



UNIVERSITY OF
GEORGIA

Center for Undergraduate
Research Opportunities

2018

CURO

Symposium

highlighting UGA's undergraduate research

April 9-10 • Classic Center • Athens, GA

Program

& Abstracts

Book of

2018 CURO Symposium

highlighting UGA's undergraduate research

Welcome to the 2018 CURO Symposium. Hosted by the Center for Undergraduate Research Opportunities, this two-day event highlights exceptional undergraduate research at the University of Georgia. Across campus, administrators, faculty and staff members, and graduate and undergraduate students have collaborated to make this an invaluable academic event.

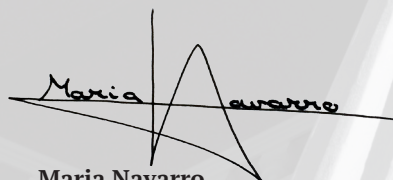
This year's CURO Symposium is the largest to date, with more than 575 undergraduates communicating their substantial research accomplishments. The presenters are pursuing 103 different majors from 14 schools and colleges and are conducting research with 330 faculty members from 78 departments.

The CURO Symposium is a celebration of our students' hard work and engagement in research, as well as the commitment of their faculty mentors to their success, which would not be possible without UGA's broad and substantial investment in outstanding experiential learning opportunities.

Thank you for your continued support of undergraduate research and CURO.



David S. Williams,
Associate Provost and
Director of Honors and CURO



Maria Navarro,
Associate Director of
Honors and CURO

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Schedule

Monday / April 9, 2018

All oral sessions on Monday are in Athena Breakout Rooms A, B, C, D, G, H, I, and J.

11:15 a.m.-12:05 p.m.

Oral Session 1

12:20-1:10 p.m.

Oral Session 2

1:25-2:15 p.m.

Oral Session 3

2:30-3:20 p.m.

Oral Session 4

3:30-4:30 p.m.

Awards and Keynote Session

Athena Room E

4:30-6:30 p.m.

Poster Session and Reception

Grand Hall South

Tuesday / April 10, 2018

All oral sessions on Tuesday are in Athena Breakout Rooms A, B, C, D, G, and H.

9:30 a.m.-10:45 a.m.

Oral Session 5

11:00 a.m.-12:15 p.m.

Oral Session 6

12:30-1:45 p.m.

Oral Session 7

2:00-3:15 p.m.

Oral Session 8

3:30-4:45 p.m.

Oral Session 9

CURO Research Mentoring Awards

The Office of the Senior Vice President for Academic Affairs and Provost and the Honors Program established the CURO Research Mentoring Awards, formerly the EURM awards, in 2001. These awards recognize outstanding faculty who consistently engage undergraduate researchers through CURO programming (courses, the Symposium, summer fellows, theses, etc.) and enhance the learning experience of undergraduate researchers at the University of Georgia. Award recipients have provided superior research opportunities and mentoring and have collaborated with undergraduate researchers on publications and presentations at professional conferences. Before 2014, awards were designated as “Early Career” and “Master Level” and were granted to corresponding faculty ranks.

The 2018 recipients are **Dr. Michael Terns**, center left, *Distinguished Research Professor, Biochemistry and Molecular Biology, Franklin College of Arts and Sciences*, and **Dr. Sarah Shannon**, right, *Assistant Professor, Sociology, Franklin College of Arts and Sciences*.



Previous recipients and their years are listed below. To view a complete list of recipients, visit curo.uga.edu/faculty/research_mentoring_awards.html.

