation, this high-throughput study synthesizes and evaluates the phase purity and measures oxygen capacity of perovskite oxides. We synthesized perovskite oxides using a small batch ball mill method. All synthesized perovskite oxides were evaluated for phase purity using X-ray diffraction (XRD) patterns to ensure a single, pure perovskite phase was formed. We determined the oxygen capacity of perovskite oxides with high phase purity using the thermogravimetric analyzer (TGA) under multiple temperature and pressure swing cycles. The study has synthesized over 60 perovskite oxide samples and over 20 of these candidates had high phase purity. Several promising candidates with high oxygen capacity are undergoing further characterizations.

Primary and Secondary Bile Acids Affect C. difficile and Commensal Clostridia Differently.

Author(s): **Nish Mathur**
Mentor(s): **Dr. Casey M. Theriot, Samantha Kisthardt**
Poster: **37**

According to the CDC, Clostridioides difficile infection (CDI) is a public health crisis affecting almost half a million Americans every year. Treatment typically includes antibiotics such as vancomycin. Antibiotics kill members of the indigenous gut microbiota, reducing the capacity for secondary bile acid production by commensal bacteria. This causes C. difficile spores to germinate into vegetative cells, colonize the intestinal tract, and produce toxins leading to CDI. Multiple studies have shown that commensal Clostridia are associated with resistance against C. difficile. Some hypothesize it is due to its ability to make secondary bile acids, which can inhibit C. difficile growth. The primary bile acids cholate (CA), and chenodeoxycholate (CDCA) are converted to the secondary bile acids deoxycholate (DCA) and lithocholate (LCA) by commensal clostridia respectively, which can inhibit C. difficile. Understanding how commensals and C. difficile grow in the presence of these bile acids will provide insight into their role in preventing CDI. Growth kinetics and minimum inhibitory concentrations (MICs) were measured in C. difficile R20291 and commensals C. scindens and C. hiranonis supplemented with a range of primary and secondary bile acids. C. difficile and C. hiranonis had a higher MIC with CA (10.0 mM and 2.5 mM respectively), compared to a lower, more susceptible MIC with DCA (1.56 mM and 0.78 mM respectively). This comparison of MIC will aid in studies to understand primary bile acid conversion to secondary bile acids in different commensal strains and how this affects C. difficile growth and pathogenesis.

Lemna gibba Spectral Fingerprinting

Author(s): **Robert McCann**
Mentor(s): **Dr. Ryan Sartor**
Poster: **38**

Lemna gibba, commonly called duckweed, is an aquatic plant with the ability to grow on wastewater and yield large quantities of high-quality biomass. Our lab is chiefly concerned with improving duckweed yield stability and and heat tolerance. The method for cross-pollinating L.gibba involves the possibility of unwanted self-pollinations. This project is an attempt to develop cheap and easy methods to differentiate between cross and self-pollinated progeny. The visual differences can be minuscule. Genotyping is the obvious choice but will require a large amount of time and expense when hundreds of crosses need to be done with dozens of plants genotyped per cross. In this study, spectrophotometry is used to examine the unique spectral signatures of Lemna gibba varieties and their progeny. Just as each variety has a specific DNA sequence, there is a corresponding chemical profile of metabolites that can be used to differentiate these varieties using spectroscopy of simple plant extracts. The distinct differences between species are apparent in the absorbance values collected through spectroscopy, which then allow for the construction of a "spectral fingerprint" that is used to differentiate selfed from cross-pollinated progeny. Analysis was conducted using the predictive Random Forest model in R to sort the raw data procured from spectral scans. The Random Forest model was trained on data from two inbred parent lines for which subsequent predictions were made to determine how similar the crosses were to their parents.

Validating the Analytical Sensitivity of PCR for Diagnosis of Feline T.foetus Infection

Author(s): **Cary Miller**
Mentor(s): **Dr. Jody Gookin, Jennifer Holmes**
Poster: **39**

Tritrichomonas foetus (T. foetus) is a protozoal pathogen and the most common cause of infectious colitis in domestic cats worldwide. The NCSU T. foetus Diagnostic Laboratory developed the original PCR assay for the diagnosis of T. foetus and currently offers diagnostic testing services for this pathogen in samples received from across the U.S. Because patient diagnosis and treatment decisions are based on the results of this assay, it must maintain a high degree of sensitivity. This study aimed to validate the analytical sensitivity of the laboratory’s commercial PCR assay used to detect T. foetus infection. Early laboratory stock of cryopreserved T. foetus was established in culture. To determine the PCR sensitivity, a serial dilution of T. foetus was generated and used to spike 100 mg aliquots of feline feces with 10,000, 1000, 100, 50, 25, 12.5, and 0 cells. Each sample was run through the laboratory PCR assay pipeline using standard DNA extraction and PCR operating procedures. Six separate trials of the series were conducted to determine the reproducibility of the results. These

results were used to assess the sensitivity of the test and the consistency of those results across runs. Results demonstrated that the PCR assay had an analytical sensitivity of 25 organisms per sample and was reproducibly able to detect ≥ 100 organisms per sample. The findings show that the NCSU T. foetus Diagnostic Laboratory PCR assay has maintained a high degree of sensitivity and remains a valuable diagnostic tool for T. foetus diagnosis.

Genetic Susceptibility to Multistage Chemical Carcinogenesis in C57BL/6 Substrains

Author(s): **Emma Morgan**
Mentor(s): **Dr. Robert Smart, John Witherspoon**
Poster: **40**

Genetic differences between mouse strains can be informative regarding elucidation of the genetics of susceptibility and resistance to disease development, as well as gene by environment interactions (GxE). The C57BL/6 mouse is a commonly utilized inbred mouse strain for biological research. Two of the most commonly used substrains, C57BL/6J and C57BL/6N mice, were frequently used interchangeably in experimental systems. However, these substrains have significant genetic differences and recent studies have documented phenotypic differences in several experimental systems. Skin tumorigenesis has yet to be assessed. Therefore, we conducted studies to compare skin tumor development in C57BL/6J vs C57BL/6N mice. C57BL/6 mice are resistant to skin tumorigenesis, so to increase their tumor response we produced identical F1 hybrid mice by breeding C57BL/6J x 129S1/SvImJ and C57BL/6N x 129S1/SvImJ mice. We utilized the mouse skin multistage carcinogenesis model with a DMBA-initiation/TPA-promotion protocol where the Hras A->T mutation (Q61L) is the canonical driver mutation. Both genotypes developed skin squamous papillomas over 21 weeks of TPA and there were no significant differences in tumor incidence, time to tumor, or tumor multiplicity between the genotypes. When TPA promotion was stopped, the number of tumors that regressed was also similar between the genotypes. Finally, the incidence of HrasQ61L mutation in skin tumors was similar in both genotypes. These data demonstrate that C57BL/6J and C57BL/6N substrains respond similarly to skin tumor development using the mouse skin multistage carcinogenesis model.

Sexual Consent Self-Efficacy among Youth who Identify as LGBTQ+

Author(s): **Xue Mullane, Lauren Richards**
Mentor(s): **Dr. Laura Widman, Jordyn McCrimmon**
Poster: **41**

Affirmative sexual consent is an explicitly communicated, voluntary, mutual, enthusiastic, and ongoing agreement about sexual activity. Although prior research has identified sexual consent as a key factor in preventing coercive sexual experiences, affirmative sexual consent has not been fully investigated among LGBTQ+ youth. Thus, the purpose of this study is to

determine LGBTQ+ youths' confidence in their ability to negotiate sexual consent in their next sexual experience. We used data from an online study among youth recruited from Instagram (M age=15.23; n=833). We limited analyses to youth who identified as LGBTQ+ (n=462; 53% girls; 41.6% White). A questionnaire included 4 items asking about participants' confidence that they could gain affirmative consent in their next sexual encounter. Response options ranged from 1 (not at all confident) to 4 (very confident). Of the four items, youth reported the lowest confidence in their abilities to communicate their sexual desires to their partners (M= 2.40). Roughly 64% of youth were very confident they could ask for consent before the start of a sexual encounter, while only 35.3% were very confident they could end the sexual activity at any point after it began. This study expands on the limited knowledge of affirmative sexual consent in LGBTQ+ youth. Findings suggest youth's confidence in their ability to negotiate sexual consent may depend on various factors, including the timing of the sexual encounter. Future research should assess how other variables, including sexual education, may influence sexual consent self-efficacy.

Finding the Sweet Spot: How Different Variables Affect Male Drosophila's Courtship Behavior

Author(s): **Odeh, Juman**
Mentor(s): **Dr. Christa Baker, Emma Droste**
Poster: **42**

Acoustic communication is widespread in the animal kingdom and serves a major role in social interactions and mating rituals. Acoustic signals facilitate courtship in Drosophila melanogaster, in which males vibrate their wings during courtship interactions to produce a song that entices females. Whereas females use songs to make mating decisions, males respond to songs by increasing courtship toward nearby flies, including other males; this phenomenon is known as male-male chaining behavior. We can use chaining behavior as a clear behavioral read-out of auditory preferences. This can be achieved by playing sounds to groups of male flies and quantifying the amount of chaining by counting the number of males exhibiting courtship behaviors. We have built a new behavioral chamber for courtship song playback, and we aim to calibrate our acoustic stimuli by optimizing chaining assays in male D. melanogaster. Based on previous work, we are testing the influence of three key variables: sound volume, wingedness, and socialization. Our goal with these experiments is to provide guidelines for delivering acoustic signals at suitable levels within the new behavioral chambers and to guide future investigations into the underlying genetic and neural basis of male courtship behaviors.

Nonequilibrium Dynamics of Model H

Author(s): **Josh Ott**
Mentor(s): **Dr. Vladimir Skokov, Dr. Thomas Schäfer, Dr. Chandrodoy Chattopadhyay**
Poster: **43**

When brought to high energies, quarks and gluons are freed from being confined in protons and neutrons, forming a new state of matter called quark-gluon plasma that behaves as a strongly-interacting fluid. This hot and dense state of matter is governed by the theory of the strong force, Quantum Chromodynamics (QCD), and can be found in high-energy nuclear collisions as well as the microseconds-old universe. The phase diagram of QCD is the only diagram of elementary particle physics than can be studied in laboratory conditions, and it's hypothesized that this diagram has a critcal endpoint at the transition to quark-gluon plasma. To direct experimental studies of the QCD phase diagram, we employ simulations of stochastic fluid dynamics to predict the behavior of quark matter around the conjectured critical endpoint. In particular, we have looked at dynamical scaling behavior to compare our method with theoretical predictions before using it to analyze time-dependent correlation functions.

Many Body Van der Waals Interactions on GPUs

Author(s): **Jeff Powell**
Mentor(s): **Dr. Brian Space, Dr. Adam Hogan**
Poster: **44**

My project accelerated the computational modeling of Metal Organic Frameworks (MOFs) for gas separation applications using Graphics Processing Units (GPUs) for critical calculations. MOFs are porous crystalline substances with potential for various industrial uses, including gas separation, water condensation and carbon capture. Accurate simulation of MOFs interacting with gasses is necessary to understand and improve their structure and function. Thus, simulating a wider range of forces, with greater fidelity, can decrease computational costs and improve accuracy. GPUs address this issue by enabling faster matrix operations – a key step for the relevant computations explored in this project. Code modifications were made that enabled GPU implementation and sped up simulation times by an order of magnitude. This permits the Space group code to include many body van der Waals interactions for practically useful MOF materials. A next step in this project is determining if there is a way to more efficiently approximate the most computationally expensive part of the calculations to allow for the exploration of even larger systems.

Finding Cell-Specific Therapeutic Targets in Pain Sensing Neurons

Author(s): **Sahana Ramamurthy**
Mentor(s): **Dr. E Javier Lopez Soto, Quiana Mosley**
Poster: **45**

Chronic pain affects one in five individuals in the general population, and available treatments are limited due to off-target effects like addiction and tolerance. The search for cell-specific therapeutic treatments is urgently needed to increase drug efficacy and reduce side effects. Our goal is to identify cell-specific targets in nociceptors, a group of specialized pain sensing neurons in the peripheral nervous system, in order to inform successful therapies to treat pathological pain. We use publicly available transcriptome datasets from different subsets of mouse nociceptors to detect cell-specific features, alternative exons, in mRNA transcripts that result from alternative pre-mRNA splicing. We perform splicing-sensitive computations to quantify alternative exons and compare their inclusion across neuronal types. We found that cell-specific alternative exons are remarkably selective to the regulation of synaptic and intrinsic neuronal properties in nociceptors. We have now identified genes that are alternatively spliced in nociceptors and that may offer novel molecular targets to decrease some symptoms associated with chronic pain in a cell-specific way.

Spin-labeling EPR Methods for Measurements at Nanoscale Interfaces

Author(s): **Roshan Rana**
Mentor(s): **Dr. Alex I. Smirnov, Dr. Tatyana Smirnova, Maxim A. Voinov**
Poster: **46**

Currently, there is a lack of measurement methods for characterizing interfaces of nanoscale objects in a non-destructive manner. This includes providing atomic scale data on the electrostatic potential at the interfaces formed by the nanomaterial and water/biological surface, as well as the subsequent environmental change effects. To fill this gap, our lab is developing a measurement methodology based on pH-sensitive EPR (Electron Paramagnetic Resonance) probes. Such probes undergo a reversible protonation that can be monitored by EPR to determine the pKa of the probe. Because the pKa of the probe depends on the local environment, the shift in pKa can be used to characterize local dielectric constant and electrostatic interactions at the location of the probe. Here we report on the characterization of the novel pH-sensitive probe synthesized in our group. The EPR spectra of the novel nitroxide shows that it is pH-sensitive due to protonation of the amine substituent on the pyrrolidine ring. The experiments analyzed the protonation equilibrium by recording EPR spectra of the probe at various pH and deriving the pKa constant, focusing on temperature and dielectric constant dependence. The data showcases that an increase in the temperature leads to decreased pKa. This data would allow for determining thermodynamic parameters of the equilibrium. We are currently investigating the effect of the dielectric constant of the solvent on the pKa. We believe the collected data will provide

insightful knowledge on how the environment affects our probes and give more information on the electrostatic properties at the nanoscale.

Maize Germination Responses to the Hormone Ethylene

Author(s): **Oliver Rasey**
Mentor(s): **Dr. Josh Strable, Dr. Alejandro Aragón Raygoza**
Poster: **47**

Plants respond to external and internal cues to control their growth. Endogenous plant hormones importantly interpret environmental signals to coordinate growth properly. Our lab studies the gaseous plant hormone ethylene. Ethylene is a pivotal signal that can be induced by environmental cues, such as abiotic stress, to limit plant growth. We are looking at ethylene's role in regulating growth of maize (i.e., corn) as a model. Our long-term goal is to understand how this important cereal crop responds to ethylene during stressful growing conditions. To do this, we developed a germination assay to quantify the effects of ethylene on maize seedling growth. We leveraged germination paper with or without the ethylene precursor ACC, which can be applied in water and taken up by the plant; ACC is then converted to ethylene in plant cells. We leveraged the assay to screen various genotypes of maize, some of which carry mutations in genes of the ethylene signaling pathway. I will present on the assay itself as well as results from our genetic screen. Overall, we were able to demonstrate that some maize genotypes are insensitive to ACC, while others are acutely sensitive. Our results demonstrate the utility of a germination assay to learn about hormone response in cereal crops.

Exploring Potential Roles of UDP-Glucose in Fructose-Treated Kupffer Cells

Author(s): **Daniel Richard**
Mentor(s): **Dr. Arion Kennedy**
Poster: **48**

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, liver failure, and hepatocellular carcinoma. NAFLD affects between 20-30% of Western populations and strongly correlates with sedentary lifestyles and unbalanced diets. A link between increased fructose consumption and higher incidences of NAFLD has been suggested via altered inflammatory expression. Specifically, resident macrophages known as Kupffer cells (KCs) have been demonstrated to metabolize fructose through glycolysis and the pentose phosphate pathway. Additionally, fructose increases inflammatory gene expression and cell viability in KCs. We recently identified uridine-diphosphate glucose (UDP-G) to be upregulated in fructose-treated Kupffer cells. UDP-G has been linked to

inflammation across a variety of pathologies through various mechanisms. To determine the role UDP-G may be playing in Kupffer cells, we first studied how inflammation may be affected by UDP-G. This was done by confirming that a known receptor of UDP-G known as P2Y14R is expressed in KCs, and by studying the phosphorylation of downstream transcription factor ERK in KCs treated with glucose, fructose, UDP-G, and an antagonist of P2Y14R. Next, we studied if gene expression of proinflammatory cytokines is altered by UDP-G administration compared to established effects by glucose and fructose. Our current studies focus on UDP-G accumulation drives the formation of hyaluronic acid, a major component of the extracellular matrix.

Contribution of Increase in Fructose Metabolism towards Metabolic Diseases

Author(s): **Nicholas Rojas**
Mentor(s): **Dr. Ian Williamson**
Poster: **49**

A high diet of fructose, coupled with the western diet of excess fat and sugar, contributes to Type 2 diabetes mellitus (T2DM). In the past it was theorized that fructose metabolism in the liver was at fault, however, recent studies have shown that most of the fructose is metabolized by enterocytes lining the small intestine. In rodents, it was shown that a diet of fat increases fructose metabolism, which in turn increases the amount of glycerate in the body. High levels of glycerate in the body can reduce rodent pancreatic islet sizes and B-cell count, inducing glucose intolerance. How lipid and fructose metabolism in the human small intestine interact with each other is not fully understood. To determine if lipids increase human enterocyte fructose metabolism similarly to rodent models, we will deliver fructose marked with an isotope (U-13C) onto the surface of human enterocyte organoids treated with lipids and controls to track its metabolism into glucose and other organic acid metabolites. We anticipate an increase in organoid conversion of fructose into glucose and organic acids. An increase in fructose conversion to glucose and organic acids will provide evidence that fructose metabolism in the small intestine contributes to metabolic diseases such as T2DM. The following is a summary of the literature and practice I have done in preparation for my contribution to the overall experiment.

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

Author(s): **Kaya Rosselle**
Mentor(s): **Dr. Lisa Paciulli**
Poster: **50**

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. The purpose of this study is to determine nursing behaviors between mother and infant. 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 mother and infant are in contact, were re-watched to determine the duration and whether the mother or infant initiated and/or terminated nursing. All nursing bouts occurred within two days, with each bout lasting between nine and fifty-five seconds. 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.

Development and Experimental Analysis of Helical Driven Propulsion for Multi-Terrain and Amphibious Vehicles

Author(s): **Gabriel Ruiz, Andrea Basuroski, Sebastian Hurtado**
Mentor(s): **Dr. Andre Mazzoleni**
Poster: **51**

The MAARCO (Multi-terrain Amphibious Arctic explOrer) research project aims to optimize a research rover for arctic conditions by taking into consideration varied terrains such as snow, permafrost, thawed permafrost and seas. This is achieved by developing a drive base mechanism which can seamlessly transition between any of these and be optimized for energy efficiency. This goal is being realized by the use of an archimedes screw style drive, which can push the rover through snow and water. The project currently consists of three rovers, a rover for solid terrain with either two or four helical drives, and an underwater rover propelled by two helical drives which can also be used to control the depth. The rovers are in the process of being tested in the lab as well as in real world scenarios, such as ski slopes in Virginia and the Casey Aquatic Center. The ultimate goal is to combine these designs after rigorous testing and iteration. The research is being used to create a modeling and analytical framework for understanding and controlling the interactions between helical drives and the terrain conditions found in the Arctic. This will benefit society by enabling easier navigation of the Arctic, which could advance our understanding of the changing climate in crucial and remote locations.

Synthesis of a Novel Fluorescent Peptidic Dendrimers

Author(s): **Arianne San Buenaventura**
Mentor(s): **Dr. Christopher B. Gorman, Juliana O'Brien**
Poster: **52**

Dendrimers are radially symmetric branched polymeric molecules that consist of a core, branching units, and terminal groups. The branching units of dendrimers have void spaces that are capable of housing therapeutics. These void spaces have lead cationic dendrimers like poly(amidoamine) (PAMAM) dendrimers, poly(propylene imine) (PPI), and poly(ethylene imine) (PEI) to be investigated as delivery vehicles for gene delivery because they are biocompatible, have commercially available starting materials, and have amines that are protonated at biological pH. However, the amine-terminated dendrimers mentioned above all lack internal functionalization within the branching units. Previous work in our group was dedicated to synthesizing a dendrimer-peptide hybrid molecule, coined a “Dendripep.” The addition of dimers allows for a wide variety of functional groups to be introduced to the branching units of a dendrimer. The synthesis of the Dendripep utilizes a divergent synthesis by combining solution phase peptide synthesis with alternating aza-Michael and amidation reactions to add the hyperbranched points from the core outward. Synthesis of the Dendripep also utilizes orthogonal protection groups to control the regiospecificity of the product. Currently, the main goal is to show that the method of synthesis of the Dendripep applies to a wide variety of amino acids, such as tyrosine and phenylalanine. To confirm the synthesis of these molecules, nuclear magnetic resonance (NMR) spectroscopy and mass spectroscopy are used to characterize the product.

Lipids Uniquely Change Rates of Lysozyme Aggregation and Toxicity of Amyloid Fibrils

Author(s): **Valeryia Serada**
Mentor(s): **Dr. Dmitry Kurouski**
Poster: **53**

In this research experiment, the employment of atomic force microscopy (AFM), a high resolution imaging technique, was done in order to view the morphology of lysozyme fibril formation in the presence of various ratios of phospholipids and sphingolipids. The ratios used were 1:1, 1:5, and 1:10 respectively. By observing the formation of these fibrils, it could be determined how different lipids at varying ratios relative to the lysozyme protein could affect the aggregation process and the resulting aggregate structures. The observed variations in the fibril morphology suggests that the presence of lipids in different ratios influence the aggregation process of lysozyme, and the protein-lipid interactions affect the formation of fibrils differently depending on the lipid and quantity.

Algal Toxins in Fish Across the Albemarle Sound, NC, 2019 to 2023

Author(s): **Madison Sholes, Clara Kintner**
Mentor(s): **Dr. Astrid Schnetzer**
Poster: **54**

Harmful algal blooms (HABs) are becoming an increasing concern in coastal North Carolina and have been linked to climate drivers and eutrophication. These events become an even larger problem when blooms are associated with the production of toxins. Microcystin (MC) is one of the most studied and common HAB toxins in NC waters, is produced by multiple genera of cyanobacteria and can cause adverse health effects. However, there is a significant knowledge gap on how frequent HABs lead to the accumulation of MC at higher trophic levels. In this study, we evaluate toxin accumulation between several fish species collected during 2019, 2022, and 2023 throughout the Albemarle Sound and some of its tributaries. The year 2019 was an active year for HABs while 2022 and 2023 had much lower HAB occurrences. Using samples collected by citizen scientists and the NC Division of Marine Fisheries, MC concentrations were determined and then compared between fish species and across years with differing HAB intensities. This study aims to inform stakeholders on the potential exposure risks to MC via the consumption of fish and provide a baseline for future monitoring and mitigation.

Investigating Ultrafiltration Membrane Performance for Green Fluorescent Protein Solutions

Author(s): **Chase Smith**
Mentor(s): **Dr. John van Zanten**
Poster: **55**

Ultrafiltration is a process used in biopharmaceutical protein purification as a method to concentrate a target protein using polymeric membranes. These membranes use the differences in size between molecules to retain the target protein while allowing low molecular weight solutes and water to pass through. This research aimed to characterize ultrafiltration performance for solutions containing green fluorescent protein (GFP), which is used as a model biopharmaceutical in NCSU's BTEC courses. Trials were conducted using solutions containing GFP concentrations of 2 mg/mL and 10 mg/mL, with high-purity water serving as both a control and a method to determine membrane cleanliness. Each trial began with a feed flow rate of 10 mL/min and transmembrane pressure (TMP) of 5 PSI, with both values being incrementally increased over time. The ultrafiltration membrane's performance was assessed by measuring permeate flow rate and flux at each increment. These permeate flux values were then plotted versus the TMP to determine the optimum operating point at each flow rate for both GFP concentrations. It was determined that there was a direct relationship between the feed flow rate and the TMP value that corresponded to the optimum operating point for both solutions. Specifically, the highest optimum operating points were approximately 35 PSI at 30 mL/min and 38 PSI at 40 mL/min for the 2 mg/mL

and 10 mg/mL solutions, respectively. These results provide further insights into the ultrafiltration membranes and process systems used at BTEC, which can be used to enhance BTEC lab courses and guide future experiments.

Working Hard, Feeling Guilty: The Behavioral Implications of Guilt at Work

Author(s): **Kayla Stewart, Allison Guild, Reilly LaRoche LaRoche, Keaton Lamb**
Mentor(s): **Dr. Ian Hughes**
Poster: **56**

It is a uniquely human experience to have a complex array of emotions, which inevitably roll over into the workplace. One emotion that remains understudied is guilt and its effect on behavioral outcomes within the workplace. This study aims to fill that gap in workplace research. To address this topic, we collected two samples of remote workers using survey methods (Sample 1 N = 318; Sample 2 N = 392). Analyses in both samples revealed a positive relationship between feeling guilt and increased withdrawal from work. Additionally, there was a positive correlation between feeling guilt and increased incivility in multiple avenues in Sample 2. Notably, there was no correlation between guilt and helping behavior in Sample 1. This study implies that those who feel guilty emotions at work may be more likely to engage in unethical workplace behaviors.

Hemostatic Fibrin Knob Triggered Microgels for Promoting Clot Formation in Neonates

Author(s): **Julia Storch**
Mentor(s): **Dr. Ashley Brown, Dr. Nooshin Zandi**
Poster: **57**

Platelets maintain hemostasis through interactions with fibrin during the wound-healing process. Fibrinogen polymerizes into an insoluble fibrin network via a cascade of coagulating enzymes, aggregating to form a hemostatic plug at the wound site. To initiate polymerization, the enzyme thrombin cleaves fibrinopeptides A and B from fibrinogen, forming fibrin. The A and B knob peptide sequences on the converted fibrin molecules are exposed, binding to corresponding a and b holes on neighboring fibrinogen molecules.
The hemostatic system is immature at birth due to differences in fetal coagulation parameters compared to adults. In neonates with compromised coagulation responses, hemostatic immaturity poses clinical repercussions, including predispositions to bleeding and thrombosis. The increased risk of thrombosis and related adverse outcomes may be associated with the use of adult blood products to treat wounds in this vulnerable population.
To meet this specific need, we have developed fibrin-triggered hemostatic hydrogels adapted to the polymerization mechanisms utilized in the neonatal hemostatic system. Our previous studies show that while adult fibrinogen polymerization mechanisms are driven by

A:a knob-hole interactions, neonatal fibrinogen polymerization relies mainly on B:b knob-hole interactions. To this end, we synthesized pNIPAm microgels and conjugated them to non-binding peptides as a control, as well as B-knob and A-knob specific peptides to prepare Non-binding peptide conjugated microGels (Non-Gs), B-knob Triggered microGels (Bk-TriGs) and A-knob Triggered microGels (Ak-TriGs) respectively. Our current research is focused on elucidating and characterizing the clotting properties of our fibrin-knob triggered microgels through absorbance-based assays, custom microfluidic devices, and microscopy imaging.

Improving the Activity of PcAcsA with Affordable CoA Alternatives

Author(s): **Sarah Taboada**
Mentor(s): **Dr. Gavin Williams, Jared Cossin**
Poster: **58**

This project aims to improve the activity of a CoA-ligase, PcAcsA, with cheaper CoA alternatives such as (R)-pantetheine and n-acetyl-cysteamine. Wild-type (WT) AcsA converts short to medium-chain carboxylic acids into the corresponding CoA-thioester. Mutations in WT AcsA have been designed to make the enzyme accept different substrates with downstream applications in creating antibiotic compound derivatives. However, CoA is expensive, which deters from using it, especially on a larger scale. This project proposes using semi-rational and random mutagenesis to create AcsA mutants that accept more affordable synthetic CoA mimics. Due to the predicted high number of mutants typically tested in directed evolution campaigns such as this, a high throughput Ellman's assay was used to facilitate the screening process. Thus far, we have successfully created a random mutant library of AcsA D449E, an already mutated protein version that works well with synthetic diketide precursors. Additionally, we began investigating and optimizing the screening conditions to provide the most accurate representation of the screened mutant population.

Effects of Enzymatic Treatments on Sweetpotato (NCDM04-0001) French Fry Textures

Author(s): **Caden Tacosik, Mollie Ruinsky, Tyler Hill, Melanie Bacon, Daniel Li**
Mentor(s): **Dr. Matthew Allan, Dr. Fernanda Santos**
Poster: **59**

Fried sweetpotatoes are often expected by consumers to be crispy, however, most sweetpotato varieties require external coatings and additives to reach that desired texture. The goal of this research is to analyze why a new breed of sweetpotato called 'NCDM04-0001' has a notably superior natural crispness, hardness, and fracturability when fried compared to other genotypes of sweetpotato. 15 kg representative samples of 'NCDM04-0001' were used to create the experimental units. These units were tempered in preparation for slicing into 1cm-by-1cm strips. The strips were then aliquoted into 1.1kg treatment bags, then each were blanched to deactivate any pre-existing enzymes. The bags were randomly assigned to a

specific treatment or as controls (not treated with enzymes). Enzyme-treated samples were treated with enzymes (pectin methyl esterase, pectinase, hemicellulase, cellulase, viscozyme, and protease) and incubated for 30 minutes before drying, then par-frying. The prepared samples were then frozen until they are ready for analysis. Fry textures were evaluated by a trained descriptive sensory analysis panel for 10 textural attributes on a 15-point scale, including crispness and hardness. Panelists were given references for each of the qualities. Mechanical texture analysis was conducted using a texture analyzer with a French fry rig. Sensory analysis results are currently being analyzed, and quantitative texture analysis has not been completed. The findings will help breeders in the development of varieties that result in crispy fried textures.

Finite Element Modeling of Cartilage Wear in the Glenohumeral Joint

Author(s): **Catherine Walter**
Mentor(s): **Dr. Katherine Saul, Morgan Dalman**
Poster: **60**

Osteoarthritis (OA) is a degenerative joint disease where the articular cartilage breaks down. In order to improve the prognosis for glenohumeral (shoulder) OA, it is helpful to predict how OA will progress in each patient. This research aims to develop a finite element (FE) model that predicts cartilage wear progression in patients with glenohumeral OA. A short literature review was completed to examine previous FE models and experimental studies to gather information such as material properties like Young's modulus and Poisson's ratio. The model contains the humerus and scapula bones generated from MRI and considered as the rigid bodies. The articular cartilage surfaces were created by enlarging the ends of the humerus and scapula by 2mm. The articular cartilage is allowed to deform under a pressure load computed from OpenSim and applied as an input. MATLAB is used to integrate OpenSim and the FE software and run the FE model. Future work involves creating an iterative process and validating the theoretical model with experimental data from the current literature. This work provides the basis for predicting cartilage wear in patients with glenohumeral OA on a case-by-case basis, informing specialized treatment plans.

Combined Lattice Physics Fuel Management Optimization for BWRs

Author(s): **Joshua Yagozinski, Cole Howard**
Mentor(s): **Dr. Jason Hou**
Poster: **61**

The goal of this project is to construct an efficient refueling pattern for a General Electric BWR/4 (Boiling Water Reactor) system running on an 18-month cycle. The reactor system simulated is based on the Chinshan Unit 1 Reactor formerly operating in Taiwan after its 24th fuel cycle. The purpose of this project is to minimize the refueling cost of the reactor system while maintaining safety and power design specifications. This project will be completed

using Framatome's proprietary MICROBURN-B2 BWR core simulator software. For this project, quarter-core symmetry will be used to lower computational load and runtime. Because of the many complexities involved in BWR fuel lattice design, the scope of this project will exclude fuel assembly construction and design and instead focus on assembly placement and control rod pattern design. To minimize the cost of refueling, the average enrichment of the fuel assemblies will be minimized. As of March 25, 2024, an optimized solution which meets all design requirements has been reached which contains an average enrichment of 4.03% and a total heavy metal weight of 17.087 metric tons.

Timecourse of FV3 Infection of Various Ectothermic Species

Author(s): **Liz Yow**
Mentor(s): **Dr. Stefanie Chen**
Poster: **62**

Ranaviruses are double-stranded DNA pathogens that target cold-blooded vertebrates and significantly contribute to declines in amphibians, fish, and reptile populations. Their ability to be isolated from one species and infect different host species under the same genus despite differences in orders and classes outlines their ecological impact (Chinchar et al., 2011). Frog Virus 3 (FV3) is an extensively studied ranavirus that inhibits host cell macromolecular synthesis and triggers apoptosis. To reduce the impact and dissemination of this virus, a comprehensive understanding of the timeline of infection across different host cell species is imperative. In this study, the response to FV3 infection of cell lines from various vertebrate species - specifically fish (Fathead Minnow [FHM], Epithelioma Papulosum Cyprini [EPC], Zebrafish [ZF4]), reptiles (Vipera Russelii [VH], Terrapene Carolina [TH-1]), and amphibians (South African clawed frog [A6]) - were analyzed. Time-resolved plaque assays were performed on each cell line to observe and quantify the ability of FV3 to induce plaque formation upon infection over the course of seven days. In the present study, these images were analyzed to evaluate the size and evolution of the plaques formed by the virus across the various cell lines. This analysis helps us to better understand the timeline and effect of infection of various ectothermic species by FV3.

ICR 3: A Potential Epigenetic Signature of Hepatocellular Carcinoma

Author(s): **Abdullah Zaben**
Mentor(s): **Dr. David Skaar**
Poster: **63**

Our ongoing research project aims to investigate how gene methylation regulates hepatocellular carcinoma (HCC). To address this question, we employ an epigenetic approach, focusing on methylation-sensitive regions in the genome, known as Imprinting Control Regions (ICRs), to regulate gene expression. Our research hypothesis centers on liver-related ICR regions that are crucial in developing HCC.

Our study design involves a blind investigation, with a control group comprising DNA samples from individuals without HCC and a case group comprising individuals diagnosed with HCC. We conducted bisulfite DNA conversion for methylation percentage analysis during sequencing. Subsequently, we designed primers specific to identified ICR regions and utilized PCR for amplification.
Our preliminary findings show the role of ICRs in HCC development, particularly highlighting the correlation between hypomethylation of ICR 3 in HCC patients. ICR 3 may regulate the nearby PKP3 gene, which is known to cause HCC.
Identifying blood-detectable epigenetic biomarkers associated with HCC is an early diagnostic tool, which will later be used for targeted interventions to mitigate HCC risk.

Comparing Different DNA Preservation Methods

Author(s): **Karen Kaiser**
Mentor(s): **Dr. Jennifer Baltzegar**
Poster: **64**

DNA provides the basic blueprint of all life, serving as a determining factor of how the body functions and disease processes. DNA degrades over time, therefore preserving DNA allows research to be conducted on organisms despite when samples were collected. This is relevant when using Aedes aegypti as a model organism to further investigate their impacts on human health and the environment. The main goal of this project was to understand which of the six preservation methods tested best preserved DNA. This required first isolating DNA from samples stored for thirteen months in various buffers and categorizing the quality and quantity of DNA isolated by a) running gel electrophoresis and b) measuring quantity on a Qubit. A gap exists when attempting to understand the efficiency of six preservation methods used in Phase I, conducted Summer 2022, of this experiment, compared to Phase II, conducted in Fall 2023, drawing conclusions on how DNA preservation methods compare over different time frames; five days, nine days, and thirteen months. DNA/RNA Shield preserved the highest concentration of gDNA among five-day, nine-day, and thirteen-month storage periods. DNA preservation helps prevent degradation, where DNA undergoes chemical modifications or damage such as oxidation, interfering with DNA polymerase's ability to replicate the template accurately and in some cases, the template may be completely lost, posing challenges for research utilizing DNA.

Lemna Gibba Image Segmentation and Analysis

Author(s): **Kyle Curley**
Mentor(s): **Dr. Ryan Sartor, Kassidy Robinson**
Poster: **3210-1**

This project aimed to enhance the tracking of the Lemna Gibba plant growth rates in Dr. Sartor's lab. Building upon Kassidy Robinson's initial efforts using PlantCV for image segmentation, I implemented the use of Ultralytics YOLOv8 in the attempt of improved accuracy. First, I annotated hundreds of images using Roboflow, creating a dataset imported into a Python script. YOLOv8 was then used to train a model on this dataset to detect plant images. The script uses the model to predict and segment the plant images and reads barcode images correlating to the plant images, separating the plant images and barcode images into respective folders. The script iterates through these folders, determining plant area via white pixel count and reading barcodes for barcode images. Results are recorded in a CSV file. Matching plant and barcode information is then consolidated into another CSV file. After thorough testing, the script was executed on larger image sets for comparison with previous methods using R. This methodology enhances plant growth tracking and facilitates comparative analysis in the lab.

Pine-Bark Biochar Anode for Wastewater Treatment and Electricity in Microbial Fuel Cell

Author(s): **Khing Masaya-anon**
Mentor(s): **Dr. Praveen Kolar**
Poster: **3210-2**

Microbial Fuel Cell (MFC) is technology that generates electricity by harnessing electrogenic microbes. MFC has gained significant attention for its simultaneous wastewater treatment and electricity production. Flows of electrons are generated by oxidation of organic compounds by electrogenic microorganisms in anoxic anodic chambers and reduction of oxygen in cathodic chambers. However, the practicality of MFC is hindered by low power density and cost of fabrication. Improving electrode performance is important for the advancement of MFC. Agricultural and forestry waste-derived biochar (BC) generated from the pyrolysis of biomass is proposed as promising MFC electrode materials due to its high conductivity, renewability, and low cost. The biocompatibility, high surface area, and high porosity are advantageous for biofilm formation and electrogenicity. In this study, pine bark biochar (PB-BC) was synthesized as anode material for MFC fed with synthetic swine wastewater (WW) to valorize local resources in North Carolina. Surface characteristics of PB-BC synthesized at high temperature (900 C) were examined via pH-pzc test, hydrophobicity

test, XPS, ToF-SIMS, and SEM. The effect of various carbonaceous solid applications on COD reduction in WW were evaluated in fed-batch systems. Anodes fabricated from biochar granule (BCG) and commercial activated carbon (AC) were applied in double-chamber MFC with WW anolyte and PBS (pH 7) catholyte. The closed-circuit voltage and COD reduction were constantly monitored over 28 days to evaluate the efficacy of the waste-derived anode in comparison with the commercial anode in MFC systems. This research–when completed–is expected to implement agricultural waste remediation and renewable energy production simultaneously.

Effect of Brachial Plexus Birth Injury on Postnatal Bone Development

Author(s): **Katie Taran**
Mentor(s): **Dr. Jacqueline Cole**
Poster: **3210-3**

Brachial plexus birth injury (BPBI) occurs during difficult births when the neck is excessively stretched, causing musculoskeletal deformity in the glenohumeral joint, which impairs shoulder range of motion and functional movements. Sequelae differ depending on nerve injury location (postganglionic or preganglionic), but little is known about the changes in bone formation and mineralization over time, which could inform targeted treatments. Sprague Dawley rats were divided into 4 surgical groups (postganglionic or preganglionic neurectomy, forelimb disarticulation, or sham) and received surgery on one forelimb at postnatal days 3-6. Prior to sacrifice (2, 3, 4, 8, or 16 wks with n=9-60 per timepoint), calcein and alizarin fluorochrome labels were injected to measure bone formation. Humeri were dissected, sectioned into transverse (cortical bone) and longitudinal (trabecular bone) sections, imaged, and analyzed using standard dynamic histomorphometry. Metrics were compared across groups with ANOVA and Tukey posthoc tests (GraphPad Prism, $\alpha<0.05$). Preliminary results for the postganglionic group: Trabecular bone volume fraction was greater at 8 weeks than 4 weeks. Total bone area plus marrow area and cortical bone area were lower at 8 weeks than 4 weeks. Endosteal and periosteal mineral apposition rate and bone formation rate were greater at 4 weeks than 8 weeks for both limbs. These results suggest that BPBI reduces bone growth and mineralization during early postnatal development. Analysis of additional timepoints and groups will provide more complete understanding of bone growth and mineralization changes following BPBI, which is critical for developing more targeted and timelier treatment strategies.

“An Absolute Nightmare”: How Students Experience and Manage Housing Insecurity

Author(s): **Olivia Ball**
Mentor(s): **Dr. Virginia Riel**
Poster: **3221-1**

Housing is an arena of social life that is foundational to gaining access to other resources. Literature across the social sciences stresses that finding and maintaining housing, or not securing housing, can critically affect life chances. Building off of existent literature and frameworks, we investigate the social process of procuring housing for a less explored vulnerable group: undergraduate students. One of the most dire aspects of the study analyzes how students conceptualize, experience, and perceive the rising issue of housing insecurity among their undergraduate student body. As housing insecurity becomes more prevalent nationwide, we aim to explore how the growing issue affects students' mental health, physical well-being, and academic performance.
The research study uses qualitative in-depth data with semi-structured interviews from 40 undergraduate students, who are currently enrolled in one of three flagship universities in the United States. We find that while some students defined housing insecurity in terms of lack of affordability or shelter, many students in the sample defined housing insecurity broadly to include the presence of uncertainty or fear of losing housing as well as lack of basic amenities. Students’ experiences with housing insecurity carried a range of consequences, including increased stress and anxiety, lack of sleep and food insecurity, and hindrances to academic performance. It also negatively affected their social relationships with friends, roommates, and romantic partners. These findings contribute to existing interdisciplinary literature which strives to increasingly encompass diverse experiences of housing insecurity while adding a focus on vulnerable student populations.

Napoleon the Machiavellian

Author(s): **Alsey Hopkins**
Mentor(s): **Dr. Holly Hurlburt**
Poster: **3221-2**

This research explores the influence of Niccolo Machiavelli’s works on the life of Napoleon Bonaparte. Machiavelli’s approach to power and government in his works, “The Prince” as well as “The Discourses of Livy,” provided Napoleon with a framework that informed his worldview. Through analysis of Machiavellian principles such as realpolitik, maintenance of a religious veneer, and the importance of fear to uphold power, along with others. This study examines the deep parallels between what Machiavelli wrote and what Napoleon put into practice. The research delves into Napoleon’s life in all facets. From his military campaigns, governing methods, personal life, and even the emperor’s linguistics. Examples will be given from all to demonstrate these Machiavellian ideas being put into practice. By providing concrete examples from Napoleon's life and rule, this research underscores the enduring

relevance of Machiavellian principles in contemporary political discourse. Napoleon's case serves as a compelling illustration of how Machiavelli's teachings continue to shape the strategies and tactics employed by leaders seeking to consolidate and wield power in the Western political tradition. Through this analysis, we gain invaluable insights into the nature of power dynamics and the enduring legacy of Machiavelli and Napoleon in shaping the political landscape.

Resource Accessibility & Awareness for University Students

Author(s): **Haley Pearce**
Mentor(s): **Dr. Fiona Wang**
Poster: **3221-3**

Universities have an outstanding responsibility to learn and understand the challenges that their students face in accessing resources, and staying attentive to its impact on their academic success and well-being. (Strayhorn, 2018) This research touches on various challenges found by six sources that hinder students' ability to receive the proper support and thrive. Research findings indicate a significant proportion of students exhibit limited awareness regarding the availability of institutional resources and support services. The survey data collected at NCSU underscores the necessity for a tool I intend to develop, which aims to alleviate the gap between university students and essential resources and support services. Implementing innovative solutions can help universities promote a supportive environment for students' academic success and well-being. My proposed solution involves the development of an assessment tool designed to help students locate necessary resources, regardless of their awareness of their existence, through a series of guided inquiries tailored to their needs.

Phosphorus-Based Cations as Main Group Catalysts

Author(s): **Almira Ahmed**
Mentor(s): **Dr. Tom Hooper, Christine Coffey**
Poster: **1**

In the past two decades, there has been a heightened interest in main-group compounds, which have been shown to mimic the reactivity of transition metals. Researchers aim to find alternative elements to use in chemical processes such as catalysis, which are reliant on rare and costly transition metals for product manufacturing. The development of main-group catalysis is crucial because it has the potential to be utilized in the production of everyday products such as pharmaceuti. The overall purpose is to improve environmental stability, provide safer alternative catalysts, and lower costs. Phosphorus can potentially be used as a catalytic center, making catalytic processes more sustainable.
This project focuses on the synthesis of phosphenium cations through air-sensitive methods such as Schlenk line and glove box. Phosphenium cations are a divalent species that contain a phosphorus center. Manipulation of the backbone of supporting ligands allows access to phosphenium cations with different properties and reactivities. Many synthesis reactions were performed, including the syntheses of 2,3-diazabutadiene (DAB) ligands. DAB (SMe), {(MeSC6H4)N=CH}2, was characterized as a novel ligand using a range of analytical techniques including NMR spectroscopy, X-ray crystallography, and IR spectroscopy. This ligand was designed to contain additional donor thioether groups to stabilize the reactive phosphenium cation. The DAB (SMe) ligand was reacted with PI3 to form a phosphenium cation which was characterized in situ by 31P NMR spectroscopy. Given further time, the reactivity of this phosphenium cation towards a range of organic substrates would be explored with focus on potential uses in catalysis.

Airfoil Shape Optimization Using Conditional Wasserstein Generative Adversarial Networks

Author(s): **Taha Ahmed**
Mentor(s): **Dr. Veeraraghava Raju Hasti**
Poster: **2**

Dust soiling on solar panels affects the efficacy of solar panels in regions susceptible to dust storms. One possible way to combat this is by creating solar panels in the shape of airfoil cross sections. The shear stress experienced on the upper surface may aid in reducing time between maintenance of solar panels. By characterizing the shear stress on the upper surface of NACA 4-digit airfoils and training a cWGAN model to produce shapes corresponding to characteristic shear, new more effective shapes may be discovered.

Stellar Wind Turbulence and its Effects on Hoyle-Lyttleton Accretion

Author(s): **Lilly Ahrens**
Mentor(s): **Dr. John Blondin**
Poster: **3**

Black holes and neutron stars that shine brightly in X-rays are largely fed by matter pulled away from nearby stars. This inflow process is known as gravitational accretion, and the matter flowing off the nearby star is referred to as stellar wind. The dynamics of this wind accretion have been extensively studied using hydrodynamic simulations, always under the assumption of smooth upstream flow. We know winds from hot stars to be clumpy which can be expected to lead to post shock turbulence at the accretor. Using three dimensional hydrodynamics simulations, we investigate the effects of turbulent flow on wind accretion. Each run is evolved with a smooth upstream wind to form a steady, smooth bow shock about the accretor. Once steady state is reached we begin to add in wind clumps upstream and evolve in order to produce turbulent flow. The wind clumps are simulated using a Perlin algorithm that produces randomized density clumps with a prescribed wavenumber and density contrast. We quantify the effects of the post shock turbulence on the efficiency of the mass accretion rate, the variation in accreted angular momentum, and the size and shape of the bow shock.

Modulation of Iron Metabolism and Cancer Cell Proliferation by the Sulforaphane Family Isothiocyanates

Author(s): **Omer Akhtar**
Mentor(s): **Dr. Yoshiaki Tsuji**
Poster: **4**

Sulforaphane (SPH) is a chemical found abundantly in broccoli and broccoli sprouts which contains the isothiocyanate (ITC) structure and may have anticancer effects. The main process that leads to the anticancer effect is the fact that SPH interacts with specific cellular proteins and modulates their functions. Our preliminary data suggest that SPH inhibits the binding of an iron-regulated RNA binding protein called iron regulatory protein (IRP) to iron responsive element (IRE), a stem loop regulatory element in mRNA of key iron metabolism genes such as ferritin and transferrin receptor (TfR1). The IRE-IRP interaction is increased in colon cancer and other cancer cells, causing increased iron availability through upregulation of TfR1 for cancer cell growth. SPH seems to inhibit IRP binding to IRE which decreases TfR1 expression. We hypothesized that the ITC structure in SPH inhibits the IRP binding. By testing other phytochemi with similar structure to SPH, we aimed to determine how SPH and other active ITCs inhibit the IRE-IRP interaction. This was done by treating colon cancer cell cultures with SPH or other ITC phytochemi and observing the IRP-IRE interaction by the IRE-regulated luciferase reporter system. Preliminary results showed that molecules with structures similar to SPH, such as Sulforaphene and Iberin, were most effective at inhibiting

IRP and growth of colon cancer cells. The specific mechanism that modulates the IRE-IRP system is still under investigation.

The Importance of Zoological Parks in Wildlife Preservation

Author(s): **Aidan Baker, Eh Taw Boe**
Mentor(s): **Dr. Erin McKenney**
Poster: **5**

Zoos attract millions of visitors every year, but these visitors often have very little knowledge about the important roles zoos play in helping wildlife around the world. Many people see zoos as fun places to observe and learn about different animals, but these institutions serve a much more critical role than that. Behind the scenes, zoos play a pivotal role in the conservation and protection of threatened and endangered species globally. The purpose of our project is to help spread awareness about all the different methods zoos use to aid wildlife conservation. To accomplish this goal, we conducted an extensive literature review to examine this issue from diverse perspectives. We propose strategies to help engage the public through various activities tailored to specific stakeholder groups. We hope these activities will raise awareness of actions and practices currently used to support wildlife, the roles zoos play in wildlife preservation, and how to raise support and resources for zoos. This project is crucial to the future of conservation because increasing publicity can help zoos to receive more funding and resources in the future to help save the animals and their habitats.

Enhancing Nearly Autonomous Management And Control System with GPT

Author(s): **Thomas Benthall, Ciana Moore, Austin Sides, Spencer Blanchard**
Mentor(s): **Dr. Nam Dinh, Dr. Paridhi Athe, Dr. Linyu Lin**
Poster: **6**

The Nearly Autonomous Management and Control (NAMAC) system is a tool designed to aid nuclear reactor design and operation through continuous monitoring of Nuclear Power Plant systems, and employing digital twins of the particular reactor for diagnosis, prognosis, and strategies for corrective operational control.
Our project's aim was to determine whether generative AI, such as OpenAI's GPT4, could improve upon NAMAC. Generative AI has the potential to create adaptive solutions outside the scope of training while maintaining adherence to the underlying principles of the training set. GPT4 is a large language model of a neural network that grows in complexity, creativeness, and logical rationale with every update.
At NAMAC's heart are thermal hydraulic simulations based on GOTHIC models of particular reactors. For potential enhancement, GPT4 was tested on its domain knowledge of thermal hydraulics; modeling and simulating such with GOTHIC. With this, GPT4 created a basic procedure to aid reactor thermal hydraulic modeling.

GPT4 was interrogated at length on its domain knowledge across several subjects like nuclear engineering specific analysis codes, reactor design, and others. GPT4's growing creativeness and logical understanding was also analyzed when given various documents to study Retrieval Augmented Generation.
OpenAI's GPT4 API was studied for how GPT's customization could enhance NAMAC. The conclusion was that GPT has extensive knowledge and makes a viable chatbot that the operator may consult for situations outside NAMAc's scope, but that it lacked in improving NAMAC directly, necessitating a third party operator to manually implement and test changes on NAMAC components.

Discrepancies Between Senior Entrepreneurs and Younger Audiences

Author(s): **Jared Caddell**
Mentor(s): **Dr. Fiona Wang**
Poster: **7**

This presentation analyzes trends and causations between senior entrepreneurs and the size of their young consumer base. Furthermore, strategies for businesses to effectively market and engage with a younger audience through contemporary media channels and social culture will be explored. This presentation helps businesses better understand the marketing needed to appeal to an ever-changing culture, as well as the knowledge needed to promote and maximize outreach in different digital environments. The primary objective is to provide local and large-scale businesses with strategies aimed at promoting consumer diversity and fostering intergenerational relationships between senior entrepreneurs and young consumers.

Investigating Plant Growth Promotion by Azospirillum Microbes

Author(s): **Mansi Chawla**
Mentor(s): **Dr. Imara Perera, Aurora Toennisson**
Poster: **8**

Phosphorus is a crucial macronutrient essential for healthy plant growth and a key component of various biological processes requiring ATP. However, the low availability of phosphorus in the soil requires widespread dependence on fertilizers for crop growth. Excess phosphorus, which often remains unabsorbed by plants, poses the challenge of contributing to runoff and polluting freshwater. One strategy to minimize fertilizer input is to utilize plant growth-promoting rhizobacteria such as Azospirillum. These beneficial microbes enhance plant growth through a variety of mechanisms, including accessing insoluble phosphate reserves and increasing the plant hormone auxin. The goal of this project was to test if strains of Azospirillum microbes isolated from diverse soil and compost sources around North Carolina enhanced plant growth and supported plants in low-nutrient conditions. We evaluated root and shoot growth parameters of Arabidopsis thaliana plants under varying

phosphate conditions following inoculation of two distinct Azospirillum strains. The microbe strains release phosphatase enzymes to break down the phosphate compounds into readily absorbable forms for the plants. Azospirillum also modifies the environment to create conditions conducive to plant phosphate mobilization and uptake. To monitor if the Azospirillum strains altered auxin levels in the plant roots, we grew DR5:GUS reporter lines with and without Azospirillum and visualized the results. Preliminary observations from this investigation revealed the influence of microbial treatments on plant root morphology. This research will provide insight into the effects of microbes on plant nutrient acquisition and utilization.

Evaluating the Efficacy of SSOPs of a Dairy Plant

Author(s): **Mrunmayi Chawnekar, Ethan Johnson, Aidan McElligott, Lottie Pate, Sarah Williams**
Mentor(s): **Dr. Fernanda Santos, Carl Hollifield, Dr. Lynette Johnston**
Poster: **9**

This study aims to determine if the current schedule of the Sanitation Standard Operating Procedures (SSOPs) controls microbial load effectively on the equipment's food contact surfaces in a dairy plant. The main concern is whether the dairy processing equipment must be recleaned and sanitized after being empty for 72 hours. The dairy plant has a 72-hour clean-hold time where the tanks remain empty after sanitization (0 hours) with the sanitizer left to dry on most surfaces. Swabs were collected in five food-contact surface areas of the equipment that processes raw or pasteurized milk 72 hours after the cleaning and sanitizing procedure described in the SSOP. The dairy plant was sampled on three separate days to obtain triplicate samples. Swabs were used to determine the aerobic bacteria and coliform counts and serve as an indicator of the overall cleanliness and sanitation of the plant. Undiluted samples were plated onto Aerobic Plate Count and Coliform Petri films and incubated for 48 and 24 hours, respectively, at 35°C. After the incubation period, no growth was detected on any of the Petri films from the three collection times. The results suggest that the current sanitation practices are efficient and recleaning and resanitizing are not necessary when restarting production within 72 hours of shutdown.
Keywords: Sanitation, Clean-In-Place, Dairy Plant, Food-contact Surfaces, Environmental Monitoring

Planktic Foraminiferal Response to the 2014-2015 Marine Heatwave in the Santa Barbara Basin

Author(s): **Katherine Cherry**
Mentor(s): **Dr. Catherine Davis**
Poster: **10**

As the oceans warm the severity and frequency of marine heatwaves (MHW) is expected to escalate and have significant detrimental impacts on marine ecosystems. However, limited data exists to provide a pre-anthropogenic baseline for MHW or suggest whether their frequency may have changed in the geologic past. Planktic foraminifera, ubiquitous marine protozoa with a calcareous test, serve as a common paleoceanographic proxy due to their sensitivity to sea surface temperature, among other environmental parameters. Changes in foraminiferal assemblage compositions recovered from sediments may therefore be used as potential proxies for MHW, but the responses of planktic foraminifera to MHW remains understudied. This research explores the foraminiferal community off the California coast in the high sedimentation-rate Santa Barbara Basin (SBB) (34°14'N, 120°02'W) during 2014-2015. At this time, the Pacific Ocean experienced a MHW known as the 'Warm Blob,' that increased average water temperatures by 4°C. We present data from 30 planktic foraminiferal assemblages collected at 10-13-day intervals in a sediment trap moored between 400-500 m below the sea surface in the SBB. The most abundant species between 2014-2015 are Neogloboquadrina incompta, Globigerina bulloides, and Turborotalita quinqueloba. Other notable species are Globigerinoides ruber (pink), Orbulina universa, and Globorotalia scitula. To assess potential differences in assemblages from non-anomalous years, we compare these findings with data on assemblages from 1993-1996, 2017-2018, and 2020-2021. Examining the predictability of foraminiferal assemblages during MHW will provide insights into their potential use as a proxy for MHW in the geologic past.

Nonaqueous Bioconjugation in Fluoroalcohol and Solvent-Free Medium

Author(s): **Isaac Cho**
Mentor(s): **Dr. Jun Ohata, Mohammad Nuruzzaman**
Poster: **11**

"Bioconjugation" is a method employed to covalently link two molecules, one of which is typically a biomolecule (e.g. proteins, peptides), with a synthetic organic molecule (e.g. drugs, fluorophores) resulting in the formation of a novel compound. During bioconjugation, one of the major challenges is to choose an optimum reaction media, as biomolecules get denatured in traditional organic solvents and whereas organic labeling agents often get decomposed or cannot react efficiently in aqueous media. Recently the Ohata lab utilized hexafluoroisopropanol (HFIP) as a non-aqueous media to achieve bioconjugation of tryptophan residues of proteins and peptides with thiophene-ethanol labeling agents via Lewis acid catalysis. Additionally, the same group is exploring the use of solvent-free bioconjugation techniques through grinding of proteins with labeling agents, where the first

important step is to evaluate the functional efficacy of the mechanically processed protein. This research investigates the effect of different leaving groups on the thiophene-ethanol backbone for tryptophan labeling in HFIP and explores the activity assay of grinded protein molecules in a solvent-free format.

Qualitative Analysis to Existing Water Quality Monitoring

Author(s): **Lauren Conway, Millie McInnes**
Mentor(s): **Dr. Angela Allen**
Poster: **12**

The stewardship of Schenck Memorial Forest was given to the over 85 years ago. In the past 30 or more years, urbanization combined with residential growth has impacted the forest in several ways. Our team has been gathering data to establish a baseline of the impacts these changes have on the water quality in the Richland Creek located within the heart of the forest. Deviations in basic water quality parameters have been monitored over time to evaluate how pH, dissolved oxygen, conductivity, turbidity, and nutrients in this waterway. Urbanization is known to have significant impacts on our environment. Expected impacts are often observed with changes in the shape and flow of the creek, the increased pollutant levels, and the increased in the clarity of the creek. We have detected decreased water quality over time, and more visible detection with the newly constructed industrial company and road improvements along Wade Avenue. Future monitoring seeks to expand our study on changes in water quality and their impact on the wildlife. Additionally, chemical testing to determine what composition of indicators are in need of our attention for water quality improvement.

Validation of Clostridium sporogenes and Genetically Modified Strain MF001 with Bile Acid Inducible (bai) Operon Knock In

Author(s): **KC Cooper**
Mentor(s): **Dr. Casey Theriot, Sam McMillian**
Poster: **13**

Clostridioides difficile infection (CDI) is the leading cause of nosocomial infection in the U.S., impacting nearly half a million people each year. Antibiotics are a major risk factor for CDI as they alter the gut microbiota and decrease colonization resistance against this pathogen. It is hypothesized that commensal Clostridia are able to prevent C. difficile growth in part due to their ability to make inhibitory secondary bile acids from primary bile acids. The bile acid inducible (bai) operon, encoded by some commensal Clostridia, is necessary to carry out 7α-dehydroxylation of deconjugated primary bile acid – such as cholate (CA) thereby converting it into the secondary bile acid deoxycholate (DCA). A recent study was able to knock in the bai operon into C. sporogenes and named the strain MF001. Genes from the bai operon are spread between different plasmids and are regulated by a sporulation promoter, which is

activated between 48 and 72 hr of growth. We sought to validate the maintenance of plasmids containing the bai operon genes in MF001 after 72 hr of growth. Growth curves of WT and MF001 strains were done over a 72 hr period, DNA was extracted from cultures, and PCR of the bai genes was done. DNA from MF001 was positive for bai genes via PCR, compared to the negative WT control. Understanding how MF001 grows and maintains its plasmids will provide insights for future experiments aimed at assessing how C. difficile's growth is affected by secondary bile acids produced by MF001.

Beach Erosion Impacts on the NC Coast

Author(s): **Raven Cummings, Amelia Faust**
Mentor(s): **Dr. Erin McKenney**
Poster: **14**

Beach erosion is a pressing issue that impacts beach goers, land owners, and endemic species on the North Carolina coast. The negative effects of this issue include habitat loss, receding shorelines, and property damage. Beaches provide substantial protection from the flooding and destruction brought on by extreme storms; but shoreline erosion is reducing this protection. In the past, synthetic physical barriers and beach nourishment programs have been implemented to prevent erosion; however, they are inefficient. New methods are desperately needed to prevent beach erosion. The goal of our project is to inform the general public of the detrimental effects of beach erosion and to promote more effective and more natural ways to combat this issue. To accomplish this goal, we conducted an extensive literature review to examine this issue from diverse perspectives. Our objective is to increase awareness of the consequences of beach erosion for different stakeholder groups and empower the public to take action. Increasing the general public's understanding of beach erosion and its consequences will inspire them to advocate for change in beach management. This project will also increase lo' knowledge of endemic species that are being harmed by coastal erosion, which will strengthen their connection to nature and inspire them to advocate for their protection.

Perceptions of Political Efficacy/Social Exclusion Among Muslims and Hindus in India

Author(s): **Juhi Dighe**
Mentor(s): **Dr. Dmitri Mitin**
Poster: **15**

This research project addresses a current academic debate in the political science and sociological literature on the impact of religious affiliation on individuals' political and social experiences and opinions about society. It examines the experience of young Hindus and Muslims in India using a quantitative and qualitative analysis, which are used to examine how young middle class citizens perceive themselves in terms of political efficacy and social

marginalization. The secondary data for this project comes from the "Religion in India: Tolerance and Segregation" survey, conducted by the Pew Research Center in 2019-2020. Additionally, we will conduct 8-10 Zoom interviews with urban, middle-class Muslims and Hindus, aged 18-25, about their perceptions of political efficacy, key economic challenges, and personal experiences with religious freedom and diversity in their community. The preliminary results suggest that, controlling for other explanations, perceptions of marginalization are higher among those living in rural areas. However, contrary to what the literature suggests, age and gender do not seem to have a significant correlation with perceptions of marginalization and political efficacy.

Rearrangement of Unique Bis(cyclopropyl) Ethers Derived from Cyclopropanones into Biologically Relevant Spirocyclic Derivatives

Author(s): **Kenyon Dunlap**
Mentor(s): **Dr. Vincent Lindsay, Joshua Hobbs**
Poster: **16**

Cyclopropanones constitute highly reactive intermediates due to their important ring strain resulting from the incorporated ketone group in the smallest possible ring. Our group employs more stable 1-sulfonylcyclopropanols that forms cyclopropanones in situ under mild basic conditions. During our investigation of the chemistry of cyclopropanones, we noticed that thiol adducts could be dimerized into interesting dicyclopropyl ether structures. We envisioned that these new compounds could be precursors of strained spiro compounds with interest as bioisosteres in medicinal chemistry. In this work, we looked at the synthesis of a cyclopropyl thiophenol group which can then be dimerized into the dicyclopropyl ether using the Vilsmeier reagent under basic conditions. This ether structure is then thought to be able to convert to a spiro compound using a silver salt employed as a Lewis acid that pre-associates with one of the thiophenol groups. Efforts towards this goal will be presented and future directions discussed.

Accelerating Qualification of New Materials for Molten Salt Reactors: an Experimental Design Approach

Author(s): **Ryan Eavenson**
Mentor(s): **Dr. Lingfeng He**
Poster: **17**

The development of molten salt reactors (MSRs) dates back to the 1950s, spurred by pioneering work at Oak Ridge National Laboratory. As interest in this innovative nuclear technology resurfaces, the material selection process becomes pivotal in ensuring the compatibility, safety, and efficiency of MSRs, demanding careful consideration of materials' corrosion resistance, mechanical properties, and radiation tolerance. As such, the mechanical properties of these materials must be tested in an environment that can emulate high

temperatures and corrosive salts while maintaining the integrity of the testing procedure and apparatus. Our team has developed a testing capsule that can withstand both high temperatures and corrosive salts, while being capable of simple mechanical testing using the ASTM four-point flexural testing procedure as a base for the design. To show the validity of the design for use in qualifying material for molten salt reactors, a finite element analysis will be done with the design, along with corrosion testing under high temperatures after the design in fully machined and operational. Conclusions will be drawn as to the effectiveness of the design for qualifying MSR materials and the difference in cost of this approach to other methods of qualifying these same materials.

Power in the Pollinators

Author(s): **Chloe Farrell, Angela Hernandez Garcia, Lauren Sims**
Mentor(s): **Dr. Erin McKenney**
Poster: **18**

Bees are the leading pollinators in agriculture and across natural habitats. Without them, the agricultural system and such as food, land, and water that humans depend on will collapse. Without pollinators such as bees, butterflies, bats, birds, flies, beetles, and many more species, flowering plants would go extinct causing all ecosystem resources and services to decline or even collapse. Almost all pollinators are facing rapid population decline due to anthropogenic impacts, especially European honeybees (Apis mellifera) as they face extreme colony collapse disorder as a result of pollution, climate change, and habitat destruction. However, pollinator population restoration, recovery, and future growth is possible with human intervention. We aim to develop action items that promote a sustainable, achievable, and mutually beneficial balance between human expansion and pollinator fitness, not just for the European honeybee, but for all pollinator species that face threats to their habitat, resources, and overall fitness. To achieve this goal, we conducted an extensive literature review to examine this issue from diverse perspectives. We hope to facilitate the implementation of sustainable change via public education and ecologically informed legislation to protect pollinator habitat, reduce pollution, and expand food sources to help our pollinators recover. This societal shift is necessary because the future of agriculture and human existence hinges on the success of pollinators.

Developing a Spectroscopic Assay to Measure Disulfide Bond Changes During Protein Aggregation

Author(s): **Jordyn Fishkin**
Mentor(s): **Dr. Michael B. Goshe**
Poster: **19**

Disulfide bonds are an essential component to the proper folding of 15% of human proteins. While they play an important role in proper folding of proteins, they are more prominent in aggregating proteins; roughly half of the known amyloid protein aggregates contain disulfide bonds. To better understand the role of redox-mediated disulfide bond changes in protein aggregation, a method is needed to determine if a cysteinyl residue exists as a free sulfhydryl or participates in a disulfide bond. Although a number of methods could be considered, a spectroscopic assay is preferred since it can provide a rapid measurement method to analyze the structural components of small molecules and proteins. Our research focuses on developing a spectroscopic method using 5,5'-dithiobis(2-nitrobenzoic acid) and 2-nitro-5-thiosulfobenzoate to quickly determine the quantity of free sulfhydryls and disulfide bonds in proteins. At this stage of assay development using several proteins containing a varying number of disulfide bonds, the most promising conditions include minimizing exposure to light, performing the labeling reaction at an elevated temperature, and using 60% methanol as a protein denaturant. Once assay conditions are established that maximize analysis efficiency and reproducibility, the developed spectroscopic assay will be used to identify the role disulfide bond shuffling plays in the mechanism of redox-mediated protein aggregation.

Upgrading the AutoJET Device to Automate Jet Erosion Tests

Author(s): **Garett Fox**
Mentor(s): **Dr. Lucie Guertault, Dr. Celso Castro-Bolinaga**
Poster: **20**

The Jet Erosion Test (JET) is a procedure used to quantify soil erosion parameters by subjecting a soil sample to a concentrated stream of water. These parameters are used to select ideal soils for constructing earthen structures such as dams and spillways. Originally designed by Dr. Greg Hanson, the JET (1990) and miniJET (2009) devices are used to conduct JETs internationally, but are labor intensive and time consuming to operate. Thus, the development of a device enabling automated functioning and data collection is a great advancement in the efficiency of JETs. A prototype automatic JET device, the AutoJET, was developed in 2023 and a finalized version, consisting of standardized components and streamlined operation, is now completed. Although much of the prototype design was maintained, new custom components were designed and fabricated for improved durability and functionality. Also, the microcontroller was converted to an Arduino-based system that is self-contained within the device. The improved AutoJET was tested for accuracy and underwent a calibration procedure to quantify energy losses due to linear friction and

contractions that occur as water passes through the AutoJET nozzle. The AutoJET is currently being compared to the miniJET in a series of side-by-side erosion tests on identical soil samples in order to verify the accuracy of the device. Current results indicate that the new AutoJET is accurate and are consistent with corresponding miniJET results. Ultimately, the AutoJET is a viable replacement for the miniJET while also allowing for less labor intensive testing and more time-efficient autonomous operation.

Roots to Ruins: Navigating the Path of Deforestation

Author(s): **Tatiana Frontera, Graham Royal, John Hendrix**
Mentor(s): **Dr. Erin McKenney**
Poster: **21**

Habitat destruction drives approximately 80% of global biological diversity loss. Increasing anthropogenic land use change converts forest habitats into urban areas and agricultural land. Increasing habitat loss leads to more species endangerment and extinction. However, given that the global human population is increasing, conversion of land use to satisfy human needs will also continue to increase. Our project goals are to increase awareness of habitat loss and propose sustainable land use alternatives that could benefit the environment and society. To accomplish these goals, we conducted an extensive literature review to examine this issue from diverse perspectives. Our project aims to consider different conservation strategies, provide educational resources on how habitat loss affects the environment and society, and propose urban planning approaches that integrate / preserve natural habitat. We hope to facilitate a reduction in unnecessary destruction of habitats while also improving overall methods for forest land use practices.

Integrating LLMs into Computing Education: a Systematic Literature Review

Author(s): **Shiva Gadireddy**
Mentor(s): **Dr. Tiffany Barnes, Heidi Reichert, Benyamin Tabarsi**
Poster: **22**

Given the recent introduction of large language models (LLMs) such as ChatGPT and Github Copilot to the public, their effects on computing education (CE) have not been thoroughly investigated. Our research aims to perform a quantitative assessment of the frequency of topics in the articles chosen for our systematic literature review, which is on the subject of LLMs and their impact on CE. Relevant keywords and identifiers (e.g., “computing”, “education”, and “GPT”) were decided upon to create a search strategy to find relevant papers, and a set of inclusion and exclusion criteria was constructed to filter out database search results. Quality criteria (e.g., “Does the paper address the research problem?”) were also developed to thoroughly evaluate the shortlisted research articles to determine their usage in our study. The papers selected from the initial 6,455 search results for the systematic literature review were then used as the data sources for a further text mining investigation.

All sections of each paper were included in the data collection process, which utilized the Latent Dirichlet Allocation (LDA) method for topic modeling. Our text mining investigation will help to visually uncover patterns in the survey papers we collected, allowing for a deeper understanding of the topics that are currently being pursued in the literature. In doing this, we hope to provide a solid foundation for future research and inform readers about the state-of-the-art technologies at the intersection of LLMs and CE.

Urban Sprawl

Author(s): **Natalie Garrett, Gianna Colonna**
Mentor(s): **Dr. Erin McKenney**
Poster: **23**

Experts predict that the state of North Carolina will lose 1.2 million acres of agricultural land by 2040 due to the expansion of cities and towns, known as urban sprawl. Housing demands near large cities have significantly increased over the past 20 years, driving the increase in urban sprawl and contributing to habitat loss, deforestation, and pollution. Informing individuals on the impacts that urban sprawl has on the environment can motivate more sustainable long-term urban planning, as well as individual actions and awareness of our own personal pollution. To accomplish this goal, we conducted an extensive literature review to examine this issue from diverse perspectives. We developed SMART (specific, measurable, achievable, relevant, and timely) strategies tailored to specific stakeholder groups, like contractors and families who have lost their peaceful homes due to urban sprawl, to facilitate urban planning that integrates nature. We hope that increasing public knowledge will help save many ecosystems and provide more resources for both humans and urban wildlife.

Malting With Enzyme Assisted Brewing

Author(s): **Jeff Gillette, Joseph Harrington, Sam Broadwell, Olivia Gordon, Chloe Wilder**
Mentor(s): **Armindo Gaspar, Dr. Fernanda Santos**
Poster: **24**

The brewing of beer has several processes and variables that take part in transforming grains into a final beer product. Enzymes are recommended to increase the efficiency of grain breakdown and save time during the germination process. One modern variation to this system is the use of industrially produced, exogenous enzymes. The purpose of this study is to determine the effects of beta-glucanase (Ultraflo® Key) and a beta-glucanase and xylanase blend (Ultraflo® Prime) on the malting process when introduced to the barley grain during steeping. Six concentrations of each enzyme, 0, 25, 50, 100, 200, and 500 g/ton, were randomly applied to the kernels of barley samples. The samples were steeped in a hot water bath at 30°C for four hours followed by 20 hours to rest, then steeped again at 30°C for two hours. The germinated grain was then analyzed. Three replicates were performed for each enzyme concentration and type, and a control was utilized by executing the experiment with

no addition of enzymes. After steeping and germination, kilning of the germinated barley was completed so wort can be made to perform sensory analysis and viscosity measurements, as well as confocal microscopy was used to determine the breakdown of the barley grain and high-performance liquid chromatography was used to determine the final concentration of beta-glucan.. This study was conducted to determine which enzyme concentration and enzyme type has the greatest positive impact on the beer malting process to optimize the end malt product.

Collecting Strain Data from Composite Tape Springs

Author(s): **Lucy Grindstaff**
Mentor(s): **Dr. Andrew Lee**
Poster: **25**

An area of active research around deployable structures is developing different methods of actuation. Dr. Lee's lab is exploring a novel approach of actuating space-deployable composite tape springs, and my research is focused on gathering strain data from the tape springs so that the progress of actuation and the state of the tape spring can be monitored. First, I had to choose an appropriate strain sensor for use on thin, bendable composites. Then, I bonded the strain gauge onto the composite tape spring and soldered fine gauge wires to the gauge. Next, I constructed a Wheatstone quarter-bridge and developed a mathematical model of the circuit which accurately predicted voltage output. Output voltage is then converted mathematically to micro-strain values. However, the data acquisition system (DAQ) I am using introduces too much noise into the signal to collect meaningful strain data. Instead, I am in the process of using a DA Q that is designed for the purpose of collecting strain data (MM01-350 StudentDAQ), with built in Wheatstone bridge completion. Once this is fully configured, I will perform experiments and gather data to correlate the tape spring's actuation progress with strain values. Because of strain gauges' flexibility and relative ease of bonding to structures, they are an ideal choice for collecting strain data, and correlating strain data to physical phenomena in deployable structures will be valuable in developing a control system for deployable devices.

Screening of Organic Dyes for use in Colorimetric Point-of-Care Aptamer Based Sensors

Author(s): **Ransom Hill**
Mentor(s): **Dr. Yi Xiao**
Poster: **26**

Aptamers are single-stranded oligonucleotides that are capable of binding targets with high affinity. Aptamers have many advantages over traditional protein bioreceptors like antibodies as they are robust, offer greater stability and are readily engineered and chemically modified to detect analytes of interest. Recently, aptamers have been implemented in dye

displacement assays for sensitive detection of analytes with the naked eyes in second. In such an assay, a dye molecule initially binds to an aptamer in its monomer form. Upon addition to the target, aptamer specifically binds to the target, displacing the dye molecules into the solution and forming dye aggregates. The change of dye optical properties between monomer and aggregates can be used to indicate the presence of a target or quantify the concentration of targets. Dye molecules which are suitable to be utilized as excellent signal reporters in aptamer-based dye-displacement assay should have a dramatic difference of optical properties between monomer and aggregates. In this work, we screened the optical properties of a total of 145 dye molecules, ranked these dye molecules based on their wavelength difference between monomer and aggregates. We then tested the binding ability of the top ranked five dye molecules to 72 different aptamers with binding affinities ranging from nM to μM under a variety of conditions. Of these dyes, three dye molecules were identified to have suitable absorbance shifts and color contrast to be implemented into point-of-care colorimetric sensors for drug detection.

Water Pollution

Author(s): **Ben Hutchins, Chase Bond**
Mentor(s): **Dr. Erin McKenney**
Poster: **27**

Did you know nearly 2 billion people drink contaminated water that may be harmful to their health? Water pollution is an ongoing problem that affects both humans and vital resources. As the problem progresses, more people have become aware of the issues resulting from water pollution. However, more widespread education is needed so that people understand the impacts of water pollution and ways to help prevent it. The goal of this project is to gain a deeper understanding of the causes of water pollution and educate the public on ways to help mitigate water contamination. To accomplish this goal, we conducted an extensive literature review to examine this issue from diverse perspectives. We created examples of healthy habits within our water system and provided action items that the audience can do to reduce water pollution. This project provides information and insight into global water pollution issues. With this information, people can make smarter decisions about how they can prevent or mitigate pollution in local water sources. This information can also influence voting and policy that will improve water quality and eventually provide equitable, safe, and affordable drinking water worldwide.

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

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

Skin interstitial fluid (ISF) contains approximately 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-yielding. 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. 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 mice. This work can help address immediate needs in point-of-care sampling and early detection of viral infections. The goal of our current research efforts is to answer the following questions: What is a suitable MN platform for the in situ detection of protein-specific antibodies? What is the detection sensitivity of this MN platform that can reliably differentiate a positive signal from the background?

Systems Analysis of Probabilistic Risk Assessment on NCSU Research Nuclear Reactor PULSTAR

Author(s): **Lauren Kohler, Nolan Ritchie, Noah Etter**
Mentor(s): **Dr. Mihai Diaconeasa**
Poster: **29**

Probabilistic Risk Assessment (PRA) evaluates the risks associated with complex systems through quantification of event likelihoods and impacts. Using nuclear reactors poses potential adverse effects on people and the environment via radiological material release. The PULSTAR reactor, located at North Carolina State University (NCSU), began operation in 1972. It offers many unique design features including an open pool design and various research facilities. However, it lacks a full scope PRA framework. Current discussions are being directed towards providing a thermal capacity upgrade from its rated 1 MW to 2 MW, requiring additional licensing. Efforts set towards advancing the PRA framework contribute to further research projects among the PULSTAR reactor. Previous studies initiated steps towards development of the full scale PRA framework through focusing on initiating event and event sequence analyses. This work furthers methodology through comprehensive

studies of fault tree analysis applications to event sequences. With the improved study, quantification of event probabilities can be determined to gain a better understanding of the reactor end states. Furthermore, uncertainties within the model judgements are assessed through application of inverse uncertainty quantification based on design basis event definitions from the Nuclear Regulatory Commission. As PULSTAR contemplates a capacity increase, these analyses become increasingly vital to ensure that potential risks are thoroughly understood and mitigated.

Energy Grid Ideas for a Changing Future

Author(s): **Owen LaVenture, Nicolás Galvez**
Mentor(s): **Dr. Erin McKenney**
Poster: **30**

The fate of the world's climate rests on whether humanity can, not only reform but reverse our destructive habits, particularly energy generation, distribution, and consumption. Globally, countries are changing how they provide energy to their citizens. A growing body of research is exploring clean energy alternatives, and billions of dollars in governmental funding have been invested in the development of clean energy distribution systems. However, the existing energy infrastructure is outdated. Requirements necessary to reach the baselines for growth are both costly to achieve and complex to construct; therefore, a comprehensive plan for clean energy grids at both a local and nationwide level is necessary for long-term success. To accomplish this goal, we conducted an extensive literature review to examine this issue from diverse perspectives. Examining proposed systems for renewable energy grid management and understanding their respective efficiency and plausibility will help direct future research, development, and policy. Substantial progress in the transition to renewable energy generation and distribution is urgently needed. The consequences of anthropogenic climate change are already apparent: extreme weather events are more frequent, energy costs are rising, and vital resources are becoming more and more scarce. The means for our energy generation, distribution, and consumption must grow alongside our changing world.

Quality Control in Accounting Research

Author(s): **Jude Lomax, Muhser Thayousoe**
Mentor(s): **Dr. Joseph Brazel, Dr. Carly Burd**
Poster: **31**

Accounting research is considered a social science that utilizes tools from basic disciplines such as economics, statistics, psychology, and sociology to address economic questions around auditing, financial reporting, taxation, information systems, and capital markets. Inferences found in accounting literature are critical for building a financially stable and sustainable future. We primarily assist with fraud and data analytics research with an

experimental approach. We have worked on multiple projects and are involved in various aspects of the research process, including data collection and input, experimental instrument testing and review, attendance at research workshops, and even the refinement of Forbes articles. One specific paper related to what we've worked on uses experimental data to examine how auditors use industry benchmarks in assessing fraud risk. The authors find that industry revenue growth is historically the most likely benchmark used as a fraud indicator.

Canopy Gaps Provide Structural Diversity and Promote Early Successional Vegetation

Author(s): **Jess Maier**
Mentor(s): **Dr. Jodi Forrester, Morgan Arteman**
Poster: **32**

Closed canopy, even-aged forests provide many ecosystem services including valuable habitat for species like the eastern gray squirrel and wild turkey. Homogeneous mature forest, however, provides limited complexity for species who thrive under disturbance. Canopy disturbance such as harvested gaps create pockets of early successional plant communities, resulting in a mosaic of uneven-aged forest. The vegetative composition of gaps creates potential habitat for early successional specialist species, including ruffed grouse, eastern cottontail, and indigo bunting. We aim to quantify vegetative vertical structure from gaps to interior forest. Using a point contact method, we measured the vegetative structure and life form composition of the gap-forest matrix and unharvested control areas in a mature mixed hardwood forest in Pisgah National Forest, NC. Calculated cover by life form, paired with Habitat Suitability Indices for the target species allowed us to assess the potential to provide habitat for early successional species. By better understanding the vegetative structural diversity created by canopy gaps, and their impact on early successional species, forest managers can be more targeted in achieving habitat-focused management objectives.

The Presence and Role of Cadps in Peptidergic Nociceptors Innervating Mice Skin

Author(s): **Joseph Majual**
Mentor(s): **Dr. Javier Lopez**
Poster: **33**

Pain management is a big issue in healthcare today with many people getting addicted to the opioids doctors prescribe. With gene therapy taking a leap in recent decades, a targeted approach to pain management can be made. The Cadps gene encodes for the Calcium-Dependent Activator Protein (CAPS1), a key priming factor for the vesicle exocytosis in the synaptic terminal of neurons. CAPS1 is highly expressed in pain sensory neurons and in vitro

regulates transmitter release that contributes to stimuli hypersensitivity following inflammation and injury. The goal of my project is to determine the CAPS1 role in pain related behaviors in vivo in mice. We use a combination of immunohistochemistry, optogenetics and mouse models to describe CAPS1 expression in mouse skin and its role during neurogenic inflammation. We find that CAPS1 is expressed in hind paw glabrous skin and that specific Cadps gene disruption in pain sensory neurons impair stimuli hypersensitivity associated with inflammation in mice. Our data suggest that CAPS1 contributes to persistent pain signaling in mice and could provide a novel target for treating pain pathologies.

The Transformation of the Roman Archaeology Lab

Author(s): **Jadyn Mann**
Mentor(s): **Dr. Tate Paulette**
Poster: **34**

In the year 63 BCE, Pompey, general of the Roman Republic, captured Jordan. From then on, Jordan was occupied by the Romans. The Roman Archaeology Lab on NC State's campus is a reflection of this time period and contains an extensive study collection containing a variety of artifacts. These artifacts originate from several projects including The Petra North Ridge Project and The Roman Aqaba Project. Currently, the lab is in the process of becoming a teaching laboratory. Over the course of the school year, extensive work has been done to ensure the lab is in the best state it can be to be able to host classes and students wishing to gain experience with these artifacts. The reason it is important to work with this collection and ensure that it is organized and accounted for is so that the laboratory is a suitable teaching laboratory. The reason that this is important is that in the archaeological world, teaching laboratories are integral for students to gain hands-on experience with the artifacts they are learning about.

Critical Soil Test Value of Phosphorus for Corn in North Carolina

Author(s): **Alejandra Martinez**
Mentor(s): **Dr. Luke Gatiboni, Dionata Filipi**
Poster: **35**

Phosphorus (P) is an essential plant macronutrient, providing energy for the plant as a vital part of photosynthesis and a major component of ATP. The critical soil test value (CSTV) of P is calculated to determine the amount of element in the soil needed to achieve the maximum crop yield. CSTVs are not static; they change depending on various field conditions and weather patterns. Even within the same field, the CSTV varies with factors such as crop species, soil type, and sampling depth. Consequently, the CSTVs require constant monitoring to ensure they meet the plant requirements and prevent under or over-fertilization. This study aimed to determine the CSTV of P for corn (Zea mays L.) through a long-term trial located in the Coastal Plain region of North Carolina. Corn was cultivated during the 2023

cropping year. Phosphorus application rates ranged from 0 to 40 kg P ha–1, with fertilizer broadcasted at planting. Soil samples were analyzed and yield was measured. Phosphorus fertilization increased yield, and the calculated P CSTV was 27 mg kg−1. This new CSTV significantly diverges from the current recommendation for NC (52 mg kg−1). Further studies on soil test correlation for P in North Carolina are necessary to refine the CSTV estimate for the state.

HipHop and the Effects on School-based Intervention

Author(s): **Kania McClees**
Mentor(s): **Dr. Issac Woods**
Poster: **36**

The year 2023 marks the 50th anniversary of Rap/Hip-Hop. This revolutionary genre of music was birthed by the struggles of Black and Brown communities to express themselves. In this systemic review, we explore how Rap/Hip-Hop has been used in school-based interventions to serve Black students. Findings suggest that more empirical research is needed to capture the usage of Rap/Hip-Hop in school-based interventions.

Evolving the Electrode: Long-term, Real-time, Co-detection of Dopamine and Glucose

Author(s): **Grace McNair**
Mentor(s): **Dr. Leslie A. Sombers, Kalynn M. Turner, Jenna M. Berger**
Poster: **37**

In the brain, many neurotransmitters exist that coordinate everything we think, feel, and do. A crucial neurotransmitter, dopamine (DA), regulates many physiological aspects of life. Studies have revealed the significant impacts of DA on mood disorders, substance dependence, locomotive symptoms of Parkinson's disease, and more. Glucose, the primary fuel source for the brain, is critical in fueling neurochemical transmission to keep the brain functioning properly. In this work, we use fast-scan cyclic voltammetry (FSCV) coupled with carbon-fiber microelectrodes (CFME) to detect DA and glucose, in real-time. However, glucose is non-electroactive, making it invisible using unmodified electrodes. A glucose oxidase enzyme can be used to take the non-electroactive substrate and convert them into an electroactive reporter molecule, hydrogen peroxide. Linear sweep voltammetry is applied to a bare CFME to fabricate an enzyme modified electrode. Traditionally, these electrodes are made of glass, which are effective in short periods of time, but they are also easily breakable. To counteract this, chronic electrodes are made using flexible silica tubing which can withstand the motions of an awake and behaving model. Moving to behavioral experiments is critical as one can witness the behaviors associated with a quantitative change in neurotransmission, as the brain varies from day-to-day. The goal of this project is to assess the variation of the biosensor's sensitivity to DA and glucose over extended periods of time.

Future work can implement these micro-biosensors in a behavioral assay to better characterize DA and glucose to improve treatment plans for patients with chemical imbalances.

Chromosomal Analysis of Genetic Correlation and Multivariate Regional Heritability Mapping in Swine Performance Traits

Author(s): **Abby Moreland-Holsomback**
Mentor(s): **Dr. Jicai Jiang**
Poster: **38**

Pig performance traits are crucial for enhancing productivity and refining breeding strategies in the swine industry. This study aims to enhance our understanding by decomposing heritability (h2) and genetic correlation (rg) at the chromosome level. Our analysis was conducted on a substantial dataset comprising approximately 26,190 Duroc pigs. Each pig was genotyped for 30k single nucleotide polymorphisms (SNPs), with three performance traits recorded: off-test body weight (WT), back fat thickness (BF), and loin muscle depth (MS). By estimating chromosome-level contributions to h2 and rg, we have discovered significant chromosomes that contribute to phenotypic variances and covariances. We then identified the important regions on each chromosome using the multivariate regional heritability mapping (mvRHM) method, implemented via 10-Mb windows with a sliding step of 5 Mb. Each individual chromosome was analyzed with mvRHM to scan for regions strongly associated with the pig traits. Our findings offer insights into the chromosome-level genetic influences on pig performance traits and also demonstrate the use of mvRHM for genetic associations.

Investigation of UDP-Glucose Dehydrogenase Protein Interactions in Prostate Cancer

Author(s): **Joslene Morgan**
Mentor(s): **Dr. Melanie Simpson, Emily Allego**
Poster: **39**

Prostate cancer is the most common form of cancer in men and can progress to castration-resistant prostate cancer which is more difficult to treat. UDP-glucose dehydrogenase (UGDH) is a unique enzyme that converts UDP-glucose to UDP-glucuronate. UDP-glucuronate use is prioritized differently in early-stage androgen-dependent prostate cancer versus late-stage castration-resistant prostate cancer. The three pathways that utilize UDP-glucuronate are glucuronidation, proteoglycan synthesis, and hyaluronan synthesis. Each process occurs in a different subcellular location. The differential recruitment of UGDH to each location may be achieved by protein-protein interactions. Some examples of potential interacting proteins are UDP-glucuronate transporters, protein kinases, and UDP-glucuronosyltransferase enzymes. To understand how UGDH is regulated, we aim to

determine its interactome. Previously, unnatural amino acid incorporation into UGDH was used to identify some of these proteins via photo-crosslinking. However, it is important to expand upon these past results, validating them and discovering new interactions. To do this, we employed plasmids that express UGDH as a fusion protein with biotin ligase (BirA). These plasmids are then transiently transfected into prostate tumor cells. BirA will biotinylate nearby proteins that interact with UGDH, therefore labelling them. These proteins can then be pulled out by tight binding of streptavidin to biotin and identified via mass spectrometry. Identification of these proteins may reveal new targets for cancer therapy.

Gender Differences in Parental Communication on Adolescent Sexual Health

Author(s): **Satya Munugoti**
Mentor(s): **Dr. Mike Sano**
Poster: **40**

Previous research indicates that open and honest communication between parents and adolescents about sexual health leads to better outcomes, including increased contraceptive use, reduced risk of sexually transmitted infections (STIs) and unintended pregnancies. However, as adolescents grow, parents typically provide less information, and peers and social media are the primary sources of sexual health information. Many factors contribute to parents' reluctance to initiate conversations about sexual health with their children. Research suggests that parental embarrassment surrounding sexual topics often serves as a significant barrier to open communication. Gender, influenced by traditional roles and societal expectations, can also impact parental barriers to discuss sexual health.
This study investigates whether gender differences exist in barriers to parental communication about adolescent sexual health. Using an online sample of 904 US parents, this study conducted bivariate and multivariate analyses in R to examine the relationship between parent gender and barriers to parental communication on adolescent sexual health topics. Control variables included income and education.
The analysis did not reveal a statistically significant relationship between parental gender and barriers to communication about adolescent sexual health. These findings point to the need to identify more prominent factors that contribute to parent communication about adolescent sexual health.

Enhancing Heat Transfer Using Natural Circulation Cooling

Author(s): **Alex Murillo, Aidan Flanagan, Bryce Davis**
Mentor(s): **Dr. John Zino, Patrick Walther, Dr. Dale McCants, Dr. David Holler**
Poster: **41**

GE Hitachi has developed an advanced fast flux Generation IV nuclear reactor called PRISM. This reactor uses a natural circulation air cooling system called RVACS. The Reactor Vessel Auxiliary Cooling System (RVACS), is a passive safety system designed to remove decay heat

from the reactor core in the event of an emergency shutdown or loss of primary cooling with the end goal of dissipating heat into the atmosphere. The incorporation of internal ribs within the RVACS is driven by the fundamental objective of optimizing heat transfer efficiency. Ribs, strategically positioned along the interior surfaces of the system, serve as heat transfer enhancement features. In pursuit of a rib design aligned with airflow, we uncovered the wavy rib concept. This innovative design exhibited a sine-like waveform running through the duct's interior. A CFD model of the RVACS system is used to test variations of the wavy rib design at different air velocities to validate its efficiency. The CFD model currently represents a limited 3-D section of the full RVACS system due to runtime constraints, focusing on various air velocities. This limited section is strategically chosen to fully develop the flow within the system. Through this study, the potential of the wavy rib design to improve heat transfer efficiency in the RVACS system is explored, offering promising insights into further enhancing the safety and performance of GE Hitachi's PRISM reactor.

Development of Highly Entangled Hydrogel Yarns via Photopolymerization

Author(s): **Emma Myer-Medina**
Mentor(s): **Dr. Thomas Schroeder**
Poster: **42**

Polymer networks that contain water in a three-dimensional matrix are known as hydrogels and possess unique properties that make them suitable for biomedical applications like artificial muscles and soft robotics. Hydrogels can take many shapes but it would be beneficial to some applications to create a hydrogel into a fiber or yarn. However, the use cases of typical yarns also require properties including toughness and resistance to hysteresis, which are not present in typical hydrogels of high cross-linking density. Recently, it has been shown that hydrogels with sparing crosslinks and many entanglements demonstrate these properties. These hydrogels can be synthesized by formulating precursor solutions with high concentrations of monomer, small amounts of cross-linker, and a photoinitiator, then applying UV light to polymerize the monomers into networks. In our early experiments, intense UV light was used to polymerize a solution of acrylamide monomer moving through tubing to create a highly entangled polyacrylamide hydrogel in a filament geometry. However, this process required low doses of photoinitiator and an extremely low flow rate of the solution through the tubing to achieve a fully polymerized gel, resulting in a very slow extrusion process. A new approach that still uses photopolymerization makes use of poly(ethylene glycol) with norbornene-functionalized end groups to create a highly entangled hydrogel with the advantage of a faster rate of gel formation. Currently, solutions of varying crosslinking ratios are being synthesized by altering the ratio of linear norbornene PEG to four-armed norbornene PEG.

Characterization and Identification of Periostin in Normal and Eczematous Skin

Author(s): **Munish Nidadavolu**
Mentor(s): **Dr. Santosh Mishra, Dr. Josh Wheeler**
Poster: **43**

Periostin is an extracellular matrix protein that has a role in many physiological processes, especially in the skin. High levels of periostin have been present in skin diseases such as Atopic Dermatitis (AD). Periostin has been shown to cause itch, and there appears to be a correlation between serum periostin levels and atopic dermatitis. Despite all the information that is already known about periostin, the cellular source of periostin in AD is currently unknown. The main question of my research was to help determine the source of periostin in the skin when it comes to AD. To find the cutaneous sources of periostin we used a genetic labeling approach; a Cre-ERT2::Ai9 mouse genetic model was used. The Cre-ERT2::Ai9 system controlled gene expression and timing, using tamoxifen as a trigger molecule. We used MC903 mouse models of AD to induce AD-like symptoms in the Perisotin-Cre-ERT2::Ai9 mice. Over the course of ten days, we applied MC903 to the mice and let them grow. After the ten day period, the mice were euthanized, perfused, and the skin was isolated. The skin was then frozen in OCT media and was sectioned into thin pieces. Those pieces were then used to do immunohistochemistry and fluorescence microscopy to see where periostin was present. Through these processes it was determined that periostin was produced by keratinocytes and hair follicles. Mast cells produced no periostin. In the future, periostin should remain a molecule of interest as it could be used to create better treatments and cures for AD.

Assessing XapΦ1 Bacteriophage Viability Under Different Storage Conditions

Author(s): **Fedora Parra**
Mentor(s): **Dr. Katherine D'Amico-Willman**
Poster: **44**

Bacteriophages (phages) are ubiquitous viruses that can infect and kill susceptible bacterial hosts. Phage XapΦ1 infects the host Xanthomonas arboricola pv pruni, an economically relevant plant pathogen that causes bacterial spot on Prunus species (e.g., peach, plum, etc.). The general aim of this work is to gain insights on the interactions between plant pathogenic bacteria and associated phage. To this end, phage isolates were collected from peach leaves symptomatic of bacterial spots to characterize phage genetic variability; however, the proper long-term conditions for Xap phage have not yet been determined. The goal of this project is to investigate the viability of phage XapΦ1 in two different storage solutions: SEA-PHAGES phage buffer (Tris stock, NaCl, water, and CaCl2) and sterile, deionized water, and at three different storage temperatures: 4 ℃, -20 ℃, and -80 ℃. XapΦ1 concentration was normalized, and an aliquot was prepared in each storage buffer and stored at each temperature. Samples were collected at 1 week, 2 weeks, and 1 month after setup. Upon collection of the samples at each time point, the samples will be serially diluted and plated on agar overlay plates containing a susceptible Xap bacterial host to quantify phage concentration in different

conditions. The data will then be analyzed to determine how the concentration of phage differs by storage condition. The expected results will provide information on XapΦ1 viability across different storage conditions and provide insights into future work involving phages and phage long-term storage.