2017 recipients

- **Dr. Kevin McCully**, *Professor of Kinesiology, Director of the Exercise Muscle Physiology Laboratory, College of Education*
- **Dr. Brenda Cude**, *Professor, Financial Planning, Housing and Consumer Economics, College of Family and Consumer Sciences*

2016 recipients

- **Dr. Mable Fok**, *Assistant Professor, Electrical and Electronics Engineering, College of Engineering*
- **Dr. Richard Lewis**, *UGA Foundation Professor in Family and Consumer Sciences, Foods and Nutrition, College of Family and Consumer Sciences*

2015 recipients

- **Dr. Jeb Byers**, *Professor, Odum School of Ecology*
- **Dr. Erik Hofmeister**, *Associate Professor of Anesthesiology, Chief of Small Animal Surgery and Anesthesia, College of Veterinary Medicine*

2014 recipients

- **Dr. Carl Bergmann**, *Associate Vice President for Research-Facilities; Associate Director, Complex Carbohydrate Research Center; Executive Director, Animal Health Research Center; Senior Research Scientist*
- **Dr. Andrew Owsiak**, *International Affairs, School of Public and International Affairs*

CURO Symposium Best Paper Awards

Since 2001, CURO Symposium Best Paper Awards have recognized excellence in papers developed from work being presented at that year's Symposium.

Applicants may submit in one or more of the following categories: Arts, Humanities and Media; Business; Life Sciences; Physical and Environmental Sciences; Public and International Affairs; Social Sciences; and Technology, Engineering and Math.

Each recipient is recognized at the Symposium's Awards and Keynote Session, and each award carries \$100 in financial support. Recipients for the 2018 CURO Symposium are listed below, along with their research topics.

Arts, Humanities and Media

Katherine E. Henley

Modeling Geographic Variation in Pronunciation of United Kingdom English

Business

Michael Sloman

Jewish Investment in Education: Do Jewish Populations Make Different Investment Choices in Education

Life Sciences

Michaela Price

Oral Oxycodone Self-Administration Protocol for Male and Female Rats

Physical and Environmental Sciences

Jaiko Celka

Economic and Environmental Trade-Off Analysis of Food Waste Reduction Solutions in the United States

Public and International Affairs

Taylor Martin

Do Dual-Use Controls Contribute to the Probability of the Pursuit or Use of CBRN Weapons by Terrorist Organizations?

Social Sciences

Nivita Sharma

Examining the Effects of a Diabetes Foot Care Intervention Program in Fiji

Monday, April 9, 2018

Oral Session 1

Monday, 11:15 a.m.
to 12:05 p.m.

Athena Breakout Rooms

Room A	Connor Trotter	Computation as Creative Interface: The Hidden Artistic Potential of Code
	Emma McMorran	Duchamp and the Consequences of the Readymade on the Art World
	Zachary Pareizs	The Intersection of Queerness and Mental Health on the Stage
Room B	Frannie Martin	Spore-Trapping Combined with Real-Time PCR to Monitor Spore Dissemination of the Plant-Pathogenic Fungus <i>Exobasidium maculosum</i> in Blueberry
	Aditya Krishnaswamy	Outbreak Spreading: Using Gradient Boosting Machines to Predict the Chance an Incipient Outbreak Will Spread
	Joshua Thedford	Monitoring for Rapid Shifts in Carbon Mineralization and Iron Availability during Soil Oxygen Changes
Room C	Rebecca Gemes	Play More, Worry Less
	Darien Aunapu	Effects of Instructor Gestures on Learning from a Video Lesson
	Bec Davis	Transcending Boundaries
Room D	Haley Audrey White	Addressing Supply Chain Logistics and Resilience Challenges for the Sustainable Commercialization of Carinata Jet Biofuel and Bioproducts
	Martinique Lefevre Edwards	High-Resolution Space-Time Dynamics of <i>Escherichia coli</i> in an Urban Stream System
	Tyler Cannida	Petrography of the Gneisses from the Mary Lou Quarry in Clinton, SC: Implications for Quantifying Mineral Compositions in the Critical Zone
Room G	Anna Turlej, Nousheen Khetani	Neuroanatomical Changes Observed in Nodose Ganglia and Hindbrain 24 Hours after Vagotomy Surgery in Rats
	Ruth Pentlarge Barrow	Characterization of Bone Collagen Fibers in a Hypophosphatasia (HPP) Murine Model using Linearly Polarized Light
	Estie Toth	Dual Oxidase (DUOX) Expression in a Murine Lung Infection Model of Influenza Virus A