Validation of UGDH Phosphorylation by ERK2 in Prostate Tumor Cells

Author(s): **Astha Patel**
Mentor(s): **Dr. Linlin (Lily) Ma**
Poster: **45**

The study examines the phosphorylation of UDP-glucose dehydrogenase (UGDH) by extracellular signal-regulated kinase 2 (ERK2) and its pharmacological modulation in the prostate cancer cell line 22RV1. Utilizing a strategic application of vehicles (Veh), PD98059 (a MEK inhibitor), epidermal growth factor (EGF), Sorafenib (a RAF inhibitor), along with kinases ERK1, ERK2, and RSK3, the biochemical pathway underlying UGDH activation was delineated. Two workflows were used to confirm the specificity of each phosphorylation: 1) EGF stimulation followed by vehicle or inhibitor treatment, and 2) inhibitor pretreatment followed by EGF restimulation. The results demonstrate that ERK2 plays a crucial role in the phosphorylation of UGDH, significantly influenced by the order of stimulant and inhibitor application. The results demonstrated that EGF significantly increased UGDH phosphorylation, confirming the role of the EGF signaling pathway in regulation of UGDH activity. Conversely, the subsequent addition of PD98059 and Sorafenib effectively reduced UGDH phosphorylation, validating the specificity of the pathway. The implication of EGF-stimulated ERK2 in UGDH regulation provides a novel insight into the control of UGDH downstream effects on biosynthesis of proteoglycans during rapid proliferation of cancer cells. The findings offer a deeper understanding of the biochemical mechanismsunderlying critical therapeutic targets in prostate cancer treatment.

Assessing Livestock Farms as Sources for Antibiotic Resistant Bacteria in Songbirds

Author(s): **Kripa Patel, Ava Smith, Matthew Clayton, Maya Moll,**
Mentor(s): **Bradley Scholten**
Poster: **46**

Antibiotic resistant (ABR) bacteria pose an increasing threat to human and animal populations. Salmonella and Escherichia coli, two common ABR bacteria, afflict both humans and animals, resulting in infections that are difficult to treat. Songbirds specifically can be susceptible to these bacteria, with epidemics leading to significant bird mortalities. Being highly mobile, songbirds may transmit these ABR bacteria to both new landscapes and birds at gathering sites such as bird feeders. However, we do not know where birds acquire these pathogenic bacteria.

Livestock farms, known for antibiotic use and large concentrations of animals, may be a source for ABR bacterial spread in songbirds. We explored how human dominated landscapes, such as farms, contribute to the prevalence of ABR bacteria in songbirds and at bird feeders. We hypothesized that ABR Salmonella and E. coli prevalence would differ between farms, backyards, and natural areas. To test our hypothesis, we placed 15 bird feeders: 5 each on livestock farms, suburban backyards, and natural locations. At each of these sites we took feeder swabs, bird fecal samples, and soil samples to assess the prevalence of ABR Salmonella and E. coli.
We expect to find a higher prevalence of ABR bacteria on feeders, in soil, and in birds near livestock farms compared to backyards and natural areas. Our results will shed light on the relationship between bird feeders, livestock farms, and antibiotic resistance to address this emerging public health threat.

Impact on Migratory Bird Species

Author(s): **Madelyn Perry, Hunter Palmer, Alejandra Flores**
Mentor(s): **Dr. Erin McKenney**
Poster: **47**

Did you know that clean energy infrastructure kills millions of migratory species each year? The negative impact on birds' migratory flight patterns is becoming a more prominent concern in the world today. Climate change, light pollution, and wind farms impact the fragile flight patterns of many bird species as they migrate between their breeding and hatching grounds. However, we do not know whether changing the distribution and layout of wind farms, in conjunction with other human interventions such as methods to decrease light pollution, could allow bird populations to rebound. Identifying the specific anthropogenic drivers responsible for declines in migratory birds could inform conservation strategies and support population growth for many migratory bird species. We therefore conducted an extensive literature review to examine this issue from diverse perspectives. We then developed strategies to enable stakeholders, including big business corporations, land owners, and politicians, as well as the general public, to mitigate their impacts on bird migratory patterns. Our research highlights the overwhelming impact conservation efforts for bird species can have for all migratory species.

Slicing Sugars: Enzymatic Deglycosylation of Weld Dyestuff to Enhance Textile Dyeing Sustainability

Author(s): **Madigan Petri**
Mentor(s): **Dr. Tova Williams**
Poster: **48**

Textile dyeing is one of the leading industries contributing to water pollution and usage. Indeed, dyeing alone accounts for 17-20% of industrial wastewater (Kant, 2012). Overcoming the use of synthetic chemi is significantly stunted by natural dyes' limitations. Unlike synthetic chemi, natural dyes are rarely pure and can be difficult to process. Natural dyes exist as mixtures of glycosides (hydrophilic dyes containing sugar rings) and aglycones (hydrophobic dyes lacking sugar rings). We propose the use of supercritical carbon dioxide (scCO2) to replace the water used in the dyeing of textiles and the deglycosylation (sugar removal) of natural weld dyestuff glycosides for their application to polyester (hydrophobic). To perform the deglycosylation, we sought to use environmentally benign enzymes to replace the use of harsh chemi such as sodium hydroxide. Mass spectroscopy was used to confirm the presence of glycosides and aglycones in the weld dyestuff mixture. Weld dyestuff containing a mixture of glycosides and aglycones and an aglycone standard (luteolin) were applied to PET using scCO2. The application of the aglycone resulted in a deeper shade. Enzymatic deglycosylation was explored using alpha- and beta-amylase along with beta-glucosidase to deglycosylate the glycosides present in the weld dyestuff mixture, and the success of the reaction was monitored using NMR. Previous research on enzymatic deglycosylation has largely ignored weld and has not targeted dye products. Therefore, this presentation will outline the effectiveness of these treatments on weld and the suitability of the aglycone dyes for scCO2 dyeing.

Electroanalytical Co-Detection of Histamine and Serotonin Exocytosis Events from Single Mast Cells

Author(s): **Emily Phillips**
Mentor(s): **Dr. Leslie Sombers, Dr. Chathuri De Alwis**
Poster: **49**

Mast cells play a vital role in modulating immune response. They are also important in coordinating the bidirectional communication of the gut-brain axis. Upon stimulation, mast cells release several inflammatory mediators including neurotransmitters such as histamine and serotonin via exocytosis from large dense core vesicles (LDCVs). In this work, disk-type carbon-fiber microelectrodes were coupled with fast scan cyclic voltammetry (FSCV) to obtain qualitative and quantitative measurements of individual exocytosis events. A triangular potential waveform was applied on the electrode to drive the oxidation and reduction of serotonin and histamine, which allowed co-detection. The resultant current versus time trace provided quantitative information on exocytosis, while a current versus potential trace allowed chemical identification. The goal of this study was to test the effect of

perinatal exposure to flame-retardants on mast cell function in adult mice. First, the electrode was characterized with bench-top calibrations performed using standard serotonin and histamine samples. Then, mast cells were extracted from mice that were prenatally exposed to polybrominated diphenyl ether (PBDE) flame-retardants. Electrochemical signals were collected at single mast cells in response to a Ca2+ ionophore, enabling precise measurement of exocytosis. The data was validated using pharmacological manipulations. Quantitative evaluation of FSCV data suggested that the average quantity of histamine per release event was significantly lower in both female and male mice that were exposed to PBDE in utero. Overall, electroanalytical monitoring of cellular mediators informs on fundamental biological changes, which in turn can assist in the development of improved treatments for neurodegenerative and immunological disorders.

Stop The Invasion: The Spotted Lanternfly

Author(s): **Kevin Ritter, Ryann Stemmer**
Mentor(s): **Dr. Erin McKenney**
Poster: **50**

“The only good bug, is a dead bug.” These words popularized by the anti-propaganda novel Starship Troopers (1959) have characterized the post-modern sentiment of humans towards insects. Although it is problematic to stigmatize native ‘bugs’, everyone should answer this call to arms against our very own alien invader. The spotted lanternfly (Lycorma delicatula) was introduced to the United States in 2014 and poses a significant threat towards agricultural crops as well as native flora, specifically grapes and ornamentals. However, this species is relatively new to North Carolina, and the public is generally unaware of its existence, much less its ecological and economic impacts. The goal of this project is to inform the public about the spotted lanternfly and ultimately eradicate this invasive species from native and agrarian environments. To accomplish this goal, we conducted an extensive literature review to examine this topic from diverse perspectives. We propose strategies to inform farmers, gardeners, and ecologists of the current knowledge and management practices for this species, and enlist individuals in the battle against this invader. Together we can stop the spread of this invasive species and protect local flora and livelihoods.

Bioinformatics in Wildlife and Hog Waste: Bacterial Analysis for Ecosystem Health

Author(s): **Pushkar Sai, Felix Smith**
Mentor(s): **Dr. Carlos C. Goller**
Poster: **51**

Our study utilized bioinformatics and microbiological techniques for bacterial analysis in hog waste lagoons to explore their roles in ecosystem health. Through nanopore sequencing, Qiagen and Zymo DNA extractions, and PCR, we targeted species like Pseudomonas

aeruginosa, Streptococcus alactolyticus, and Lactobacillus amylovorus. This approach helped uncover how certain bacterial communities can improve waste degradation and water quality, suggesting enhancements in waste management and biodiversity support.
Efforts to analyze bear fecal samples faced obstacles due to PCR inhibitors, illustrating the complexities of wildlife microbiome research. This challenge underscores the importance of developing robust methodologies for environmental microbiome studies.
Our focus on cyanobacteria, especially Porphyrobacter, revealed their significant metabolic functions, emphasizing the need for careful analysis in microbial studies to understand ecological effects accurately. Cyanobacteria's capabilities, such as photosynthesis and nitrogen fixation, highlight their potential in bioremediation and ecosystem management. Overall, this research illuminates the importance of detailed bacterial studies in hog waste lagoons and the necessity for advanced techniques to overcome analytical challenges in environmental microbiome analysis. Our findings, indicating the ecological benefits of managing microbial communities, underline the vital contribution of bioinformatics and microbiological methods to environmental science and the enhancement of ecosystem health.

Quantification of the Relationship between a Transportation-based Predictor Variable and Urban Development

Author(s): **Kerneep Sandhu**
Mentor(s): **Dr. Okan Pala**
Poster: **52**

Urban growth (UG) models can be used to predict urban expansion for different development policy approaches. FUTure Urban-Regional Environment Simulation (FUTURES) is an urban growth model that simulates development based on predictor variables and the rate of per capita land consumption by using a stochastic patch growing algorithm. For our research, we utilized FUTURES at the subregional level to simulate urban development while modifying the computation method for the “distance to primary and secondary roads'' predictor variable. To this end, we utilized previous work on the project, which had culminated in the addition of functions for the generation of a raster map that would be used as our “distance to primary and secondary roads'' predictor variable. We examined the accuracy of several quantifications of the relationship between distance to primary and secondary roads and urban development by preparing the predictor variable with a different function for each scenario. Existing research in the field focuses heavily on the efficacy of the different UG models such as the Cellular Automata model and the Markov model. Our research aims to go one step inwards and explore the impact of transportation-based predictor variables on urban expansion and the quantification of their relationships with urban development. The analysis of the distance to major roads is an initial step for our study question. Future work would involve the analysis of the relationships of other transportation-based predictor variables such as “shortest distance to interchanges” with urban expansion.

Evaluation of Variable Loading Tasks for Optimization of a Wrist Musculoskeletal Model

Author(s): **Max Shipp**
Mentor(s): **Dr. Katherine Saul, Christopher Jadelis**
Poster: **53**

Musculoskeletal models are highly effective tools for studying functional impairments arising from disability and bodily injury; however, currently, available musculoskeletal models rely on average measurements of cadavers or limited in-vivo studies, limiting patient-specific studies. Personalization of musculoskeletal models has been demonstrated previously for lower limb models using indirect non-invasive measurements, including surface electromyography (sEMG), ground reaction force, and kinematic data collection. However, limited work has been performed on the personalization of models of the upper limb such as models of the hand and wrist. Tasks in the lower limb such as gait involve loading due to gravity, recorded as ground reaction forces, while tasks in the upper limb are highly dynamic with minimal loading such as freehand motion to highly loaded tasks such as lifting heavy objects, it is unknown if current data collection tasks are adequate to inform personalization methods. This project aims to address this by evaluating the effect of variable loading of the wrist joint on predicted muscle parameters and the accuracy of simulated joint torque in comparison to experimental torque using a numeric optimization method for model personalization. We predict that greater muscle activity elicited by greater loading of the wrist joint will enable more accurate joint torque predictions in an optimized model. To accomplish this, a custom testing apparatus will be developed to simulate a zero-load case, in addition to task development using a rehabilitation robot (Biodex Medical Systems) for the variable load cases.

Influence of Circadian Disruption on Cell Line Cytoxicity and Murine Hepatotoxicity

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Mentor(s): **Dr. Shobhan Gaddameedhi, Gillian K Szabo**
Poster: **54**

Per- and poly-fluoroalkyl substances (PFAS) are synthetic chemi often found in commercial products such as non-stick cookware and fire-fighting foams. Perfluorooctanoic acid (PFOA), a type of PFAS, has displayed resistance to environmental degradation and has a 3.5-year half-life in humans. PFOA-contaminated water and food have caused growing concerns and are linked to chronic conditions including cancers. Further, circadian disruption, often experienced by shift workers, has been shown to increase the risk of cancer. Here we sought to understand whether disruption of circadian rhythm in mice and cell lines treated with PFOA would increase hepatotoxicity and cellular cytotoxicity.

To imitate circadian disruption in vitro, the core clock gene BMAL1 was knocked out in an immortalized human keratinocyte cell line (HaCaT). The HaCaT cells were treated with increasing doses of PFOA to determine IC50 values using cell viability assays.
To investigate hepatoxicity in vivo, mice were placed in day shift conditions or environmental circadian disruption (ECD). These mice were treated with 10mg/kg of PFOA for 7 days. Differences in liver weights were investigated for each treatment group and sex. Western blots and immunohistochemistry staining looking at Ki67 as a marker of cellular proliferation were conducted on the livers of mice. In vitro, we expect a decrease in IC50 values for the BMAL 1 knockout cell line. In vivo, we expect an increase in cellular proliferation and organ weight for ECD mice treated with PFOA. Overall this study will provide new insight into the effects of circadian disruption on PFOA exposures.

A Survey of Beneficial Insects in Southeastern US Sesame (Sesamum indicum) Fields

Author(s): **Lauren Todd**
Mentor(s): **Dr. Hannah Levenson**
Poster: **55**

Sesame, initially introduced to the United states (US) in the 1930's, is considered an easygoing, promising new crop for the southeastern US. Sesame was grown commercially for the first time in the region in 2023, with 16000 acres planted. Little is known about the insect fauna of sesame in the US; however, as interest is expected to rise, it will be important to understand insect communities in this crop. Here, we provide the first survey of beneficial insects–pollinators and potential natural enemies–for sesame in the US.
Beneficial insects within sesame fields were surveyed in 2023 at two locations in North Carolina using two sampling methods: visual identification and sticky cards. Each sampling method was repeated 3 times during peak bloom. During visual surveys, insects were field identified, with up to 5 physical specimens collected per species for identification verification. These physical specimens were then used for pollen identification in the lab. Insects collected on sticky cards were sorted into four categories of potential natural enemies: stilt bugs, dragonflies, lady beetles, and wasps.
We found 12 bee species visiting sesame flowers across both sampling locations, with honey bees collecting the most sesame pollen per specimen. Wasps were the most abundant natural enemy category, with over 100 wasps collected at some sampling events. As sesame is a new and emerging crop for the southeastern US, with commercial acreage expected to increase dramatically over the next few years, these results will provide important information on beneficial insects growers should work to protect.

The Detrimental Effects of Feral Cats

Author(s): **Crista Belen Villasenor-Reyes, Wil Mabe, Clark Axtell**
Mentor(s): **Dr. Erin McKenney**
Poster: **56**

Humans began domesticating cats (Felis catus) over 10,000 years ago. Feral cats, though viewed as cute and cuddly by many, are one of the most pervasive invasive species in the world. Feral cats currently run rampant in many urban areas across the world, where they have caused the decline and even extinction of several bird, reptile, and mammal species. This is not a known fact to many, and there is a big misconception about feral cats' impact on multiple ecosystems. In fact, public opinion is opposed to the fact that outdoor cats kill native wildlife. As more research is conducted, it's important that people learn the impacts of feral cats on native fauna, as well as new methods to control the threats they pose. To accomplish this goal, we conducted an extensive literature review to examine this issue from diverse perspectives. Our objective is to change public opinion of feral cats, and propose methods to protect native wildlife. If feral cats remain unmanaged, native populations are at further risk of decline, and in many cases, extinction.

Use of Remote Sensing to Understand Shoreline Migration after Extreme Events

Author(s): **Evelynn Wilcox**
Mentor(s): **Dr. Celso Castro-Bolinaga**
Poster: **57**

Over the past 60 years, the NC Coastal Reserve and National Estuarine Research Reserve has observed pronounced erosion at and around the Rachel Carson Reserve, which is located across the historic Town of Beaufort in Carteret County in southeastern North Carolina. This erosion has caused significant shoreline migration at the western end of Shackleford Banks, leading to an expansion of the Beaufort Inlet from around 4,000 ft in 1964 to almost 8,000 ft in 2020. Consequently, it directly influences sediment dynamics around the Reserve, notably demonstrated by Bird Shoal's eastward shoreline movement during this period. However, predicting these simultaneous changes is challenging due to their unpredictable nature and spatial-temporal variability, posing difficulties in devising an effective resilience plan. One of the key drivers behind this variability is the impact of extreme events, particularly hurricanes. This study employed a combination of publicly available aerial imagery and satellite imagery data to quantify erosion rates in and around the Reserve caused by major storms and hurricanes that affected southeastern North Carolina from 1986 to 2020. It specifically focused on determining shoreline migration at the western end of Shackleford Banks and along Bird Shoal before and after each major storm or hurricane. To evaluate the influence of extreme events, the findings of this study were compared with the long-term shoreline migration rates determined by the NC Coastal Reserve and National Estuarine Research Reserve.

Chronic Cu65 Toxicity Evaluations of the Species Hyalella Azteca

Author(s): **Rebecca Williams**
Mentor(s): **Dr. Tim Vadas, Dr. Nafis Fuad, Dr. Alexandra Hain**
Poster: **58**

Presently, EPA water quality regulations do not have a strong representation of crustaceans and insects in their toxicity and sensitivity tests. The amphipod Hyalella Azteca can be used as an indicator species (Borgmann) that more-closely represents the size of riverbed inhabitants that are typically ignored. With the Hyalella being relatively insensitive to other environmental factors such as light or pH, it is easier to focus on contaminants leading to toxicity endpoints or death. Copper is one of the most common contaminants of concern found in both stormwater (Na Nagara) and wastewater (Qasem) impacted surface waters. The assays were used to determine an LC50 and compare it across different settings, including source of water, concentrations of organic matter, and dose of Cu. The goal of the overall experiment was to establish a baseline for which acute toxicity was experienced and resulted in death. The demonstrated LC50 for both ExpA, contaminated food and water exposure, and ExpB, food exposure, was ~78 ppb. The LC50 derived from the collected data is close to the higher range of experimental concentrations. The experimental variability of the data was higher than expected which can be attributed to: poor substrate, poor accessibility to the provided food, small test subject pool, and aggressive aeration. In order to decrease the variability, future experiments will make use of different substrate, an adjusted food delivery process, minimized aeration, and overall increase in the number of organisms. The concentration range will also be widened to account for the higher than expected LC50.

Chemical Inhibition of Self-pollination in Peanut (Arachis hypogaea) to Improve Out-Crossing Efficiency

Author(s): **Chloe Williams**
Mentor(s): **Dr. Jeffrey Dunne, Dr. Ryan Andres, Andrew Oakley**
Poster: **59**

The NC State University Peanut Breeding and Genetics Program plays a pivotal role in the development of Virginia-type peanut cultivars for North Carolina, South Carolina, and Virginia. Despite the program's successes, peanut breeding encounters challenges due to the plant's complete flowers, enabling self-fertilization unless meticulously hand-emasculated. Moreover, cross-pollination yields only 1-2 seeds per attempt, necessitating multiple trials for success. These implications not only impact program efficiency but also introduce time-consuming hurdles in the breeding process. Introducing a chemical emasculant has the potential to transform breeding efficiency by bypassing the need for labor-intensive hand emasculation and preventing inadvertent self-pollination. This study explores the potential of Trifluoromethanesulfonamide (TFMSA) as a chemical emasculant and cross-pollination facilitator in peanut breeding. TFMSA has demonstrated efficacy in rendering pollen unviable without adverse effects on female reproduction or other plant

processes in various crops. By applying TFMSA as a spray solution to plant leaves one week before flowering, pollen from treated flowers becomes sterile while staying receptive to pollen from untreated plants, thereby facilitating controlled cross-pollination.The objective of this research is to evaluate the suitability of TFMSA for enhancing efficiency in peanut breeding by refining emasculation processes and optimizing cross-pollination outcomes. This investigation holds promise for revolutionizing peanut breeding practices, potentially leading to accelerated cultivar development and improved crop productivity in peanut-growing regions.

Examining Elite Leisure Scenes in Global Cities

Author(s): **Sara Yamadi**
Mentor(s): **Dr. Virginia Riel**
Poster: **60**

Studies of elite nightlife clubs demonstrate that status often shapes the selection criteria for desired consumers and applying rules for exclusion of undesired consumers, but previous studies have not examined the processes shaping interaction in leisure scenes from the perspective of both workers and consumers. Drawing on interviews with consumers and workers in elite nightclubs in global cities, this study illuminates processes relating to social networking and closure, employment practices, and cultural sorting. Initial findings suggest that workers in nightclubs have varied experiences depending on their position. While guards perceived their work as dangerous and cited violent encounters with consumers and club owners, working inside the club was characterized by pressure from managers to make sales and increase the profit for club owners while facing competition for customers. We examine how workers manage the risks associated with their jobs and perceive opportunities and challenges associated with future mobility.

Proanthocyanidin Content in North Carolina-Obtained Pine Bark Extract Offers Promise of Local Pycnogenol Manufacturing

Author(s): **Owen York**
Mentor(s): **Dr. Lucian Lucia**
Poster: **61**

Oligomeric Proanthocyanidins and their monomers offer a myriad of health benefits. Being natural antioxidants, their application ranges from reducing inflammation to preventing heart disease, when taken in the form of Pycnogenol. This supplement primarily contains pine bark extract from Pinus pinaster, otherwise known as the Maritime Pine. This tree is present in the warm regions of southern Europe, whose climate is not unlike North Carolina's. Collection of pine bark samples from various regions of North Carolina followed by extraction and analysis of these samples will provide insight to the proanthocyanidin content of locally sourced pine bark to assess the possibility of energizing a new local industry.

Magnet-driven Origami Soft Robotics

Author(s): **Peiqi Zhang**
Mentor(s): **Dr. Xiaomeng Fang, Sen Zhang**
Poster: **62**

Conventional magnet-driven origami robots have faced limitations due to low integration of their magnetoactive materials, origami skeletons, and hard materials. Recent studies have introduced soft magnet-driven actuators, employing magnetic microparticles within a polymer matrix, thereby enabling the creation of soft magnetoactive composites. These advancements have paved the way for the development of soft magnet-driven origami robots, particularly in biomedical applications such as drug delivery robots. Magnet-driven soft origami robots have been realized by attaching soft magnetoactive caps to Kresling origami skeletons. However, challenges persist, particularly in the realm of hard magnet-driven origami robots, where low compliance hinders functionality. For instance, in drug delivery, hard origami robots struggle to conform to wounds, unlike their soft counterparts, which reduces drug release efficiency. This project discusses the evolution of magnet-driven origami robots, emphasizing recent advancements in soft materials and their implications for biomedical applications.

Generation of the Double Holliday Junction DNA Substrate for Single-Molecule Imaging

Author(s): **Anika Anandpura**
Mentor(s): **Dr. Hong Wang**
Poster: **1**

We are currently exploring the interaction between the Structural Maintenance of Chromosomes 5/6 (SMC5/6) complex and Double Holliday Junctions (dHJs). The SMC5/6 complex plays a crucial role in maintaining genome stability, yet its interaction with dHJs and the influence of ATPase activity remain poorly understood. We aim to visualize these interactions by using High-Speed Atomic Force Microscopy (HS-AFM) in liquids and traditional AFM in air to capture the SMC5/6 complex engaging with dHJs at the single-molecule level. We generated the dHJ substrates by packaging of circular single-stranded DNA in Escherichia coli, followed by cleavage and purification steps to produce the dHJ substrate. We will then probe the ability of wild-type SMC 5/6 complex and an EQ ATPase mutant SMC5/6 to interact with the dHJ, both with and without ATP. This research aims to highlight the potential of HS-AFM as a powerful tool in studying protein-DNA interactions, with significant implications for genomic stability, cancer, and aging research.

Analyzing Undergraduate Students' Career Decision Self-Efficacy Prior to a Career Development Intervention

Author(s): **Maggie Anthony, Anshika Gutta**
Mentor(s): **Dr. Natalie Cooke, Christina Chapman**
Poster: **2**

Career decision self-efficacy (CDSE) is a significant indicator of the level of preparedness an individual has to explore career options, set career goals, and finalize career decisions. Increased CDSE and career readiness can help students minimize employability skill gaps. The aim of this study is to understand students' perspectives and insights regarding their career decision-making self-efficacy within the unique context of an undergraduate nutrition course. Data was collected from 25 NC State undergraduate students who provided informed consent and completed a career development project as part of the assigned coursework for NTR 302: Introduction to Nutrition Research, Communication, and Careers during the 2023 calendar year. As part of this assignment, students completed a 25-question survey on CDSE and a reflection on their results. We used thematic analysis to explore the factors influencing self-efficacy beliefs among nutrition undergraduate students. The analysis specifically focuses on participants' reflections after completing the CDSE survey. After completing the

CDSE scale, participants reflected on gathering occupational information and reflected on their job-related experiences and professional networks. Participants felt the CDSE survey was beneficial to recognizing areas of strengths and weaknesses about which they were previously unaware. The career development project provided students with applicable skills necessary to be prepared for post-graduation and allowed participants to reflect on their strengths and weaknesses. The findings from this research will contribute to a more holistic understanding of CDSE, which can broaden the discourse on career decision-making in educational and counseling contexts.

Developing CRISPR-Cas12a Genome Editing Tools for Lactobacillus acidophilus

Author(s): **Sydney Baker**
Mentor(s): **Dr. Rodolphe Barrangou, Kalani Gast**
Poster: **3**

Probiotic bacteria, often associated with maintaining gut health and producing fermented food, are clinically and commercially important targets for genetic manipulation. Genome editing of certain probiotic features can enhance gut colonization, improve stress tolerance during food production, and eliminate undesirable genetic content like antibiotic resistance genes, prophages, and mobile genetic elements. Currently, CRISPR-Cas9 systems, like Streptococcus pyogenes Cas9 (SpyCas9), have been used in conjunction with single guide RNA (sgRNA) technology to direct precise double-stranded DNA breaks in probiotic bacteria of interest. CRISPR-Cas12a systems hold a similar, unexplored potential for genome editing, with programmable, precise, and multiplexable targeting.
The focus of this project is to develop a set of sugar-inducible plasmids containing CRISPR-Cas12a systems and the necessary machinery to target and cleave lacS, ltaS, and slpA genes in the Lactobacillus acidophilus NCFM genome. Unlike Escherichia coli, Lactobacillus sp. do not have a readily available molecular toolbox encompassing many inducible promoters, making introducing potentially toxic proteins an issue. By testing sugar-inducible promoters such as fructooligosaccharide, trehalose, and lactose, the amount of Cas12a protein can be titered to a dose optimized for genome editing. We have designed editing plasmids containing a sugar-inducible promoter, a novel Cas12a protein with reduced ssDNA trans-cleavage capabilities, a CRISPR locus expressed under a constitutive promoter, and a customizable 2kb repair template. By targeting lacS, ltaS, and slpA, we can provide foundational proof of concept expanding the CRISPR-Cas toolbox. This research will open new avenues for the deployment of CRISPR-Cas12a tools for genome editing in probiotic bacteria.

Skin Carotenoid Levels among Eastern North Carolina Head Start Children (3-5 years)

Author(s): **Jacob Baker, Claire Rice, Haley Sparks**
Mentor(s): **Dr. Virginia Stage**
Poster: **4**

The purpose of this study was to examine the relationship between skin carotenoid levels and fruit and vegetable (FV) liking, and time among Head Start children (3-5 years) enrolled in five Head Start centers located in Eastern North Carolina (ENC). Researchers collected skin carotenoid levels and FV liking at four time points (September, November, January, and May) from children (n=273) enrolled in five Head Start centers across three counties in ENC. The Veggie Meter™, a tool used to measure skin carotenoid levels, was used to scan skin carotenoid levels. FV liking data was assessed using a validated 5-point hedonic survey (e.g., super yummy to super yucky). Children were an average age of 3.94 (SD=.71) years. Veggie Meter™ scores significantly increased from 170 (SD=69) at timepoint one to 188 (SD=121) at time point four (p=.03). FV liking data did not significantly change from time point 1 to time point 4 (T1 2.69, SD=0.75; T4 2.82, SD=.78). Overall, children's skin carotenoid levels improved over the school year which may be reflective of children's increased access to FV through the federally funded, free meals and snacks through the Child and Adult Care Food Program and nutrition education. More research is needed to understand the variance of skin carotenoid scores over a longer period and how scores change as children age.

Confirming the First Mastrevirus in a North American Maize Sample

Author(s): **Claire Boles**
Mentor(s): **Dr. Trino Ascencio-Ibanez**
Poster: **5**

Mastrevirus is a monopartite virus of the Geminiviridae family that affects cereals and tropical grasses, including maize. These viruses are responsible for the destruction of staple crops necessary for the socioeconomic stability of tropical and subtropical nations. Until 2022, Mastrevirus had only been identified in the eastern hemisphere, however a recent research paper was published discussing the metagenomic identification of a Mastrevirus sample in Guanajuato, Mexico. This research aims to confirm the presence of Mastrevirus in the original sample from Mexico via rolling circle amplification and sequencing of the purified viral DNA. Various methods were employed to isolate the ssDNA from the original sample, including a Qiagen DNA extraction kit and an alkaline lysis procedure. The confirmation of Mastrevirus has so far proven elusive and it is currently unclear as to whether the North American continent is in danger of a Mastrevirus infestation.

In vitro analysis of Selenium-treated porcine alveolar macrophages upon PRRSV-2 infection

Author(s): **Christina Bourne,**
Mentor(s): **Dr. Elisa Crisci, John Byrne**
Poster: **6**

Selenium is a trace mineral with strong antioxidant and anti-inflammatory properties, and its deficiency can lead to immunosuppression and cause organ damage. In swine, Selenium has been used as a dietary supplement to improve immune function, enhance growth performance, and increase antioxidant bioavailability. Several studies demonstrated that Selenium protects immune cells against oxidative stress during viral infections (i.e. Influenza virus, Coronavirus). Porcine Reproductive and Respiratory Syndrome virus (PRRSV) causes respiratory and reproductive failure in swine, with high mortality rates that lead to significant economic losses. The efficacy of available vaccines is greatly hampered by the high mutation rate of the virus, hence there is a need to evaluate alternative therapeutic approaches. This study aims to examine the effects of both organic (L-selenomethionine, DL-selenomethionine) and inorganic (sodium selenite) forms of selenium on PRRSV infection in vitro. Lung is the primary site of infection for PRRSV, and it has tropism for porcine alveolar macrophages (PAM). PAM were isolated from the lung, infected with PRRSV-2 NC-134, and treated with different selenium compounds at different concentrations in vitro. After 24h infection, cell lysate and cell supernatant were used for RT-qPCR and virus titration assay, respectively. A significant difference in viral load was observed between selenium and non-selenium treated conditions by RT-qPCR, but no significance was present in the levels of infectious viral particles evaluated with the TCID50 method. The effect of selenium on PRRSV-2 impairment of mitochondrial function will be evaluated using the Cell Mito Stress kit and Seahorse XF technology (Agilent).

Single Stranded DNA Discovery in Fecal Matter From House Pets

Author(s): **Megan Bryenton, Grace Erickson**
Mentor(s): **Dr. Trino Ascencio-Ibáñez**
Poster: **7**

The purpose of this study was to investigate the viral distribution of single stranded deoxyribonucleic (ssDNA) in household pets. Fecal matter was obtained from three dogs, three cats, a chicken, and a bearded dragon. To isolate the DNA from the sample, we used QIAamp MinElute Virus Spin protocol (QIAGEN) and a protocol we created to suspend and isolate the DNA. Using nanodrop spectroscopy we confirmed that our ssDNA isolation protocol was successful as each of the selected samples contained the needed material. Rolling circle amplification followed by sequencing may reveal the diversity of ssDNA viruses in household pets.

The Dark Side of Dark Chocolate: Quantitation of Toxic Heavy Metals in Dark Chocolate by ICP-MS

Author(s): **Eliza Buhrman, Bobbi Foster**
Mentor(s): **Dr. Gregory Buhrman, Dr. Gabriel Harris, Dr. Cyndell Gracieux-Singleton**
Poster: **8**

Cadmium (Cd) and Lead (Pb) concentrations in Lindt dark chocolate bars containing 70%, 85% and 100% cocoa respectively were measured using Inductively Coupled Plasma Mass Spectrometry (ICP-MS). Cd and Pb are known contaminants in chocolate and concentrations have been positively correlated to cocoa levels. Serious health risks are associated with over exposure to both metals. Prolonged exposure to Pb can result in neurodevelopmental defects, primarily in younger children, and reduced cardiovascular or renal functions in adults. Long-term dietary exposure to Cadmium can cause reduced kidney function. The isotopes Cd-111, Cd-114, and Pb-208 were quantitated by ICP-MS using a seven-point standard curve ranging from 0.01 – 10.0 ppb Cd and Pb. To prepare samples for ICP-MS, chocolate was digested by microwave-assisted acid digestion. The concentration data was recalculated as the percentage of daily allowance per 1 ounce of chocolate to compare our data to previously published reports using California's Allowable Dose Level (MADL) of 0.5 µg per day for Pb (known as the safe harbor level) and 4.1 µg per day for Cd. Our results showed an increase in Pb to levels above the 100% threshold for 85% and 100% cocoa chocolate. Our results also showed an increase in Cd levels above the 100% threshold for 100% cocoa. Only the 70% cocoa was below the 100% threshold for both Cd and Pb. Our results are consistent with previously published consumer reports

Improving the Production of 19 Xanthomonas citri pv. citri Bacteriophages

Author(s): **Esme Chiara**
Mentor(s): **Jennie Fagen**
Poster: **9**

Xanthomonas citri pv. citri is a bacteria that causes citrus canker, a disease found in many citrus-producing regions. Copper bactericides are commonly applied to citrus crops as part of an integrated approach to pathogen management, but continual usage introduces the risks of bacterial resistance and soil contamination. Bacteriophages may be a solution in tandem with other practices due to their ability to rapidly target and kill bacterial hosts. However, more characterization research is needed before phages can be engineered that successfully eliminate X. citri pv. citri. Nineteen phages were collected from a batch used for a previous dissertation, some from commercial sources and others isolated from infected plant tissue in Florida and Argentina. These phages are being used in a screening protocol developed to determine the best conditions for growing each one in liquid media. Results from this study should provide more information for improving the production of each phage on its respective host. Methods used so far have yet to yield success with the phage lysates tested, so more research is required. Evaluation of potential adsorption on a closely related

bacterium, Xanthomonas citri malvacearum, was also performed, but there was no infection by the phages tested.

Exploring Students' Professional SMART Goals: Insights After Completing a Career Development Project

Author(s): **Avery DiPasquale, Taylor Moen**
Mentor(s): **Dr. Natalie Cooke, Christina Chapman**
Poster: **10**

Career readiness and career development learning are two components that can be used to create a comprehensive framework for students to cultivate the competencies and confidence needed to excel in their careers. SMART goals provide students with a structured framework to articulate and pursue their aspirations, fostering accountability, and motivation throughout their career journey. The aim of this study is to conduct a thematic analysis of SMART goals students set as part of a novel career development project in order to provide insight into how students intend to apply their learnings from this project in developing as a professional post-graduation. Data was collected from 25 NC State undergraduate nutrition students who provided informed consent and were enrolled in NTR 302: Introduction to Nutrition Research, Communication, and Careers during spring 2023 (n=15), summer 2023 (n=5), and fall 2023 (n=5). We utilized thematic analysis to identify recurring themes and patterns in students' professional SMART goals created after engaging with a semester-long career development project. Preliminary results reveal that students set SMART goals aimed at securing field-related experience and advancing their education. This emphasizes a proactive approach to career development among participants. Moreover, a notable preliminary finding is the high level of confidence expressed by students in their ability to achieve these set goals, suggesting a positive impact of project-based learning on students' self-efficacy in pursuing their professional aspirations. This study provides insight towards undergraduate students' career decision making self-efficacy, but further analysis is needed to determine final results.

Exploring Demodex Mites on Captive Lemurs

Author(s): **Adam Ehmke, Sydney Gardner, Alexander Parillo, Vi Greene, Francis Vial**
Mentor(s): **Dr. Lisa Paciulli, Dr. Adam Hartstone-Rose**
Poster: **11**

Mites (class arachnida) are arthropod ectoparasites living on hosts. Mites have been investigated in mammals regarding their possible role in disease development, and few studies have examined mites on lemurs. Therefore, to study mite presence on lemurs, Duke Lemur Center (DLC) lemur hair samples taken from six facial and eight limb regions were examined under light microscopes. Potential mites were photographed and identified based on their morphology. Thirty potential mites were found including some that look like they

belong to Demodex, a mite genus commonly found on dogs. In the future, genetic analysis would be needed to identify the specific mite species found. Studying the presence of mites on lemurs will provide insight into the largely unstudied relationship between ectoparasites, mites in particular, and lemurs, and if / how mite proliferation causes illness in lemurs.

A Lab Animal Research Study- Can Old Dogs Learn New Tricks?

Author(s): **Ashlynn Eurey, Dani Huston, Alexandra Casiano Rivera, Grace Kayler**
Mentor(s): **Dr. Shweta Trivedi, Dr. Marnie Metzler, Sarah Kinlaw, Sina Mahs**
Poster: **12**

Training and behavioral conditioning are staples of canine enrichment and care. These principles are imperative in animal research and teaching, which thrives on the cooperation between the canine subject and the academic. The Canine College interns Fall of 2023 and Spring 2024 learned about laboratory animal medicine, its importance, factors of canine enrichment, and learned research principles to explore how responsive purpose-bred research beagles and hound canines were to training based upon different factors. These factors were age, sex, and the breed of canine on the ability to acquire new skills in a given amount of time. Twenty-eight canines underwent timed training sessions to learn and perform “sit”, “touch”, "paw", "down", and "spin" upon consecutive requests without reinforcement. Ethograms and scatter plots with treadlines were composed to assess the results and quality of data. Currently, 8 canines have learned “paw”, 8 canines learned “down”, 7 canines learned “spin”, and “sit” and “touch” are being taught. The results showed that all ages and breeds of canines had the ability to learn new skills despite age, breed, or sex. The data showed weak correlations between a canine's age and ability to learn a new skill. Ultimately, learning these new skills provided enrichment to the canines and offers ease of handling during labs and studies by instructors and researchers.

Design of High Flux Solar Simulator

Author(s): **Edward Ferreira**
Mentor(s): **Dr. Sajjad Bigham**
Poster: **13**

Being able to simulate solar radiation at high flux intensities could enable conducting research in a lab environment on a wide range of energy technologies including concentrated solar power (CSP) and solar fuel production. In this project, a high-flux solar simulator enabling high solar flux intensities up to 400 suns (i.e., 400 kW/m2) is engineered. This resembles employing up to 400 heliostats pointing on a local spot reaching temperatures exceeding 1000℃. At the heart of the simulator, there are three main components: a 4 kW metal halide lamp, a concentrating reflector, and a high power supply unit. The setup integrates an ignitor, power supply, and socket to power the lamp, which emits radiation at a spectrum resembling the sun. An elliptical reflector is placed

surrounding the lamp to concentrate the radiation towards a cavity where the testing specimen is located. To accurately measure the simulated solar intensity onto a specimen, a high heat flux sensor is employed. Given the risk of equipment overheating, both the sensor and the specimen plate are equipped with active cooling mechanisms. A temperature-controlled water supply with a calculated flow rate is set up to the heat flux sensor to prevent device failure. A heat exchanger will be used to reject heat out from the plate which holds the testing cavity and is absorbing the lamp's radiation. In summary, the developed high-flux solar simulator enables environmental conditions for conducting meticulous testing on a wide range of energy applications and beyond.

Reanalyzing Shelled Zooplankton Samples to Test Effectiveness of Commonly Used Preservation Methods

Author(s): **Peyton Fitts**
Mentor(s): **Dr. Catherine Davis**
Poster: **14**

The shells of planktonic foraminifera are foundational to generating past climate records, with much of what we know linking their shells to climate derived from sediment trap studies. Sediment trapping has now produced decades' long time series, but it is unclear whether standard preservation methods are appropriate for analysis or reanalysis of older material. Here we re-analyze species counts to examine how effective the preservation methods were in successfully maintaining the integrity of the sample after 30 years. We focus on planktonic foraminifera samples originally collected from sediment traps located in the Santa Barbara Basin, CA, collected between February 1994 to August 1994. Reanalysis will involve wet picking, speciation, and counting intact foraminifera species. We then compare the recounts of the species with the counts of species recorded by the original team of scientists that collected these samples in the 1990s. Foraminifera tests require a specific pH in their preserving solutions; any deviation may lead to sample dissolution or fragility. If counts are similar, this suggests that researchers may revisit archival samples with new questions and modern technological approaches. The method that was used to collect and preserve these samples in 1994 is still practiced with foram collection today, so significant change in the counts originally recorded and the counts re-recorded in 2024 may suggest that new avenues of preservation may need to be suggested for further research so that samples can have a longer shelf life.

Veterinary Internship at a Spay and Neuter Nonprofit

Author(s): **Lindsey Frye**
Mentor(s): **Dr. Andrew Weaver**
Poster: **15**

In the Summer of 2022, I completed a pre-veterinary internship at the nonprofit Operation Catnip in Gainesville, Florida. This is a high-volume spay/neuter clinic that works to reduce the feral cat population while improving the health of these animals through vaccination programs. My main duties were related to the Critical Care program, wherein community cats receive free spay or neutering services in addition to rabies and other vaccinations. I prepared cats for surgery through shaving and cleaning of surgical sites and provided post-operative care in the form of vaccinations, flea treatment, and reversal of anesthesia. I was also responsible for monitoring patients post-surgery to ensure there were no complications. I was given the opportunity to observe spays, neuters, amputations, and enucleations during my time as an intern. Another component of the internship was the Kitten Shelter Diversion program, wherein socialized kittens of community cats receive medical services, spay/neuter surgery, and temporary homes to lessen the burden on shelters to provide these resources. I served as a scribe during wellness appointments and assisted in interactions with the public. My participation in this internship improved my communication and team-building skills and will serve me well as a future veterinary professional.

Salinity Tolerance of Dionaea muscipula in the Context of Saltwater Intrusion

Author(s): **Mataeus Funderburk**
Mentor(s): **Dr. Seema Sheth, Dr. William Morris, Dr. Natalie Kerr, Aeran Coughlin**
Poster: **16**

Dionaea muscipula, the Venus flytrap, is a flowering carnivorous plant native to longleaf pine savannah-pocosin ecotones in the coastal plains of the Carolinas. Saltwater intrusion resulting from rising sea levels is becoming a major threat to these coastal environments and their endemic species, yet how these species will respond to increased salinity remains poorly understood. I hypothesize flytrap performance would decrease as soil salinity increases above their natural soil salinity. Here, I focus on the salinity tolerance of D. muscipula in the context of saltwater intrusion. I will first conduct soil and plant pilot studies to understand the dynamics of salinity in potted soil and the salinity limitations within flytraps respectively. Then, I will conduct a full experiment with three treatments, representing low, medium, and high salinity, with three flytrap populations. For each flytrap plant, I will record soil salinity, the number of healthy leaves, the number of dead leaves, and the longest leaf length weekly for 4 weeks. I will perform an ANOVA to determine differences in performance across the treatments and populations. Evaluating the salinity tolerance of D. muscipula will improve our understanding of the impacts of saltwater intrusion on the species' distribution under climate change, and will allow conservation efforts to focus on mitigating the environmental threats facing this rare, iconic plant of the Carolinas.

Seat Belt Counseling Prevalence from National Survey Data 2009-2015

Author(s): **Mary Gallaher**
Mentor(s): **Dr. Jason Forman, Corina Espelien, Ruyun Jin**
Poster: **17**

Objective: Observe the frequency of seatbelt counseling from the Pregnancy Risk Assessment Monitoring System (PRAMS) in reporting states from 2009-2015.
Problem Outline: For pregnant individuals, motor vehicle collisions are the leading cause of trauma. Seatbelt use can decrease the likelihood of adverse fetal and maternal outcomes in the event of a collision. The American College of Gynecologists recommends clinicians to provide guidance on how pregnant individuals should wear their seatbelt in prenatal counseling.
Methodology: To assess the prevalence of seatbelt use counseling, PRAMS data from 2009-2020 was accessed via the CDC. To target a dataset with consistent reporting, states that reported seatbelt counseling data every year from 2009-2015 were assessed in this analysis. The data was weighted using given weighting factors and the percentages of each state's response that responded "yes" to receiving prenatal counseling about seatbelt use were calculated.
Results: The average weighted percentage of responses that reported receiving seatbelt use counseling across all included states was 52.4%. The percentage of individuals who received prenatal seatbelt counseling are consistently between 40% to 60%, with the exception of higher rates (>60%) in Illinois in 2010 and Maine in 2011, 2013 and 2014 and lower rates (<40%) in Utah in 2011-2013.
Conclusions: Seatbelt belt use counseling is not consistently being provided to pregnant individuals in their prenatal visits. Additionally, data was only available for 16 states, highlighting a gap in sampling for topics relevant to pregnant motor vehicle safety.

Black Women's Mental Health Study: Sis, are You OK?

Author(s): **Meredythe Galliher**
Mentor(s): **Dr. Sarah Ascienzo**
Poster: **18**

This study is a part of a larger project seeking 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. Guided by the Superwoman Schema Framework (Woods-Giscombe, 2010; 2018) and intersectionality theory (Cho et al., 2013; Collins, 2000; Crenshaw, 1991), the purpose of this qualitative study was to explore the ways in which Black women faculty have experienced the dual pandemics of COVID-19 and anti-Black racism. Nonprobability snowball and purposive sampling was used to recruit Black women faculty (N=12) to participate in semi- structured interviews in March 2023. Using thematic analysis, six themes emerged that speak to the stress, burnout, and mental health issues these women encountered due to the intersecting challenges of sexism, racism, and the COVID-19 pandemic. Based on the

findings, recommendations are made, including the implementation of support systems and resources to help Black women in academia cope with and thrive in their academic environments.

Captive Aye-aye (Daubentonia madagascariensis) Mother Vocalizations After Giving Birth

Author(s): **Chloe Glynn, Rachel Culbertson**
Mentor(s): **Dr. Lisa Paciulli, Jeni Smithson, Jade McLain, David Watts**
Poster: **19**

Communication between mother and infant primates is important to the infant's survival. Aye-ayes (Daubentonia madagascariensis) are nocturnal, tree-dwelling, and cocoon-nest living primates that are difficult to see and hear. Adults make four vocalizations - aacks, eeps, drums, and huffs. In this study, the vocalizations made by a captive aye-aye mother were examined for 24 hours the day of and the day after giving birth. The hypothesis was that the mother would vocalize and make several different vocalizations. With Duke Lemur Center IACUC approval, three Sennheiser MKE2-60GOLD lavalier condenser microphones were placed in a female aye-aye's enclosure and nest box. Audio recordings were imported into Adobe Audition, and listened to for vocalization type. The results showed that the hypothesis was supported as the mother vocalized 106 times on the day of birth and 27 times on the day after birth. On the day of birth, the mother made more huff vocalizations (n=79), while on the day after birth, drums were the most common vocalization (n=16). The mother likely vocalized more during the day of birth due to her discomfort and stress. Both huff and drum vocalizations indicate that the mother was stressed on both days as would be expected so close to giving birth. One big limitation of the study was the small sample size (n=1). Future research should include more aye-aye mothers as well as data on vocalizations made a year prior to birth to have a baseline of vocalizations for each mother.