Room H	Simran Modi	Optimizing Success Strategies for Entrepreneurship Incubators
	Monte Fischer	Investigating Additive Combinatorics through Freiman's Theorem and Plünnecke's Inequality
	Ashe Viswanathan	Is China's Economy Headed for a Crash?
Room I	Kaito Nagashima	Elucidation of the Critical Residues of the Mumps F and HN Proteins in Cell-Cell and Virus-Cell Fusion
	Trisha Dalapati	Effects of <i>Plasmodium falciparum</i> on Placental Expression of Inflammatory and Coagulation Factors
	Essilvo Sulejmani	Analysis of Oncogenic Properties and Peptide Inhibitors of NMT1
Room J	Logan Ballard	Developmental Changes in Extracellular Vesicles from African Trypanosomes
	Brendan Harris	Flexibility in Gorilla Communication: The Repertoire and Vocal Behavior of Captive Western Lowland Gorillas
	Shannon Leigh Freeland	Incidence and Treatment of Pain in Canine Oncology Patients

Oral Session 2

Monday, 12:20 to 1:10 p.m.

Athena Breakout Rooms

Room A	Elise McDonald	Promoting Outdoor Recreation to Combat Childhood Obesity
	Jessica Ma	Crisis Pregnancy Centers: Establishing Accuracy and Transparency in Georgia's Family Planning Services
	Rachel McCardel	Assessing Workplace Support for Exclusive and Continued Breastfeeding among Working Mothers
Room B	Aditya Krishnaswamy	Reducing Insurance Illiteracy: Teaching Health Insurance in Georgia Health Classes
	Elina Acosta	A Policy Analysis of Georgia's Anti-Human Trafficking Laws
	Nidhi Aggarwal	Expanding Rural Care: Provisions to Increase Independent Rural Freestanding Emergency Departments
Room C	Sarah Jane Dillon	Pogo to Social Change: Activism and Violence in Bali
	Chelsea Batchelder	Diet and Culture at the Greek Colony Himera

Room C	Prabhjot Minhas	Acculturation and Refugee Health: A Scholarship Review
Room D	Elizabeth Griffin	The Convention Spotlight Theory: Women at National Conventions
	Lauren Jayne Lauterbach	Intersectionality and Context in Human Development across the Lifespan: A Thematic Analysis of Published Works in Social Science
	Madison Conkel	If It Was Important I Would Have Learned It in "Intro to International Relations"
Room G	Adam Smith Jackson	Installation and Testing of an Electronically Controlled Actuator for Slow Compression of Combustion Gases
	Niklas Endler	UGA's Leap to Space: Small Satellite Research Lab Testing
	Samuel Paul Douglass Jr.	Supplemental Thermal Energy Storage Tank for UGA's Central Campus Chilled Water Loop
Room H	Alexandra McCluskey	Sustainable Nanocellulose Gel Dyeing of Polyester Fabric
	Mary Kate Donahue, Lauren Klas	Subcultural Merchandising Patterns and Experiences: Background and Methods (Part 1)
	Ariana Gibson-Rivera, Jose Pena	Subculture Merchandising Experiences: Data Analysis and Results (Part 2)
Room I	Kevin Charles Williams III	The Effects of Galanin in the Mesolimbic System
	Maria Granros	The Associations Between Neuroticism, Executive Function, and Brain Volume in Older Adults
	James Conners	Location of the Point of Contact Influences a Person's Perception of a Rod's Length
Room J	Audrey-Ann Jeanne Lafontaine	Novel Adjuvants Potentiate the Antimicrobial Activity of Polymyxin B in Two Gram-Negative Bacteria, <i>Escherichia coli</i> and <i>Acinetobacter baumannii</i>
	Maggie Clark	Climate and Collapse: An Observational Look at Climate Change's Impact on Human Experiences
	Mira Bookman	Food Waste for Thought
	Isabel Ott	Evolutionary Analysis of West Nile Virus in Georgia, 2017

Oral Session 3

Monday, 1:25 to
2:15 p.m.