The Aggressive Coyote, Examining Coyote Aggressive Behavior Towards Humans and Pets

Author(s): **Valeria Gonzalez Perez**
Mentor(s): **Dr. Roland Kays**
Poster: **20**

The expansion of coyotes across North America, including urban areas, has led to increased potential for conflicts with humans. Understanding these conflicts and identifying seasonal and spatial patterns is crucial for shaping policies to maintain healthy human-animal relationships. Analyzing five years of news articles (2019-2023) revealed 664 incidents, including 317 attacks on humans, 296 on dogs, and 42 on cats. Nearly half of the human attacks occurred in clusters, with 54 involving people defending their pet dogs. While most attacks targeted adults, children could usually scare off coyotes, and no fatalities were

reported. Only a small percentage of attacks were by rabid coyotes. Attacks on unleashed dogs were more common in urban and natural spaces, with some incidents involving leashed dogs, particularly small breeds. Attacks on humans and dogs correlated with human and coyote population density, particularly in recently colonized areas and northern latitudes. Seasonality played a significant role, with spikes in January (mating season), June-July (pup dispersal), and September (coyote exploration). To reduce the risk of attacks, communities should avoid attracting coyotes with food and be vigilant, especially around small dogs, during breeding and dispersal seasons.

Completing the Puzzle: Genome Sequencing of Tomato Lanai

Author(s): **Reshma Goud**
Mentor(s): **Dr. Trino Ascencio-Ibáñez**
Poster: **21**

The primary aim of this research project is to fully sequence the genome of tomato Lanai. Our laboratory has proposed tomato Lanai as a useful laboratory tomato variety for viral studies, due to its determinate height, rapid development and viral symptom display. The complete sequencing of the Lanai tomato genome is vital for a thorough comprehension of its genetic composition. This is fundamental for exploring its biological functions and potential applications, particularly in the context of gene expression studies. Recognizing the high cost and lack of educational value in outsourcing samples for sequencing, our laboratory sought to establish an in-house sequencing capability to meet our educational and research needs. To tackle this challenge, we employed Oxford Nanopore sequencing technology. This method was chosen for its ability to sequence long strands of DNA, which is vital for assembling a complete genome. The project began with careful total DNA sample preparation, ensuring the integrity of the genetic material. After successfully running the samples in the sequencer and acquiring base pairs, our next task is to map the genetic sequences to the reference genome to reconstruct the tomato Lanai genome. This information will help us for our future research on changes in gene expression patterns and other biological functions. Additionally, the development and refinement of Nanopore sequencing techniques within our lab will not only advance our own research but also enrich the experimental biochemistry curriculum, offering hands-on learning experiences for students in the Molecular and Structural Biochemistry Department.

How Employee Contact with Nature during the Workday Influences Work Outcomes

Author(s): **Allison Guild**
Mentor(s): **Dr. Ian Hughes**
Poster: **22**

Employee contact with nature during work can be as simple as taking a walk, but has the potential to positively impact outcomes in the work day. Currently, there is little literature for the topic of nature contact within the organizational sciences. To investigate the role of nature contact in predicting work outcomes, 559 U.S. workers were recruited from Prolific. These employees completed measures of work outcomes (e.g., work engagement) and nature contact (e.g., spending a morning or afternoon work break outside). The findings showed that employees who have greater contact with nature during work may be more likely to enjoy positive outcomes during the week. Workers who reported greater contact with nature during the work week also reported greater levels of work engagement ($r = .18$, $p < .01$), greater levels of sleep quality (i.e., better sleep; $r = .17$, $p < .01$), lower levels of burnout ($r = -.09$, $p < .05$), greater levels of positive mood ($r = .18$, $p < .01$), and greater levels of helping behavior toward other employees ($r = .21$, $p < .01$). In all, employee nature contact appears to be a positive phenomenon.

Development of a Biomimetic Soft Robotic Tongue Actuated by Fiber-shaped Pneumatic Muscles

Author(s): **Sarah Gullion, Youssef Kozman**
Mentor(s): **Dr. Xiaomeng Fang, Robert Seevers**
Poster: **23**

The human tongue plays a key role in speech production and is an essential component to human quality of life. The shape of the tongue affects the overall shape of the vocal tract and the unique sounds produced. The tongue's movement during speech is almost hidden due to its internal nature. Without a visual aid, it is very challenging to describe the function of each tongue muscle in speech production for speech pathology education. The development of a model robotic tongue would be a gamechanger for actively visualizing tongue movement and shape during speech production along with the associated muscle groups. This research project has constructed a tongue using an elastomer body driven by ultrafine fiber-shaped pneumatic artificial muscles (FPAMs). The thin FPAM consists of an internal silicone bladder wrapped by a textile braided sheath. When inflated, the FPAM expands radially while simultaneously contracting longitudinally. The hollow silicone tongue body was cast using a 3-D printed mold based on a finite element tongue model. The specific silicone materials used mimics the soft properties of tongue tissue, and the FPAMs contract similar to human muscle tissue. The current prototype utilizes eight FPAMs, four along the centerline and two on each side of the tongue, these mimic the arrangement of the hyoglossus and genioglossus muscles. We aim to further develop the model to be able to add the

palatoglossus, styloglossus, and the superior longitudinal muscles and coordinate their movement to generate the shapes of the vowels /a/, /i/, and /u/.

Exploratory Analysis of Feeding and Drinking Behavior in Relation to Weight Gain for Newly Weaned Pigs

Author(s): **Emma Hailey, Sydney Minch, Moriah Williams**
Mentor(s): **Dr. Suzanne Leonard**
Poster: **24**

When piglets are transferred from the farrowing barn to the nursery, they experience stressors that decrease both feed and water intake. This study specifically targeted the issue of weight loss in weaned pigs by recording behavioral data and tracking weight gain. The objective of this exploratory analysis was to better understand pig feeding and drinking behavior in relation to weight gain. The weaned pigs were placed into groups of four based on sex and body weight. In each of the three pens observed, the individual pigs were identified with livestock paint colors. Video cameras recorded top-down views for the first two days post-weaning. The video behavioral observations were classified into three categories: actively feeding, interest in feeding, and drinking. Behaviors were documented for up to two days post-weaning and body weights were recorded until 28 days post-weaning. Data were cumulatively calculated per pig and analyzed in three-hour increments. Within individual pens the pig behavior was compared with weight gain. The minimum and maximum results of each behavior were compared between pigs. Overall, the active feeding behavior ranged from 0 to 53.0 min for a single pig in a three-hour interval. The interest in feeding behavior ranged from 0 to 4.2 min and the drinking behavior ranged from 0 to 12.5 min. Altogether, the most significant finding was the amount of variation amongst individual pigs within and between pens. These results can be used to further inform future studies on swine research by emphasizing the importance of observing individual pig behaviors.

Identifying Prevalent Myths regarding Veterinary Admissions among Pre-Veterinary Track Students

Author(s): **Emma Hailey, Sophia Jodka, Madison Manzo, Diana Dabdub,**
Mentor(s): **Dr. Shweta Trivedi**
Poster: **25**

The myths and fallacies associated with veterinary school admissions are prevalent among pre-veterinary (PreVet) track students. This study focused on PreVet students' preconceptions regarding academic, extracurricular, and competitiveness criteria for veterinary admissions. A Qualtrics survey presenting fifteen statements with an agreement Likert scale responses was approved by IRB (26881). Over 495 American Pre-Veterinary Medical Association National Symposium attendees were surveyed on 8th March, 2024 and a 52% response rate was achieved. The attendees' responses provided a national

representation of the prevalence of these myths. Data were analyzed thematically for percentages of agree and strongly agree categories, and strong preconceptions were identified. Myths with prevailingly high agreement rates were classified into three categories: additional education, GPA requirements, and extracurricular experiences. After analysis, 61.9% agreed adding a minor and 74.2% agreed a Masters or PhD degree would make their application more competitive. The students placed significant emphasis on GPA requirements and 89.9% agreed that a 3.7 GPA or higher increases competitiveness. Data analysis showed that 68.1% of students felt engaging in study abroad experiences also added competitiveness to their application. It is clear that several myths are strongly prevalent among PreVets. By working with AAVMC, statistical information on successful applicant data and advising resources can be provided to students to dispel these misconceptions for current and future DVM applicants.

Integrating AI Core Concepts with K-12 STEM Education

Author(s): **Nithya Janapati**
Mentor(s): **Dr. Bita Akram**
Poster: **26**

My research is focused on conducting a meta-review of research and practice on integrating AI core concepts with K-12 STEM education. Integrating AI-integrated STEM curriculum is essential for K-12 since real-world STEM problem-solving involves AI-based solutions. Conducting a systematic review of the literature identifies evidence-based best approaches for improving teaching and learning for AI-integrated STEM education. It also helps us identify and address gaps in research and practice in this area. To aid in this process, my research has been centered on a meta-review of related scientific papers.

Exploring the Progression and Prevention of Alzheimer's Disease: Amyloid-β & Tau Protein Aggregation

Author(s): **Hannah Jewett, Giannah Dowen**
Mentor(s): **Dr. Michael Goshe**
Poster: **27**

Many neurodegenerative diseases are associated with protein misfolding, protein aggregation, and accumulation in the brain, which may lead to cellular dysfunction, damage of synaptic network, destruction of neurons, and brain-mass loss. Specifically, Alzheimer's disease is characterized by the accumulation of extracellular amyloid-β and intracellular hyperphosphorylated tau protein aggregates. Amyloid is a large fibrillar aggregate composed of misfolded β sheets that can accumulate into plaques, and tau is a protein that stabilizes neurons and can cause the silencing of neuronal circuits when aggregated. Certain physiological traits may exacerbate protein aggregation, such as overexpression of amyloid precursor protein, elevated cholesterol in membranes, and elevated calcium levels. To

explore the mechanistic tendencies of amyloid-β (Aβ) plaques and tau aggregation, we assessed current in vivo experimental therapy treatments on transgenic mice models as well as the effects of both Aβ and tau on neural activity and circuits. We also evaluated assays using thioflavin-T (ThT) fluorescence, circular dichroism, Fourier transform infrared spectroscopy, transmission electron microscopy, Congo red birefringence, and proximity ligation that characterize protein aggregation. In our research, we performed a ThT fluorescence assay to characterize amyloid-β fibril formation involving redox-mediated aggregation. Through the examination of mice models and assays, we were able to gain insight on the interaction and effects of antibodies, enzymatic inhibitors, ligands, synthetic peptides, ions, and targeted gene expression on Aβ and tau aggregation as related to neurodegenerative disease progression.

Optimized Cryopreservation Process for E. coli Cell Bank Generation

Author(s): **Alexa Jimenez**
Mentor(s): **Dr. Hayley Flores**
Poster: **28**

Escherichia coli (E. coli) is a model bacterium commonly used in biomanufacturing as an expression system to produce recombinant therapeutic proteins. E. coli manufacturing processes are initiated from a cell bank, which consists of uniform cell aliquots that are preserved and stored under controlled conditions to ensure cell viability and genetic stability. Most microbial cell banks are preserved by cryopreservation, a process that involves the storage of cells at ultra-low temperatures ranging from -80℃ to -196℃. A cryoprotectant, such a glycerol, is added prior to freezing to prevent or reduce the formation of ice crystals that can damage cells. An optimized cryopreservation protocol is critical for high cell viability and process consistency after thawing. This research project is using a Design of Experiments (DOE) approach to investigate the impact of key process parameters such as cryoprotectant concentration, media type, and wash steps on the cryopreservation process and post-thaw cell viability. Treatments resulting in cell banks that have high viability after freezing and subsequent thawing will be further characterized by measuring growth kinetics and protein expression. Project results will be used to generate an improved E. coli cell banking protocol.

The Rollercoaster of Conflict in a Caregivers of Autistic Children Facebook Group

Author(s): **Sydney Johnson**
Mentor(s): **Dr. Suzanne Goodell, Dr. Suzanne Goodell, Aygul Akhmadullina**
Poster: **29**

Conflict among caregivers of autistic children (CACs) on social media commonly occurs when CACs discuss autism spectrum disorder (ASD) and nutrition. Most ASD nutrition interventions lack evidence of safety and efficacy, and sites can contain misinformation. The purpose of this facebook group is to provide support to CAC, this is hard to do when there is conflict on the

information they are seeking support for. This research examined how conflicts start, escalate, and de-escalte in a CAC Facebook support group through a secondary analysis of posts and comments extracted from the site. Data analysis included open coding, codebook development, targeted coding, theme weaving and pictorial representation.
Analysis revealed that conflict is like a rollercoaster with a beginning (trigger), ups and downs (escalators and de-escalators), and an end. Triggers were all controversial topics and escalators included emotion, behavior, instruct, repetitiveness, question, name calling, swearing, assume, and defensive. De-escalators included agreeing, support, and avoidance. The end occurred when people came to an agreement or someone stopped commenting. CACs could apply the findings to their own posts and comments so that they can get the support they need from the facebook group while also implementing ways of de-escalating conflict and knowing what escalates a conflict. The findings need to be quantified by testing hypotheses. Additional research is needed to determine how conflict starts, escalates, and de-escalates pertaining to other areas on social media.

Galactic Supernova Neutrino Burst Signals with PUSH and SNEWPY

Author(s): **Veronika Juylova, Benjamin Hanestad**
Mentor(s): **Dr. Jim Kneller**
Poster: **30**

PUSH is a 1D supernova simulation code that simulates the supernova explosions and generates unoscillated neutrino spectra. SNEWPY is software which combines the data from supernova simulation with a prescription for the flavor transformation and then computes the neutrino event rates in terrestrial detectors. Together, they form a pipeline that allows us to simulate the neutrino signal from a nearby supernova and design protocols for extracting the information we seek from a signal. To develop this, we created a PUSH supernova model class using Python to be inserted into the current SNEWPY software. We then extracted and read data from PUSH to form correlations between neutrino data and supernova events.
The PUSH model class extracts, reads and handles data for us to model the relationship between different variables, including luminosity, flux, time, neutrino flavor/type, and energy. From there, SNOwGLoBES provides functions to format the data run through a chosen set of neutrino detectors, and output the final result of what we speculate to see on Earth at the next captured CCSN event.

Exploring the Psychological Implications of Prolonged Generative AI Reliance for Emotional Support

Author(s): **Sanjana Kedla**
Mentor(s): **Dr. Christopher Mayhorn, Douglas Jonidis**
Poster: **31**

This research examines the psychological risks and side effects associated with prolonged and excessive reliance on generative artificial intelligence (AI) for emotional support, and to compare these effects to other forms of human interaction with technology or therapeutic interventions. With AI on the rise, people are beginning to misuse AI excessively, especially the younger population. Misuse refers to over relying on automation which can result in decision biases (Parasuraman & Riley, 1997). This misuse is typically because people fail to rely on these sources appropriately, people either end up putting too much trust in these automatic sources or too little trust (Lee & See, 2004). By identifying these risks and side effects I believe that we can implement means to avoid getting to the point of permanent effects. AI is already prevalent in our daily communication (e.g. email smart replies) that is already a major part of our lives (Hohenstein, 2023). With this open access supposedly "all knowing" platform readily available at our fingertips as well as the younger adult population whose brains haven't fully developed and learned important skills such as critical thinking this could be a big obstacle in that development (Li, 2023). Thus, the following research goals will be investigated:
Identify and analyze the psychological risks arising from dependency on AI for emotional support (e.g. emotional dependency, altered self perceptions of self and others)
Assess the comparative effectiveness of generative AI-based emotional support systems versus traditional human interaction and therapeutic interventions (e.g. emotional well-being, social functioning)

Tree Canopy Influence on Arthropod Predators in Understory Turf Landscapes

Author(s): **Ben Kirschner**
Mentor(s): **Dr. Sujan Dawadi, Dr. Steve Frank**
Poster: **32**

Tree canopies contain diverse arthropod communities including many generalist natural enemies. Maintaining trees in urban landscapes may support natural enemies and reduce pests in adjacent plants such as turf. However, the effect of tree canopies on arthropod natural enemy populations and predation in surrounding turf is yet to be understood. The goal of this project was to assess the diversity, abundance, and distribution of prey, predators and parasitoids present in turf landscapes under tree canopies. To achieve this, we placed a series of pitfalls and sticky traps at set distances under and nearby willow oak trees found on the NC State University campus. We collected these traps monthly over a span of six months, counting all trapped arthropods and sorting predators and parasitoids to the family level. Total counts were recorded for prey population.

We found the presence of 14 predator families in the pitfall samples, as well as 13 predator and 8 parasitoid families in the sticky trap samples. Arthropod abundance peaked in July and drops in October. Prey population spiked in September. Ants, spiders, minute pirate bugs, and long legged flies were the most abundant predators. This suggests prey populations under the tree canopies are too large for natural enemies. This information will be helpful in identifying common arthropod populations, their distribution, and predator prey interactions in turf landscapes. Additionally, this will aid in pest management strategies.

How Far has Personality Science Come? Personality's Statistical Relationship with Job Performance

Author(s): **Steven Krahe**
Mentor(s): **Dr. Sarah Ascienzo**
Poster: **33**

Background: The study of personality has sparked many large conversations since its formal introduction into the academic space over a hundred years ago (Judge & Zapata, 2015). One of the most dominant topics within the field has been the exploration of relationships, and predictive power, between personality taxonomies and life outcomes such as job performance (Zell & Lesick, 2021). A personality taxonomy that could accurately predict job performance across industries would be very powerful. It could help individuals identify the careers they would be most successful in or help employers more effectively identify the best candidate for a job, all with a simple test. The Big Five personality taxonomy, also known as the Five Factor Model, is currently the most used taxonomy in personality science (Zell & Lesick, 2021). This literature review asks what, if any, associations exist between the Big Five personality traits and job performance across industries. Methods: A literature search was conducted to identify studies from 2013-2023 using the following search terms: ((Big Five) OR (Five Factor Model)) AND (job performance); (personality) AND (job performance). Results: A total of 10 articles published from 2015-2023 were reviewed, including 1 systematic literature review and 1 quantitative synthesis of 54 meta-analyses. Discussion: Overall, most studies reviewed found statistically significant associations between the Big Five personality traits and job performance in a multitude of industries. Limitations of the search and articles reviewed, as well as implications of the future of personality-job performance research, will be discussed later in this project.

Environmental Science Classes: A Solution for Eco-Anxiety or are we all Doomed?

Author(s): **Brooke La Fuente**
Mentor(s): **Dr. Megan Lupek**
Poster: **34**

Eco-anxiety is defined as mental distress caused by climate change and environmental degradation and is particularly prevalent in youth and young adults. While recent research has studied general eco-anxiety manifestations, there is limited research on how course content affects university students' experiences with eco-anxiety. In this study, we conducted pre and post course surveys with a group of 70 students enrolled in an introductory level online environmental sciences course. In doing so, we looked at different themes such as concerns over specific environmental challenges, eco-anxiety, preparedness, and hope for the future, or "eco-hope". Though we are still in the analysis stage, our results may impact how instructors design and teach their courses in the future; our findings will be discussed on the basis of future directions for improving students' experiences in all environmental science courses.

Optimization of PAMAM Dendrimer Amino Acid Hybrid Molecule Synthesis

Author(s): **Julia Linville**
Mentor(s): **Dr. Chistopher Gorman, Juliana O'Brien,**
Poster: **35**

Dendrimers are systematically branched macromolecules. The specific dendrimer used for this synthesis are poly(amidoamine) (PAMAM) dendrimers as they are good candidates for a gene delivery molecule. Adding different amino acids to the PAMAM dendrimer structure changes the properties of the overall molecule. The PAMAM dendrimer amino acid hybrid molecule is referred to as a DendriPep. The original method of Dendripep synthesis was to add functional groups starting from the center of the molecule; this is called a divergent approach. By using protecting groups such as base liable Boc and acid liable Fmoc, the regioselectivity could be controlled. While this method is viable, the synthesis is time consuming. The synthesis can be optimized by synthesizing dipeptides, a compound consisting of two amino acids. By doing this, a step can be eliminated, which makes the synthesis more efficient. Running a model system of reactions will show what equivalencies of starting materials give the best ester to amide bond formation. With each reaction, nuclear magnetic resonance (NMR) spectroscopy is run to show what functional groups are present and mass spectrometry gives the molecular weight of the molecule. These analyses are used to characterize the products of each reaction. These model system reactions will be used to determine the optimal conditions for DendriPep synthesis.

Systemic or Cell Autonomous? ARR7 Downregulation by Geminivirus Infection in Arabidopsis

Author(s): **Nicolas Mastrovito**
Mentor(s): **Dr. Trino Ascencio-Ibáñez**
Poster: **36**

Many aspects of plant growth rely on cytokinin signaling. Cytokinins initiate growth pathways through a phosphate relay system between a histidine kinase and a response regulator. Arabidopsis response regulator 7 (ARR7) is among the group of Type A response regulators observed to exhibit the greatest fold increase in expression upon cytokinin signaling. Type A response regulators are known to negatively regulate further cytokinin signaling and thereby lead to a reduction of plant growth. Microarray analysis of Arabidopsis thaliana infected with the geminivirus Cabbage leaf curl virus (CaLCuV) indicates that ARR7 is downregulated during infection. It can therefore be proposed that geminivirus replication may be reliant on some downstream effect of cytokinin signaling, and that ARR7-mediated negative feedback may interfere with this. It is hypothesized that geminiviruses directly induce downregulation of ARR7 expression in a cell autonomous manner, as opposed to being a systemic effect resulting from some indirect action of geminiviral components. Preliminary immunohistochemistry assays were used to detect Rep in the nuclei of CaLCuV-infected A. thaliana tissue. It was investigated here whether immunohistochemistry combined with GFP-fused ARR7 (ARR7::GFP) fluorescence can co-localize ARR7 with Rep in the cells of leaf and meristem tissue sections from infected A. thaliana. It was determined that tissue fixation and immunohistochemical staining may interfere with the ability of ARR7::GFP to fluoresce. Additionally, co-localization of ARR7 and Rep by chemical staining may be difficult to characterize reliably since they are both nuclear proteins. Immunolocalization of Rep and ARR7::GFP by fluorophore-tagged antibodies will be pursued.

Evaluating Nutrition Undergraduate Students' Career Readiness Using a Course-Development Learning Project

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Poster: **37**

Career development learning (CDL) aids students in developing skills that help them transition to their future careers by forming connections between course learning and future goals, which can increase students' self-efficacy. Self-efficacy can be bolstered through vicarious learning, which occurs when students learn about the successes and failures of an expert in a certain field. Discussing these learnings with peers encourages higher-order thinking, requiring students to form connections with course material and engage in thoughtful conversations. The goal of this project was to determine themes in students' career-related discussion posts and responses as part of a course-based approach to career

development learning. Students in NTR 302: Introduction to Nutrition Research, Communication, and Careers identified key learnings from career-related alumni videos and discussed the learnings through Packback, an AI learning platform for inquiry-based discussion. This study utilized secondary data collection and extraction with qualitative thematic analysis to find patterns and themes using inductive coding. Our dataset consisted of 56 participants enrolled in the course during one of the seven semesters from Fall 2019 to Spring 2022. Our dataset consisted of 572 questions and 1,109 responses. After analysis, the following three preliminary themes emerged. First, students lack awareness of career opportunities for their major. Secondly, students want to be successful in the “real world.” Lastly, resume building, gathering occupational information, and career and graduate school exploration enhance students' career readiness. The results of this study provide a framework for higher education professionals to use to prepare students for their future careers.

Testing the Unusual Multi-step Reaction of AsqJ and Homologous Enzymes

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Poster: **38**

Cyclopenin is a benzodiazepine derivative found in the genera Aspergillus and Penicillium. Cyclopenin, along with its analogs, has been found to have medicinal properties, including antiviral, antibacterial, and anti-inflammatory activities. Multiple biosynthetic pathways have been found in different species, typically employing three enzymes: a dehydrogenase and epoxidase to convert cyclopeptin to cyclopenin and a cyclopenase to rearrange to viridicatin. However, an iron(II)-and 2-oxoglutarate-dependent enzyme (Fe/2OG) called AsqJ has been found to catalyze the multi-step reaction on its own. Fe/2OG enzymes are known to catalyze a wide variety of reactions. These include hydroxylation, cyclopropanation, halogenation, rearrangement, desaturation/dehydrogenation, cyclization, and epoxidation. AsqJ is unique in that it catalyzes a multi-step desaturation-epoxidation reaction to form cyclopenin followed by a Lewis acid-catalyzed rearrangement. Through homology studies of gene clusters and individual enzymes, two other Fe/2OG enzymes, PenM and VdoC, have been predicted to also catalyze this multi-step reaction. During this project, I focused on the unique enzyme AsqJ and its potential orthologs, PenM and VdoC. I expressed and purified these enzymes. Since AsqJ’s function is known, I will use it as a product standard during NMR assays to obtain the typical spectrum of cyclopenin as a comparison of the reactions by PenM and VdoC. This work gives insight into easier biosynthetic routes for drug development involving cyclopenin and its derivatives.

Secondary Traumatic Stress and Self Compassion in Mental Health Workers

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Poster: **39**

Background: Mental health is a demanding field given the severity and quantity of client need and suffering. Many mental health workers(MHWs) are experiencing adverse responses that have been connected to occupational stress factors. In particular, concerning levels of secondary traumatic stress (STS; Elwood et al., 2011) have been reported, which can negatively affect clinician wellbeing and reduce the quality of client care (Bride et al., 2007; Newell & MacNeil, 2011). As a result, attention has focused on identifying contributing factors and developing effective intervention strategies. One of these factors is self compassion which is defined as a healthy way of relating to oneself in light of difficulties. The purpose of this study is to assess the relationship between levels of STS and self compassion among current MHW and assess differences that may exist. Methods: This project included secondary analysis of survey data. The original survey utilized non-probability sampling methods to recruit a national sample of mental health workers to complete an online survey that queried respondents' use of self-care practices, self-compassion, and levels of secondary traumatic stress. The Secondary Traumatic Stress Scale (Bride et al., 2004) assessed levels of STS and the Self-Compassion Scale (Neff, 2003) measured self-compassion. Bivariate correlation was used to analyze relationships between STS and self-compassion, as well as among the subscales of each scale. Results: Several significant relationships were revealed between STS and self-compassion, with some variations among subscales. Implications: Understanding the relationship between STS and self-compassion will be beneficial to developing informed intervention strategies.

Modifying Acetyl-CoA Carboxylase and Malonyl-CoA Decarboxylase Protein Expression Alters Fatty Acid Oxidation

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Poster: **40**

This study investigates the impact of modifying acetyl-CoA carboxylase (ACC) and malonyl-CoA decarboxylase (MCD) on hepatic fatty acid (FA) oxidation in neonatal piglets to improve energy utilization and survivability. Newborn pig hepatocytes were cultured with or without clofibrate (0.3 mM), vitamin A (5 μM), and clofibrate + vitamin A. The effects of 5-Aminoimidazole-4-carboxamide riboside (AICAR, 0.5 mM) and MK-886 (0.05 mM) were examined to activate AMPKα and inhibit PPARα, respectively, affecting ACC and MCD protein levels. FA oxidation and ACC and MCD protein levels were assessed using 14C-oleic acid (0.5 mM, 16.5 μCi/mmol) and Enzyme-Linked Immunosorbent Assay (ELISA), respectively. The study found that AICAR did not affect ACC and MCD protein levels, while MK-886 increased ACC protein ($P < 0.01$) and decreased MCD protein ($P < 0.0005$). Clofibrate, vitamin A, and

their combination did not alter the MK-886-induced changes in ACC and MCD protein ($P > 0.05$). Correspondingly, MK-886 treatment reduced 14C accumulation in CO2 and acid soluble products (ASP) significantly ($P < 0.0001$). AICAR had no impact on CO2 and ASP levels, regardless of clofibrate or vitamin A treatment ($P > 0.05$). Total fatty acid oxidation (CO2 + ASP) was 57% lower in MK-886-treated cells compared to control cells and AICAR ($P < 0.0001$). No interactions were detected between PPARα activation and AICAR or MK-886 ($P > 0.05$). This suggests that altering ACC and MCD protein expression reduces hepatic FA oxidation, with further investigation warranted regarding MK-886's role in this modification.

Children's Perception of Milk and the Different Heat Treatments of Milk in the School Lunch Program

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Mentor(s): **Megan Watson, Dr. Fernanda Santos, Dr. MaryAnne Drake, Carl Hollifield**
Poster: **41**

The school lunch program is a vital part of ensuring proper nutrition to support the healthy growth and development of schoolchildren. The program is not only essential to meeting the nutritional needs of children, but by developing good eating habits in their formative years, helps students to develop and maintain better health and nutritional patterns throughout their adult lives. The research question that is the focus of this study is: What is the preference between aseptic, ultra-pasteurized (UP), and high-temperature short-time (HTST) milk for students participating in the school lunch program? The project will study and assess children's qualitative perception of aseptic milk, compared to UP and HTST, as it pertains to the school lunch program. Hour-long qualitative focus groups will be conducted with 25 children, ages 8 to 13 years old, to investigate how different heat treatments are perceived including the sensory attributes of flavor, viscosity, and appearance, as well as the impact of specific milk packages utilized with different heat treatments. There will be five separate focus groups, consisting of five schoolchildren in each according to age and gender. The outcomes of this study will provide insight into the perceptions of different factors involving milk, and facilitate tailoring school meal programs to align with students' interests, promoting healthy eating habits.
Key Words: school lunch program, perception, preference, heat treatment, focus groups, qualitative research

Wetlands are Shifting Inevitably: What are the Drivers of this Ecological Shift?

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Poster: **42**

Wetlands serve as critical components of global carbon and water dynamics, yet they face increasing pressures from climate change. This study investigates the carbon dynamics and

ecological transition in a natural bottomland hardwood forest in Alligator River National Wildlife Refuge, North Carolina, USA. This once-healthy wetland forest has deteriorated into a 'ghost forest.' From 2009 to 2019, the changes in gross primary productivity (GPP), ecosystem respiration (RE), and net ecosystem carbon exchange (NEE) were monitored in response to changes in hydrology and forest cover by utilizing the Eddy Covariance Method. Our findings reveal a notable shift in carbon balance from a net carbon sink in 2009 to a net carbon source in 2010 onwards, attributed to escalating tree mortality associated with changing hydrological conditions such as sea level rise. Furthermore, our data highlights an increase in tree mortality following hurricanes. A closer look at tree demography reveals a pine bark beetle infestation in Loblolly Pine (Pinus taeda) and the drastic decline of Black Gum (Nyssa sylvatica), a dominant species at the site. The leaf area index (LAI) emerges as a key ecological driver influencing GPP and NEE, while RE remains temperature-dependent. This research underscores the profound influence of hydrological shifts and extreme weather events on carbon dynamics within wetland ecosystems and the critical role of this ecosystem as a keystone entity in the face of ecological transition. This emphasizes the need for conservation and management strategies to safeguard these vital habitats in the era of rapid environmental change.

Demonstrating the Relevance of Many-Body VDW Effects in Molecular Simulation

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Poster: **43**

Herein is explored the effects of 3-body and many-body dispersion on chemically distinct systems using a classical forcefield, PHAHST. The effects of many-body van der Waals dispersion were studied on the neat bulk supercritical fluid regime of several rare gas atoms as well as adsorption sites of HKUST-1, a well-studied metal-organic framework. PHAHST is an atomistic molecular modelling forcefield which includes contributions from repulsion-dispersion, permanent electrostatics, and many-body polarization. The ideas behind this potential include mimicking its first-principles counterparts while using as few fitting parameters as possible. Although this forcefield is relatively robust and accurate compared to its counterparts and makes use of Thole-Applequist many-body polarization, the absence of a many-body van der Waals term has been shown to have importance in the prediction of energetics of van der Waals-dominated systems. Possible application systems include small molecule binding in porous materials, the folding of proteins, and drug-binding reactions in the human body. The general importance of many-body dispersion effects in systems as simple as rare gas fluids or bulk water continues to be an open question. Added as corrections to the pairwise PHAHST model, the 3-body Axilrod-Teller-Muto correction (ATM) and the more general many-body coupled dipole method (CDM) can be employed to test the importance of such effects. By doing this, the necessity of including non-additive effects in molecular modelling to achieve physically realistic results, in a wide variety of contexts, with reasonable computational expense, can be evaluated.

Biochemical and Histological Evaluation of Meniscus Following ACL Injury in Porcine Models

Author(s): **Rachel Morris**
Mentor(s): **Dr. Matthew Fisher, Margaret Easson**
Poster: **44**

Anterior Cruciate Ligament (ACL) and meniscal tears are some of the most commonly reported knee injuries. Approximately 35% of all knee osteoarthritis cases occur following a knee injury. The goal of this study was to explore how the meniscus changes following a partial or complete ACL transection (ACLT). 32 juvenile Yorkshire pigs underwent unilateral ACL injuries including anteromedial (AM) bundle transection, posterolateral (PL) bundle transection, and complete ACL transection with sham-operated contralateral joint. After 24 weeks, the pigs were euthanized and tissues were collected. It was predicted that a tear of the ACL would lead to increased inflammation, volume, and disorganization of the tissue in the meniscus compared to the sham legs. It was also anticipated that these differences would be observed regionally in the meniscus. For this reason, the posterior and anterior horns, as well as the middle of the meniscus, were analyzed using both histological and biochemical evaluation. Additionally, the inner and outer portions of each of these sections were evaluated using biochemical analysis. Through biochemical testing, specifically dimethylmethylene blue (DMMB) assays, differences in Glycosaminoglycans (GAGs) were anticipated, with changes in concentration expected in injured legs and different horn locations. Finally, samples from both horns and the middle section of the meniscus were sectioned, stained, and imaged to further understand regional differences in composition.

Preliminary Assessment of Heavy Metals in Market-Facing Sweetpotato Products

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Poster: **45**

Plants have developed various strategies to cope with heavy metal exposure in soils, and due to their high root-to-shoot ratio, large biomass, and metal absorption capacity sweetpotatoes are excellent at removing toxins from the soil. However, this trait raises food safety concerns over the bioaccumulation of toxins from the edible storage roots. The purpose of this study is to collect published literature and laboratory data on the content of acrylamide, arsenic, lead, cadmium, zinc, copper, and selenium in raw and processed sweetpotato to determine how much contamination is occurring and what kind of contaminants are present in commercial foods whose target market is in early childhood. To test this, several early childhood and common household sweetpotato products were sampled, weighed, oven-dried, ground into a fine powder, and then put through acid digestion. This process removes unwanted components in the samples, leaving only the target contaminants for concentration measurement. The data for this experiment has not been analyzed yet, so preliminary

findings are still unknown. This experiment aims to define how high heavy metal contamination levels are in sweetpotatoes and how much of a threat contamination poses to early childhood development.

Exploring Small Molecule Inhibition: A strategy for Enhancing Resistance Against Viral Infection

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Poster: **46**

Geminiviruses have single stranded DNA genomes that are transmitted by phloem feeding insects affecting many economically important crops. Geminiviruses' replication machinery is highly dependent on the replication-associated protein (Rep). Rep binds to specific sequences in the viral genome facilitating its replication. Rep creates an environment favorable for replication by interacting with the host's regulatory factors to induce cell cycle alterations. Therefore, targeting Rep protein and inhibiting its function offers a promising approach for controlling geminivirus. The project aims to evaluate the effectiveness of 84 small molecules that were identified in silico, focusing on their affinity and suppressive properties. To examine this, the focus is on the production and purification of Rep in high quantity and quality. Previously, small and large scale production of Rep were performed. With the help of expertise from the biochemistry department, Rep protein was purified from a 12 liter culture using His-Trap column followed by size exclusion chromatography. It was then dialyzed and concentrated in PBS. The proteins obtained from the large-scale purification were analyzed by running SDS-PAGE gels to verify the presence of Rep. Once verified, the Bradford assay was performed, highlighting the need to further concentrate the protein. The three-dimensional structure of the concentrated Rep was assessed using NMR spectroscopy, confirming that the Rep was properly folded. Future work will also be using the NMR spectroscopy to examine the interaction between the protein and the ligands. Specifically, analyzing the NMR data to determine whether the small molecules bind to the Rep protein.

Measuring Thermal Conductivity of Liquid Metal Utilizing Fiber Optic FDTR

Author(s): **Justin Overman**
Mentor(s): **Dr. Alexander Bataller**
Poster: **47**

Determining thermal conductivity and thermal diffusivity of high temperature liquids can be done by utilizing frequency-domain thermoreflectance (FDTR). The experimental setup consists of laser beams being focused into a fiber optic cable which is inserted into molten metals. Although the thermal properties of molten metals are well known, confirmation that this experimental setup works on molten metals allows for the future addition of other high

temperature liquids such as molten salts. FDTR is an experimental procedure performed by utilizing a pump-probe beam setup where the pump beam applies heat to the sample and the probe beam measures the changes in thermoreflectance. The modulated pump beam will change frequencies causing the phase and amplitude of the probe beam to change and is detected using a balanced photodetector. The changes in phase and amplitude as a function of frequency can then be related to thermal diffusivity and thermal conductivity by manipulating Fourier's law of heat transfer. Confirming this experimental setup works for high temperature liquids such as molten metals allow for confirmation that this will work for other high temperature liquids such as molten salts. Advanced nuclear reactors utilizing molten salts need to know how heat will transfer through the reactor system and this requires the thermal conductivity and thermal diffusivity of the material used.

The TORiffic Simulation: A Look at the Relationship Between TOR and Sim.

Author(s): **Kermit Pennington**
Mentor(s): **Dr. Patricia Estes**
Poster: **48**

To use energy effectively and maintain homeostasis, body systems must be coordinated, and the nervous system plays a major role in this coordination. One set of neurons, the Single-minded neurons, are present in the paraventricular nucleus of the hypothalamus of mammals and regulate appetite. In mice, heterozygous mutations in Single-minded cause increased appetite, feeding, and insulin levels. Insulin is a "sensor" for the metabolic hub target of rapamycin (TOR). TOR acts on nutrient signals to decide a cell's growth. TOR also activates cell division by activating transcription of cell division genes, including the cyclin genes, which regulate cell cycle progression. Cell cycle progression requires lots of energy for macromolecule synthesis and DNA replication.
Flies also have single-minded neurons, and the insulin and TOR pathways are conserved in flies and mammals. The goal of this research is to test if single-minded neurons regulate insulin, cyclin, and TOR gene expression. For this, we measured the relative expression of one of the Drosophila insulin-like peptides, dilp2, TOR and cyclin3 using reverse transcription-qPCR in wild type flies and flies with silenced single-minded neurons. We found that flies with silenced single-minded neurons had increased expression of dilp2, TOR, and cyclin3. These findings suggest that single-mindedneurons are needed for organisms to properly partition energy between metabolism and cell division.

Single-cell transcriptomics of Geminiviruses Infected Cells

Author(s): **Maddie Pietras, Ashley Kim**
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Poster: **49**

Geminiviruses are a family of plant viruses that negatively affect agriculture and are made of single stranded DNA that replicates in the nuclei using the host's DNA replication machinery. These viruses need to modify the transcriptional landscape of the cell to allow replication of their viral DNA. We want to use single-cell transcriptomics to differentiate infected from non-infected cells and to identify the differences in transcriptomic status. This is important for the understanding of systemic versus cell autonomous effects during infection. If we are able to differentiate an infected cell from a non-infected cell, we can pinpoint the cell-autonomous changes after the cells are infected with the virus. Ultimately, once the initial changes are identified, they can be impaired, thus inhibiting further infection. We used tomato Lanai and Arabidopsis thaliana plants infected with Tomato yellow leaf curl virus and Cabbage leaf curl virus respectively. This experiment entails many steps, including plant maintenance, inoculation, nuclei extraction, fixation, barcoding, cDNA production, and sequencing. We were able to produce and fix nuclei from both species, however when we assessed the cDNA production, no cDNA was found. We are now troubleshooting with the company we got the system from, to aid in pursuing the downstream steps.

Uncovering Agricultural Microbiomes: Isolating microbes from NC's Center for Environmental Farming System soil

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Mentor(s): **Dr. Mallory Choudoir, Madaris Serrano Perez**
Poster: **50**

Understanding agricultural microbiomes is important because soil microbiomes perform nutrient cycling, break down crop residues, and stimulate plant growth. We sampled soils from the North Carolina Center for Environmental Farming System's (CEFS) Farming Systems Research Unit (FSRU) at their Cherry Research Farm in Goldsboro, NC. In 1999, FSRU implemented different agricultural management practices plots and our research lab is focused on 3 of these: conventional, organic, and successional or agriculture abandonment . The goal of our project is to identify and isolate microbes from soils within these different systems using two types of media: AIA (pH 7.4) and VL55 pH 5.5). After processing soil samples, we plated dilutions and incubated each for 4 days at 28 ˚C. Lastly, we amplified the 16s rRNA gene of the resulting colonies and analyzed using Sanger sequencing. As preliminary results, we isolated a total of 47 isolates on AIA and 38 isolates on VL55. Preliminary results indicate that the AIA media grew mainly Pseudarthrobacter (from the Actinomycetota phylum and Micrococcaceae family). We also identified Gordonia hongkongensis, Paenarthrobacter nicotinovorans, Priestia aryabhattai B8W22, Peribacillus acanthi, Kitasatospora purpeofusca, Chryseobacterium oranimense, Arthrobacter humicola,

Streptomyces melanogenes, Kitasatospora purpeofusca and Prescottella. For next steps we would like to focus on isolating Acidobacteria using VL55 media. Ultimately, our goal is to characterize their metabolic activities and interactions to gain deeper insights into agricultural microbiomes and their functions within diverse farming systems.

Campus Tree Tours Connect the NC State Community with Nature and Value of Trees

Author(s): **Nicole Garcia, Elena Kellt**
Mentor(s): **Dr. Steph Jeffries**
Poster: **51**

In spring 2021, Dr. Steph Jeffries and her students installed high-quality arboretum tags on over 100 tree species across NC State's main campus. This initiative aims to cultivate awareness and appreciation for trees and their diverse contributions to the campus environment. This year, Dr. Jeffries applied for a Sustainability Grant to develop a user-friendly web application to host self-guided tree tours. MGIST graduate Kim Garrett developed the web app, while four Campus as a Classroom interns rounded out the team to create four themed tours. The tours are: "Honoring the Land: Indigenous People's Stories," "Rooting for Change: Tree Ecosystem Services," "Leafing Through History: Trees Across Time," and "Flora Meets Fauna: Wildlife Use of Trees" . We piloted the tours with 272 students in Introduction to Environmental Science to gauge the web application's user-friendliness and participants' overall experience.The official launch of the tours on Arbor Day (March 22) encouraged participants to develop a deeper appreciation for trees beyond their aesthetic appeal, recognizing them as integral components of human life and urban landscapes. The ultimate objective of these initiatives is to allow individuals of the NC State community as well as the general public to immerse themselves into creating firsthand experiences with trees and instill a deeper connection for nature's beauty.

Using Brief Animated Videos as a Sexual Education Medium for Parents and Children

Author(s): **Sabrina Ryan**
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Poster: **52**

Digital media has become more popular with adolescents, and can readily be used to share information on important topics. This study was performed to determine the effectiveness of using animated videos as a medium to help parents navigate conversations with their children regarding sexual health. The video was created using Vyond–an AI-animated video solution, with a script that reflected curiosity in early adolescents as they go through puberty. The parent advisory groups established on Facebook were made up of 30 parents with

children between the ages of 10-13. Each parent was asked to watch the constructed Vyond video and answer three questions:
“Can you watch this and share your honest feedback? Do you think it would resonate with your kid? Anything we should change?”. Through these questions, adjustments to this method of educating can be incorporated and evaluated.
The participant responses were generalized by category to exemplify common trends in their answers. Responses were tracked based on the categories of video content, and how relatable the video felt. While responses vary depending on the family, many participants found the video to be both relatable to them when they were growing up, while still being applicable to their children. However, participants often noted the video content feeling relatively “childish" for the targeted age group, and therefore not the most effective way to educate. Given this feedback, changes can be made to the characters age in Vyond and also the terminology of the script in order to better accommodate the intended audience.

High Throughput Virus Silencing Vectors for Core Cell Cycle Genes in A. thaliana

Author(s): **Jayson Sanchez**
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Poster: **53**

Gene silencing is the process of downregulating specific gene expression in cells. The objective of this study was to create a series of TRV VIGS vectors to assess cell cycle gene silencing in Arabidopsis thaliana Col-0 and examine their significance in geminivirus infection. In the lab, we have identified several cyclin-dependent kinases upregulated during geminivirus infection (CKL5 and CKL6). Through bioinformatic analysis, putative cognate cyclins for CKL5 and CKL6 have been identified. Following the analysis, primer sets were designed for identified cyclin genes, encompassing a total of 60 specific cyclin genes. The primer sets were designed via the utilization of SnapGene and BLAST. Each primer set was designed to amplify a region targeted for silencing, ranging between 450-550 base pairs. After primer sequences were generated, eight primer sets were ordered to commence bench work and assess primer design accuracy.
Each primer set was assessed via the use of an annealing temperature gradient to determine which annealing temperature would be the best for cloning. The ideal annealing temperature was sought within the range of 50-65 degrees Celsius. To determine the optimal temperature, a PCR test was performed, examining eight different temperatures for a specific primer set. Throughout this process, a total of eight primer sets will be evaluated this semester. Once the optimal temperature is determined for each primer set, a subsequent PCR will be carried out at the specific temperature identified, allowing for the excision of gel bands and subsequent in-fusion cloning.

Milking the System: The Challenge of Getting Dairy Subsidies Right

Author(s): **Isabel K. Chang, Kyleah B. Cox, Marissa C. Santaniello, Isabel Chang, Kyleah Cox**
Mentor(s): **Dr. Frank Siewerdt**
Poster: **54**

Fluid milk and dairy products are an important component of the diets of most Americans. Guaranteeing a steady supply of these products is challenging due to fluctuations in production cost that may surpass the price paid to dairy farmers. Subsidies help mitigate risk by providing government funding to assist a business. Dairy subsidies, coded into the Farm Bill since 1933 as the Dairy Margin Protection Program, help farmers cover the difference between the price of feed cost and milk prices. By offering different coverage levels, depending on tolerance of risk, it guarantees a certain price per unit of milk, acting similarly to insurance. Our analysis looks at several aspects of dairy subsidies and whether they should continue. While these subsidies help keep dairies solvent, they benefit farms with at least 500 cows, who have the resources to navigate competitiveness. Subsidies are used to purchase better quality feed, invest in technology, purchase higher quality genetics, and pay debt. Removing subsidies could drive farmers out of business, decrease production and increase prices, which could affect competitiveness of U.S. products in the global market. Foreign countries have experienced different levels of success with dairy subsidies, from positive stimulation of production to near-complete dependence on subsidies for the viability of farms. An ideal subsidy system would be self-sustaining (avoiding constant appropriations of public funds), offer flexible coverage elections, stimulate small operations to stay in business (strengthening rural communities), secure strategically defined milk production volumes, and keep dairy products at affordable prices for consumers.

The Relationship Between Child Abuse and Homeschooling

Author(s): **Patricia Scholle**
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Poster: **55**

Approximately 2 million children in the United States are homeschooled annually (Murphy, 2014). Homeschoolers are children who are educated at home typically by a parent instead of an institution, such as a private or public school. In addition, roughly 600,000 children experience child maltreatment annually (NCA, 2024), including various forms of neglect as well as physical, emotional, and sexual abuse. Homeschooling grants substantial power to parents and can lead to children having less interaction with individuals outside the family, such as teachers. Teachers and other youth-serving professionals are often those who notice potential signs of child maltreatment and report their concerns to the proper authorities. However, children who are homeschooled do not have regular contact with teachers and other professionals. In addition, nearly half of children involved in legal child torture cases are removed from traditional schooling to be homeschooled, leaving them with less oversight and at increased risk for future maltreatment (Knox et al., 2016). There is little research

investigating whether a relationship exists between incidences of child maltreatment and children who are homeschooled. Given the lack of research in this area and the potential risks for these children, a literature review was conducted to examine findings related to the relationship between child maltreatment and homeschooling. A total of 7 studies were identified and reviewed. Findings indicated children who are homeschooled may potentially be at higher risk of child maltreatment, although additional research is needed to draw conclusions and better understand this issue.

Constitution of Clusters: Colocalization of Bacterial RadD and SSB Proteins in DNA Repair

Author(s): **Justin Stegeman**
Mentor(s): **Dr. Stefanie Chen**
Poster: **56**

DNA repair mechanisms are both conserved and homeostatically critical to all known organisms. Homologous recombination of damaged DNA is a primary methodology by which organisms respond to double-stranded breaks upon exposure to genetically toxic environmental factors. The putative Escherichia coli DNA helicase RadD is hypothesized to have a 'director' function in the stabilization of intermediates in homologous DNA repair. RadD has been shown to bind to single-stranded DNA, single-stranded binding protein (SSB), and ATP in vitro; however, the order, timing, and location of in vivo interactions are unclear. In this study, we sought locational evidence of RadD-SSB-DNA colocalization in E. coli cells that would give insight on the repair body constitution formed in RadD interactions. To evaluate these colocalized clusters, we utilized multichannel confocal fluorescence microscopy of DNA-damaged E. coli cells with vector-based fluorescently-tagged SSB and RadD proteins and manual fluorescence staining of DNA. Additionally, RadD mutants with abrogated binding to SSB, DNA, or ATP were evaluated for a comparative cluster phenotype. We find that RadD and SSB proteins are colocalized within the nucleoid space of damaged bacterial cells and DNA/SSB-binding mutants can modify these colocalization reactions. We visualized that RadD, supported by the SSB protein, forms distinct regions of activity on effected DNA strands when bacterial cells experience severe DNA damage. Understanding the in vivo molecular dynamics of DNA repair-associated proteins like RadD offer a greater understanding of the complex mechanistic world of DNA repair.

The Impact of a Free Walk In Acute Care Clinic in Wake County

Author(s): **Olivia Suker**
Mentor(s): **Dr. Benoit Jacquet**
Poster: **57**

Lack of insurance is considered a major risk factor associated with lack of access to healthcare and reduced likelihood of having a primary care provider. The Open Door Clinic of Urban Ministries of Wake County is a free and charitable clinic in Wake County that addresses this disparity by providing primary health care for more than 1,500 uninsured and low-income adults. In addition to primary care, free prescription medication access, specialty consultations, and referrals for established patients, the Open Door Clinic has implemented a new Walk-In Clinic program. The Walk-In Clinic provides acute care for members of the community who live in Wake County and are self-attested to have low income (250% below the poverty level). This care model allows both members of the community and established patients to walk in without an appointment to be seen for a variety of acute care issues. The overarching goals of the Walk-In Clinic are to aid the community by providing health care services for acute issues at no cost, introduce community members to a primary care setting, give them the option to become established patient, and reduce local ER volume by providing a free alternative for people to seek care for issues that can be managed outside of an emergency room or urgent care setting. This research project seeks to evaluate how the Walk-In Clinic has performed in these areas and impacted access to acute health care and primary care in the Wake County community.

Effects of Looming & Stationary Sounds on Visual Orientation & Contrast Performance

Author(s): **Hannah Sumner, Ben Gagnard**
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Poster: **58**

Auditory signals have been shown to influence visual perception as early in the perceptual circuit as the primary visual cortex. Previous research suggests that alerting sounds can enhance performance on visual orientation and contrast tasks, but it is unclear whether these effects are the same for both types of task. Sixteen participants were placed under varying auditory conditions and asked to determine the direction of visual stimuli with low contrast or small orientation deviations from vertical. Each participant completed 18 blocks of 50 trials, with sound (Looming, Stationary, No Sound) and task (Contrast, Orientation) held constant within each block. In each trial, participants would hear a sound or no sound, briefly be presented with their visual target, and report their response. We hypothesized that looming and stationary sounds would differentially influence orientation and contrast sensitivity. We further hypothesized that sound quality would have an impact on orientation sensitivity, but not contrast sensitivity. We calculated d' scores for contrast and orientation sensitivity across sound conditions, and used an ANOVA to analyze changes in d' as

compared to the No Sound control. Our analysis suggests that alerting sounds enhance both contrast and orientation performance, but the effect is larger for contrast performance. Sound quality (looming vs stationary) had no impact on visual performance for either task. Future work may explore the mechanisms behind this effect, as well as test whether response times differ based on task type or sound.

A Philosophical Account of Fun: Neo-Aristotelian Redundancy

Author(s): **Camden Toumbleston**
Mentor(s): **Dr. Nicholas Barber**
Poster: **59**

Throughout history, philosophers have struggled to integrate happiness and meaning. Often, the former is rejected as pleasure or pleasure is given an amorphous role in happiness or meaning. This is despite palpable justifications for the significance of fun. A life devoid of fun is surely devoid of meaning. Moreover, to ascertain meaning without fun would be akin to studying celestial motion without gravity. Then, how do philosophers account for fun when it is elusive yet vital?
Plato's Parable of the Cave and Nozick's Experience Machine serve as waypoints in the account of fun and meaning. The former emphasizes self-sufficiency as a basis for proactive and self-initiated virtuous activity and, importantly, enjoyment of that activity. The latter argues that there is something beyond an inclusive pleasure that we derive fulfillment from. Additionally, Susan Wolf's Moral Saints argues against perfectly moral lives, casting them as unenviable. However, these neo-aristotelian thought experiments result in an incohesive notion of meaning and happiness. Furthermore, they fail to provide anything more substantial than an extrapolation of Aristotle's ideas of eudaimonia, which focuses on balancing moral and non-moral goods. Namely, Aristotle's idea that happiness consists in contemplation (the contemplative life) involves balancing moral and non-moral goods. The upshot is that neo-aristotelian criticisms of anything ethical purport to express creative but unoriginal extensions of Aristotle's ethics. This redundancy results in convoluted discussions that yield little more than the simple idea that sparked them: The way to assign meaning is if it is enjoyable. In other words, have fun.

Minimum Inhibitory Concentration of Peroxyacetic Acid Against Salmonella Enteritidis

Author(s): **Farrah Waddell, Tristin Troy**
Mentor(s): **Dr. Lin Walker, Mary Mendoza, Yabaiz Tahir**
Poster: **60**

Peroxyacetic acid (PAA) is a popular antimicrobial sanitizer used to decontaminate raw poultry products in the United States. Salmonella spp. are a common bacterial contaminant of raw poultry products and a leading bacterial cause of food borne illness in the United

States. The goal of this study was to determine the minimum inhibitory concentration (MIC) of PAA against Salmonella. The overnight culture of Salmonella Enteritidis at a concentration of 8 log10 CFUs/mL was diluted and then S.enteritidis of different dilutions were exposed to PAA treatments of 0, 20, and 40 ppm for treatment times of 0, 20, 40, and 60 seconds. The samples were serially diluted with a starting concentration of 8 log10 CFU/mL and exposed to a PAA concentration of 0 ppm and 100 µL samples were taken at 0, 20, 40, and 60 seconds then serially diluted and spread plated on TSA plates. This process was repeated for the remaining PAA concentrations. The plates were incubated overnight at 37℃ and observed the next day. After examining the samples that were at concentrations of 1, 2, 4, 5, and 6 log10 CFU/mL, the MIC for PAA against S. enteritidis was determined to be 40 ppm at 60 seconds of treatment time. The findings in this study are a good foundation to studying the efficacy of PAA against Salmonella enteritidis as this was an in vitro study without using a raw poultry matrix. Further research including PAA interacting with a contaminated meat surface would yield a more accurate MIC.

The Impact of Enclothed Cognition on Animal Science Students in the Anatomy Lab

Author(s): **Meghan Wall, Madison Burden**
Mentor(s): **Dr. Shweta Trivedi, Dr. Charlotte Meli**
Poster: **61**

The impact of encothed cognition on animal science students within the anatomy lab was tested by using a control group of students (section 1) that wore normal lab attire and the variable group (section 2) were given white laboratory coats typically associated with professionalism in science fields. Section 1 encompassed 20 students and section 2 encompassed 29 students who agreed to participate in the project. The students wore the lab coats from the beginning of the lecture to the end of the laboratory activities and then took off the lab coats to be worn again throughout the entire semester. The hypothesis tested involved the idea that a certain amount of competence is perceived internally and externally based on professional and unprofessional clothing/appearances. When comparing the control group to the variable group, the group wearing lab coats performed measurably better on the practical exams and in the overall anatomy of domestic animals laboratory class.

Environmental Drivers of Wetland Macroinvertebrate Communities in Wake County, NC

Author(s): **Riley Westman**
Mentor(s): **Dr. Katherine Martin**
Poster: **62**

Macroinvertebrates are critical components of wetland ecosystems, linking primary producers and predators in food webs, and serving as biological indicators of water quality. There is little consensus on which environmental drivers are most important in structuring wetland macroinvertebrate communities, but there is some evidence that communities only respond to extreme environmental conditions, such as significant degradation associated with urban land use. Our goal was to determine the most important drivers of macroinvertebrate community structure in wetlands in watersheds representing a gradient of urbanized land cover. We collected macroinvertebrates from four highly urbanized (83–98% developed land cover) and two less urbanized (13 & 28% developed land cover) wetlands in Wake County, North Carolina and calculated community richness, diversity, and average pollution tolerance of the organisms at each site. We also collected data on vegetation communities, water quality and depth, and soil characteristics, and contributing watershed land covers. We found that increasing developed area corresponded to decreasing diversity and richness, and increasing pollution tolerance. Opposite trends were observed with increasing percentages of forests, agricultural land, and wetlands within watersheds. Community diversity was strongly correlated with soil pH, while pollution tolerance was strongly correlated with water pH. Genus richness significantly differed between sites based on presence of emergent herbaceous vegetation. Multiple environmental factors interact to impact macroinvertebrates in these wetlands, highlighting the sensitivity of macroinvertebrates to all components of these ecosystems. Anthropogenic development negatively impacts wetland macroinvertebrates, making it imperative to pursue low-impact development strategies in actively developing watersheds.

The Geminivius: How does it Affect Arabidopsis thaliana with Varying Ploidy?

Author(s): **Pierce Willoughby**
Mentor(s): **Dr. Trino Ascencio-Ibáñez**
Poster: **63**

Geminiviruses are a family of plant-infecting viruses that devastate many different crops in tropical, subtropical, and temperate areas of the world. They are small, circular, ssDNA viruses that replicate in the nuclei of the infected cells. Geminiviruses have been shown to induce a higher ploidy state in the infected tissues. This project aims to determine if different ploidy levels in Arabidopsis thaliana directly influence the replication rates and distribution of geminivirus-infected cells to verify their susceptibility to the virus. A. thaliana with diploid, tetraploid, and octoploid genomic levels were inoculated with Cabbage leaf curl virus (CbLCV). Preliminary flow cytometry was performed looking for changes in ploidy ratios in

the infected nuclei during Cabbage leaf curl virus infection. All different ploidy plants are going to be infected with CbLCV and with Beet curly top virus (BCTV-Logan), and immunohistochemistry and/or in situ hybridization will be performed to determine if the differences in ploidy affect the tissue distribution and colonization of the viruses. Results from these experiments will provide information to better advise growers on what kind of varieties to deploy for better crop production.

Assessment of Stress in undergraduate Anatomy-Lab using Salivary Amylase & DASS-21

Author(s): **Gilad Zeif, Abby Todd, Meredith Moss, Heidi Min**
Mentor(s): **Dr. Shweta Trivedi, Dr. Charlotte Meli**
Poster: **64**

Recent studies across the US have suggested that there is an increase in mental health concerns within undergraduate populations. The lack of information about undergraduate students led the authors to delve into the impact of stress on college students on this path, highlighting the prevalence of mental health issues in these populations. The study discusses the physiological responses to stress, focusing on salivary alpha-amylase (sAA) as a key indicator of stress-related autonomic nervous system activity. The research methodology involved collecting saliva samples from college students during stressful academic situations to analyze sAA levels. Additionally, the study utilized the Depression Anxiety and Stress Scales (DASS-21) to assess emotional distress among participants. Two lab sections in an animal science anatomy class underwent four salivary collection periods to capture routine labs and practical exams. The results indicated salivary amylase levels were approximately the same over the different data points with no p-values being statistically significant. An alternative marker like cortisol may need to be considered for more non-invasive techniques for assessing stress levels. After analyzing the DASS-21 survey, the means for anxiety were statistically significant between Lab Practical 1 when compared to other labs. Therefore, we can determine that students do experience more anxiety during exams. With the rise in mental health issues in undergraduate students across the US, knowing what groups of the undergraduate population may be experiencing more stress can help develop strategies to alleviate it.

Examining the Behavior of Animals Behaviors During a Solar Eclipse

Author(s): **Nhaturie Atkinson**
Mentor(s): **Dr. Caren Cooper**
Poster: **3210-1**

Animals such as gorillas, pelicans, Galapagos tortoises, etc., have been shown to exhibit behavioral responses to celestial events, prompting us to investigate the impact of the total solar eclipse on animal behavior. Prior studies at zoos have shown that solar eclipses influence the behavior of captive species. During the October 2023 annular eclipse, a citizen science project gathered observations of animal behavior from people across the country. We found that citizen science participants were able to report on general animal behavior, revealing some animals were quieter during the eclipse, had increased activity, and overall more interactions. We created Solar Eclipse Safari for people to report systematically on animal behavior during the total solar eclipse on April 8, 2024. We recruited and trained over 60 ambassadors and prepared over 100 participants in 23 states, thereby engaging participants across various eclipse maximums.

Comparing PER1 and SLC5A7 expression in Rectal Tissue from Horses with Colitis and Healthy Horses

Author(s): **Morgan Jeter**
Mentor(s): **Dr. Breanna Sheahan, Dr. Lilly Haywood**
Poster: **3210-2**

When horses get colitis, they are quickly dehydrated and frequently require hospitalization for fluid resuscitation, pain control, and prevention of sequelae (laminitis). This treatment is extremely expensive, and despite aggressive approaches, 20-30% of horses with colitis die or are euthanized. One of the goals of the Sheahan lab is to learn more about colitis and figure out ways to treat it. My project, under the supervision of Dr. Breanna Sheahan, compares gene expression in rectal tissue from horses with colitis and healthy horses. Specifically, I am studying the PER1 and SLC5A7 genes. From previous RNA sequencing results, PER1 is upregulated in horses with colitis. PER1 plays a role in the circadian rhythms of the GI tract and therefore may influence the frequency of defecation in these cases. SLC5A7 is downregulated in horses with colitis. This gene encodes for a major transporter involved in choline transport (CHT1) so that it can be synthesized into acetylcholine (a neurotransmitter). My role is to perform immunofluorescence on tissue samples for the PER1 and CHT1 proteins, as well as validate the preliminary gene expression results in a larger cohort of samples via qRT- PCR. The overall goal is to determine if expression of these genes differs in horses with

colitis vs healthy horses. The project is ongoing, and I am excited to continue to explore these two genes in the rectal tissue of healthy horses vs horses with colitis.

Larval Locomotory Behavior of the Cat Flea (Ctenocephalides felis)

Author(s): **Jake Norton**
Mentor(s): **Dr. Adrian Smith**
Poster: **3210-3**

Fleas are insects known for their incredible jumping ability as adults. The morphology and behaviors of their larval form have been studied extensively but there has not been a clear answer on how the larval stages move. In this study we set out to definitively describe larval locomotion in the cat flea, Ctenocephalides felis. This study employed high-speed video to capture and analyze movements of 75 larval specimens across both flat and carpeted surfaces. Our findings revealed a consistent locomotion method irrespective of surface type. Using SEM imaging we confirmed that the larvae are using their maxillary palps to hook onto the substrate before contracting their ventral muscles to pull themselves forward. Body length, total distance, and speed of each specimen was calculated. We observed larval fleas reaching a maximal speed of 1.14 body lengths per second. After each sample was taken the larvae were preserved in ethanol to later determine the instar (life stage) by measuring the width of the head capsule. All of the three instars displayed the same movement behavior and a similar speed in body lengths per second, however, first instar larvae were overall slower in millimeters per second. A survey of the literature indicates that many other species of flea move in a similar fashion, as larvae, using similar anatomical structures. This work demonstrates a unique form of locomotion used in the legless stages of insect development.

Comparison of AFM and Tensile Testing Methods on Mechanical Properties of Equine Superficial Digital Flexor Tendons

Author(s): **Samantha Watson**
Mentor(s): **Dr. Matthew Fisher**
Poster: **3210-4**

Tendon injuries are one of the most common musculoskeletal injuries in humans. These injuries commonly occur in the midsubstance of the tendon and variations in the intrinsic mechanical properties of the tendon could play a role. Mechanical properties can be studied macroscopically and microscopically, to probe different levels of the hierarchical collagenous extracellular matrix independently and determine if a relationship exists between them. The objective of this study was to look at the regional mechanical differences of equine superficial digital flexor tendon (SDFT) on the macroscale and microscale and determine if a relationship exists across the length scales. Equine SDFTs were obtained and divided into three sections: proximal, middle, and distal. From these sections, longitudinal and transverse dog bone punches were taken for tensile testing, and a 1 cm x 1 cm square was taken for

atomic force microscopy (AFM). Statistical differences between subjects and regions separately were determined via a one-way ANOVA and Tukey's post hoc analysis. Linear regression analysis was done between data for the different testing methods. Between different regions, there was no consistent rank-order in terms of modulus values across the different testing methods. Across scales, longitudinal modulus was found to be 3 orders of magnitude larger than microscale testing, while the transverse modulus was 1 order of magnitude larger. No significant associations were found between either longitudinal or transverse testing and microscale testing. Overall, this study found that regional differences of the SDFT tendon are not replicated between different length-scales.

Evaluating the Accuracy of Longleaf Pine Growth and Yield Models in NC

Author(s): **Mary Pinyan**
Mentor(s): **Dr. Cassio Ussi-Monti, Dr. Joeseph Roise**
Poster: **3221-1**

Longleaf pine (Pinus palustris) restoration projects have been a recent focus in the southeastern United States, particularly in North Carolina, where these forests once thrived. Different studies have focused on specific aspects of longleaf pine management. For naturally regenerated even-aged stands, (Farrar and Matney, 1994) developed a diameter distribution recovery model, which helps plan thinning operations. (Gonzales-Benecke et al., 2012) developed a system of models for longleaf pine plantations, considering a range of conditions. (Gonzales-Benecke et al., 2014) developed models for individual tree measurements, allowing for more precise management decisions. Additionally, the Forest Vegetation Simulator (FVS) Southern Variant provides a software tool for simulating tree growth and yield in complex stand structures, using extensive data from the Southern Region. This study aims to compare the available longleaf pine growth models and evaluate their accuracy and effectiveness.

The Effect of Light and Leaf Litter on the Germination of Seeds in the Smooth Coneflower, Echinacea laevigata

Author(s): **Chloe Roberts**
Mentor(s): **Dr. Rebecca Irwin, Erin Eichenberger**
Poster: **3221-2**

The Smooth Coneflower, Echinacea laevigata (Boynton and Beadle) Blake, is a federally threatened plant associated with the Piedmont prairie grassland ecosystem. Suitable conditions for germination and establishment of seedlings of E. laevigata are not well-documented. Seedlings are rarely observed and abundance varies wildly, with some populations having hundreds of seedlings and others with none. There is a poor understanding of what habitat is the most suitable for E. laevigata recruitment. In collaboration with the NC Botanical Garden, I have planted 768 seeds into 4 treatment

groups (Shade, litter; Shade, no litter; No shade, litter; and No shade, no litter), each with a replication group (total of 16 groups). I will be measuring germination and survivorship of each seed planted. Restoration plans for E. laevigata hinge on population recruitment. If the recovery needs of E. laevigata are different than other Piedmont prairie adapted plants, this study will outline the need for a different approach of restoration for E. laevigata. This project will also bring us a step closer to defining what aspect of the habitat makes recruitment in some populations much larger than others.

Determining Novel Biomarkers for Detection of Canine Prostatic Carcinoma

Author(s): **Carter Schrag**
Mentor(s): **Dr. Matthew Breen, Dr. Rachael Thomas**
Poster: **3221-3**

Prostate cancer (PC) killed approximately 34,700 men in the United States in 2023 and 1,414,259 men worldwide. It was deemed the most common cancer in men and the second most common cancer overall with an estimated 288,300 new cases in the United States. When examining the similarities and differences between PC in dogs and humans, studies have found that tumors remain largely consistent in development. Because canine PC quickly metastasizes to the bones, it is considered a good model for late-stage human PC. Additionally, because over 90% of male dogs are neutered, canine PC is androgen-resistant and serves as an excellent model for castration-resistant PC – the subtype most deadly in men. PC is often responsive to treatment, but because it occurs in vulnerable populations (mainly older men), targeted genetic and immune treatments are preferred to traditional chemotherapy and radiation. Within dogs, PC often has a poor prognosis due to a lack of techniques to diagnose early.
While much research has been done into what genes can be used as biomarkers of PC in humans, there is still debate over which ones are viable for targeting in detection studies and treatment. Our study is aimed at using comparative genomics to identify novel somatic mutation events associated with PC. Using whole exome sequencing of genomic DNA isolated from canine prostatic tumors and patient-matched healthy tissue, we aim to determine tumor-specific mutations in canine PC that may offer opportunities to advance research to improve outcomes for men with PC.

Brachial Plexus Birth Injury Effects on Biceps, Supraspinatus, and Subscapularis Muscle Composition

Author(s): **Brooke Dunkley**
Mentor(s): **Dr. Jacqueline Cole, Kyla Bosh**
Poster: **3210-1**

Brachial plexus birth injury (BPBI) occurs when the nerve bundle innervating the shoulder is excessively stretched during difficult childbirth. It occurs in about 0.9 of every 1,000 births, with 30-40% resulting in lifelong shoulder impairment, including musculoskeletal deformities, reduced range of motion, and muscle paralysis. These deficits vary by injury location (preganglionic vs. postganglionic), but the effect on underlying muscle composition is unknown. We hypothesize diminished muscle growth from BPBI is related to increased collagen content between muscle fibers (fibrosis), which impairs muscle function.
Sprague Dawley rats underwent surgery on one forelimb at postnatal day 3-6: preganglionic or postganglionic neurectomy (n=8/group/timepoint), forelimb disarticulation to assess effects of disuse without nerve injury (n=8/timepoint), or sham surgery (n=6/timepoint). Contralateral forelimbs served as added controls. Biceps, subscapularis, and supraspinatus muscles were dissected at 2, 3, 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 to muscle tissue. Injured-to-uninjured limb ratios were calculated, and groups were compared using the Kruskal-Wallis test with Dunn's correction (GraphPad Prism, α=0.05).
Preliminary data for biceps indicate that preganglionic injury has greater fibrosis than sham and disarticulation groups at 3 weeks and only the disarticulation group at 4 weeks. For subscapularis, preganglionic injury has greater fibrosis than postganglionic injury at 4 weeks. This is the first study characterizing fibrosis development and progression in glenohumeral muscles following BPBI. Understanding the progression of altered muscle composition throughout development following BPBI may inform treatment planning.

Use of Aptamer Targeting Agents for Radiopharmaceutical Treatment of Colon Cancer

Author(s): **Peter Lawing**
Mentor(s): **Dr. Jonathan Lindsey, Dr. Yi Xiao**
Poster: **3210-2**

New strategies for treating metastatic cancer are urgently needed. Aptamers are short oligonucleotide strands that may prove useful for cancer targeting: they can be designed to bind specific targets with both high affinity and specificity, while their small molecular weight (e.g.,~16kDa for a 50-mer) allows rapid clearance by the kidneys. At NC State, the Lindsey lab focuses on the treatment of cancer with radiopharmaceuti, a form of internal radiation therapy. These drugs require a radionuclide carrier and a targeting agent with both high affinity and high specificity. While aptamers may fulfill these criteria for next-generation radiopharmaceuti, they are often unstable in the presence of serum nucleases. The Xiao lab at NCSU is the world leader on aptamer science. For proof of principle, our groups together have identified a known aptamer that targets a transmembrane protein that is upregulated on a variety of cancer cell lines, including colon cancer. We have tested the serum stability and binding affinity of this known aptamer to ensure that it is the correct choice for internal radiotherapy. Colon cancer accounts for the second most American cancer deaths, and the death rate for Americans under 55 has risen steadily by 1% per year since the mid-2000s. Subsequent work will include (1) incorporation of a radionuclide ligand for cell and animal studies, and (2) identification of higher affinity aptamers.

Recapitulating the Microenvironment of the Heart Using Decellularized Extracellular Matrix Derived Hydrogel

Author(s): **Tanya Upadhyay**
Mentor(s): **Dr. Jessica Gluck**
Poster: **3210-3**

The heart is one of the most important organs of our body yet it possesses a limited amount of regeneration capacity, which is not ideal in cases of heart failure that leads to a loss in cardiovascular function. Regenerative medicine offers innovative solutions to problems like organ damage using biomaterials that resemble the native tissue composition. Decellularized extracellular matrix (dECM) has been widely researched in tissue healing as it closely mimics the biochemistry of the original tissue. Expanding on this research, we conducted a comprehensive decellularization protocol to extract the extracellular matrix of the porcine heart as it bears a great resemblance to the microenvironment of the human heart. We confirmed the successful extraction of dECM by performing immunohistochemistry on decellularized samples, wherein a lack of nuclei indicated successful cell removal and stained ECM proteins reflected their retention within the tissue. The extracted dECM was utilized as a biomaterial to formulate a naturally derived 3-Dimensional dECM-based hydrogel with structural stability. Initially, mouse-derived cells will

be incorporated to establish the hydrogel's biocompatibility before progressing to cardiac cells. Our research aims to develop a dECM-derived scaffold seeded with specialized cardiomyocytes that can proliferate and grow in a native 3D heart tissue microarchitecture and act as a therapeutic for cardiac injuries. Additionally, we aim to utilize extrusion-based 3D bioprinting technology to fabricate a layer-by-layer 3D tissue scaffold mimicking the native mechanical and morphological characteristics of the human heart.

Hacking The System: Insights into Middle School Social Dynamics Management

Author(s): **Francesca Kyanda**
Mentor(s): **Dr. Kate Norwalk**
Poster: **3221-1**

Social dynamics play a large part in a student's integration into middle school. Teachers are one of the biggest influences on these students, yet they aren't fully aware of how their influence impacts their students' experiences. This project conducted interviews with 10 sixth-grade teachers about their current understanding of social dynamics in their classrooms and strategies they use to manage them. Responses were coded and sorted into categories. The study found that teachers use myriad strategies to shape the social dynamics of their classrooms. Results serve as a guide for teachers in public middle schools on managing the social dynamics inside their classrooms by providing insight into how students work in different dynamics within the classroom setting, and how they as teachers can influence those dynamics as the primary authority.

Using Large Language Models to Learn and Improve from Microarchitecture Design and Attacks

Author(s): **Anant Patel**
Mentor(s): **Dr. Samira Mirbagher Ajorpaz**
Poster: **3221-2**

Computers have become more prevalent than ever before. Today, computer systems are used in fields ranging from doing work, processing website traffic, modeling, and health systems. However, many computer systems we use today are prone to attacks that exploit hardware vulnerabilities, making them more elusive and dangerous. Modern microarchitectural attacks like Spectre and Meltdown highlighted the effects of such attacks and questioned what we can learn from these attacks.
In recent years, artificial intelligence has expanded massively on an unprecedented scale. Large language models like OpenAI’s ChatGPT, Google’s PaLM, and Anthropic’s Claude have shown that there are systems that can learn and pick up patterns that are not so obvious to humans. These models have the potential to generate new attacks and highlight vulnerabilities that we could not find on our own.

This research aims to focus on leveraging the use of large language models (LLMs) to detect code patterns and microarchitecture designs that may indicate microarchitectural vulnerability exploitation automatically through fine-tuning with existing data. This LLM serves to observe new and existing designs and attacks and evaluate these designs with the database of attacks. We will talk about a novel approach that fine-tunes our large language model using an existing database that is curated based on known attack code. This allows the large language model to learn the patterns associated with various designs and attacks, allowing for feedback on old and new microarchitecture designs.

STEM Identity: A Mathematical Approach

Author(s): **Isaiah Stevens**
Mentor(s): **Dr. Kelly Lynn Mulvey**
Poster: **3221-3**

STEM Identity is defined as one's inclination to identify with an element of science, technology, engineering, and/or mathematics. This identity is derived from a combination of experiences, and is influenced both by intrinsic values and extrinsic values alike. By analyzing the quantitative differences in STEM identity continuously over time, we can obtain further insights on significance that pedagogical approach and other external force variables that may have on a student's career trajectory. In this study, we quantitatively analyze 9th grade student STEM identity to predict identity values in the 12th grade. Subject data is taken from the public use 2009 High School Longitudinal Study (HSLS) dataset, and is analyzed on a student by student basis. To account for missing data, we use data imputation techniques to generate realistic values of missing variables relative to the student. We assume a linear correlation between a student's STEM identity composite score and each interaction variable, and thereby use a linear model for STEM identity value prediction. This model represents student STEM identity composite values as a continuous function of time, and uses 34 of the available HSLS variables to create composites for the 4 parameters needed for model generation. Resulting values will be compared against discrete time point measurements (9th grade composite and 12th grade composite), upon which error will be calculated. Future work includes stochastic modeling of paths with external variable force presence and neural network generation for predictive STEM college enrollment.

Sex Differences in PFAS Levels and Associations with Liver Health in Couples

Author(s): **Gina Austin**
Mentor(s): **Bess Smith, Dr. Jung-Ying Tzeng, Dr. Cathrine Hoyo**
Poster: **1**

The Southern Liver Health Study (STRIVE) is a cohort study observing the effects of environmental contaminants, including per- and poly-fluoroalkyl substances (PFAS), on liver health and their association with hepatocellular carcinoma. Twenty-five PFAS were measured in blood samples for 378 STRIVE participants. We analyzed a subgroup of 13 cohabiting heterosexual couples (26 individuals), allowing us to look at sex differences among participants with similar home environmental exposures.
This project focuses on PFAS where the proportion of observations above the lower limit of quantification (>LLOQ) was greater than 0.5. For these participants, six of the 25 PFAS measured met these criteria: PFOA, PFOS, PFNA, PFDA, PFHpS, and PFHxS. We imputed the levels that were < LLOQ. A stratified analysis of PFAS levels was performed using an exact Wilcoxon Rank Sum Test to determine differences between male and female levels for each PFAS type. A multivariable analysis using Bayesian Kernel Machine Regression was done to determine whether PFAS and sex have an effect on liver health using triglyceride levels as the response.
The analysis of PFAS by sex showed statistically significantly higher levels for males than females for PFOA, PFNA, PFHpS, and PFOS when controlling the false discovery rate at 0.05. There was not evidence of a sex difference in levels for PFDA and PFHxS. The overall mixture effects for the PFAS does not show evidence of an effect on mean triglyceride levels. Given the small sample size, more data is needed on cohabitating participants to determine associations between PFAS, triglycerides, and sex.

Analyzing the Trash Trout's Impact: A Continual Walnut Creek Watershed Study

Author(s): **Morgan Ayscue, Cecilia Nottingham**
Mentor(s): **Dr. Angela Allen**
Poster: **2**

Trash entering our waterways, whether intentionally or unintentionally, has a negative impact on the quality of aquatic, vegetative, and human life in the surrounding area. In this study, we are monitoring the impacts of trash on Little Rock Creek located within the Walnut Creek Wetland Center near downtown Raleigh. This area has a history rich in environmental injustice, resulting in a lack of stewardship of the land. Downtown stormwater drainage pipes and high traffic areas such as the nearby campuses, sports fields, and greenway all contribute to the presence of synthetic material in the water. As a method of combating this

ongoing issue, Sound Rivers, a non-profit organization, embedded a “Trash Trout” litter catchment system in Little Rock Creek. Weekly measurements of basic water quality parameters such as pH, conductivity, dissolved oxygen, nutrients, and turbidity give us insight into the pollutants causing changes in the observed data. Accompanying biweekly bacterial testing quantifies the biological presence in the waterway. Additionally, observation of the various macro debris both being collected by and able to pass through this system provide further insight into the water quality challenges the creek faces. By also testing upstream and downstream the system’s location in addition to the primary “Trash Trout” site, we can observe their differences and analyze the significance of trash collection on the watershed’s overall health. Thus, preliminary conclusions can be drawn regarding the effectiveness of this system. Further, these findings will be beneficial in exploring engineering adjustments to be applied to the litter trap.

Role of Nanoparticle Additives in Radical-Driven Degradation of Oil Lubricants: Spin-Trapping EPR

Author(s): **Phil Bankaitis**
Mentor(s): **Dr. Tatyana Smirnova**
Poster: **3**

Oxide nanoparticles (NPs) have been shown to improve tribological properties of lubricants. However, little is known about the potential contributions of nanoparticles to the radical-driven degradation of oils due to UV-light. Using Electron Paramagnetic Resonance (EPR) spectroscopy, we have investigated the effects of metal-oxide NPs on the radical production in a light oil (LO) sample upon exposure to UV-light. Since the radi formed are very short-lived, we employed a spin trapping method, a covalent reaction between a free radical with a diamagnetic compound, known as spin trap, to form more stable paramagnetic adducts that are EPR active. An increase in radical production upon light illumination was observed in the presence of NPs as compared to only LO samples. This was also true with an increase in irradiation times both in the presence of metal-oxide NPs as well as in the LO only samples. Two main types of radi have been identified: peroxyl radi and alkyl radi. Analysis of EPR line shapes indicated that the observed spin adducts originate from higher mass compounds in the oil. Deoxygenating the oil before irradiation resulted in an increase in EPR signal intensity, indicating a higher number of radi trapped. Spectral resolution loss was observed in deoxygenated samples, likely due to a higher variety of adducts being formed in the deoxygenated samples. The capability of spin trapping EPR to identify free radi present in oil demonstrated here will allow for further examination of the effects of nano-lubricant additives on radical driven oil degradation.

The Effects of SEGS-1 on EACMV Infection in a Resistant Cassava Cultivar

Author(s): **Sierra Begley**
Mentor(s): **Dr. Linda Hanley-Bowdoin, Mary Dallas**
Poster: **4**

Cassava (Manihot esculenta Crantz) is primarily cultivated in Sub-Saharan Africa, where it is a major calorie source for more than 300 million people. Crop yields are greatly reduced by cassava mosaic disease (CMD), which is caused by any of 9 whitefly-transmitted begomoviruses. Three mechanisms of CMD resistance have been observed in cassava cultivars, including the CMD2 genetic locus first found in the tropical Manihot esculenta (TME) line. Plants with CMD2-type resistance develop symptoms early in infection, and then display a recovery phenotype characterized by new, healthy leaf growth and a decrease in viral DNA. Two sequences have been implicated in previous studies in enhancing CMD symptom severity and breaking resistance – SEGS-1 (sequences enhancing geminivirus symptoms), an endogenous genomic sequence found in all cassava cultivars and as episomes during infection; and SEGS-2, a begomovirus satellite. This study is investigating the effects of the SEGS-1 and SEGS-2 sequences on a CMD2-resistant cultivar, TME3 by monitoring symptom severity, viral DNA accumulation, and episome activity during infection by the East African cassava mosaic virus Kenyan Isolate (EACMV-K401). The study will also assess the synergy between EACMV-K401 and another begomovirus, African cassava mosaic virus (ACMV), in terms of symptom severity and release of SEGS-1 episomes.

Development of Scalable Manufacturing Processes to Improve Solar Panel Efficiency

Author(s): **Benjamin Black**
Mentor(s): **Dr. Jong Eun Ryu, Dr. Sipan Liu**
Poster: **5**

In 2022, the United States implemented an additional 110 gigawatts (GW) of solar capacity. To quantify, this addition can power over 1 billion LED light bulbs alone. While solar panels are starting to become a larger source of energy, solar panel efficiency in high-temperature environments remains a concern. As the surface temperature of the solar panel increases by 1℃, the overall efficiency of the solar panel decreases by 0.5%. This decrease in efficiency has sparked researchers to explore passive radiative cooling. This approach uses micro/nanotextured films that improve the emissivity of the solar panel while allowing visible and near-infrared light to the solar panel beneath. Previous studies have demonstrated a decrease in surface temperature of 4-14.95℃ using films aimed at promoting passive radiative cooling. The manufacturing processes in these studies are time intensive, expensive, and require high levels of precision, which makes passive radiative hard to integrate at a large scale. In this research, a scalable and cost-effective manufacturing process for passive radiative cooling films using a manufacturing process known as forward roll coating. The thin films are manufactured using PDMS and SiO2 nanoparticles. These materials were chosen

due to their high and mid IR emission, which refracts non-usable light. The nanoparticle addition also increases the viscosity of the coating material to allow for the creation of surface topographies that promote thermal radiation. When directly exposed to sunlight, the engineered coatings exhibited a reduction in temperature by 3.5°C while maintaining the efficiency of solar panels.

Evaluating the Ephemera: Cataloging a Donated Collection at Körner's Folly

Author(s): **Sophie Blankenship**
Mentor(s): **Dr. Dru McGill**
Poster: **6**

I will present about my time as a Collections Intern working with the Ephemera Collection at Körner's Folly Historic House in Kernersville, NC during the summer of 2023. The collection is made up almost entirely of paper materials from the late 19th and early 20th century (such as pamphlets/brochures, diaries, postcards, maps, tickets, and letters) belonging to Jules Körner (the house's designer), his wife Polly Alice, and his two children Doré and Gilmer. The collection was donated by Pamela Wolfe Browne, Doré's granddaughter. My work consisted mainly of cataloging the objects by recording information such as the respective title, publisher, author, and year of each, as well as a physical description and the object's condition. Additionally, I transcribed and summarized the written information, and when necessary, conducted research to identify locations mentioned in the text and roughly translated materials written in another language. In addition to cataloging, I photographed the objects to be later uploaded to the museum's online database or for advertising purposes in the museum's newsletter. Finally, I contributed to the conservation of the objects, transferring them to appropriate storage locations, assisting with environmental monitoring in the house, and managing pests. By the end of the internship, I cataloged more than 339 objects and photographed more than 435. My time at Körner's Folly expanded my knowledge of collection management and conservation in small museums compared with classroom labs and larger museums and highlighted the value of presenting history in a manner accessible to the public.

Linkages Between Imprint Control Regions and Hepatocellular Carcinoma in the ACE Study

Author(s): **Amanda Blasy**
Mentor(s): **Bess Smith, Dr. Cathrine Hoyo, Dr. David Skaar**
Poster: **7**

Hepatocellular Carcinoma (HCC) is the sixth most commonly occurring cancer worldwide and the fourth deadliest worldwide, primarily due to late detection. CpG DNA methylation sites and imprint control regions (ICRs) have been shown to play a role in the development of HCC. Research has also identified the connection between specific CpG sites and HCC,

indicating that these biomarkers may be used as a diagnostic tool for HCC. This project aimed to investigate any relationships between ICRs 2,4,7, and 85 with HCC outcomes using ACE study samples.
Whole blood samples were collected from participants and DNA was extracted via Monarch® Genomic DNA Purification Kit, subject to bisulfite conversion. PCR protocols, and Next-generation sequencing to determine differential methylation at target sequences were performed. ICR 7 (chr1:1232897) and B36GAL4 are CpG DNA methylation sites that have been shown to play a role in the development of HCC. Preliminary results show high methylation rates using the ACE study samples on ICR 7. ICRs 2,4 and 85 show levels of methylation that were not abnormal. Understanding how HCC-specific CpG methylation sites and ICRs interact and are connected to the prognosis and development of HCC can be used as an early diagnostic tool and help thousands of people. Finding connections between CpG methylation sites and imprinted genes to HCC is key to learning how and why cancers develop.

Benefits of a yeast-based trace-mineral source on growth performance of weaned pigs

Author(s): **Alana Boone**
Mentor(s): **Dr. Eric van Heugten**
Poster: **8**

Trace-minerals play important roles in biochemical processes supporting growth and health of animals. The chemical form that trace-minerals supplied in the diet may impact bioavailability and function. An initial study, 220 pigs (weaned at 21 days of age, weighing 6.80 ± 0.18 kg) were fed a diet without supplemental Cu, Zn, and Mn and diets supplemented with 24, 70, and 40 ppm of Cu, Zn, and Mn from sulfate (positive control), amino acid, or yeast complexed sources. Supplementation of yeast-based trace-minerals improved final body weight by 5.69%, average daily gain by 7.64%, and average daily feed intake by 7.12% compared to the positive control and increased serum mineral concentrations, particularly Zn ($P < 0.05$). Subsequently, two replicate studies proceeded using 320 newly weaned pigs (body weight of 6.27 ± 0.09 kg to compare the yeast-based mineral product used in the initial study to a yeast fermentation product and an amino acid complexed trace-mineral product at their respective inclusion levels of 0.20% and 0.075%. Pig body weight (+1.35 kg), daily gain, and feed intake were greater ($P < 0.03$) for pigs fed the yeast-based mineral product compared to the yeast fermentation product. When comparing the yeast-based mineral product to the amino acid complexed trace-mineral product body weight, daily gain, and feed intake tended to be greater ($P \leq 0.09$) for the first 14 days after weaning, but not overall. Overall, results suggest that the yeast-based mineral product improved growth performance and bioavailability of trace-minerals and compared favorably to existing competitive products.

Use of Coffee Chaff-Derived Biochar for the Adsorptive Mitigation of Methylene Blue

Author(s): **Thanh Thuy Bui**
Mentor(s): **Dr. Praveen Kolar**
Poster: **9**

Agricultural wastes are excellent precursors to the synthesis of high-value chemi and useful products, including biochar. The proposed research focuses on synthesizing, characterizing, and testing coffee chaff-derived biochar as an adsorbent for mitigating Methylene Blue (MB) in aqueous systems. In the first phase, the coffee chaff was carbonized at 400°C in a furnace for 3 hours under a nitrogen atmosphere to obtain the biochar. The biochar was systematically characterized through wet chemistry to determine the acid value, hydrophilic/hydrophobic, point of zero charge (PZC), and the absorption capacity of biochar in various environmental conditions such as different temperatures and different initial concentrations of methylene blue. The data analyses indicated that the acid value and PZC of the biochar were 10.13 and 10.75 respectively, while the biochar was determined to be hydrophilic (index = 0). In the second phase, experiments were performed in 150-mL batch reactors to determine the adsorption capacity of the biochar by mixing solutions of various concentrations of MB (0-60 mg/L) with 0.5 grams of biochar. Results obtained from batch reactor experiments indicated that the maximum adsorption capacity of biochar was 5.9 mg/g. In addition, the temperature did not affect the adsorption capacity. As a result, our results suggest that biochar from coffee wastes can be valorized into biochar for treating environmental pollutants in water.

Parasite Biodiversity in Snake Species Native to North Carolina

Author(s): **Christian Choto, Priyanka Amalean, Alyssa Weeks**
Mentor(s): **Dr. Skylar Hopkins**
Poster: **10**

Every vertebrate species has at least one parasite species, and likely many parasite species, but most parasite species have yet to be described by science. Parasites of snakes are especially understudied relative to other vertebrate host species. Therefore, we conducted an observational study of parasite communities in some snake species native to North Carolina and compared our observations to those published in existing literature for North Carolina or other locations in the United States and Canada. For our observational study, we dissected roadkill snake specimens from 32 species and examined all organs and the mouth, body cavity, and skin for macroparasites: nematodes, trematodes, acanthocephalans, cestodes, pentastomes, or mites/ticks. We calculated the prevalence of infection for each parasite group in each snake species. For example, 59% of Banded Water Snakes (Nerodia fasciata) were infected with at least one nematode parasite, and in existing literature, we found records of 17 nematode species known to infect Nerodia fasciata. We are still working to compare the parasite communities across snake species and better understand whether

snake diets play a role in determining what types of parasites, such as trematodes that live in snake mouths, can be found in different snake species. Understanding how diets and other ecological factors impact parasite communities is important not just for snake health, but for understanding the health of all vertebrate species.

Introducing 3D Printed Models to Improve Student Understanding of the Lac Operon

Author(s): **Dalton Crocker**
Mentor(s): **Dr. Christopher Halweg, Dr. Christopher Halweg, Dr. Whitney Jones**
Poster: **11**

Models are an important part of education in the field of science and allow for a deeper understanding of information through the use of physical learning aids. At North Carolina State University, the use of physical models in the "GN 311: Principles of Genetics" course has been utilized to help students learn advanced topics through a hands-on approach. This project aims to improve student understanding of the Lac Operon system through the use of a 3D printed Lac Operon model consisting of removable and interchangeable DNA sequences and proteins. When the model is introduced alongside a TA-led review lecture, it is proposed that students will reinforce their knowledge of the Lac Operon and have improved recall of the information. This hypothesis will be tested by administering a Pre and Post lecture quiz, and the results will be compared to observe changes in the data.

Leveraging Bioinformatics Workflows to Uncover Novel Biological Characteristics and Comparative Genomics

Author(s): **Zachary Dubner**
Mentor(s): **Dr. Carlos Goller**
Poster: **12**

Previous research on Delftia acidovorans uncovered useful biological processes such as bioremediation, bioplastic generation, and gold nanoparticle biosynthesis. The research question we proposed was: "How can bioinformatics be leveraged to uncover linkages between sequenced genomes of bacterial isolates believed to belong to the Delftia genus, and what does that mean for potential uses given novel biological characteristics?"
Our research developed bioinformatics workflows for five bacterial isolates that were understudied as compared with the extensively studied Delftia acidovorans sp. SPH-1. Based on taxonomic classification derived from genomic assemblies, at least one isolate is believed to belong to the Delftia genus. The isolates were sequenced using Illumina and Nanopore technologies utilizing a MiGS sequencing service. The workflows were generated using the KBase Data Science Platform, a powerful web-based genomics tool. Metabolic modeling tools were used on KBase.

The reports were used for quality checks, comparative genomics, metabolic modeling, and phylogenetic trees. Quality checks revealed incompleteness and contamination present to varying degrees, where contamination is the presence of more than one copy of marker genes, and incompleteness signifies the absence of marker genes. Comparative genomics revealed numerous homologous genes among isolates with high evolutionary genomic conservation. Metabolic modeling linked present annotated genes critical for carrying out various metabolic pathways. Follow-up studies incorporating RNA sequencing data and Biolog plate phenotypic characterization will improve models. `

Electromagnetically Aligning Ni@Au Core-Shell Microparticles for Enhanced Efficiency of Electronic Connections

Author(s): **Lauren Dunlap,**
Mentor(s): **Dr. Thomas LaBean, Dr. Nikolay Frick**
Poster: **13**

Ball grid array (BGA) chips are compact and highly conductive packing technology that are used to connect integrated circuits (ICs) to printed circuit boards (PCBs) (“BGA PCB Chip”). The solder balls on the bottom of the BGA chips are soldered to the PCB using wire bonding. This process takes a lot of time and effort. One potential way to reduce the time and manual labor required for this procedure is to create a material composite with conductive Ni@Au core-shell microparticles that can be electromagnetically aligned into microwires to make connections between BGA chips. Ni microparticles of varying dimensions and weight percent were tested for magnetic alignment, with a conclusion being drawn that 2.2-3 micron particles in 10 wt% solution would be best for the next step of the procedure. It was determined that Ni particles would need to be coated in Au to increase conductivity. Ni@Au core-shell microparticles were synthesized following a modified procedure created by Ding et. al. through redox transmetalation. Particles in silicon oil solution were placed between indium tin oxide coated glass slides and aligned using a Halbach array while resistance was measured and plotted. When 2.2-3 micron Ni particle resistance was measured as a function of time as alignment occurred, an increase in conductance was observed.

Investigating the Irregularity of Rhyolitic Columnar Joint Formation via the Devil’s Honeycomb

Author(s): **Susan Edelstein**
Mentor(s): **Dr. Arianna Soldati**
Poster: **14**

Columnar joints are a geologic phenomenon that occurs due to the rapid cooling of lava on Earth’s surface. Most of these joints occur in basaltic lavas due to their low silica content (SiO_2 wt%) lowering the lava’s viscosity and resulting in relatively swift cooling. Lava cools from top to bottom, with the layers closest to the surface solidifying first. In events of rapid cooling,

cracks of the lower layers form as the rock experiences thermal contraction. These cracks form at random initially, but as they approach the heat source they form columns that often tend towards hexagons, as the shape allows maximum stress release in the system. Seldom, columnar joints form from higher viscosity rhyolitic lava flows. As rhyolitic lava contains a higher SiO2 wt%, the cooling speed slows, drastically reducing the rate of thermal contraction amidst cooling. Slower contraction causes columns to become less tessellated as thermal cracking attenuates, leading to more uneven fracture patterns. There are limited research reports available on rhyolitic joints. We traveled to Hughes Mountain, Missouri, a Precambrian igneous province home to the Devil's Honeycomb, an outcrop of rhyolitic columnar joints dating back over 1.4 billion years. We aerially mapped the outcrop in 3D with a DJI Phantom 4 drone, and collected samples. We compared the geochemical and geospatial data gathered from the Devil's Honeycomb with that of columnar joint outcrops varying in composition. We aim to apply our findings to further investigate the specific conditions required for columnar joint formation.

Maize Hybrid Heterotic Effects in flg22 Response via ROS and Gene Expression

Author(s): **Brady Farlow**
Mentor(s): **Dr. Asher Hudson, Dr. Peter Balint-Kurti**
Poster: **15**

Plants recognize Pathogen-Associated Molecular Patterns (PAMPs), such as flagellin-22 (flg22), and respond by inducing defense mechanisms. In F1 hybrids of inbred crop lines, sometimes the offspring show heterosis, which is a phenomenon when progeny show superior phenotypes when compared to their parents, which is seen in maize (Zea mays) in disease response, such as with the PAMP flg22. To better understand these heterotic effects in response to flg22 in the F1 hybrid (B73 x Mo17) and its inbred parent lines B73 and Mo17, we studied Reactive Oxygen Species (ROS), which are released under stress conditions in plants, through ROS assays, and we studied gene expression to quantify these effects using RT-qPCR. We expect there to be a difference in ROS accumulation, and the upregulation and downregulation of several defense related genes in response to flg22 in the inbred parents when compared to the hybrid.

Identification of Mast Cells in the Female and Male Rat Nucleus Accumbens.

Author(s): **Sarah Fletcher**
Mentor(s): **Dr. John Meitzen**
Poster: **16**

The brain contains multiple types of immunocytic cells including microglia, lymphocytes, and mast cells. Mast cells are derived from stem cells within the bone marrow, travel throughout the body, and are involved in a battery of allergic and inflammatory processes. Mast cells have been identified in several brain regions including the thalamus and hypothalamus; they

enter the brain via blood vessels and can travel in the absence of inflammation. This is an important topic of study because mast cells have been shown to regulate neurons in other parts of the brain in both inflammatory and non-inflammatory conditions. The nucleus accumbens is a critical nexus site which connects the limbic system to the premotor system for motivated behaviors and is implicated in important disorders such as drug addiction, anxiety, and depression. Given that these motivated behaviors encompass important functions like food seeking, reproduction, and goal-related rewards, it is important to understand what can modulate this brain region. Because it is unknown whether mast cells are present in the rat nucleus accumbens, our study focused on establishing whether mast cells are present in this region in both male and female prepubertal rats. To date, I have established the methodology for the slicing, mounting, staining, and microscopy involved in this project and investigated mast cell presence. From here, we hope to investigate changes in presence, quantity, and density of mast cells across development.

Is PFAS Present in Rocky Branch Creek Near Lee Residence Hall?

Author(s): **Olivia Fulcher, Lauren Conway, Alyssa Paull, Bryce Carleton**
Mentor(s): **Dr. Elizabeth Guthrie Nichols**
Poster: **17**

PFAS are widely used in everyday products and frequently end up in natural waterways due to their resistance to breaking down and their water solubility. The goal is to assess PFAS contamination in campus surface waters via stormwater outflows, focusing on the quarter-mile tract traversed by Rocky Branch Creek near Lee residence hall. Sampling locations were determined using a targeted sampling method, based on storm drain maps. Four mid-depth surface water grab samples and one field duplicate were collected using high-density polyethylene (HDPE) containers, and field measurements were conducted with a calibrated YSI 80 water quality instrument. Consulting DOE PFAS Sampling Guidance, one field blank (of HPLC-grade water), one matrix spike, and one matrix spike duplicate were collected; clothing and footwear aligned with recommendations to prevent contamination of samples. After collection, samples were stored on ice at 0-6℃. The next day, samples underwent solid phase extraction by STATERA ENVIRONMENTAL Inc. with a mass-labeled PFAS for surrogate recovery analysis. PFAS analytes targeted for detection include various perfluoroalkyl carboxylic acids (PFCAs), perfluoroalkyl sulfonic acids (PFSAs), and fluorotelomer sulfonic acids (FTSs), among others. Samples will be quantified at the NCSU Molecular Education, Technology, and Research Innovation Center (METRIC) by liquid chromatography-mass spectrometry (LC-MS) following EPA Method 537.1 for 30 PFAS analytes with modifications for isotope dilution. Anticipated results include the quantification of PFAS concentrations in campus surface waters, highlighting potential sources and distribution patterns. This is the first evaluation of PFAS in surface waters at NC State University.

PFAS Quantification in Rocky Branch Creek between Gorman Street and Varsity Drive.

Author(s): **Embla Georgesdottir, Dana Sanderson, Adam Ernest, Jack Wagner**
Mentor(s): **Dr. Elizabeth Guthrie Nichols**
Poster: **19**

Per- and polyfluoroalkyl substances, or PFAS, have been used in consumer, commercial, and industrial products. PFAS analytes are characterized by a strong C-F bond, which allows these chemi to persist in the environment. These persistent chemi are especially worrisome when you consider their carcinogenic properties and potential for harmful reproductive effects in both humans and wildlife. Potential sources of PFAS at North Carolina State University led to the estimation of PFAS levels in various surface waters on campus. Surface water samples were collected from Rocky Branch Creek at locations between Gorman Street and Varsity Drive. Specific sampling sites were selected using stormwater maps of NC State's campus, with locations judgmentally chosen based on proximity to stormwater outfalls expected to be potential sources of PFAS due to various nearby university facilities. HDPE bottles of 250 mL volume were used to collect 4 total samples, 1 field duplicate, 1 field blank, 1 matrix spike, and matrix spike duplicate. The surface water was monitored for conductivity, pH, temperature, and dissolved oxygen with a YSI-80 Meter. Samples were collected on February 8th, 2024, and kept on ice under 6°C until solid phase extraction by Statera Environmental Inc., which took place on the next day. PFAS quantification was completed by the METRIC lab at NC State, following USEPA Method 537 for 30 PFAS analytes. This is the first evaluation of PFAS in surface water at NC State, however expected results are that the collected surface water samples will contain an unknown magnitude of PFAS analytes.

Assessment of Native and Introduced Species on Rocky Branch Greenway

Author(s): **Laura Graham, Kayla Ruff**
Mentor(s): **Dr. Lara Pacifici**
Poster: **20**

Our research aimed to explore the biodiversity on Rocky Branch Greenway, specifically the presence of native and introduced species. It was hypothesized that the Rocky Branch Greenway would have higher overall diversity of native species than introduced species, and the Dan Allen & Sullivan section of the greenway would have more introduced species than the beaver pond section. To collect our data, we used the Seek and Merlin apps, trail cameras, and an Echo Meter. Data was entered into Google Sheets and visually analyzed with a histogram. Our results clearly show that the majority of species identified were native, not introduced. There were more species found at the beaver pond than on Dan Allen and Sullivan. We concluded that the beaver pond fostered more biodiversity than the Dan Allen and Sullivan site, but also had more introduced species.

Thermal Power Uprate Fuel Management Studies for a Westinghouse 4-Loop PWR

Author(s): **Alex Graham, Jacob Mast, Aaliyah Zuniga**
Mentor(s): **Dr. Maria Avramova, Dr. Kostadin Ivanov, Baxter Durham, Blaine Taylor**
Poster: **21**

The Inflation Reduction Act, signed into law during 2022, provides a production tax credit for existing nuclear reactors which takes full effect this calendar year. One way for electric utilities to effectively capitalize on this financial incentive is through a thermal power uprate. The primary goal of such an upgrade is to increase the thermal output of a nuclear reactor facility, allowing it to produce, and then sell, more electricity thereby increasing the plant's revenues. However, undergoing this process will cause a plant to incur additional costs. To create the higher thermal powers more efficient loading patterns, the arrangement of fuel assemblies loaded into the core, and higher enrichment fuel must be used. Therefore, it is of the utmost importance to ensure the additional earnings generated outweigh the additional costs undertaken. To determine the best option, unique loading patterns were designed for the standard power output, a 2% power uprate, and a 10% power uprate. The loading patterns were tested using ANC, a core simulation code provided by Westinghouse. During the design process various plant constraints, safety limits, and economic criteria all factored into the analysis. After safety and economic calculations were completed, the most economically attractive 4-loop PWR loading pattern was determined.

Helicobacter pylori VacA toxin may be the Cause of Gastric Cancer

Author(s): **Isabella Heckman, Diya Patel**
Mentor(s): **Dr. Jonathan Olson, Bella Condo**
Poster: **22**

Helicobacter pylori is a human pathogen typically associated with ulcers, but has also been identified as the causative agent of gastric lymphoma. H. pylori produces the toxin VacA, a toxin that creates a vacuole within the infected cell. Our hypothesis is that the toxin may interfere with host cell stress response pathways. In order to investigate any role for the toxin in lymphomagenesis, we have cloned the vacA gene into a eukaryotic expression vector. The vector (pVacA) contains the 3,800 bp coding region and has been verified by sequencing to be correct. Expression of the protein is being confirmed by SDS-PAGE and Western Blot. Future experiments will be to express VacA in mouse lymphocytes and assay for vacuolization and dysregulation of stress response genes.

Gambian Girl Power - An Intervention for Girls' Education and Empowerment

Author(s): **Maeve Hennessy**
Mentor(s): **Dr. Haddy Njie**
Poster: **23**

The mission of the Gambian Girl Power (GGP) non-profit is to keep girls in school by teaching them the intrinsic value of an education and by building their academic resilience. We strive to get as many girls as possible in The Gambia, West Africa to higher education through developing a positive attitude towards academic achievement and by providing them with a female-centric empowerment framework. Our work targets girls aged about nine to sixteen in primary and secondary schools, and we currently have over 200 members in about four schools. We center around the "I CAN" slogan, which emphasizes the power of positivity and self-belief. We hope that instilling this in a community of strong-willed, driven girls will reinforce itself for years to come. Our approach is multi-faceted, including mentorship programs, workshops, and community events, and we are currently engaging in an educational materials drive where we will ship school supplies and menstrual products to GGP schools. Additionally, we are building a Model Sister Library here at NC State and are planning a servitude trip to The Gambia to help work on one of the GGP school's real library this summer. We believe that by creating a supportive environment and fostering a love for learning, we can help young girls in The Gambia uplift one another and develop the skills and mindset necessary to succeed in school and beyond. The presentation will go into each one of our goals and projects further and will be in a poster format.

Developing a CRISPR/Cas12a Mediated Gene Targeting protocol in Arabidopsis

Author(s): **Breyton Hill**
Mentor(s): **Dr. Anna Stepanova, Katie Vollen**
Poster: **24**

CRISPR-based tools have revolutionized the world of plant biology, enabling the generation of small, sequence-specific DNA insertions or deletions (indels) with relative ease. However, there is no efficient protocol for gene targeting, or insertion of large DNA fragments of interest at a precise locus in plants. This project focuses on creating an efficient and widely accessible set of vectors for gene targeting using Golden-Braid technology in the model plant Arabidopsis.
One of the main bottlenecks in gene targeting experiments is providing enough repair template to encourage large insertions instead of random indels. The plant virus, Beet Curly Top Virus (BCTV), can insert its DNA into a host plant and reprogram the host for viral replication. To take advantage of this increased replication, a non-pathogenic version of BCTV modified to contain a DNA sequence of interest can be used to provide DNA repair template at the site of a double-stranded break. This will ideally provide enough repair template for the host plant cell to repair the double-stranded DNA break through homology directed repair, introducing a large DNA fragment of interest.

This project uses Golden-Braid cloning to build constructs that contain the necessary components to deliver CRIPSR Cas12a gene-editing machinery and the viral replicon carrying a DNA sequence of interest as the repair template. After the construct is built, it will be transformed using floral dip into Arabidopsis and positive gene targeting events will be selected by screening for an ethylene response associated gain-of-function phenotype.

An Investigation into the Mechanism of the Cytochrome P450, CYP121

Author(s): **Veronica Hill**
Mentor(s): **Dr. Tom Makris, Hannah Gering**
Poster: **25**

The cytochrome P450, CYP121, is an enzyme that catalyzes the intramolecular C-C linkage between two Tyrosine side chains of its substrate, cyclo-L-Tyr-L-Tyr (cYY). The resulting product, mycocyclosin, is critical for cell survival of the pathogen Mycobacterium tuberculosis. The aim of this study was to investigate if CYP121 utilizes a similar catalytic mechanism as homologous cytochrome P450s such as AspB, that perform intermolecular linkages found in other bacterial species. AspB uses ferric superoxide (“oxy”) as the reactive intermediate for catalysis and does not require a second electron, unlike other CYPs utilizing Compound I as an oxidant do. Mechanistic analyses were performed using stopped-flow spectrophotometry and high performance liquid chromatography (HPLC). Various electron sources, which could donate either one or two electrons to CYP121, were used in the catalytic reactions and the reactions were analyzed for mycocyclosin via HPLC. The use of redox partners, ferredoxin and ferredoxin reductase, resulted in the most formation of mycocyclosin. CYP121 was also able to form product using the two-electron donor hydrogen peroxide (H2O2), providing support for the use of an oxidant downstream of oxy. Transient kinetics analysis of the oxy complex further supports the need for two electrons similar to most other CYPs. These findings suggest that inter- and intramolecular bond formations catalyzed by CYPs may be performed using different oxidants.

Combined Lattice Physics Fuel Management Optimization for Boiling Water Reactors

Author(s): **Cole Howard, Joshua Yagozinski**
Mentor(s): **Dr. Jason Hou**
Poster: **26**

The objective of this project is to develop an efficient refueling strategy for a General Electric BWR/4 (Boiling Water Reactor) operating on an 18-month cycle. Our primary goal is to minimize the refueling costs associated with the reactor system, while adhering to safety standards and power design constraints. These constraints include maintaining proper values for the effective neutron multiplication factor (keff), critical power ratio (CPR), and linear heat generation rates (LHGR).

To achieve this, the project employs Framatome's MICROBURN-B2 BWR core simulator software. By leveraging quarter-core symmetry, we aim to reduce the computational load and runtime significantly. Given the complexities inherent in BWR fuel lattice design, this project will not cover fuel assembly construction and design. Instead, it will concentrate on optimizing assembly placement, manipulating control rod patterns, and adjusting coolant flow rates to lower refueling costs. A key strategy to achieve cost reduction involves minimizing the average enrichment of the fuel assemblies.
Our findings have led to an optimized solution that fulfills all design and safety requirements, featuring an average fuel enrichment of 4.03% and a total heavy metal weight of 17.087 metric tons.

Development of Human Long Noncoding RNA Knockdown Cell Lines using CRISPRi

Author(s): **Alexandra Istishin**
Mentor(s): **Dr. Xinxia Peng, Kristen John**
Poster: **27**

Long non-coding RNAs (lncRNAs) are defined as transcripts greater than 500 nucleotides in length with low translational potential. Although previously regarded as inconsequential, recent studies have implicated their involvement in regulating a myriad of biological processes, including the host immune response to viral infections. Despite the annotation of over 20,000 lncRNAs in the human genome, their precise functions remain largely undefined. Using bulk RNA-sequencing (RNA-seq) analysis, our lab previously identified novel lncRNAs that were upregulated after influenza A infection and interferon-beta treatment. To investigate the functions of these lncRNAs, we aim to explore the impact of individual lncRNAs on host immune responses through the creation of CRISPR interference (CRISPRi) knockdown lines. Utilizing the CRISPR system, CRISPRi offers an RNA-based approach to block transcription and impede the expression of target genes without altering their genetic sequence. While previous efforts in our lab have yielded knockdown efficiencies of approximately 70% for individual lncRNAs, we aim to achieve a more robust 90% knockdown for functional analysis. To do this, we first validated the genomic sequence of the lncRNA, as lncRNAs tend to have less accurate annotations, and the correct sequence is crucial for efficient CRISPR guide RNA (gRNA) targeting. After the generation of lncRNA knockdown lines using newly designed gRNAs, we will assess the knockdown efficiency through both interferon treatment and viral infection assays. This project highlights the unique challenges associated with manipulating poorly annotated genomic regions and the importance of characterizing the target region prior to gRNA design and functional assays.

Serine-Selective Labeling for Antibody Drug Conjugate Applications

Author(s): **Yume Iwakura**
Mentor(s): **Dr. Jun Ohata, Seiya Ishizawa**
Poster: **28**

An antibody-drug conjugate (ADC) is a complex that links a payload, or cytotoxic agent to antibodies, made possible by selective modification. While traditional cancer treatment solutions such as surgery, radiation therapy, and chemotherapeutic drugs can be invasive, ADCs offer a more targeted and effective approach to cancer treatment. They combine a molecule of biological origin with cytotoxic drugs, minimizing the side effects of chemotherapeutic drugs for the person while maximizing antitumor effects. ADCs are one potential application of our research in the Ohata Lab, where we are developing a new method for modification of proteins and antibodies. My research focus is on selectively modifying serine via Fischer esterification reactions using carboxylic acid labeling reagents. This is quite a challenge, as amino acids such as threonine share similar structures, particularly the hydroxyl group, which participates in Fischer esterification in both amino acids. As the first step to test the serine-selectivity of the present method, amino acids were employed as model substrates. We have screened various amino acids against different carboxylic acids to determine whether reaction conditions are specific to serine.

Effects of Various Forces, Environment, and Launch Angles on Batted Baseball Trajectories

Author(s): **Alex Johnson**
Mentor(s): **Dr. Kasey Wagoner**
Poster: **29**

Baseball has been America's pastime for more than a century; however, only recently has the baseball world become enamored into exploring the physics behind this sport. From the sweeping slider to the towering home run shot, the flight of the baseball in any of these cases is complicated. The goal of this project is to create an analytical model that can accurately predict the flight of a batted baseball. To achieve this goal, Python was used to create a simulation of how a baseball would fly off the bat in various scenarios. These scenarios included differences in spin-rate, launch angles, air densities (due to elevation), and the type of spin that a baseball has when coming off of the bat. From modeling these various scenarios, there were a few key takeaways. First, increasing backspin only increases distance until about 4000 rpm, and then there is a disproportionate increase in the height of the ball. Second, higher elevations that have lower air density dramatically increase the distance of a batted ball. Third, the launch angle that maximizes the distance a batted ball travels is between 20-35 degrees. Lastly, having topspin on a baseball will significantly decrease the time a ball spends in the air. Future models will attempt to expand on this model by including the orientations of the seams of the baseball as it comes off the bat, and they will account for spin-rate decay.

Unveiling Social Health Factors in Natural Hair Care for Women of Color

Author(s): **Kelis Johnson**
Mentor(s): **Dr. Ami Zota, Dr. Lariah Edwards**
Poster: **30**

This research investigates the environmental injustice of beauty, exposing health disparities caused by unequal exposure to toxic chemi through personal care products. Even with recent changes in the way natural hair is viewed and the chemical formation changes in hair care products, prejudice still exists and is supported by the media and the legal system, among other societal actors. Exposure to endocrine-disrupting chemi (EDCs) is associated with health hazards, including the development of uterine fibroids, breast cancer, and problems with reproductive health. This study examines the relationship between chemical exposure, race, and social determinants of health, highlighting the need for distinct viewpoints to address health disparities in Black and Latinx communities. These findings prompt a critical reassessment of product safety and usage patterns, advocating for informed consumer choices to mitigate potential health risks. By analyzing natural hair care products, based on hazard scores, it has been revealed that there are moderate risks associated with shampoos/co-washes and leave-in conditioners. Drawing from the researcher's personal experience, the study attempts to close knowledge gaps by advocating for policy reforms and public health measures that will improve the lives of Black and Latinx women. The research contributes to a broader understanding of the environmental injustices embedded in beauty standards and underscores the necessity for comprehensive strategies to foster equitable health outcomes in marginalized communities.

Diffusion Probabilistic Models for Droplet Coalescence

Author(s): **Kanak Joshi**
Mentor(s): **Dr. Hangjie Ji**
Poster: **31**

Droplet coalescence driven by capillary forces is an important phenomenon in many physical processes and engineering applications. This project focuses on studying the dynamics of droplet coalescence using generative diffusion probabilistic models. First, we develop a differential equation solver for generating hydrostatic droplet profiles by solving the Young-Laplace equation. By enforcing the conservation of mass, this solver is utilized to generate droplet samples before and after coalescence. Next, we employ the generated droplet samples for training a Diffusion Probabilistic Model. This model, grounded in the conservation of mass principles, captures the nuanced dynamics of droplet coalescence. Our results provide a feasibility study of using diffusion models for characterizing droplet interactions, motivating future research on the pattern formation inherent in free surface flows beyond droplet coalescence. This project is under the guidance of Dr. Hangjie Ji (NCSU) and Dr. Sungtaek Ju (UCLA).

Structure-Reactivity Relationship Study for Tryptophan Modification in Hexafluoroisopropanol

Author(s): **Emily Joyner**
Mentor(s): **Dr. Jun Ohata**
Poster: **32**

Selective chemical reactions on proteins are highly relevant in various pharmaceutical applications. However, traditional aqueous solvents limit the range of organic reactions while organic solvents risk denaturation or protein substrates. Using a nonaqueous medium that is compatible with organic reactions allows for unique bioconjugation reactions. The Ohata group has evaluated the reactivity and selectivity of these reactions using nonaqueous media. Recently, experiments have been completed to study reactions between thiophene-ethanol with peptides using hexafluoroisopropanol (HFIP) as a nonaqueous solvent. This study is aimed at modifying the benzylic position of the thiophene group with different alcohol-containing substituents, and testing tryptophan containing peptide and amino acid substrates using HFIP as a nonaqueous reaction solvent.

Analysis of Thermal Uprates for a 2-Loop Pressurized Water Reactor

Author(s): **Alina Jugan, Caden Sekelsky, Jake Mikouchi-Lopez**
Mentor(s): **Dr. Maria Avramova, Dr. Kostadin Ivanov**
Poster: **33**

With rising global approval, nuclear energy, due to its reliability and lack of greenhouse gas production, is becoming more commonly deployed to increase baseline energy production, replace traditional non-renewable technologies, and complement wind, solar, and geothermal energy. The nuclear industry is often challenged with high upfront costs and slow return on investment. With the increasing demand for sustainable and cost-effective energy solutions, advancements in nuclear technology, such as fuel reload and thermal uprates, are vital for meeting economic performance goals. If the thermal efficiency of the nuclear reactor is retained, thermal uprates result in a higher electrical output, increasing revenue. However, more reactor power requires more fresh fuel which thus incurs additional costs. This study, focusing on a Westinghouse 2-Loop Pressurized Water Reactor (PWR), explores the utilization of the Westinghouse Advanced Nodal Code (ANC) in identifying feasible fuel loading patterns (LPs). By examining thermal uprates at 100%, 102%, and 110%, this project aims to navigate the balance between economic performance and core design challenges such as shutdown margin, neutron fluence, radiation heating, peaking factors, and axial power distributions to address the pressing needs of the global energy sector.

Mutating OGC to increase carbon fixation and reduce atmospheric CO2

Author(s): **Vennela Katta**
Mentor(s): **Dr.Robert Rose**
Poster: **34**

Since the Industrial Revolution, atmospheric greenhouse gases, primarily CO2, have steadily increased. Plants play a crucial role in mitigating this issue by absorbing CO2 through the Calvin Cycle, facilitated by the protein RuBisCo. However, carbon fixation by RuBisCo can be limiting, hampering plant growth. This research aims to develop a synthetic carbon-fixing cycle to supplement RuBisCo and enhance plant growth, particularly in Camelina sativa, a plant whose seeds yield biofuels. The proposed cycle is based on the reductive TCA cycle, which utilizes NADH and ATP to fix CO2. One key enzyme in this cycle is OGC, which catalyzes CO2 fixation. However, OGC is currently only active in thermophilic organisms. The goal is to identify mutations in OGC to make it functional in plants by lowering its temperature sensitivity. OGC comprises three domains: Biotin Carboxylase (BC), Biotin Carboxyl Carrier Protein (BCCP), and Carboxy Transferase (CT). The BC domain, crucial for CO2 fixation, is more active when bound to BCCP-biotin. The interaction between BC and BCCP domains will be studied to understand their functional relationship. Previous work involved introducing mutations in the BC domain using Golden Gate Mutagenesis to lower its temperature sensitivity. The project aims to identify mutations enhancing BC domain activity at lower temperatures, contributing to the development of a more efficient synthetic carbon-fixing cycle.

Global De-risking in the Pacific Islands

Author(s): **Alianna Kendall-Brooks**
Mentor(s): **Dr. Mark Nance**
Poster: **35**

As banks in developed nations started cutting ties with their counterparts in poorer countries in the early 2010s, a trend dubbed "de-risking" emerged that threatened to isolate many developing regions from the global financial system. De-risking occurred as institutions in places like the U.S. and Europe grew worried about the potential for money laundering and terrorism financing through correspondent banking relationships in areas with weaker regulatory regimes. This led them to sever those relationships and "de-risk" their portfolios, even though it severely restricted financial access for some nations.
In the Pacific Islands, the Pacific Islands Regional Initiative (PIRI), part of the Alliance for Financial Inclusion, has been a key network coordinating a regional response to de-risking's impacts. Launched in 2014, PIRI brings together central banks from countries like Samoa, Timor-Leste, Papua New Guinea, and others. Their goals include promoting financial inclusion through new policies, fintech adoption, financial education, and evidence-based policymaking using improved data. In 2021, PIRI released a Regional De-Risking Action Plan mapping out further steps like harmonizing regulatory frameworks, exploring regional

payment systems, and creating regulatory sandboxes for fintech innovation. Under the guidance of Professor Mark Nance, the goal of my research is to understand how the Pacific Islands have pivoted their financial infrastructure through PIRI and other means following de-risking and what consequences have arisen in the process.

How NCSU Can Improve Lab Safety for Students and Staff

Author(s): **Josephine Kinsey**
Mentor(s): **Dr. Elizabeth Nichols**
Poster: **36**

In 2013, OSHA conducted a study that found that people working in university laboratories were 11 times more likely to sustain an injury than laboratories in the industry. This statistic is alarming, and action should be taken by universities to ensure that faculty, students, and staff are working in safe environments. I reviewed the current literature to develop a literature review that addresses three elements of lab safety: space compliance, safety management, and safety training/education. These elements are synergistic and should be applied together for improved compliance and safety. Space is how the lab itself is organized. Ideally, a lab is kept neat, all containers are labeled, and areas where caution should be exercised are outlined on the floor with tape. Management is how the primary investigator, or supervisor, manages the lab; they should provide plenty of resources to authorized users, conduct frequent reviews of the lab, and implement accessible workflows to report safety issues. Education/training ensures all people in the lab know safety and health risks within the workspace and are taught to avoid injury or incidents through training. This review summarizes best safety compliance practices and methods that the Safety Committee should implement; these practices and methods are adaptable to other colleges and departments at NCSU.

Utilizing the Extrusion Process to Create Recycled 3D Printer Filament.

Author(s): **Catherine Kirch, Bella McInnes**
Mentor(s): **Dr. Daniel Saloni**
Poster: **37**

Plastic extrusion is a widely used and applicable process used in the creation of many plastic pieces and in manufacturing. This process involves melting virgin plastic pellets and forcing it through a nozzle to create a plastic strand that can then be used for 3D printing applications. Our current project looks at how we can, firstly, learn how to utilize this process at a small scale to make our own 3D printer filament from virgin plastic pellets. This involved extruding our own PETG and PLA plastic filament from pellets to learn how the different variables like melting temperature, spool speed, and screw rpm can be refined to produce a filament of consistent diameter for 3D printer application. Beyond this, we are working on developing and modifying this process to turn waste plastic into new, effective 3D printer filament. The

waste plastics we are focusing on are Polypropylene plastic coffee cups, sourced from local cafes on campus, as well as PLA filament waste from the Hill Library Makerspace. This process involves grinding the plastic down into pellets, melting and extruding these pellets, and spooling it into new usable filament. Our goal is to provide higher value products from common underutilized waste streams on campus and promote sustainability in the local 3D printing community.

Impact of Residual Surfactants on Flammability Characteristics of Firefighter Outer Shell Fabrics

Author(s): **Hannah Kirk**
Mentor(s): **Dr. Bryan Ormond, Dr. Arash Kasebi**
Poster: **38**

This project sought to determine the relationship between residual surfactant post-laundering and outer shell material flammability. Firefighting is a dangerous profession, due to exposure from fireground contaminants such as carcinogens. As a result, firefighters have begun to wash their gear more frequently. There is concern that using high concentrations of surfactant may have an impact on flammability of outer shell material. The samples were prepared by padding different concentrations of two surfactants onto outer shell material. The outer shell material was Firedex TECGEN Untreated, this was standard across all trials. The two surfactants were Citrosqueeze® and Firedex Gearwash. They were selected because they are manufactured specifically for firefighter turnout gear. The concentration levels of surfactant were 100%, 50%, 25%, 12.5% and 0%. After the surfactant was applied, the material was dried at 110°C for 5 minutes. The fabric flammability was tested according to ASTM D6413 Standard Test Method for Flame Resistance of Textiles (Vertical Test) and evaluated according to NFPA 1971. The samples were evaluated based on afterflame, afterglow, and char length. Samples with concentrations of 100%, residual surfactant showed both afterflame and afterglow. The conclusions of this project were that outer shell material with a residual surfactant concentration of 25% or less would still meet the NFPA 1971 performance requirements. It should be noted that the padding and curing process is not representative of the actual gear laundering process. Future research should be done on the realistic amount of residual surfactant on turnout gear after laundering.

Peptide Modification in Acidic, Biomolecule-Compatible Media

Author(s): **Anuja Koirala**
Mentor(s): **Dr. Jun Ohata, Seiya Ishizawa**
Poster: **39**

Peptide therapeutics is an emerging drug modality that can be used to treat unmet medical needs as well as enhance drug selectivity. Such therapeutics includes chemically modified peptides or peptide conjugates. Amino acid selective modification methods are chemical

tools that create the peptide conjugates, as well as expand the chemical library of peptide drugs including macrocyclic peptides. Many amino acids have been proven to be modified, however, as of now, serine targeting methods are limited, and very little research has been conducted on this topic. In the Ohata lab, we are currently proposing a new bioconjugation method, specifically with serine selectivity. This project's goal is to successfully modify serine-specific sites in different peptides by Fischer esterification, with carboxylic acid as both the acylating reagent and solvent. To achieve serine-selective modification while maintaining reaction efficiency, different catalysts (Brønsted acids and Lewis acids) were screened. Liquid chromatography–mass spectrometry (LC–MS) is utilized to analyze the modification of peptides. This data further proves that serine has successfully been modified from a hydroxyl group to an ester. The substrate scope of the method was investigated by modifying different peptides. The serine-selectivity after the modification of peptides was confirmed by tandem mass spectrometry (MS/MS).

Comparative Analysis of Marine Bacteria to B1 and its Vitamers

Author(s): **Wil Mabe**
Mentor(s): **Dr. Ryan Paerl**
Poster: **40**

Vitamin B1 (thiamin, called B1 herein) is required by nearly all cells as it serves as a cofactor for enzymes crucial for respiration, TCA-cycle steps, and pathways of central metabolism. Besides being a required nutrient, B1 and its vitamers (B1 related compounds) could potentially serve as attractants for motile microbes, especially bacteria. To test this hypothesis, B1-related chemotaxis by marine bacterioplankton Vibrio anguillarum PF430-3, Vibrio anguillarum PF430-3 (ΔthiC mutant), and Rugeria pomeroyi DSS-3 was conducted using in-situ chemotaxis assay (ISCA) plates. Specifically, replicated exposures of compounds including B1, 5 B1-vitamers, glycine, leucine, and autoclaved seawater (negative control) were used in chemotaxis assays. Cell counting using flow cytometry was performed to assess chemotaxis towards compounds. Comparisons of results from chemotaxis assays will be presented.

Determining PFAS in Surface Water on NCSU's Centennial Campus

Author(s): **Benjamin Massey, Mary Claire Wise, Carter Macklin, Christopher Myers**
Mentor(s): **Dr. Elizabeth Nichols**
Poster: **41**

Per- and polyfluoroalkyl substances (PFAS) are a group of synthetic compounds that come from a variety of industries including paper industries, wastewater treatment plants, etc. PFAS compounds bioaccumulate and are linked to a number of public health and environmental concerns. This study determined the presence of PFAS in surface waters on Centennial campus. Surface water samples were collected on February 8th, 2024 in high

density polyethylene (HDPE) bottles at four targeted sampling locations along the creek running adjacent to the Wildlife Resources Commission and Venture IV. Using a YSI-80, measurements for pH, temperature, conductivity, dissolved oxygen, and mmHg were taken at each location. Sample locations were chosen based on proximity to outfalls. One sample was collected next to Avent-Ferry road, one field duplicate and sample were collected downstream of an outfall from a stormwater retention pond, one sample was collected under Varsity Drive bridge, and one sample was collected under Research Dr. bridge. A field blank using HPLC-grade water, one matrix spike and one matrix spike duplicate were collected for quality control following 2023 DOE PFAS Environmental Sample Guidance. Samples were kept on ice at 5°C and delivered to Statera Environmental for solid phase extraction. Dried extracts were submitted to NCSU's METRIC facility for LC/MS following USEPA method 537.1. This is the first evaluation of PFAS in surface water on NCSU's Centennial campus.

PFAS Analysis of Surface Waters on Centennial Campus near the College of Textiles

Author(s): **Millie McInnes, Caroline Ruppel, James Gartin, Shelton Bocook**
Mentor(s): **Dr. Elizabeth Guthrie Nichols**
Poster: **42**

The goal of this project was to determine if PFAS were present on NCSU centennial campus. Four sampling locations were selected representing different stormwater outfall locations from campus buildings and roads flowing into lake Raleigh. Mid-depth surface water samples for PFAS analysis were collected in HDPE bottles on 02/08/2024. With these samples, a field duplicate, field blank, matrix spike, and matrix spike duplicate were collected. Prior to collecting samples, all sites were analyzed for temperature, conductivity, dissolved oxygen, and pH with a YSI- 80. Surface water samples were kept at 5℃ and submitted to StATERA for solid phase extraction; 24 mass-labeled PFAS analytes were added to samples prior to SPE for surrogate recovery. Dried extracts were submitted to NCSU METRIC for PFAS analysis for quantification of 30 PFAS analytes following USEPA Method 537.1. This is the first evaluation of PFAS in surface waters on NC State's Centennial campus.

Structure and Regulation of the Diiron N-oxygenase HrmI

Author(s): **Aditi Mudireddy**
Mentor(s): **Dr. Thomas M Makris, Sydney S. Skirboll, Han N. Phan**
Poster: **43**

HrmI is structurally classified as a heme oxygenase-like diiron oxidase (HDO). HrmI catalyzes the O2-dependent conversion of L-lysine to 6-nitronorleucine in the S. griseoflavus biosynthetic pathway for the antibiotic hormaomycin. The binding of oxygen to diferrous HrmI results in the production of two distinct iron-oxygen intermediates in the catalytic

pathway that leads to substrate oxidation that spectroscopically resembles the (Fe3+)2-peroxo species found in several other diiron enzymes. While most HDOs require substrate binding to form these iron-oxygen intermediates, HrmI can do so independently of its substrate. This research project aims to study the structural factors regulating catalysis and the formation of these iron-oxygen intermediates. We hypothesize that a glutamate (E194) that interacts with the active site iron is crucial for catalysis. To probe the importance of the E194 ligand, we applied site-directed mutagenesis to shorten E194 to an aspartate residue (E194D). Using stopped-flow spectroscopy, we demonstrate that the E194D HrmI variant exhibits drastically altered kinetics but retains its substrate-independent mechanism. Using X-ray crystallography, we determined that the mutant structure also has perturbed iron-ligand interactions. Activity assays, measured with high-performance liquid chromatography, show the formation of a new possible product, indicating lysine metabolism by the E194D mutant may proceed differently. Our findings suggest that the E194D mutation regulates iron-ligand interactions and oxygen reactivity kinetics but does not abolish the substrate-independent mechanism. Further studies aim to expand our understanding of the factors regulating catalysis and the formation of (Fe3+)2-peroxo intermediates.

Machine Learning Assisted Detection and Analysis of Plant Cellulose Synthase Proteins

Author(s): **Siri Mudunuri**
Mentor(s): **Dr. Alexey Gulyuk, Dr. Yaroslava Yingling**
Poster: **44**

A large amount of energy obtained from plants is converted into the lignocellulosic cell wall, an energy rich, versatile material that is utilized as a recalcitrant feedstock for liquid biofuel production. By understanding how plants manufacture lignocellulose, new methods for controlling and transforming it can be developed to improve the current technologies that supply our energy and material needs for a sustainable future. Rosette-like cellulose synthase (CESA) proteins, also called rosettes, are a key component of plant cell walls. Their structure in part facilitates the formation of cellulose microfibrils in plants that can eventually form larger macrofibrils in the cell wall structure.
The identification and analysis of rosettes is promising to better understand lignocellulose and its formation. To that end, scanning technologies like transmission electron microscopy (TEM) and scanning electron microscopy (SEM) have been utilized to create datasets of nanocellulose scans. In practice, the number of available microscopy images makes the process of identification and analysis of these nanoscale proteins very laborious and time-consuming. In this research project, we aim to construct a data analysis pipeline that implements supervised machine learning-based computer vision (CV) techniques to identify rosettes and perform basic structural analysis of rosette protein properties. This will allow for the automatization of the identification and analysis of rosettes, resulting in faster protein detection, increased objectivity in identification, extraction of structural parameter distributions, and generation of training sets for further analysis of the nanoscale properties present in the lignocellulosic cell wall.

Hip Angle-Step Width Connection for Enhancing Lower Limb Rehabilitation Systems

Author(s): **Avery Murray**
Mentor(s): **Zhenyuan Yu, Dr. Helen (He) Huang**
Poster: **45**

Balance is an important aspect of integrating rehabilitation systems in lower limb applications; however, not much research has been conducted on the frontal plane. Current hip exoskeletons show very limited applications of torque in the mediolateral direction to help improve user stability. However, lateral changes in step width can cause an increase or decrease in instability during walking. Finding a relationship between hip angle and step width is vital to improving stability in people with balance impairments. The connection can then be applied in rehabilitation devices with a focus on the mediolateral plane. In our study, the correlation between hip angle and step width was found using a visual feedback interface and a mediolateral hip exoskeleton. The visual interface provides the user with real-time feedback on their hip angle and the target hip angle. The goal of the interface was to help the subject maintain an increased, decreased, and normal step width during multiple walking trials. A biomechanical analysis was conducted in Matlab to relate hip angle, step width, and the margin of stability. Through the correlation of hip angle and step width, further studies can be conducted with torque on the exoskeleton to show the result of assistance on the user's biomechanics.

Ten Years of Feed the Pack's Impact on Alleviating Food Insecurity

Author(s): **Emma Myer-Medina, Abhinav Thakur**
Mentor(s): **Rose Krebs, Mr. Brian Mathis**
Poster: **46**

In 2012, NC State students, faculty, and staff from across the university formed a steering committee united towards the goal of providing vital basic needs resources to members of the Wolfpack community. After learning that 16% of NC State students faced food insecurity, the committee began Feed the Pack Pantry (FTP). Since 2012, Feed the Pack has had over 47,000 visits and distributed 683,000 pounds of food. In 2023, Feed the Pack saw an average of 1,000 visits a month. The pantry has collected data on the number of visits, pounds of donated items, pounds of distributed items, and more. The data presented captures the impact of FTP on the NC State community. Feed the Pack started with as little as 494 total visits its first year and now serves thousands of visitors. As highlighted in the data, Feed the Pack consistently sees an increase in the number of patrons visiting. The goal of this presentation is to highlight the growing issue of food insecurity and what Feed the Pack has done to adjust to the increasing demand on NC State's campus. Data collection is critical as it informs FTP on how the pantry's efforts need to be focused on spreading awareness of their mission which helps to raise awareness about food insecurity on campus. It also results in

valuable resources being accessible to the community and addressing the demand for more resources needed to combat food insecurity.

Women In Sport Leadership Summit: Addressing Barriers in the Women's Sport Industry

Author(s): **Paige Neiman**
Mentor(s): **Dr. Kimberly Bush, Ashley Correa**
Poster: **47**

Women working in the current landscape of the sport industry face a myriad of barriers and contemporary problems. Attempting to navigate this environment laden with underlying misogyny and misinformation places women at a disadvantage, exposing them to a pervasive lack of connection that smothers networking opportunities and career development. The creation of exclusive “Boys Clubs” marginalizes voices, and stifles inclusion and diversity. Working to overcome those challenges requires dynamic and cooperative solutions.
The Women In Sport Leadership Summit (WISL) is an event conceptualized and executed to investigate and address the systemic issues faced by women in the sport industry. WISL concentrates on three central ideas: The lack of connection between women in the sport industry, including a lack of available networking opportunities. How the creation and upholding of the “Boys Club” forces women to overperform without proper recognition leading to disproportionate rates of time and mental productivity between men and women. And, how these barriers manifest into physical and mental complications for women due to a lack of capacity to invest in themselves.
Through analysis of current industry professionals, and female presenting Sport Management undergraduates we designed WISL to address and tackle these issues. Information from the preceding year is used to pinpoint issues closest to our student population. These two sources of information are utilized to design breakout sessions and select speakers. We then create space for open conversations, networking, and advice sessions during WISL for a chance to create equitable space and experiences within the sport industry.

Expression of Female Lethality Utilizing the SxlPe-Gal4/UAS System in Drosophila melanogaster

Author(s): **Emelia Pearson**
Mentor(s): **Dr. Maxwell Scott, Dr. Akihiko Yamamoto**
Poster: **48**

Drosophila suzukii, a fruit fly species originating from southeast Asia, is currently an invasive pest in the United States. This species in particular poses a large threat to soft fruit production like berries and cherries, as through using a serrated ovipositor it is able to lay

eggs in ripening fruit prior to harvest. This ability is unique as most fruit flies will deposit eggs in rotting fruit. As a result, sterile D. suzukii females would still retain the ability to harm fresh fruit, meaning a different method of pest control is necessary. Drosophila melanogaster is a closely related species to D. suzukii, and can be used to observe methods of transgenic modification for potential control of the species. My aim was to use the Gal4/UAS system to develop a new method for killing female flies that could be adapted to D. suzukii. The early acting female-specific promoter SxlPe was used to drive Gal4, which in turn activated genes crucial to early development of the fly embryo and which are normally expressed in restricted domains. Offspring production was observed over time in lines of D. melanogaster to determine the success of different genes in causing female lethality through misexpression in embryonic development. Some genes showed high rates of success; such as with even-skipped (eve), wingless (wg), Antennapedia (Antp) and Abdominal-B (Abd-B). In the future, this system could be applied to D. suzukii; if successful, transgenic males could be utilized to contribute to eradication of the population through reduction of females.

The Use of Multispectral Imaging for Early Detection of CMD/CBSD in Infected Cassava Plants

Author(s): **Gretchen M. Perez Castillo**
Mentor(s): **Dr. Linda Hanley-Bowdoin, Mary M. Dallas**
Poster: **49**

Cassava (Manihot esculenta) is an important staple food crop in sub-Saharan Africa, where its production is severely limited by two whitefly-vectored viral diseases – Cassava mosaic disease (CMD) and Cassava brown streak disease (CBSD). Poor cassava crops threaten the food security of farmers and their families, who are the primary cassava producers in Africa. CMD is caused by a group of single-stranded DNA viruses designated as cassava mosaic begomoviruses (CMBs) that cause bright yellow, deformed leaves and stunted, deformed tubers. CBSD is caused by two potyviruses that cause root necrosis that can render tubers inedible. Unlike CMD, the above-ground symptoms of CBSD are very mild, making it difficult to detect early in the growing season. This research describes the use of a custom-built active multispectral imaging (A-MSI) handheld device and machine learning to detect CBSD before arial symptoms are visible in TME14 plants, which are partially resistant to CMD and susceptible to CBSD. We also monitor symptom development and measure viral titers in CMD resistant plants infected with different combinations of CMBs, a CBSD potyvirus, a CMB satellite, and a host episomal DNA associated with CMD. These experiments provide insight into how CMD and CBSD interact during infection and generate information that can be used in cassava breeding programs to generate cultivars that are resistant to both viral diseases.

Evaluation of the Effect of Pseudomonas on Wheat Exposed to Salt Stress

Author(s): **Anna Pollock**
Mentor(s): **Dr. Amy Grunden, Jabeen Ahmad**
Poster: **50**

Pseudomonas are a genus of Gram-negative aerobic bacteria commonly found in soil, water, and vegetation. Some species are known to have plant growth-promoting properties, while others have been used in waste degradation, oil refineries, and more. My research aimed to isolate plant-beneficial Pseudomonas spp. from the wheat-associated microbiome using selective media and to test them in a plant growth trial with salt stress imposed. Isolates were cultured from wheat roots sampled at different developmental timepoints and from six different field sites. Rhizosphere, rhizoplane, and endosphere samples of wheat roots were obtained and diluted 1:100 and plated on a Pseudomonas-selective media. Colonies were screened by sequencing their amplified 16S rDNA fragments. Isolates confirmed to be Pseudomonas were evaluated using plate assays, which examined whether the isolates could fix nitrogen, solubilize phosphorus, and or tolerate high salt (up to 250mM). The three best performing strains of Pseudomonas (Pse12, Pse23, and Pse38) were selected for wheat seed germination studies and a wheat plant growth trial. The growth trial consisted of 34 wheat plants with 8 plants receiving no bacterial inoculation (negative control) and 26 plants inoculated with one of the three Pseudomonas isolates/ consortia. Half of the wheat plants received 250mM of salt treatment to the soil. All the wheat plants were scored for their germination, height, tiller number, and fresh/ dry biomass over the course of 2 months. The Pse23 inoculated wheat plants appeared to be tallest but highest tiller number was observed for plants treated with either Pse23 or the consortium.

Analysis of Particulate Matter Data and Chemical Classes Burned in Colfax, Louisiana

Author(s): **Sydney Pollock**
Mentor(s): **Dr. Jennifer Richmond-Bryant**
Poster: **51**

In Colfax, Louisiana an open-burn/open-detonation hazardous waste thermal treatment facility opened in 1985 and has since emitted chemi during processing of munitions wastes. Citizens of the area surrounding the site have experienced negative health effects including respiratory irritation, skin rashes, thyroid disease, cardiovascular disease, and cancer. We conducted an analysis of particulate matter data collected from sites surrounding the facility. Additionally, we analyzed operational records (“burn logs”) from the Louisiana Department of Environmental Quality. The burn logs included a collection of the chemical classifications burned during these burn events along with total weight and weight of explosive material. The regulated chemical classes included 1.1d, 1.4c, 1.4g, and 1.1a. These chemical classes represent secondary detonating explosives, propellant explosives, pyrotechnic substances, and primary explosive substances, respectively. Each classification corresponds to different

levels of air pollution emissions. These classifications show that a variety of air pollution emission levels exist and are being emitted into the Colfax community. This research can be used to determine if there is a correlation between particulate matter data and air pollution emission levels being burned. It can also inform citizens of the air pollution present in their community and has been shared with legislators in the area to support restrictions on open-burning.

Maize Immune Response to Chitin and Live Microbes

Author(s): **Kurt Ray**
Mentor(s): **Dr. Asher Hudson**
Poster: **52**

Plants have an immune system that relies on the innate ability to recognize microbe-associated molecular patterns (MAMPs) to initiate an immune response. Quantifying MAMP responses is crucial to the understanding of MAMP signaling components and thus plant immunity as a whole. Many studies utilize isolated MAMPs from microbes to quantify plant response, but in nature plants are exposed to living microbes containing more molecular components than the isolated MAMPs studied in labs. Living microbes may elicit different MAMP responses than synthesized MAMPs, therefore inoculation with live microbes for MAMP response quantification may lead to new insights. We tested the response of maize leaf tissue to the isolated MAMP chitin and several species of live microbes and present our findings.

Affect of Human Presence on Wildlife Biodiversity

Author(s): **Olivia Reece, Paige Meadows, Mckaila McMillan**
Mentor(s): **Dr. Lara Pacifici**
Poster: **53**

Studying the effect of human population on animal biodiversity is essential to the conservation of our resources. Our research analyzed the difference in biodiversity across two spots on the Rocky Branch Greenway, located on NC State's campus. The Beaver Pond site was more isolated, had a standing body of water, and was only frequented by foot traffic. The Dan Allen/Sullivan site was more populated, had a running creek, and was surrounded by a road, a dining hall, and a residence hall. Three trail cameras were set up at each spot on the Rocky Branch Greenway, and sardines were placed in front of each camera once at the beginning of trapping to attract surrounding animals. These cameras collected pictures based on movement from September 6, 2023 to October 16, 2023, then the cameras were collected and photos analyzed. Our results showed 11 species at the Dan Allen/Sullivan site, and 7 species at the Beaver Pond site, indicating a greater mammal presence at a more industrialized and populated spot. These findings highlight the need for detailed

assessments of the intricate interactions between industrialized areas and wildlife biodiversity to further assist our understanding of effective conservation methods.

A Quantification of Event Sequence Frequencies of the EBR-II using Inverse Estimation

Author(s): **Elijah Rushing, Amy Whitley**
Mentor(s): **Dr. Mihai Diaconeasa**
Poster: **54**

Aalo Atomics is a start-up company that is seeking to develop a 10 MWe micro-reactor ("micro-reactor") based on the design of the Experimental Breeder Reactor II (EBR-II) from Idaho National Laboratory. Aalo Atomics' mission is to significantly decrease the cost of nuclear energy, making clean energy more affordable and accessible to all. Aalo Atomics believes that through the implementation of the micro-reactor, nuclear energy can be reduced to a cost of 3 cents / kWh. To achieve this goal and deploy the micro-reactor, it is necessary to first receive regulatory approval and licensing from the Nuclear Regulatory Commission (NRC). Understanding the safety and risk associated with the reactor is imperative to obtain licensing. As the micro-reactor is based on the EBR-II design, conducting a probabilistic risk assessment (PRA) of the EBR-II provides useful insight into the safety and risk of the micro-reactor. Through conducting a PRA, we can address the risk triplet which poses three questions: What can go wrong; How likely is it; and What are the consequences. In this study we primarily address the second question by quantifying specific event frequencies. The main methodology used to quantify event frequencies is inverse estimation, a statistical process that uses observed values to infer the conditional variable. Upon using the inverse estimation method, we can define the likelihood of events and move forward in the process of a PRA for the EBR-II. This information is vital to help Aalo Atomics achieve licensing for the micro-reactor and advance accessibility of nuclear energy.

Impact of Dissolved Organic and Inorganic Nitrogen Compounds on Bloom Forming Cyanobacteria

Author(s): **Bella Russ**
Mentor(s): **Dr. Ryan Paerl**
Poster: **55**

Cyanobacteria commonly found in freshwater ecosystems and select populations bloom and produce toxins that are harmful to humans and animals. Previous studies indicate that various inorganic and organic nitrogen compounds contribute to harmful blooms by supporting increased cyanobacterial biomass. Our research aims to further understand cyanobacterial blooms by investigating how various dissolved organic and inorganic nitrogen compounds affect the growth of bloom forming cyanobacteria found in coastal North Carolina. Nitrogen addition experiments were conducted where Dolichospermum and

Anabaenopsis isolates (N-fixing cyanobacteria) were supplied with ammonium, spermidine, a combination of both compounds, or no added nitrogen source. Experimental results indicate that ammonium addition leads to highest growth rates in both strains, while spermidine addition in the presence or absence of ammonium results in the inhibition of Dolichospermum and Anabaenopsis growth. These unexpected results contrast with those from prior experiments with Anabaena isolates and motivated additional experiments to determine the concentrations of spermidine that inhibit growth. Results of concentration gradient addition experiments and genome sequencing (identifying the isolates further) will be presented. Results of this project indicate that spermidine, unlike other nitrogen compounds, is an inhibitory compound for multiple N-fixing cyanobacteria, and potentially has a role in natural control of cyanobacterial blooms and may be useful as a chemical treatment for mitigating N-fixing blooms.

Nature of Peer Feedback Among Mathematics Teachers During Instructional Rounds

Author(s): **Snehanshu Samanta**
Mentor(s): **Dr. Erin Krupa, Katie Burkett**
Poster: **56**

The objective of this research study was to analyse the nature of feedback given among mathematics teachers participating in instructional rounds as part of a professional development program. Middle school mathematics teachers worked in groups of five or six to observe and offer each other feedback during classroom visits. Teachers visited each other in the classrooms, writing feedback on forms during the observations and offering oral feedback during debrief meetings after the observations. This paper characterizes the feedback teachers gave to one another during the debrief meetings. 48 teachers participated in the instructional rounds and there were 1,802 unique feedback reviews the teachers gave one another. The results showed that teachers' feedback was largely descriptive and focused on instructional, rather than mathematical elements of the lessons.

Digitization of historical Dyes from the Max Weaver Dye Library

Author(s): **David Speckhart**
Mentor(s): **Dr. Nelson R. Vinueza**
Poster: **57**

Throughout history, dyes have been crucial to various industries, including textiles, cosmetics, medicine, and food. Among these, the textile industry has been the largest consumer of dyes. Eastman Chemical Company donated the Max Weaver Dye Library to the , which comprises a staggering 100,000 powdered dyes, mainly manufactured over thirty years, starting in the 1950s. These dyes are an invaluable resource for research, as most are not commercially used. This library contains unique information that can help us better understand dye properties

and characteristics. With the introduction of modern analysis techniques, including mass spectrometry, this new information can be used to discover new applications of dyes. To facilitate an easier way to analyze their properties and characteristics, I am currently digitalizing the dyed fabric samples of these dyes. This digitization is essential as it preserves historical information that would have been forgotten without this library. The information contained within has the potential to benefit many industries, including forensics and medicine.

Presence of PFAS in Rocky Branch Creek behind Carmichael Gymnasium

Author(s): **Morgan Starnes, Sophia Cunningham, Coy Turnage, Meredith Motamen**
Mentor(s): **Dr. Elizabeth Guthrie Nichols**
Poster: **58**

On February 8, 2024, an area of Rocky Branch Creek on NC State University's campus was sampled to determine the presence of PFAS in surface water. The designated sampling area extended from Dan Allen Drive to Morrill Drive behind Carmichael Gymnasium, parallel to Cates Avenue. Four surface water grab samples were collected from the creek mid-depth, following the procedure described in the DOE PFAS Sampling Guidance (2023). Surface water samples were taken from four different targeted locations located near stormwater outfalls at Miller Field, Carmichael Gymnasium's Pool, the Tennis Courts, and the Cates Plant. A field duplicate was taken at the Cates Plant outfall location. Additionally, there was one field blank of HPLC-grade water. Each sample was collected in an HDPE bottle, and sampling locations were monitored via a YSI-80 for pressure, temperature, dissolved oxygen, conductivity, and pH, which were reported on a Chain of Custody Form. Following field collection, the samples were stored on ice at about 4℃, and SPE extraction took place the following day by Statera Environmental Inc. with 24 mass-labeled PFAS for surrogate recovery. They were then submitted to METRIC at North Carolina State University for quantification. METRIC also created a matrix spike and a matrix spike duplicate. Samples were tested and quantified for 30 different PFAS compounds following an LC-MS method per USEPA Method 537.1. This is the first evaluation of PFAS in surface waters at NC State.

Enzymatic Treatment for Enhanced Plant-based Yogurt Mouthfeel and Texture

Author(s): **Luke Shawn Thomas, Addison Detig, Donald Miller, Justin Gilleland, Amara Samoura**
Mentor(s): **Palaniswamy Indumathi**
Poster: **59**

Plant-based alternatives to dairy products are becoming popular in today's market. While demand for these products is increasing, companies struggle with the decreased functionality of plant-based protein in mimicking the mouthfeel and texture characteristics of dairy products. Pea protein, oat flour, an enzyme (Viscozyme®L, Novonesis), water, and

coconut oil were used at various concentrations to produce dairy-like products. Water, oat flour, and pea protein were combined in a Thermomix TM6 (Vorwerk). The mixture was hydrated for 15 minutes at 50°C using speed 3. The enzyme was added to the mixture and agitated in the Thermomix for 60 minutes at 50℃ on speed 3. The amount of enzyme was determined based on the amount of oat flour added. The heat was increased to 90°C with agitation for 10 minutes at speed 4 to deactivate the enzyme. The mixture was transferred to an ice bath and cooled to 30°C. Glucono-delta-lactone was then added to achieve a final pH of 4.3-4.5. Preliminary trials were conducted to test different ratios of pea protein isolate (PPI) to oat flour (OF). The ratios used were 50:50 PPI:OF, 75:25 PPI:OF, and 25:75 PPI:OF. The first trials resulted in a very thick consistency, but doubling the amount of water added created a consistency more similar to dairy yogurt. Three ratios ranging from 50:50 PPI:OF to 75:25 PPI:OF will be tested with a Brookfield viscometer and sensory analysis to determine the optimal ratio to mimic dairy.

Fabrication of Nanofibrous Aerogels for Multifunctional Applications

Author(s): **Sara Trimech**
Mentor(s): **Dr. Saad Khan, Muhammed Ziauddin Ahmad Ebrahim**
Poster: **60**

Aerogels are highly porous, low-density 3-D structures with a large surface area, enabling their use in capturing various pollutants, from carbon dioxide to heavy metals. This study focuses on the fabrication and characterization of aerogels synthesized via electrospinning, homogenization, and freeze-drying techniques. The primary objective is to investigate the feasibility of utilizing these aerogels for the absorption of per- and polyfluoroalkyl substances (PFAS). PFAS are chemi that have been used worldwide in many products, only to be found detrimental to human health.
The aerogel fabrication processes involve electrospinning polymer solutions followed by homogenization. Subsequent freeze-drying ensures the removal of solvent, resulting in aerogel formation. Furthermore, the investigation will involve optimizing polymerization conditions with respect to monomers and reaction time. The investigation extends to the characterization of the aerogels and testing their performance as piezoresistive sensors. Moreover, the study will ultimately follow the absorption capabilities of the aerogels concerning PFAS due to the choice of cationic polymer being used to remove negatively charged PFAS molecules, exploring potential applications in PFAS removal. This research contributes to the advancement of aerogel technology for multifunctional applications, including pressure-sensitive absorption scenarios, encouraging innovations in numerous fields such as material science, environmental engineering, and more

Genomic Exploration of Challenging-to-Culture Blueberry Varieties

Author(s): **Ellen White**
Mentor(s): **Felicia Shepard**
Poster: **61**

Micropropagation of blueberries through tissue culture is a potential way to advance trait development which is difficult to achieve with traditional breeding. The lack of a standardized regeneration protocol has deterred growers from utilizing this method for difficult-to-culture varieties. Research has been conducted to explore how morphogenic genes like BABY BOOM (BBM) and WUSHEL (WUS) impact regeneration. BBM exhibits promise in tackling regeneration and transformation efficiency challenges, while WUS is critical for shoot regeneration and early shoot formation. Our team has identified the locations of WUS and BBM genes in blueberry transcriptome data and designed primers for PCR and sequencing. We have isolated the BBM and WUS genes from 'Pinnacle' and 'NC 4499'; both of which varieties lack transcriptome data. These two varieties were selected because they show resistance to tissue culture propagation despite carrying BBM or WUS genes. In order to explore this topic further, we are extracting DNA from different varieties of blueberry, performing PCR, running sequencing, and conducting analysis. This research will allow us to understand the genetic differences between harder to propagate blueberry varieties and explore morphogenic genes BBM and WUS within these plants. Our research will then allow us to better understand the role of these genes in regeneration and apply what we learn in cultivars that are harder to culture.

Mutation of UGDH Aspartate 379 Eliminates Enzyme Activity and Induces Developmental Dysfunction

Author(s): **Hali Harwood**
Mentor(s): **Dr. Melanie Simpson, Dr. Brenna Zimmer**
Poster: **62**

UDP-glucose dehydrogenase (UGDH) is an essential enzyme that catalyzes the NAD+ dependent conversion of UDP-glucose to UDP-glucuronate, the precursor for biosynthesis of proteoglycans and hyaluronan. Missense mutations in the UGDH gene can cause epileptic encephalopathy. A novel biallelic UGDH mutation (D379N) was identified in a patient with developmental disease. We analyzed patient fibroblasts and found UGDH activity was absent in the patient bearing the D379N mutation relative to patients with wild type (WT) UGDH. Therefore, we generated the D379N mutant protein in vitro to characterize the structural and functional impacts of the D379N clinical mutation. Steady state kinetic measurements of purified recombinant human UGDH revealed that UGDH D379N had significantly reduced affinity for the substrate UDP-glucose relative to the WT UGDH enzyme. UGDH is maximally active in a homohexameric state so we compared the quaternary structure of UGDH D379N. As an apoenzyme, D379N was found in both the dimeric and hexameric states, with the majority in the dimeric state, in contrast to the majority hexamer exhibited by WT UGDH. In

the presence of substrate, UGDH D379N shifted to the hexameric state similarly to WT UGDH, but nonetheless retained partial dimeric assembly, consistent with reduced binding to its substrate. No significant differences were observed between WT and D379N thermostability, so the reduced substrate binding is not attributable to a change in intrinsic stability of the enzyme. This is the first example of a UGDH point mutation that eliminates enzymatic activity but does not impact expression of the protein in the patient.

Preliminary Comparisons of Water Quality Between Waterways Within the Walnut Creek Watershed

Author(s): **Dominic Zecca, Andrea Putri**
Mentor(s): **Dr. Angela Allen, Dr. Solomon Ghezehei**
Poster: **63**

The impact of aging water infrastructures on urban stream water quality is under investigation, focusing on two specific waterways. One is situated within the Centennial campus at NC State University (CC), where riparian coverage loss due to stormwater runoff and surrounding buildings is notable. The second waterway is located at the Raleigh Wetland Center (RWW), approximately 3 miles away from CC. RWW faces challenges such as poor water quality stemming from aging water infrastructure, erosion, and flooding. The differences between the sites were mainly due to the differences in the non-point sources of pollution. Our initial water quality parameter data (pH, conductivity, dissolved oxygen, and nutrients) has shown fluctuations in the parameter values in RWW while more steady changes in the CC creek. The objectives of this study are to develop reference indices for freshwater quality parameters from CC and use the reference indices to compare data of the same parameters from RWW waterways before and after the replacement of the sewer pipes. We will use existing water quality data from RWW before and after pipe replacement and continue to monitor both waterways. The result of this study will be vital to understanding the effectiveness of replacing aging sewer pipes to enhance the water quality in urban waterways. Furthermore, study findings are expected to highlight the importance of maintaining and repairing the water infrastructures in the watersheds and have important implications for policy and budget allocation of municipalities in the fast-changing world.

Investigating Relationships Between Antibody Repertoire and Country of Residence

Author(s): **Gabriella Alexander**
Mentor(s): **Dr. Kelly Meiklejohn**
Poster: **1**

Antibodies are proteins produced by differentiated B-cells called plasma cells. Antibodies function to protect the immune system by responding to future exposures of the antigens they bind to. Antibodies can be generated independently, through natural exposure and recovery from an antigen, or through inducing immunological memory via a vaccine. The use of vaccination has been widely implemented in global healthcare systems, with some vaccines being requisites for living in a particular region. This poses the question of whether an individual's country of residence can be estimated based on their antibody repertoire. The goal of this research is to statistically assess whether there is a correlation between an individual's antibody repertoire and the region they currently reside. Using public data from Adaptive Biotechnologies, samples from existing studies that met two criteria were identified: 1) sequence data available from the T-cell receptor beta subunit (TCRB locus), given it contains a variable region which provides antibody diversity, and 2) collection locality was noted, specifically targeting patients from countries in North America, Europe, Asia, Australia, and Africa. We will present initial non-metric multidimensional plots and assess possible relationships between the presence/absence of specific antibody rearrangements as related to country of residence.

Ex vivo Analysis of Cell Migration in Partial ACL Tear Wound Model

Author(s): **Adrian Aligwekwe**
Mentor(s): **Dr. Ashley Brown, Grant Scull**
Poster: **2**

Anterior cruciate ligament tear is an enervative injury that occurs in about 350,000 individuals in the United States each year. The ACL has limited healing capacity due to the joint's highly degradative synovial fluid environment that inhibits fibrin scaffold formation. The current clinical standard of care for many active patients is a surgical intervention to restore knee stability, namely ACL reconstruction using soft tissue grafts. Yet, 30%–80% of patients develop osteoarthritis 10–15 years post-injury. There is a need to establish a native tissue-preserving treatment that prevents prolonged inflammation and scarring. Platelet-like particles (PLPs) are synthetic particles conjugated to a fibrin-binding antibody that has shown in previous experiments the ability to promote fibrin scaffold formation in synovial fluid in vitro. This study aimed to determine the ability of an injectable treatment of PLPs and

exogenous clotting factors to promote fibrin scaffold formation and enhance cell migration in the ligament in an ex vivo model of partial ACL tear in pigs. ACLs were extracted from 3-month-old pigs, and partial tears were created with a 4 mm biopsy punch. Treatments comprised PLPs combined with thrombin and fibrinogen in synovial fluid to mimic the knee femorotibial joint environment. Treatments were injected into voids and incubated for 60 min. ACLs were then placed under tension via a 3D-printed clamping mechanism. Hoechst Stain was applied to monitor cell migration into the scaffolds over 7 days via fluorescent microscopy.

Enzyme Solutions for Improved Oat Milk

Author(s): **Kirstin Brown, Maddie Brenner, Lucy Caldwell, Abdullah-Ahmed Abdelkader, Jonathan Gallagher**
Mentor(s): **Peter Rizzo, Dr. Fernanda Santos**
Poster: **3**

Oat milk has increased in popularity in recent years due to its ability to mimic the creamy texture of dairy milk particularly in coffee based applications. However, there are shortcomings of oat milk including its emulsion stability, causing oils to separate, and protein stability, leading to protein aggregation in acidic environments (pH = 5), such as coffee. To mitigate this, buffer salts such as dipotassium phosphate are often included in commercial oat milk products but these ingredients are listed as chemical names on the ingredient list, which are known to cause consumer hesitation when making a purchasing decision. Proteases, a type of enzyme, have the potential to enhance traditional buffer salts to improve emulsion and protein stability. They also have the added benefit of being processing aids, which do not need to be listed on the nutritional label. The objective of this study was to determine if proteases can effectively improve the emulsion and protein stability of oat milk. Five proteases were introduced to formulated oat milk (water, oat flour, canola oil, salt, liquefaction amylase enzyme). Each oat milk was tested for particle size, protein content, solids/fat content, and degree of hydrolysis. Microscopic images were taken using a confocal microscope. Measurements were taken after initial production and seven weeks after at refrigerated temperatures. These findings will contribute to the understanding of proteases' impact in oat milk and identifying the best performing enzyme with respect to protein stability and oil emulsification.

Radiopharmaceutical Treatment Strategy for Glioblastoma

Author(s): **Sophia Burgess**
Mentor(s): **Dr. Johnathan Lindsey**
Poster: **4**

Glioblastoma multiforme (GBM) is the most common and aggressive form of glioma, with a median survival of 14 months post-diagnosis. Present therapeutic strategies involve surgical removal of solid tumors from the brain followed by systemic delivery of chemotherapeutic drugs and external beam radiation therapy. Despite their efficacy in removing visible tumor masses on MRI scans, these interventions inevitably fall short in eradicating the metastases that spread throughout the entirety of a glioma-afflicted brain. Indeed, GBM is now recognized as a whole-brain disease.
A major obstacle in developing effective treatment methods derives from the selective permeability of the Blood Brain Barrier (BBB), a series of endothelial cells that limit the entry of certain molecules into the brain including potentially therapeutic compounds. Targeted therapies appear to be a promising avenue for GBM treatment; however, they face considerable challenges due to the impermeability of the BBB.
Radionuclide treatment has emerged as a form of targeted therapy that involves assembling a tripartite structure comprising a cancer-targeting agent (CTA), a linker, and a radionuclide carrier (RC). This design minimizes molecular weight and may facilitate BBB permeability. The design of this treatment approach is simple. A present challenge is to identify suitable cancer-targeting agents that cross the BBB.

Effects of Multiple Polymer Degradation Pathways within Compost Conditions

Author(s): **Gray Calaway**
Mentor(s): **Dr. Julio Terán, Dr. Olgha Qaqish**
Poster: **5**

Polymer materials' production, usage and further disposal have been exponentially increasing for the last 30 years. Consequently, its disposal and interactions with the environment have been discussed extensively and continues to be an ongoing topic leading to research initiatives worldwide. Composting techniques have been integrated throughout agricultural practices for thousands of years. The integration of polymer materials and compost has been evaluated extensively, however, most of this literature focuses on a single type of polymer degradation mechanism. This in particular deviates from the actual usage of polymer materials which undergo a variety of environments and process conditions.
This work aims to evaluate the extent of degradation of thermoplastic materials surfaces when they are subject to different degradation conditions (light, thermal, and mechanical) as a combination. Then, this integration will be applied into composting conditions available at NC State facilities. A chemical, physical and topological evaluation of the polymer surfaces will accompany these samples and conditions.

This knowledge will directly impact our decisions towards how and when to remove polymer materials within compost, their impact onto soil quality, and safety considerations to use composed exposed to polymers.

Exploring Molecular Dynamics: Leveraging Visual Molecular Dynamics for Simulation Analysis

Author(s): **Meggie Cangu**
Mentor(s): **Dr. Xingcheng Lin**
Poster: **6**

Visual Molecular Dynamics (VMD) has emerged as a powerful tool in computational biophysics for investigating complex molecular systems. This abstract delves into the application of VMD in simulating and analyzing biomolecular structures and dynamics. Through its intuitive interface and robust visualization capabilities, VMD facilitates the exploration of molecular structures, trajectories, and interactions at various scales. Its integration with molecular dynamics simulations enables researchers to observe dynamic behaviors, such as protein folding, ligand binding, and membrane dynamics, providing valuable insights into biological processes. Furthermore, VMD's extensibility through scripting languages allows for customized analyses and the integration of advanced algorithms, enhancing its versatility in research endeavors. This abstract highlights the significance of VMD as a valuable tool for elucidating molecular mechanisms and guiding experimental investigations in diverse fields such as drug discovery, protein engineering, and materials science.

Screening the Optical Properties of Dyes for Application in Aptamer-Based Dye-Displacement Assays.

Author(s): **Gabriel Castro**
Mentor(s): **Dr. Yi Xiao**
Poster: **7**

Aptamers are short single-stranded oligonucleotides that can be isolated to bind with high affinity to small molecules, proteins, and ions via Systematic Evolution of Ligands by Exponential Enrichment (SELEX). Of the various applications of aptamers as biosensors, dye-displacement assays have high potential due to their high sensitivity, low cost, and simple execution. Dye-displacement works through the initial mixing of an aptamer and small organic dye molecule. This results in a non-covalent aptamer-dye complex with the aptamer bound to the monomer of a dye. With the addition of target, aptamer specifically binds to the target and the dye monomer is displaced into solution to form aggregate(s). The concentration of the target can be quantified by measuring the absorbance of the monomer and aggregate forms of the dye. For practical dye-displacement assays, the dye's monomer

and aggregate forms must have different absorbance properties (i.e., peak absorbance wavelength). Ideal dyes for this assay have a large peak wavelength shift (causing a strong color contrast) between monomer and aggregates. Currently, the sensitivity of dye-displacement assays are limited by small monomer-aggregate dye peak shifts and low molar absorptivity. The purpose of this project is to screen the optical properties of dyes acquired from the Max Weaver Dye Library to identify potential candidates with a large absorbance shift between organic solvent (where the dye is a monomer) and aqueous buffer (where the dye aggregates). Optimal dyes can be used to develop dye-displacement assays amenable for practical use, for instance, in forensic and medical diagnostic applications.

Utilizing Liquid Metal and Red Phosphorus in Energy Storage Technology

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

There is an increasing need for energy storage solutions like batteries to facilitate the transition from fossil fuels to intermittent renewable energy sources like wind and solar energy. We aim to fabricate high capacity and long life-time lithium-ion batteries (LIBs) by incorporating Red P (RP) nanoparticles with eutectic gallium-indium (EGaIn) as the negative electrode in lithium-ion batteries (LIBs). We are interested in RP because of its extremely high theoretical capacity of 2596 mAh/g, low cost, stability in air, and low toxicity. For comparison, graphite is used in commercial LIB anodes, and only has a capacity of 372 mAh/g. However, RP has an inherently low electrical conductivity. Additionally, RP has a low life span due to the delamination of red phosphorus off the electrode during cycling. This delamination occurs due to RP's large volume expansion (~300%) during charge and discharge. We hypothesize that EGaIn can act as a "self-healing" agent by maintaining electrical contact with delaminated RP particles. Since EGaIn is liquid at room temperature, we speculate that it will fill in any defects that occur due to volume expansion and maintain electrical contact with any delaminated RP. In this sense, EGaIn can act as a liquid metal buffer to prevent the delamination of RP particles from our anode, increasing the life-time of our cells. In our work, we show how the inclusion of EGaIn improves the capacity retention of RP for lithium over multiple charge discharge cycles.

Self Attention Graph Exporter for Causal Relationship Analysis in Biological Systems

Author(s): **Andrew Combs**
Mentor(s): **Dr. Ross Sozzani**
Poster: **9**

From economics to neurology, countless fields use the analysis of causal relationships between nodes to gain better understandings of their work. Though extremely important, causal relation networks are difficult to construct, and often require lots of manual labor or reliance on statistical inference. In this paper, we introduce a transformer-based pipeline to infer causal relationship graphs from spatiotemporal data. We utilize architecture from sequence-to-sequence transformers like BERT, data processing techniques from time series forecasting models, and learning parameters from vision transformers. The proposed pipeline is completely unsupervised and provides a metric to justify the accuracy of networks using pairwise reconstruction loss. In addition to finding causal relations, the nature of the model allows it to infer missing genes in sparse datasets which could be used to fill in missing data in low throughput datasets. We base the model on the construction of gene regulatory networks (GRNs) from the Arabidopsis Thaliana model and demonstrate its efficacy on the BEELINE project for single-cell RNA sequencing data.

Design and Fabrication of a High Aspect Ratio Sensor for Semiconductor Manufacturing

Author(s): **Natalie Coon, Alexandra Peevy, Nathaniel Rogalski**
Mentor(s): **Dr. Steven Shannon**
Poster: **10**

One of the most notable applications of plasma etching in the semiconductor industry is the creation of high aspect ratio (HAR) features, which are deep and narrow structures in a substrate. Plasma etching allows for highly selective and precise cuts crucial for the manufacturing of microelectronic components. During the etch process, charged particles can build up on the sidewalls of the HAR features, altering the trajectory of the etching ions and causing undesirable feature distortion. Even small effects of this type may compromise the functionality of a product, which is detrimental in an industry that advances quickly and requires fast monetary return on fabrication facility investment. We propose a novel sensor design built on a silicon wafer to measure the sidewall charge accumulation on HAR features during a simulated etching process, which may be used to investigate mitigation of charge accumulation in the feature. The sensor will consist of alternating layers of dielectric and aluminum with a grid of approximately 10:1 aspect ratio vias. The aluminum layers will be patterned into rings, half of which encircle vias at several depths, with the other half at the same depths without vias. Each ring set at each depth will be connected and wired out of the wafer, where the differential voltage will be measured and calibrated to reflect the accumulated sidewall charge. An attempt will be made to fabricate this sensor at NCSU's

Nanofabrication Facility, and if successful, the sensor will be tested using plasma reactors at Burlington Nuclear Laboratories.

Atomistic Approach to Analyze Metal-Coordinated Peptide Amphiphiles with Different Tail Architectures

Author(s): **Victoria Crunkleton**
Mentor(s): **Dr. Yaroslava Yingling**
Poster: **11**

Stimuli-responsive self-assembly in amphiphiles has a strong potential in drug and gene delivery applications but requires the development of tunable, resilient structures that are stable in ambient conditions. Utilizing histidine-functionalized peptides and transition metal ions in self-assembling amphiphile systems can lead to ranges of morphological and mechanistic responses by inducing charge transfer and altering bond characteristics. Additionally, by altering the hydrophobic tail structure of the amphiphiles can undergo different morphological changes in the presence of an excess of transition metal ions. Understanding this phenomenon will provide insight into controlling self-assembled structure morphology for fabrication and tailoring amphiphiles for stable drug delivery vehicles with satisfactory cargo retention and responses to environmental stimuli. This project utilizes molecular dynamics simulations to investigate the self-assembled morphologies of different hydrophobic tails (polymers and fatty acids) in the presence of divalent transition metal ions (Zn). Results indicate that both systems reached stable configurations independent of Zn(II), with the fatty acid-peptide system exhibiting greater stability compared to the polymer-peptide system. The varied stability between compositionally different amphiphiles suggests potential morphological changes upon interacting with Zn(II). Ultimately, these findings highlight the potential of stable and morphologically adaptable histidine-functionalized peptide-based self-assembled structures for use in therapeutic applications.

Applications of Microfluidic Organ-on-chip Devices

Author(s): **Shania Dantes**
Mentor(s): **Dr. Sarah Shelton**
Poster: **12**

Microfluidic organ-on-chip devices are useful tools for studying the effectiveness of different treatments and drugs due to their ability to facilitate 3D multicellular culture. These devices allow us to replicate complex physiology in the lab. This research project begins with the design and fabrication of three-channeled microfluidic organ-on-chip devices that will be used to create complex blood vessel models. These 3D blood vessel models will later be used in different experiments to explore angiogenesis and vascular transport. In this research, a mold was used to create the individual microfluidic devices using Polydimethylsiloxane

(PDMS). These three-channel devices have two media channels with fluidic outlets created with a biopsy punch and are parallel to a central region for hydrogel loading. The channels are separated by partial walls which provide the surface tension necessary to constrain a fibrinogen solution as it polymerizes. Ongoing research will use these models to study angiogenesis, by applying endothelial cells to the fibrin interface with the media channel. We will explore differences due to factors such as fibroblasts, tumor spheroids, novel therapeutics, etc. These studies will help reveal the biology of mixed cell populations, specifically how blood vessels are formed and respond to different stimuli. Microfluidic devices enable us to create complex physiological models of processes found in the human body which will be extremely helpful in the development of treatments and drugs.

Upstream Stimulatory Factor's Impact on Etoposide Resistance

Author(s): **Rachel Edwards**
Mentor(s): **Dr. Michael Sikes, Lisa Metzger**
Poster: **13**

Every day, America reports 5,250 new cases of invasive cancer, amounting to 1,918,030 cancer diagnoses annually. While major advances in prognostics have been made, the disease remains complex due to its aggressive proliferation in spite of treatment. Understanding the relationship between mutations in cancer cells and their impact on standardized treatments is crucial for improving patient survival. The DNA damage response, which is central to cancer therapy, is driven by transcription factors. Therefore, dysfunctions in these factors lead to treatment resistance. Our laboratory has observed double-stranded DNA breaks (DSBs) regulate the activity of the transcription factor, Upstream Stimulatory Factor (USF), and USF binds to the promoters of multiple genes essential to DNA repair and cell death. The project aims to determine whether loss of USF binding affects a cancer cell's sensitivity to the chemotherapeutic drug etoposide, a topoisomerase inhibitor that kills cells by inducing DSBs. We used RNA interference to suppress the expression of USF1, in mouse B lymphoma cell lines, M12 and CH12, and compared their viability following etoposide exposure. USF1 knockdown cells showed greater resistance etoposide compared to control cells, suggesting a link between USF deficiency and treatment resistance. Currently, we are measuring the expression of USF target genes involved in the DSB response to identify pathways associated with increased etoposide resistance. These preliminary studies suggest USF deficiency is a novel indicator of etoposide resistance. Understanding its role in the DNA damage response will guide cancer treatment strategies to enhance treatment effectiveness and patient survival.

Modifying Carminic Acid to Enhance its Hydrophobicity for Waterless Textile Dyeing

Author(s): **Rachel Falkowski**
Mentor(s): **Dr. Tova Williams, Michele Schmidt**
Poster: **14**

The textile industry significantly contributes to global wastewater, with dyeing processes alone consuming over one trillion gallons of water annually. These processes release various chemi, including petroleum-derived dyes, into waterways, exacerbating environmental impacts. Considering the longstanding concerns associated with these processes, the textile industry has been motivated to transition towards more sustainable dyeing practices, including the adoption of natural dyes and waterless dyeing processes. Thus, of interest was to explore modifying the structure of carminic acid, a natural anthraquinone dye derived from the cochineal insect commonly used in food, cosmetics, and textiles, to enhance its suitability for application to polyester (PET) using supercritical carbon dioxide (scCO2), a waterless dyeing process. Indeed, scCO2 dyeing is practical for dyeing fibers with hydrophobic dyes. Consequently, carminic acid was modified via acetylation and pivaloylation to increase its hydrophobicity and suitability for application to PET using scCO2. The modification of the dye's molecular structure post-esterification proved successful using techniques such as High Resolution Mass Spectrometry (HRMS) and Nuclear Magnetic Resonance (NMR) spectroscopy. Additionally, the DOZN™ tool was utilized to evaluate greenness of the esterification processes. Results highlighted the esterifications incorporated bulky substituents acetyl or pivaloyl groups in carminic acid. The utilization of carminic acid, derived from a natural source, enhances the sustainability of the dyeing method while the process reduces water and energy consumption, ensuring dyeing without the need for chemical additives.

Brachial Plexus Birth Injury Effects on Biceps, Supraspinatus, and Subscapularis Spindle Morphology

Author(s): **Joshua Farrelly**
Mentor(s): **Dr. Jacqueline Cole, Kyla Bosh**
Poster: **15**

Brachial plexus birth injury (BPBI) is a neuromuscular injury that occurs in 1 out of every 1,000 live births, often causing lifelong shoulder muscle paralysis, reduced range of motion, and musculoskeletal deformities. Deficits depend on severity and location of injury (preganglionic vs. postganglionic), resulting in different effects on functional mobility and neuromusculoskeletal signaling that disrupt muscle and bone development. Muscle spindles are stretch sensory organs located within skeletal muscle, responsible for afferent signaling pathways, and can be denervated following injury. We hypothesize muscle spindle quantity will be lower in injured limbs and higher in uninjured limbs to compensate for injured-limb muscle function.

Sprague Dawley rats underwent surgery on one forelimb at 3-6 days postnatally: preganglionic neurectomy (n=4), postganglionic neurectomy (n=5), forelimb disarticulation (n=7), or sham (n=6). Biceps, supraspinatus, and subscapularis muscles were dissected for injured and uninjured limbs at 2, 3, 4, or 16 weeks post-injury, snap-frozen, cryosectioned, and stained using hematoxylin and eosin. Muscle sections were imaged, and muscle spindles were counted. Limb comparisons were made using paired t-tests, and group comparisons were performed with Kruskal-Wallis tests (GraphPad Prism, α=0.05).
Analyses are ongoing for progressive changes in muscle spindles following BPBI. Preliminary results at 3 and 4 weeks indicate that muscle spindle quantity tended to decrease over time in injured biceps and supraspinatus muscles for the postganglionic group ($p<0.1$). This study is the first to characterize progressive changes to muscle spindles after BPBI injury, which may inform optimal timing for treatments.

Critical Thinking in College: Credit Hours Matter

Author(s): **Anna Fertin, Noora Moghazi, Dipali Shrivastava**
Mentor(s): **Dr. Daniel Gruehn, Caitlin Reynolds, Jen Fredette**
Poster: **16**

Critical thinking is thought to be a hallmark for the successful completion of a college degree. College should improve critical thinking with time, that is, critical thinking should increase with increased college credit hours. In the present study, we used the Psychological Critical Thinking Exam (PCTE) as a measure of critical thinking. The PCTE presents 14 research scenarios in which people make a conclusion. Participants indicated if there was a problem with the researcher's conclusion and what the problem was. These responses were open-ended. Despite its name, the scenarios are not unique to Psychology; they cover common fallacies (e.g., control group, third-variable problem) in research contexts applicable to many research-focused disciplines. In the present study, we collected data from 614 students across majors (57.9% women, 42.1% men). Students were 206 freshmen, 299 sophomores, and 109 juniors. Two coders rated each response from 0 to 3 (0 = no problem recognized, 1 = a problem recognized but not identified, 2 = problem identified but with some qualification, 3 = problem correctly identified). Any disagreements were discussed and resolved to reach consensus. Total scores could range between 0 and 42. Consistent with our expectation, students performed significantly better on the PCTE with increasing earned credits in college. These effects were rather small, suggesting that other sources of interindividual differences (e.g., classes taken, academic stress and support, or socioeconomic status) might be more relevant for critical thinking.

Probabilistic Genotyping Software Analysis using Mixed Canine STR Profiles

Author(s): **Natalie Flack**
Mentor(s): **Dr. Kelly Meiklejohn, Teresa M Tiedge**
Poster: **17**

Probabilistic genotyping (PG) has been utilized regularly in forensic cases to interpret and analyze mixed human STR profiles, however this method of analysis can also be beneficial to companion animal related crimes. Many times, animal abuse or dog fighting cruelty cases involve the collection of mixed canine STR profiles where PG software analysis could prove to be exceptionally beneficial. Using the PG software, MaSTR™ (SoftGenetics, State College, PA), multiple aspects were tested to examine how the program interpreted mixed canine STR profiles. The experiment can be broken into two testing stages: 1) Two-individual mixture analyses - 12 two-individual mixtures that demonstrated both high and low allele sharing were tested at 1:1, 1:2, 1:3, and 1:4 ratios. The impact on the known contributor's likelihood ratio (LR) was studied to determine if the software could confirm or refute the presence of the provided profiles. 2) Alternate position testing – 3 three-individual mixtures were tested at 1:1:1, 1:1:2, and 1:1:4 ratios to determine the impact on the LR when multiple profiles were placed in the alternate position. The results of these testing stages will be presented along with strategies for future testing involving identifying non-contributors to confirm true negatives versus false positives.

Validation of Flow Parameters in a Bone-Vascular Microdevice.

Author(s): **Carter Gamble**
Mentor(s): **Dr. Jacqueline Cole**
Poster: **18**

Our bone-on-chip platform fills a crucial gap in previous systems by integrating vasculature and mineralized bone to mimic bone-vascular interactions essential for bone metabolism. Leveraging computational fluid dynamics in COMSOL Multiphysics®, we optimized chamber dimensions and flow rates for device functionality. This study aims to validate these computational findings in physical devices.
Fabricated using polydimethylsiloxane (PDMS) in 3D-printed resin molds, our devices feature bone and endothelial cell chambers separated by a polycarbonate membrane, bonded with plasma treatment. To validate flow characteristics, we perfused 10-µm fluorescent beads through the assembled chambers and calculated bead velocity via fluorescence imaging. Derived shear stress along chamber walls was compared with predicted values for flow rates ranging from 100-1200 µL/min.
Predicted and experimental average velocities ranged from 0.011965 to 0.14337 m/s and 0.010526 to 0.116005 m/s across the specified range of flow rates, respectively. Shear stresses ranged from 0.785 to 9.524 dynes/cm2 and 0.75 to 9.07 dynes/cm2, respectively. Experimental data fell within 19% error for average velocity and 5% error for shear stress across all flow rates, indicating device functionality consistent with our computational model.

Despite minor discrepancies attributed to fabrication limitations and velocity measurement constraints, our data affirm the reliability of our device and support the accuracy of our COMSOL model. Future steps involve further validation using dextran diffusion and incorporating endothelial cells into the device.

Fractionation of OCC as a Pretreatment to Oxygen Delignification

Author(s): **Karla Garcia**
Mentor(s): **Dr. Richard Venditti, Autumn Reynolds**
Poster: **19**

Old corrugated containerboard (OCC) is a blend of two fiber types: unbleached softwood Kraft and semichemical hardwood pulps. Oxygen delignification is a treatment used to oxidize residual phenolic structures of lignocellulosic pulp while retaining a large portion of the structure of the carbohydrate components (hemicellulose and cellulose). This research uses a simple water-based screening system as a pretreatment to OCC pulp to enhance the outcome of subsequent oxygen delignification. In screening-based fractionation, OCC fibers were passed through an industry-standard Pulmac Masterscreen with a 0.004" slotted configuration. Screening and screen-based fractionation homogenized OCC pulp by: separating the fibers into two distinct fractions of OCC short and OCC long; enhancing cellulose of the pulp by an average of 6.1%; reducing inorganics/ ash and fines content of the pulp by at least 50% in all cases; redistributing the intrinsic viscosity and lignin content of the OCC long and short fractions compared to the untreated OCC. Results also showed that by performing screening and screening-based fractionation, the process yield of oxygen delignification at a 6% and 8% charge to pulp could be improved by 6.3% and 7.5%, respectively. Screening and screen-based fractionation could yield fractions of OCC that were more homogeneous with higher cellulose content and lower contaminants, thereby enhancing subsequent chemical processing by oxygen delignification.

Biodegradation and Composting Assessment of Biobased Materials

Author(s): **Kevin Garcia-Diaz**
Mentor(s): **Dr. Richard Venditti**
Poster: **20**

The research activities involve composting of biomaterials in controlled experiments. Dr. Richard Venditti, supervisor, and Jose Fernandez, mentor, have previously examined biomaterials composting and have set up equipment to do research on this topic. Inside an incubator at 60 °C, biomaterials were mixed with compost in containers with water reservoirs underneath to provide moisture while a continuous air flow was provided to the systems to maintain aerobic digestion. The samples, alongside blank vessels, were analyzed to compare and assess the compostability. The measurement method involves utilizing a Respirometer to collect and measure the carbon dioxide released during the composting process,

providing insights into environmental impacts. In addition to the biomaterials composting experiment, another ongoing experiment evaluates biomass biodegradation in air. In this experiment, each sample is placed inside desiccators with a potassium hydroxide carbon dioxide trap, and with a gauge that measures temperature and oxygen content. The measuring method involves determining the total carbon dioxide produced and trapped by the potassium hydroxide by titrations. This method allows the quantification of carbon dioxide emissions and the monitoring of oxygen during biodegradation, providing data to understand the overall biodegradation process.

Assessing Conifer Seed Viability and Gene Isolation for Autoluminescent Christmas Tree Development

Author(s): **Sophia Gay**
Mentor(s): **Dr. Justin Whitehill, Angela Chiang**
Poster: **21**

1,762 conifer seed samples in cold storage were evaluated for viability, as part of a larger project of genetically engineering and developing stable lines of autoluminescent Fraser fir trees. Seeds of a variety of species and collection dates were tested. Subsamples of 25 seeds each were weighed and recorded before and after drying in an oven for 48 hours at 60 degrees Celsius. This method allows us to calculate the percent moisture content, which can be used to predict seed viability. The ideal moisture content for conifer seeds for best viability in storage is between 6-12% (Danielson & Grabe, 1973). Because this range can vary by species and there were multiple species tested, for the purpose of analyzing this data a range of 5-15% was applied as the viable range. According to this metric, approximately 94% of the samples were in the viable range, which is a higher percentage than expected given that the majority of the samples are older than 10 years. Based on the findings of these viability tests, germination tests are planned to assess viability for use in the Christmas tree breeding program. Additionally, we performed PCR amplification of 4 fungal genes for insertion into a Fraser fir tissue culture line: Hisp, CPH, Luz, and HSP, fungal genes involved in autoluminescence (Kotolbay et al., 2018).

Microbial Inactivation by Atmospheric Pressure Plasma and Quality Effects on Shell Eggs

Author(s): **Justin Gilleland**
Mentor(s): **Dr. Deepti Salvi, Urvi Shah**
Poster: **22**

Plasma (the fourth state of matter) is shown to be an effective sanitizer against various food-borne pathogens and spoilage organisms. This study investigates novel plasma technology efficacy in sanitizing the surface of shell eggs and evaluates the egg quality characteristics post-plasma treatment. A plasma jet with compressed air was used to produce plasma at

high velocity through a rotating nozzle. Eggs were spot inoculated with Salmonella Typhimurium and placed under plasma at various times and distances (1-3 cm). Low treatment times (1, 2 min) at all distances provided low reductions of 0.3 - 0.7 log for S. Typhimurium while a 3 min, 3 cm treatment resulted in a 2.2 ± 0.5 log reduction. The efficacy of plasma-activated water (PAW) was also investigated. To produce PAW, plasma nozzle was arranged 6.5 cm above the surface of DI water and operated for 15 minutes. Eggs were dip inoculated with Klebsiella aerogenes. PAW (60 mL) was poured over eggs ensuring liquid covered the entire surface area. Reduction on egg and survival in spent PAW were calculated. Reduction caused by PAW and DI were insignificant between each other (1.2 ± 0.4, and 1.7 ± 0.3 log respectively) while chlorine (200 ppm) showed highest reduction (3.8± 0.2 log). K. aerogenes was unable to survive in spent PAW or chlorine post process (<0.5 log cfu/mL) but survived in spent DI (2.1 ±0.2 log cfu/mL). A shelf-life study on the plasma effects on cuticle is currently being conducted using a dye staining method and chromameter.

Mealybug Crawler Emergence Following Imidacloprid Application

Author(s): **Suzannah Hale**
Mentor(s): **Helena Jolly, Zachary Everson**
Poster: **23**

Citrus Mealybugs (Planococcus citri) are a common insect pest, posing a threat to ornamental and fruiting plants. Previous trials have examined mortality rates of mealybugs using systemic insecticides, such as imidacloprid. However, the emergence of the first instar nymphs, which are also known as crawlers, has not been measured following various rates of imidacloprid drench applications to infested plants. The goal of this project is to provide a better understanding of mealybug crawler emergence following drench applications of imidacloprid. To accomplish this goal, we set up a greenhouse research study using infested coleus plants and applying various rates of imidacloprid. Following this, we obtained an egg case from each plant 2, 3, 4, and 5 weeks after the application of the insecticide and counted the number of crawlers that emerged 1 and 2 weeks after we acquired the egg cases. We predicted that crawler emergence would be lower for the plants that were treated with a higher rate of imidacloprid. Although our results do not clearly reject or support our hypothesis, we were able to use this trial to further refine our methods and learn about mealybug biology. In the future, we aim to better understand how the rates of systemic insecticides influence the fecundity of mealybugs, which will be very useful for integrated pest management practices such as when and how much insecticide should be applied.

On-axis comparison of Conventional Beamforming for Phased Microphone Arrays

Author(s): **Jason Hoffman**
Mentor(s): **Dr. Kenneth Granlund**
Poster: **24**

A phased array microphone data acquisition system is developed using a proposed “Equi-Area array” design for microphone placement. This proposed microphone placement is theorized to improve the rejection performance over other conventional array designs. The design of the acquisition system includes the assembly of a physical microphone array, hardware implementation, software for logging and processing, and array calibration. This system is then used in sound localization applications. Acquired sound data is processed with conventional beamforming and used to verify the array's rejection performance and validate a new rejection performance-defining parameter, G.

Formation of N1, N2-Dialkylated Azapeptide Atropisomers via Sequential Alkylations of Azapeptides

Author(s): **Chris Howard**
Mentor(s): **Dr. Caroline Proulx, Molly Carter**
Poster: **25**

Peptides are natural compounds composed of amino acids. They are desirable drug compounds because they are the natural ligands for a variety of receptors. Peptidomimetics are similar to peptides but have slightly different properties due to their unnatural composition. Nonetheless, these peptidomimetics can act as drugs in essentially the same manner peptides do. Aza-peptides have the same general structure as the corresponding peptide, with the exception that an α-carbon is replaced with a nitrogen atom.1 This nitrogen substitution causes the loss of a stereocenter, however, when aza-peptides are dialkylated or monoalkylated at the azapeptoid nitrogen atropisomers can be synthesized. Atropisomers are stereoisomers formed due to added steric hinderance.2 The substitution of the aza residue can impact its selectivity and inhibition but this property has only been explored with methylated analogs.3 In this work, we synthesized atropisomeric disubstituted analogs of Cbz-Glycine-azaGlycine cyclohexylamine by sequential alkylation of the aza residue.4 With these compounds in hand we calculated the energy barrier of rotation for these analogs. This work with N-N atropisomers allows further understanding in an under researched area, providing new potential drug applications.

Alterations to Shoulder Muscles following Brachial Plexus Birth Injury

Author(s): **Brian Hua**
Mentor(s): **Dr. Jacqueline Cole, Kyla Bosh**
Poster: **26**

Brachial plexus birth injury (BPBI) occurs in about 1 out of every 1,000 human births, and damage to the neck or upper trunk during delivery frequently results in muscle weakness, paralysis, or decreased sensation in the upper limb. Previous rodent studies have shown reduced muscle mass and fiber length in the shoulder muscles at 8 weeks following injury, though injury progression and contributions of unloading to these changes remains unknown.
For this study, Sprague Dawley rats received one of four surgeries on one forelimb at postnatal day 3-6: preganglionic (n=12) or postganglionic (n=12) neurectomy, forelimb disarticulation (n=12), or sham (n=8). Animals were sacrificed between 2-16 weeks post-injury, and 11 muscles surrounding the glenohumeral joint were dissected from injured and uninjured limbs. Muscle mass and length were measured for each muscle, and ratios between limbs were calculated for each specimen. These ratios were compared across timepoints using paired t-tests, and across surgical groups with Kruskal-Wallis tests (α=0.05). Muscle mass and length were significantly altered in the injured vs. uninjured limbs for some muscles: spinal deltoid, supraspinatus, infraspinatus, and triceps ($p<0.05$). Preliminary results suggest that, at 8 and 16 weeks, muscle mass and length are significantly decreased in preganglionic and disarticulation groups compared to postganglionic and sham groups. Ratios of mass appeared to be affected to a greater extent than length in these timepoints. Results suggest that BPBI-related muscle weakness results from both muscular unloading and preganglionic nerve injury, and that weakness occurs as a result of reduced muscle size and mass.

Cognitive Effort and Attitudes About Artificial Intelligence (AI)

Author(s): **Sarah Isenhour, Colin Mayhorn, Caroline Wilbourne, Devon Oepen,**
Mentor(s): **Dr. Anna Maria Behler**
Poster: **27**

The rapid advancement of artificial intelligence (AI) technology in recent years has raised serious questions about AI's place in society. Previous research has established measures of willingness to engage with cognitively challenging tasks, as well as the perceived costs of and motivations for engaging with pro- and counterattitudinal information. However, these metrics and findings have not yet been applied to positive and negative attitudes about AI, or a person's willingness to engage with AI-related discourse. We used a behavioral economic cognitive discounting paradigm to assess if a person's attitude towards AI predicted their willingness to engage with news articles that aligned with or deviated from their beliefs. We hypothesized that participants with a more positive view of AI would report higher willingness to engage with pro-AI information, and participants with a more negative view of

AI would report lower willingness to engage with pro-AI information. The results indicated that AI attitudes were predictive of willingness to read articles about AI when controlling for Need for Cognition and Need for Argumentativeness. Our findings identified cognitive effort as a prejudiced process that has implications in our identities and attitudes, and introduced how cost can be used to understand counterattitudinal engagement.

Children's Peer Conflicts: A Participatory Science Observational Study

Author(s): **Gouri A. Kallambella**
Mentor(s): **Dr. Kelly Lynn Mulvey**
Poster: **29**

Prior research shows that children negotiate conflicts with their peers through prosocial and peaceful resolution (Spivak, 2015). However, there are limited studies on parental responses (Kramer, Perozynski, & Chung, 2003). This project used participatory science approaches, in which data was collected from introductory psychology students with limited training. This approach has been previously used primarily in biological and environmental fields. The present study seeks to understand how the type of conflict between children is related to the parental response time to conflict and the type of resolution. Participant data comes from observed conflicts in the community (i.e., public parks). Students in introductory psychology courses collected data at the undergraduate level, where they received brief ethics training and basic instructions on observational data collection. They were instructed to observe and record conflicts between children in public spaces. The participatory scientists then applied a pre-set coding scheme to record their observations. Trained researchers compiled and cleaned the data before analyses were run. ANOVA analyses revealed that parents responded more quickly to conflicts such as hitting than conflicts such as those surrounding gameplay. Additionally, chi-squared analyses revealed that resolutions differed depending on the type of conflict observed, the participants' age group, and their gender. These analyses also revealed a correlation between the gender and age of participants and the type of conflicts they were involved in. Our findings contribute to the literature on conflicts between children and offers initial support for the contributions of participatory science within psychological and developmental research.

In Vivo Efficacy of Fibrin-Specific Nanogels in a Rat Model of Sepsis-Induced DIC

Author(s): **Arushee Kamra**
Mentor(s): **Dr. Ashley C. Brown, Halle J. Lutz**
Poster: **30**

Disseminated Intravascular Coagulation (DIC) is a coagulopathy characterized by both excessive clot formation and spontaneous bleeding. DIC presents a critical challenge in medicine due to its high morbidity and mortality rates. Current therapeutic strategies involve treating the underlying conditions associated with DIC. Additional therapies, such as

administering fibrinolytics or anticoagulants systemically, have been used but are controversial due to their inherent risks of causing off-target bleeding. This study aims to evaluate the efficacy and safety of a targeted therapeutic approach using fibrin-specific nanogels (FSNs) to deliver tissue-type plasminogen activator (tPA) and antithrombin-3 (AT3) at sites of clotting to address DIC in a rat model of sepsis-induced coagulopathy. Our hypothesis is that dual-loaded FSNs will accumulate at sites of clot formation and be excreted through the urine*. To do this, we synthesized FSNs, labeled the FSNs with a fluorescent tag, loaded FSNs with tPA and AT3, and characterized their loading efficiencies with ELISAs. We then used an in vivo imaging system to assess FSN biodistribution in male and female rats with sepsis-induced DIC, tPA and AT3 ELISAs to evaluate drug release in the rat plasma, and confocal imaging to quantify ex vivo clot structure and function. Dual-loaded FSNs have the potential to become a standard DIC treatment, offering a precise intervention with minimal side effects. Beyond DIC, the research provides a platform for targeted therapeutic approaches in other coagulopathies, wound healing, surgical hemostasis, and critical care medicine.

Reversible Electroporation in the Treatment of Cancer Cells In Vitro and In Vivo

Author(s): **Yearim Kim**
Mentor(s): **Dr. Mike Sano, Robert Williamson**
Poster: **31**

Our lab incorporates electroporation, which is the process of opening up the pores of cell membranes using electrical pulses and allowing movement of DNA molecules and chemotherapeutic drugs into cells. However, high amounts of pulses may cause muscle stimulations when treated in vivo. To avoid these side effects, our experiment focuses on customizing the doses, waveforms and rates of these pulses when delivering treatments, in search for the most optimal protocol. Our experiment focuses on reversible electroporation, unlike previous irreversible electroporation trials, because it also supports the recovery of cells post tumor removal.
Our high-throughput experiment uses a pulse generator that emits electrical pulses to HEK 293 and BJ cells through an electrical probe. The overarching goal of the experiment is to find the most optimal treatment on the cells that would result in the highest transfection rate. Our lab has also started treating black and white mice with the electroporation protocols to test in vivo. The results would help determine whether or not the results of the in vitro experiments are successfully translated in live organisms and would prove to be an effective cancer treatment option.

Effects of Electroporation Phenomena with 3D cell cultures

Author(s): **Annabelle Kim**
Mentor(s): **Dr. Laura Widman, Dr. Jim Yocom**
Poster: **32**

With our current research and experimentation using passaged cell cultures and development of gels, we have been experimenting how electroporation using different high-voltage pulses works with the cells. Electroporation, or electropermeabilization, is a technique in which an electrical field is applied to cells in order to increase the permeability of the cell membrane.With our weekly protocol of passaging, zapping, and imaging, we are in the midst of understanding what aspects we need to change in regards to our cell cultures and gels to get the transient cell membrane pores that we want. With the data that we are currently collecting, we are trying to develop a foundation that will be used towards other projects that will incorporate how we can use this technology to insert our own DNA/RNA into cells.

Structure and Optical Properties of $CrCl_3$ Thin Films

Author(s): **Robbie Leske**
Mentor(s): **Dr. Daniel Dougherty**
Poster: **33**

As technology continues to get smaller, it becomes increasingly important to find materials that can support nanoscale electronics. One class of materials are the transition metal trihalides which have the ability to form atomically thin monolayers of the material. The discovery of magnetic phenomena in 2017 in single layers of chromium triiodide caused interest in chromium trihalides to grow rapidly. Additionally, chromium trihalides have interesting optoelectronic properties potentially allowing them to be applicable to photovoltaics. Specifically, the absorption of light leads to the formation of excitons, which become coupled to molecular vibrations in the structure. This study characterizes the nature of these excitons via diffuse reflectance measurements at various temperatures with supporting data about the lifetime of these excitons via time resolved photoluminescence.

Increased Endocannabinoid Tone Modulates Zebrafish Adiposity and Development

Author(s): **Joseph Lewis**
Mentor(s): **Dr. Seth Kullman, Morgan Barnes**
Poster: **34**

Zebrafish (Danio rerio) grown under vitamin D deficient (VDD) conditions exhibit inhibited growth, proliferated adipose tissue, and a surge in endocannabinoid tone (1,2). The resulting phenotypes in the fish express shortened length and amplified ventral adiposity. Endocannabinoids, such as anandamide (AEA), have active roles in several neuroregulatory systems involved in appetite and metabolism which may contribute to the phenotype observed in VDD fish(3). This pilot experiment aimed to investigate the connection of increased endocannabinoid tone to VDD conditions further by exposing zebrafish to dietary AEA at two concentrations and endpoints (1 or 5 μM AEA at both adult and larval developmental periods). Histology and fluorescent imaging were used to visualize adiposity and standard length was employed to measure growth of the fish. 5 μM cohorts did not exhibit any significant differences from their controls, but analysis of adiposity and standard length after experimentation revealed significant adipose accumulation in adult female and larval groups of the 1 micromolar AEA concentration along with increased length. These findings may illuminate more of the connection between VDD and endocannabinoid tone. Future directions involve gene expression analysis via RT-qPCR and further histological analysis.

Synthesis of Spiro[2.3]hexan-4-ones using Diphenylcyclopropyl Sulfonium Salts and 1-sulfonylcyclopropanols as Cyclopropanone Equivalents

Author(s): **Allen MacMillan**
Mentor(s): **Dr. Vincent Lindsay, Joanna Muir**
Poster: **35**

Cyclopropanones constitute highly reactive substrates due to their important ring strain. Due to their kinetic instability, isolating cyclopropanones is extremely difficult as they are known to quickly polymerize at room temperature. In order to address this issue, our group employs stable 1-sulfonylcyclopropanols as surrogates to generate cyclopropanones in situ under basic conditions. Nucleophiles present in the medium are then capable of trapping the cyclopropanone intermediate, forming adducts susceptible to ring opening or ring expansion rearrangements. In this work, a diphenyl cyclopropyl sulfonium ylide is employed as nucleophile, and the resulting adducts spontaneously undergo a Meinwald rearrangement, affording spiro[2.3]hexan-4-ones highly relevant as bioisosteres in medicinal chemistry research. Importantly and since the rearrangement is stereospecific, this approach constitutes the first route to enantioenriched bioisosteres of this type.

Aggression in Animated Children's Media

Author(s): **Kennedy Martin-Jones, Nico Oriani, Tayler Cox, Ava Weddle,**
Mentor(s): **Dr. Anna Maria Behler**
Poster: **36**

In recent years, there has been significant concern over exposure to aggression via the media, particularly amongst children. Animated children's movies can be a major source of learned aggression for young children, serving as a potential vehicle for introducing them to various aggressive acts. In this ongoing content analysis, we are investigating the frequency and types of aggression in animated Disney films, and examining whether these factors have changed over the past several decades. Research assistants have been instructed to code 60 Disney movies for various acts of aggression, both physical and verbal, with two coders randomly assigned to each film so that interrater reliability can be assessed. In addition to measuring the aggressive acts themselves, we will examine whether there is a relationship between the amount of aggression in each film and how it is received by critics and audiences. By examining trends in aggression portrayal, this study provides a deeper understanding of children's animated media and lays the groundwork for future research.

Criminal Justice Policy Responses Toward the Opioid Epidemic

Author(s): **Seth Morton**
Mentor(s): **Dr. Steven Greene**
Poster: **37**

The effects of the opioid epidemic in the United States have had profound societal and economic impacts. While debates continue around drug legalization and decriminalization, synthetic opioids like fentanyl have become cemented in the American drug supply. Previous "War on Drugs" approaches aimed at preventing drug use have been criticized for negative societal effects. In response, policymakers have shifted toward "harm reduction" strategies, which have also begun to face criticism. Using criminal justice policy as a tool, it is crucial to prevent extreme aggregate harm from drug use while avoiding unintended consequences of overly punitive measures. This study reviews the current literature to identify appropriate criminal justice policy responses to the opiate epidemic. Findings suggest the need for certain and swift punishments for drug offenses while drawing on approaches from nations like Portugal that have successfully implemented desirable policies. Utilizing such evidence-based policies could improve public health outcomes and mitigate issues stemming from the prevalence of synthetic opioids.

Impact of Fructose Metabolism on Phospholipids in Immortalized Kupffer Cells

Author(s): **Ashley Mullen**
Mentor(s): **Dr. Arion Kennedy**
Poster: **38**

The increased prevalence of non-alcoholic fatty liver disease (NAFLD) in global populations correlates to the overconsumption of fructose in western diets. Many studies have linked the chronic consumption of high fructose amounts to increased liver inflammation, fibrosis, and de novo lipogenesis, accelerating the progression of NAFLD. Recent findings demonstrate that Kupffer cells (KC) metabolize fructose through glycolysis and the pentose phosphate pathway, leading to an anti-inflammatory and wound-healing phenotype. We aim to determine if fructose metabolism alters the lipid profile of KCs due to fructose increasing de novo lipogenesis in the liver. Using immortalized murine KC (IMKC), cells were treated with 25 mM fructose or glucose for 24 hours. Mass spectrometry lipidomics profiling was utilized to determine differences in producing 295 unique lipid species under these conditions. Only three lipid species had a statistically significant increased production under fructose treatment: phosphatidylserine (PS) – PS(18:1_16:0) – and phosphatidylethanolamine (PE) – PE(16:1_18:0), PE(22:6_18:1) – as determined by unpaired parametric T-tests using GraphPad. PS accelerates liver fibrosis and has many downstream effects on signaling pathways, including apoptosis. PE, a structural component of the lipid bilayer, is linked to increased liver fibrosis and altered apoptotic and inflammatory signals. When KCs are treated with fructose, there is a significant shift in the production of cellular membrane phospholipids PS and PE compared to glucose treatment. Future research will determine how fructose regulates the accumulation of PS and PE by investigating the activity of lipogenesis enzymes PS synthase and PS decarboxylase.

Development and Testing of a High-Throughput 90% Hydrogen Peroxide Catalyst Bed

Author(s): **Donovan Ngum, Nazar Rush**
Mentor(s): **Dr. James Braun**
Poster: **39**

High-test peroxide (HTP) is a preferred propellant for many propulsion and power applications. As a highly concentrated (85 to 98%) aqueous solution of hydrogen peroxide (H2O2), HTP's relatively low toxicity and lack of polluting decomposition products have earned it wide recognition as a "green" monopropellant. Furthermore, it is dense, storable, non-cryogenic, and its decomposition products enhance ignition and combustion efficiency when paired with various fuels for bipropellant applications. Despite these advantages, the design of catalyst beds for its rapid decomposition presents significant challenges. These complexities arise mainly from the lack of detailed, accessible historical research and a prevailing dependence on experimental methods for design optimization. This study evaluates a streamlined methodology for the development of a silver mesh catalyst bed

intended for decomposing 90% H_2O_2. Leveraging computational methods to predict performance, a catalyst bed for an 11 kg/s mass flow of 90% H_2O_2 is designed, modeled, and tested as part of a larger Liquid Rocketry Lab project for a 31 kN HTP/RP-1 bipropellant engine. The accuracies of applied computational models are compared. The aim of the described methodological improvements is to reduce burden and costs associated with experimental catalyst bed development. The findings demonstrate the methodology's effectiveness, contributing to a modernized approach to catalyst bed design. The implications of this work extend to enhancing the efficiency and sustainability of propulsion systems, aligning with the aerospace industry's growing emphasis on green technology.

Effect of TDP-43 Knockouts on Gene Expression and Motor Function in Zebrafish

Author(s): **Annabelle Nunnally**
Mentor(s): **Dr. Antonio Planchart, Laura Montes**
Poster: **40**

Amyotrophic lateral sclerosis (ALS) is a neurological condition that causes degeneration of motor neurons in the brain and spinal cord. ALS is a complex disorder in which genetic and environmental risk factors are hypothesized to play a role, including the TAR DNA-binding protein 43 (TARDBP; TDP-43), which is responsible for regulation of gene expression and mRNA processing. In both sporadic and familial ALS pathology, TDP-43 is mislocalized in the cytoplasm, leading to aggregation of the protein and degeneration of the neuron. We investigated the potential effects of knocking out Tardbp and Tardpl, the zebrafish orthologous genes for human TDP-43. We hypothesize that loss of Tardbp and Tardbpl function will alter the transcriptome and disrupt essential cell processes that further exacerbate motor dysfunction phenotypes in the zebrafish. Motor capabilities were examined through analysis of phenotypic data, including spinal deformities and motor deficits. We also carried out transcriptome analysis to explore levels of gene expression in TDP-43 knockout fish. We found that genotype at the Tardbp and Tardbpl loci does influence the prevalence of motor deficits in zebrafish, with knockout fish having the highest incidence of motor deficits in our preliminary data. However, the incidence of spinal deformities was similar between Tardbp and Tardbpl genotypes. We are currently working on performing qPCR assays and will have results to analyze soon. Analysis of the results of this project should contribute to our understanding of the impact of TDP-43 on gene expression and motor function.

Investigating Children's Reasoning About Rule-Breaker's Emotions

Author(s): **Lily Palmer, Rachel Bellamy, Mariam Sanjak, Brooke Wilson, Christopher Kha**
Mentor(s): **Dr. Kelly Lynn Mulvey, Christina Marlow**
Poster: **41**

Prior literature has found significant shifts in emotion reasoning as children get older, with decreases in expecting transgressors to feel good; however, these findings may vary depending on the nature of the transgression, whether moral or not.
This study aimed to investigate whether gender, age, or expected emotion affects the type of reasoning 4- to 10-year-old children employ to explain transgressors' emotions in response to rule-breaking in a game.
We conducted a 2 (gender) x 4 (emotion: positive/happy, sad, sorry, other) ANOVA controlling for age on the likelihood of endorsing broken norms as the reason behind the transgressor's emotion. There was a significant main effect of emotion, $F(1, 197) = 8.08$, $p = .048$. There were no other significant effects, all p's ≥ .120. Following Bonferroni-corrected pairwise comparisons, we found that if the child thought the transgressor was sorry ($M = .71$, $SD = .09$), they were more likely to endorse the broken rule as the reason than if they thought the transgressor was happy ($M = .21$, $SD = .06$, $p < .001$) or an emotion other than sad ($M = .40$, $SD = .05$, $p = .028$).
Overall, children who thought the transgressor was sorry were more likely to endorse broken rules as the reason behind them feeling sorry, in line with prior work looking at moral violations. We did not find evidence to support any age differences in the reasoning used, which means reasoning behind endorsing a specific emotion likely does not change with age or gender.

Recent Migration Pattern Analysis of Phytophthora ramorum in Ireland

Author(s): **Claire Patrick**
Mentor(s): **Dr. Jean Ristaino, Amanda Mainello-Land**
Poster: **42**

Phytophthora ramorum is a pathogen that causes disease in plants found in nurseries and forests, such as rhododendron. Plants are easily affected by these pathogens, comparative to people getting sick during flu season, making it extremely important to track the emergence and migration of P. ramorum in order for pathogen management decisions to be made more effectively. This pathogen has been found in North America and Europe, and is said to originate from forests in South East Asia. This project aims to study the migration of P. ramorum genotypes throughout Ireland using microsatellite and multi-locus sequence analysis (MLSA). We assessed genetic variation and estimated migration patterns by genotyping 100 P. ramorum isolates collected in Ireland over the past 15 years using 11 microsatellite regions. To further compare these isolates, we used sequences of four loci (gweuk, avh120, avh121, and trp1) to build a phylogenetic tree and observe the relationships of P. ramorum isolates in Ireland. In future studies, this data can be used to contribute to the

investigation of global P. ramorum movement and aid in the tracking of new and emerging genotypes and lineages.

Decoding the Matrix: Investigating Synaptic Connections involved in Acoustic Communication using Drosophila

Author(s): **Emma Payne**
Mentor(s): **Dr. Christa Baker, Dr. Alexandra Venuto, Emma Droste**
Poster: **43**

As social beings, we rely on auditory cues to communicate and navigate our daily interactions. Fruit flies (Drosophila melanogaster) use a similar system, particularly during courtship behaviors, which makes them an ideal model organism for understanding the neural control of acoustic communication. In Drosophila, descending neurons transmit signals from the brain to the ventral nerve cord and lower motor neurons that modulate the activity of spinal motor neurons, thereby influencing movement patterns and reflexes. Utilizing FLYWIRE.ai, a resource containing the full adult female connectome, we constructed a detailed connectivity matrix highlighting the connections between previously identified descending neurons and the auditory neurons of D. melanogaster. This matrix, represented as a heat map, serves as a valuable tool for finding anatomical links between auditory neurons and motor circuits. High synaptic connectivity between several auditory and descending neurons suggests that they may be involved in acoustic communication behaviors of Drosophila.
Future research will target descending neuron groups involved in male Drosophila courtship songs to understand how auditory information drives behaviors. Additionally, investigating the role of these neurons in female Drosophila, which do not produce courtship songs, will provide insights into their broader function. Future work will use calcium imaging to view and analyze neural activity, as well as optogenetic techniques to identify neuronal function. By probing and activating these neurons, we aim to elucidate their role in behavior across sexes. Ultimately, our study will use the valuable model organism of Drosophila to understand the intricate neural networks orchestrating acoustic communication.

Social Contexts and Rates of Glass-Hitting by Western Lowland Gorillas (Gorilla gorilla gorilla) at the North Carolina Zoo

Author(s): **Jonah Peckham**
Mentor(s): **Dr. Emily Lynch, Dr. Jenny Campbell**
Poster: **44**

A common welfare concern for Western lowland gorillas (Gorilla gorilla gorilla) under human management is glass hitting. This behavior is often interpreted as a stress response to either crowd size or social interactions. Following the formation of an all-male gorilla troop at the North Carolina Zoo, staff began to suspect that Hadari (14 years old) the lowest ranking male,

was hitting the glass more often than desired. To assess this concern, I designed a study to evaluate: 1) the hitting rate of Hadari and his conspecifics, and 2) the contexts in which Hadari hits the glass barrier, considering both social interactions and crowd size. Using ZooMonitor©, I collected both continuous behavioral data and all occurrence data on glass hitting during 10-minute observation sessions. Additionally, I recorded Hadari's location using a digital map, his nearest neighbor, and the crowd size near the window closest to him at 1-minute intervals. Preliminary results reveal that Hadari's glass hitting was more frequent when crowd size was small, and decreased as crowd size increased. Additionally, for 50% of all glass hitting events, some agonistic social encounter was observed. These preliminary findings suggest that Hadari is hitting the glass as a form of redirected aggression, where small crowds can be used as a means for which he can displace aggression towards the higher ranking males. Our study provides an opportunity for the North Carolina Zoo to create evidence-based management changes and a better understanding of the context for Hadari's behavior can lead to improved welfare.

Presence of PFAS in Rocky Branch Creek Surface Waters near Dail Softball Stadium & Derr Track and Soccer Field

Author(s): **Sydney Pollock, Trey Mumma, Nathan Archer, Thor Iverson**
Mentor(s): **Dr. Elizabeth Guthrie Nichols**
Poster: **45**

Per- and poly-fluoroalkyl substances (PFAS) are synthetic compounds that have become increasingly prevalent in everyday life. Due to their chemical makeup, these compounds persist in multiple environmental compartments, including air, water, and soil. Some are known to cause negative health effects in humans and disrupt ecological equilibria. One organization that potentially releases PFAS is North Carolina State University in Raleigh, NC. The goal of this study is to determine whether PFAS is present in Rocky Branch Creek (RBC), specifically near athletic facilities. Four sampling locations were chosen based on a targeted approach using stormwater outfall maps. On February 8th, 2024, we collected four samples, one field duplicate, one field blank, one matrix spike, and one matrix spike duplicate. Following 2023 DOE PFAS sampling guidance, RBC was sampled at mid-depth with HDPE bottles downstream of stormwater outfalls. Using a YSI-80 probe, we then measured the physical parameters of RBC to determine conductivity, pH, temperature, atmospheric pressure, and dissolved oxygen. Samples were kept below 6 °C until delivered the next day to Statera Environmental where samples were extracted using solid phase extraction (SPE); 24 mass-labeled PFAS for surrogate recovery were added to samples before SPE. Sample extracts were dried and submitted to NCSU's METRIC lab for the quantification of 30 PFAS analytes following USEPA method 537.1. This is the first evaluation of PFAS in surface waters at NC State.

Characterization of Polyethylene Terephthalate-hydrolyzing Enzymes from Bacillus subtilis Isolated from Worn Polyester

Author(s): **Alyssa Pope**
Mentor(s): **Deaja Sanders, Dr. Amy Grunden**
Poster: **46**

Polyethylene terephthalate (PET) is one of the mostly widely used plastics on a global scale and is used in a number of applications including synthetic textiles, where polyester accounts for approximately 52% of global fiber production. Because PET and other plastics resist biodegradation, pollution has become a global environmental concern as plastic waste continues to accumulate in the environment. As such, enzymes from microorganisms are being explored as an alternative to depolymerize PET into its monomers, terephthalic acid (TPA) and ethylene glycol (EG), for a circular economy that fosters sustainable recycling. The goal of this project is to identify and characterize novel PET hydrolyzing enzymes (PHEs) from Bacillus subtilis, a bacteria isolated from the textile microbiome. In this work, putative PHEs were identified in a B. subtilis strain and were subsequently cloned into Escherichia coli for overexpression and purification. The PET hydrolyzing activity of the enzymes was verified, and active enzymes were characterized using agar screening, enzyme activity assays, and analytical techniques. This work will aid in understanding microbial degradation of PET and promote sustainable plastic recycling where waste can be upcycled into high-quality products.

Utilizing Hybridization Capture to Sequence the Mitochondrial Genomes of Australian Blowflies (Diptera: Calliphoridae)

Author(s): **Bailey Popson**
Mentor(s): **Dr. Kelly Meiklejohn, Melissa Scheible**
Poster: **47**

Australian Calliphora blowflies (Diptera: Calliphoridae) are an important genus of blowflies that serve as decomposers, and pollinators, and can provide critical information regarding the time since death in forensic investigations. Within the past 20 years, there have been limited advancements to the taxonomy of Australian Calliphora species, resulting in numerous new species to describe and place within an evolutionary context. To augment traditional morphology, whole mitochondrial genomes can provide valuable information for species delineation. In this project, the whole mitochondrial genomes of 24 different Calliphoridae samples from different regions of Australia and New Zealand were sequenced using hybridization capture, along with a flesh fly (Diptera: Sarcophagidae), a crane fly (Diptera: Tipulidae), and a house fly (Diptera: Muscidae). The methodology of the project began with DNA isolation on a total of 46 samples using legs (either ground or subjected to overnight soaking), followed by DNA quantitation, library construction, hybridization capture, and Illumina sequencing. Raw sequence data were analyzed using CLC Genomic Workbench (Qiagen) to create consensus mitochondrial genomes using an established workflow. Key

metrics from the wet laboratory workflow will be presented, along with the successes and limitations of this approach used to sequence the mitochondrial genomes of Australian Calliphora blowflies.

The Effects of Uncertain Tax Disclosures on Firms

Author(s): **Adrianna Ras**
Mentor(s): **Dr. Nathan Goldman**
Poster: **48**

The growing amount of private firms disclosing their taxes has struck an interest in researchers when looking at how and if it affects their investments. We investigated whether or not private firms had financial disclosures via the SEC before 2010. In addition to financial disclosures, we then looked to see if those firms also made uncertain tax position disclosures. Private firm disclosures were scarce compared to public firms because there was a lack of readily available information. With the new information, trends relating to investments and potential tax benefits were examined. Following this research, the findings show there is double the influence on private firms compared to public firms; and that firms who are more financially constrained are more impacted by the legislature.

Development of Statistical Break Junction Measurements for Single Molecule Conductance Quantification

Author(s): **Nicolas Salazar**
Mentor(s): **Dr. Daniel Dougherty**
Poster: **49**

Electrical Junctions on macroscopic scales follow Ohm's law but as the size of an electrical junction is scaled down to an ideal single-atomic path a universal value of conductance is reached. This is known as the quantum of conductance. However, a single organic molecule does not exhibit single-channel ballistic conductance and is instead a more complicated nanoscale object with relatively localized molecular orbital wave functions. It is a long-standing challenge to characterize the conductance of single molecules to assess their use as functional layers in devices or even as nanoscale active layers. The purpose of this project is to establish statistical break-junction capabilities, to experimentally verify the quantum of conductance, and to use it as a control to measure the properties of complex single molecules with the same setup. In a custom-built experiment, various methods were used to create the 1-dimensional translation needed to smash a gold wire tip into a gold substrate while continuously measuring conductance. The tip-smashing process creates single-atomic point contacts a statistically significant portion of the time. When plotted on a histogram the conductance distribution should yield a peak at the quantum of conductance and at the single molecule conductance of any bridging molecular species. This poster describes the design and calibration of hardware and software for the new quantum conductance

instrumentation at NC State that will enable new collaborative experiments in the Carbon Electronics Cluster.

U.S.-ROK-Japan Trilateral Cooperation: Green Initiative Implementation in the Indo-Pacific

Author(s): **Surbhi Sharma**
Mentor(s): **Dr. Jessica Liao**
Poster: **51**

On August 18th, 2023, Japan, the Republic of Korea, and the United States met in a historical summit in Camp David to discuss collective efforts and collaborations for joint trilateral outreach. The following trilateral cooperation has great potential for further innovation within the Indo-Pacific in terms of initiatives such as clean energy, green infrastructure, quality infrastructure, and for a stronger grasp within private and public sector partnerships if global and regional outreach is implemented in a way that best complements collective foreign aid policy. Under my advisor, Dr. Jessica Liao, I have completed research pertaining to initiatives and developments that have been made within the realm of trilateral development, as well as highlighting indications of stress that may be prevalent within the efforts for strong trilateral cooperation. For the project that I intend to present at the symposium, I will detail the background and significance of the U.S.-ROK-Japan trilateral cooperation, developments that have been made, and introduce policy suggestions pertaining to enhancing green initiatives in the Indo-Pacific. While the research currently completed has been for Dr. Liao's personal policy project and work, I hope to expand upon Dr. Liao's pre-established paper to further discuss trilateral policy implementation with a focus on green development. I will present in a poster format at the symposium.

Development of the Transition Zone Theory for Nucleation in Oligoacenes

Author(s): **Elena Shipp**
Mentor(s): **Dr. James Martin, Tyler Knapp**
Poster: **52**

Nucleation is the required first step of crystal growth in which a nucleus is formed. Classical Nucleation Theory (CNT) proposes the idea of a steady state nucleation rate, therefore, introducing a deterministic rate constant. It has been seen through experimentation that nucleation follows a probabilistic distribution rather than a deterministic function which directly refutes classical nucleation theory. Discrepancies between CNT-predicted particle size and observed particle size showcase the ways in which CNT does not properly demonstrate the full story of nucleation mechanics. In the development of Transition Zone Theory for nucleation, a class of molecules known as oligoacenes are used due to their extremely rapid growth rate and the ability to control factors in dimensionality. Experimentally, two methods are utilized: a rapid quench and controlled quench. The rapid

quench experimentation is employed to identify evidence of a “deadzone” between the melting point and some lower temperature in which the oligoacene sample does not nucleate. The controlled quench, using differential scanning calorimetry, is used to identify the effects of varied, slower, rates on the nucleation temperature of the oligoacene sample. The development and further research in Transition Zone Theory presents a paradigm shift in understanding nucleation mechanics, challenging the deterministic assumptions of Classical Nucleation Theory and highlighting the probabilistic nature of nucleation processes.

Negative Effects of Vitamin D Deficiency and Possible Endocannabinoid System Involvement

Author(s): **Zach Sides**
Mentor(s): **Dr. Seth Kullman**
Poster: **53**

Previous discoveries regarding vitamin D (1α, dihydroxyvitamin D3) deficiency during development have been associated with stunted growth and increased central adiposity in the later stages of adult life. Another area of significance includes an increase in endocannabinoid tone. Further investigations are being conducted regarding endocannabinoid receptor knockout models to better understand if the increased endocannabinoid tone plays a role in the dysfunctional metabolic rates and bone mineral growth with vitamin D deficiency. The hypothesis of focus is if endocannabinoid tone is a key factor regarding these previous results and how consequential its involvement may be in facilitating an obese phenotype. Two cohorts of endocannabinoid receptor knockout zebrafish are being established due to there being two separate endocannabinoid receptors within zebrafish: each holding a separate physiological role. Both cohorts will be exposed to two dietary regulations at 2 months post fertilization (mpf) and will conclude around 6 mpf. The diets consist of a null diet containing vitamin D sufficient (VDS) food for better control variable purposes and a vitamin D deficient (VDD) diet serving as an experimental variable. Upon finalization of dietary administration, adipose tissue and standard length will be analyzed in order to determine the importance of the endocannabinoid system involvement post developmental VDD subjection.

Unlocking Math Success: How Attitudes, Mindsets, & Career Interest Shape Teen Expectations

Author(s): **Henry Smith**
Mentor(s): **Dr. Kelly Mulvey, Christina Marlow**
Poster: **54**

Promoting STEM abilities in adolescence is critical and necessary for future economic growth, innovation, and problem-solving. We aimed to examine what individual and programmatic factors predict math achievement expectations for adolescents (N = 183)

involved in out-of-school STEM programs using hierarchical linear regression. Model 1 evaluated the roles of math attitudes and growth mindsets on math outcome expectations. Model 2 added perceptions of their STEM volunteer program, and Model 3 included STEM career interests. Age was controlled across all models.
The 3rd model was the best-fitting model, ΔF (3, 172) = 4.13, p = .007, $\Delta R2$ = .06. The final model significantly predicted adolescents' belief in their future math performance, F(10, 172) = 5.23, p < .001, R2 = .23. Students' valuing learning mathematics emerged as a unique and powerful predictor of success expectations (B = .21, p < .001). Additionally, career interests in math and engineering careers predicted math achievement expectations (B = .21, p = .003). All other predictors did not uniquely predict expected math achievement; all ps ≥ 0.05.
The findings underscore the significance of specific attitudes as influential in adolescents' achievement expectations. Surprisingly, age, fixed mindset, and growth mindset were not unique predictors. This suggests that individual values and goals, i.e., career interests, regarding math more strongly impact students' perceptions of future achievements than their overall mindset.
These findings point to the potential for educational engagement and STEM program perception to shape expectations of math achievement, offering promising avenues for pedagogical and programmatic enhancements.

Universal Grammar Theory: An Unsatisfactory Account of the Origin of Moral Judgment

Author(s): **Ryan Sterner**
Mentor(s): **Dr. Veljko Dubljevic, Dr. Dario Cecchini**
Poster: **55**

John Mikhail argues that the properties of moral judgement imply that the mind contains an innate moral grammar, i.e., a complex system of principles, rules, and conceptual building-blocks that generates and relates various mental representations upon which moral intuitions depend (Mikhail, 2013, 3.). In this paper I will offer an overview of Mikhail's argument for moral nativism and present relevant counter arguments. The main issues I highlight concern the dependence of Mikhail's theory on assumptions made from cognitive aspects of various disciplines which ultimately render an incomplete framework for the theory. Finally, I consider the plausibility of the analogy between linguistics and moral psychology.

High Performance PMN-PT Based 1-3 Composite Transducer for Clot Characterization with Multi-frequencies

Author(s): **Christopher Summers**
Mentor(s): **Dr. Huaiyu Wu**
Poster: **56**

This study evaluates the performance of transducers in detecting blood clots, focusing on sensitivity and resolution in different environments. Testing transducers in blood and blood clot settings revealed significant damping of signals in blood compared to water, leading to increased interference with signal reception. Particularly, denser blood clot areas exhibited a notable decrease in signal strength, posing challenges for accurate detection. These findings underscore the importance of optimizing transducer performance for clinical applications, such as intravascular ultrasound imaging (IVUS) or contrast imaging. Further research is warranted to address these challenges and enhance transducer capabilities for improved diagnostic accuracy in vascular conditions.

Befriending Immigrant Peers: Role of Direct and Indirect School Contact

Author(s): **Khadeeja Ali Syeda, Sophie Biancofiore, Sandhya Purohit, Kylie Radford**
Mentor(s): **Dr. Kelly Lynn Mulvey**
Poster: **57**

Children's perceptions on immigration can be heavily influenced by nationality status and values surrounding immigration in school curriculums (Brown & Lee, 2014). It is important to examine the directional relationship between these factors and children's attitudes surrounding their immigrant peers. The current study asks the following: does learning about immigration in schools or having direct interactions with immigrants influence 8-12 year olds' desire to befriend immigrant peers? Participants included (N= 379) 8-12-year-olds who self-identified as American. Participants answered questions related to perceptions of peers from immigrant backgrounds and how they perceived equality between immigrant and non-immigrant peers. Participants evaluated immigrant peers from one of three countries: Mexico, China, and Egypt. Findings revealed that in general, the more positively teachers talked about immigrants, the more likely students wanted to befriend them. However, for participants assessing Mexican immigrants, the more participants learned about Mexican immigrants in school the less likely they were to want to befriend them, surprisingly. It was also found that the more direct contact participants had with Mexican immigrant peers, the more likely they were to want to befriend them in other scenarios. For both other groups (China and Egypt), neither direct contact nor learning about immigrants in school was associated with a desire to befriend peers from those countries. The findings indicate that education and exposure to immigrant peers are related to students' perceptions of immigrants and willingness to befriend them.

Coaxial Turbine Blade Design

Author(s): **Andrew Taylor, Ryan Dukes, Emma Stults**
Mentor(s): **Dr Kenneth Granlund**
Poster: **58**

Producing clean, reliable and consistent power is a major challenge for our future. One solution being researched by our group is the design of a mechanism to harness ocean currents to produce power. Given the great depth at which the ocean currents are located, a solution which can be suspended within the water column, independent of external supports, is needed. The solution to that problem, proposed by Dr. Granlund's Lab group, involved using a coaxial turbine with counter-rotating blade rotors. This design aimed to produce a net rotation about the generator while eliminating the torque of the whole turbine assembly. Thus, it allowed the use of a tether-based connection to transmit the generated power. In other words, the only force or moment the turbine puts on the tether is an axial tension force normal to the turbine rotors.
Our contribution to this large, ongoing project was to design more efficient rotor blades that maintained balanced torques between the upstream and downstream rotors. The blade design process was challenging as the need to match the torques between the front and back rotors increased the complexity of the calculations and number of variables to consider. Discussed are the calculations used in the design of the blades. This includes the principles existing for single-rotor turbines and how we applied them to the two-rotor coaxial turbine. In addition to the hydrodynamic design, the blade's fabrication was an important consideration. We investigated the options of both in-house fabrication and custom fabricated solid-metal blades.

Systematic Literature Review of the Recent Research on Bisexual Women and Depression

Author(s): **Ashley Telli, Olivia Mitchell**
Mentor(s): **Dr. Paige Averett**
Poster: **59**

The following is the first study to systematically review the existing literature on bisexual women and depression. Inclusion criteria were peer-reviewed articles published from 2012 - 2023, had United States only samples, and analyzed via both gender/sex and sexual orientation. Ultimately there were 22 articles that met the criteria and were reviewed. Findings include that there is a lack of current research focused solely on bisexual women and depression. Many articles were excluded because they centered on either the bisexual population as a whole and did not analyze via sex/gender, or included sexual minority women (SMW) as a whole and did not analyze via sexual identity. Within the examined literature, all were quantitative studies with similar existing data sets and scales of measurement. As well, the overwhelming majority of samples were white, young adults, and cisgender. Consistently the studies reviewed found bisexual women to have more depression

than heterosexual women, lesbians, and bisexual men, with a potential pattern of decreasing symptoms over time with age. Future quantitative research should seek to sample with equal comparison groups, study bisexual women of color including immigrant women, bisexual transwomen, and experiences of depression over time. More importantly, qualitative studies are greatly needed as the voices and experiences of bisexual women are missing from the literature. Implications for mental health practitioners will be presented.

Exploring Potential Augmentative Biological Control of Chinese Wax Scales (Ceroplastes sinensis)

Author(s): **Alexiah Thompson**
Mentor(s): **Helena Jolly, Dr. Steve Frank**
Poster: **60**

Chinese Wax Scale (Ceroplastes sinensis) is an invasive scale insect that is a common pest of various ornamental plants. This scale insect is hard to treat due to the wax they produce, making insecticides less effective. There is a need to find an effective biocontrol to manage the populations. This project aims to determine which predatory species will be the most effective on Chinese Wax Scales. To accomplish this goal, we experimented with testing three predatory species; Mealybug Destroyers (Cryoptolaemus montrouzieri), Green Lacewings (Chrysoperla rufilabris), and Lady Beetles (Hippodamia convergens), on two life stages of the Chinese Wax Scale to establish the most successful course of action. As we have previously worked with Mealybug Destroyers for soft-scale insects, we predicted they would be the most impactful to the population. Overall, finding an effective biocontrol for Chinese Wax Scales has the potential to prevent damage that could be done to various ornamental plants.

Cued Memory: The Impact of Images/Pictograms during Encoding on Word Recall

Author(s): **Susannah Throckmorton, Allison Martinko**
Mentor(s): **Dr. Daniel Gruehn, Taylor Leonard**
Poster: **61**

In recent years, education companies (e.g. Picmonic) have created learning systems that implement pictograms as mnemonic devices for studying to increase retention. In the present study, we investigated the impact of two factors on word recall: (1) the type of mnemonic device: images vs. pictograms and (2) the similarity of the depicted object to the word: (a) word only (e.g. “king”), (b) word with same object (“king” and representation of king), (c) word with related object (“king” and representation of castle), and (d) word with unrelated object (“king” and representation of apple). We expected the simpler mnemonic device (pictograms) to help with encoding more than the complex depictions (images). We also expected that presenting a word with the same representations would improve recall, and

would correspondingly worsen with related and unrelated representations. In an ongoing data collection, we have collected data from 111 college students. Participants were either in the image (n=58) or pictogram (n=53) condition and completed four blocks consisting of three phases: (a) encoding - 10 nouns were displayed (with representations below) sequentially for 2 seconds each, (b) retention - short personality questions as a filler task, and (c) retrieval - write all words they could recall from the current block. Compared to the word-only block, word recall was higher, the same, and lower for using the same, related, and unrelated representations, respectively. These findings highlight that mnemonic devices only help word recall if they semantically match. Future research may investigate more complex material than words.

Differences in Aquatic Macroinvertebrate Communities Among Urban and Forested Watersheds

Author(s): **Riley Westman**
Mentor(s): **Dr. Katherine Martin, Dr. Marcelo Ardon, Joyce Gaffney**
Poster: **62**

Stream macroinvertebrates are effective bioindicators that are often used in monitoring programs to track stream ecological health. The impact of urbanization on stream macroinvertebrates is a field of active interest, especially in the southeastern United States, which is an area experiencing rapid population growth. A primary goal of this study was to compare the macroinvertebrate communities in two regions, one urban and one rural, forested region, from 2018–2023. We compared data from 22 urban streams monitored by City of Raleigh Stormwater to data from 26 streams in rural, forested western NC monitored by Lake James Environmental Association. The watersheds in Raleigh had extensive developed area (mean 84%, range 44–100%) and impervious surface cover (30.6%, 8.9–55.1%), and low forest cover (12.3%, 0–47.9%). In comparison, watersheds in western NC had high forest cover (84%, 54.8–98.4%), and lower developed land cover (8.9%, 0.7–32.3%) with low impervious surface cover (1.1%, 0–7.1%). Streams in Raleigh were also characterized by low community richness (5.8, 2–11) and diversity (6.2, 0.13–0.86), and dominance of macroinvertebrates with high pollution tolerance (6.55, 4.78–9.3), indicating severe ecological degradation, which was consistent by year. Streams in western NC had higher richness (28.1, 3–45) and diversity (1.17, 0.23–1.49), and species with lower pollution tolerance (3.57, 1.49–7.10). We found strong correlations between macroinvertebrate metrics and land cover metrics between regions, but not within regions. Next, we will quantify the strength of the relationship between land cover and macroinvertebrates, and determine which species are most negatively impacted by urbanization.

PCR-Marker Development for Genotyping Vaccinium spp.

Author(s): **Ellen White**
Mentor(s): **Dr. Hudson Ashrafi**
Poster: **63**

The NCSU Blueberry breeding program is releasing new blueberry cultivars that need patented for plant intellectual property a.k.a. IP protection. In order to patent these cultivars, we will fingerprint the new advanced selection by deploying Single Nucleotide Polymorphism (SNP) markers. The markers will also help validate the progenies and their parents to ensure their pedigrees are correct. For fingerprinting, DNA from 94 previously harvested blueberry cultivars have been extracted and normalized to build a database. Twenty-two markers have been tested and validated in our laboratory before. The platform that we are using is Kompetitive allele-specific PCR (KASP). We have synthesized allele-specific primers for these markers. Each KASP marker will be run on three replications on the same PCR plate to identify markers that are repeatable and reliable in allele detection. For the purposes of developing these KASP markers, we will run the markers with 16 of the 94 previously harvested cultivars. A total of 1,188 PCR reactions are being run on four plates to identify markers that show consistent alleles in 90% of the genotypes. These markers will then be analyzed using Excel for cultivar identification and their unique pattern of segregation. This procedure will allow the Blueberry Genomics Lab to use these markers as a routine procedure to genotype new selections for the program.

Evolution of Changes to Glenohumeral Macrostructure Following Brachial Plexus Birth Injury

Author(s): **Jason Zhang**
Mentor(s): **Dr. Jacqueline Cole, Vivian M. Mota, Kyla B. Bosh, Dr. Katherine R. Saul**
Poster: **64**

Brachial plexus birth injury (BPBI) is a neuromuscular injury that occurs during live birth, resulting in muscle paralysis, shoulder contracture, and scapular and humeral deformities. While previous BPBI studies using rodent models established changes in normal glenoid development, the timing for when changes begin remains unclear. Our goal is to better understand the development of glenohumeral deformities by characterizing changes in glenohumeral macrostructure throughout growth following BPBI.
Sprague Dawley rats (n = 99) underwent one of four surgeries (postganglionic or preganglionic neurectomy, disarticulation, sham) on one limb at 3-6 days postnatally. At various endpoints (2, 3, 4, 8, or 16 weeks) rats were sacrificed, and humeri and scapulae of uninjured and injured limbs were harvested. Micro-computed tomography scans of the scapula and humeral head were reconstructed, and macrostructural parameters were measured in Materialise Mimics. At each timepoint, the injured/uninjured limb ratio was compared across groups using a Kruskal-Wallis test (GraphPad Prism, $\alpha = 0.05$).

Preliminary data for the postganglionic and sham groups (endpoints: 2, 3, and 4 weeks) showed that the glenoid inclination angle was lower in the injured limb compared to the uninjured limb for both groups. This altered glenoid macrostructure was detectable as early as 2 weeks after postganglionic injury. Establishing the timeline of deformity development and progression will lend insight into the most appropriate time for clinical intervention following BPBI.

Numbers by College

College	Unique Student Presenters	Unique Mentors
Agriculture & Life Sciences	119	91
Education	2	6
Engineering	94	74
Humanities & Social Sciences	60	39
Natural Resources	57	26
Poole	5	3
Sciences	128	88
Textiles	9	10
Veterinary Medicine	1	26
University College	4	3
Outside of NC State	2	31
TOTAL	**481**	**397**