Athena Breakout Rooms

Room A	Jillian Schmidt	The Application of the Odious Debt Doctrine to the Debts of the Maduro Regime in Venezuela
	Rara Reines	The Wellbeing Economy and Cooperative Market Economics: Backcasting a Future from Within and Beyond Neoliberalism
	Jennifer Ashtyn Hardister	Fund Balances in Georgia's Cities
Room B	Nivita Sharma	Examining the Effects of a Diabetes Foot Care Intervention Program in Fiji
	Harrison Jones	A Mendelian Randomization Study on Depression and Alzheimer's Disease
	Andre Gabriel Jove	Arboviral Outbreak Prediction Following Hurricanes Irma and Maria in Puerto Rico
Room C	Samuel Driggers	The Framing of Two Sovereigntist Movements
	Hannah Mahoney	Putting America First: Renegotiating NAFTA and Trade Implications
	Matthew Fasig	Exploring the Association Between Candidate Quality and Electoral Performance in Congressional Primaries
Room D	Patrick Thomas Seethaler	Protein Expression of <i>bclA</i> Gene in <i>Bacillus cereus</i>
	Caroline Langley	Impact of ISG15 Species-Species Variation on ISG15 Structure and Viral-Host Interactions
	Nikhil Reddy Gangasani	A New Approach to Improved Treatment of Type 3 <i>Streptococcus pneumoniae</i> : A Purification Exploration
Room G	Sunishka Thakur	Examining the Context Dependency of Genetic Clines in <i>Boechera stricta</i>
	Matthew Martinez	Evaluation of Proteins Secreted by <i>Toxoplasma gondii</i>
	Chiso Ikechukwu Ahanotu	Characterization of Ribonuclease E Substrate Specificity in Proline tRNA Maturation <i>Escherichia coli</i>
Room H	Austin Hattori	The Rhetoric of Ariadne and the Catullan Ego
	Anna Goebel	Motherhood in Bertolt Brecht's <i>The Caucasian Chalk Circle</i>
	Trevor Talmadge	The Spanish Dialect of Roswell, Georgia

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Room I	Bailey Palmer	When Famine is an Opportunity: Examining the Effects of Drought on al Shabaab Attack Patterns in East Africa
	Johanna Rodriguez Mercurio	Cambodian Refugees and Agency through the Resettlement Process
	Emma Katherine Protis	No Longer Used: Designing Non-Exploitative Communication Methods to Represent Survivors of Human Trafficking

Oral Session 4

Monday, 2:30 to 3:20 p.m.

Athena Breakout Rooms

Room A	Shannon Duffy	Reese-Hancock Housing Research Collaboration: Documenting Displacement in the Reese-Hancock Corridor
	Rachael Folakemi Akinola	Alleviating Food Insecurity in Athens-Clarke County through Public Transportation
	Karan Ajit Pol, Aditya Krishnaswamy, Anita Qualls	Mental Health Training in the Georgia Police Force
Room B	Nico Marin	Potential Competitors to the Dollar Based System
	Zack Flagel	An Evaluation of Major League Baseball's Amateur Player Acquisition Systems
	Andrew Teal, Sebastian Puerta	The Future of Investor-State Dispute Settlement
Room C	Nikita A Vantsev	Adapting a CRISPR-Cas System into a Novel Gene Knockdown Platform
	Stephan N George	Biochemical Characterization of Missense Mutations in O-GlcNAc Transferase Found in Patients with X-Linked Intellectual Disability
	Joshua Fricker	Testing the Effects of PAD4 Inhibitors on Neutrophil Effector Functions
Room D	Alyson Wright	The Long-Term Effects of Corticosterone Exposure on Sex Ratios in Laying Hens
	Ana Lorton	Emergent Pathogens Associated with Canine Infectious Respiratory Diseases in the United States
	Christian R Laurent	Prenatal Exposure to EDCs Followed by High Fat Diet Challenge in Adulthood Effects Organ Weights in Rats

Room G	Kate Huller	Burqas, Bangles, and Beautiful Women: Gender Implications of the Disnification of Religion in Film
	Christian Michael Sullivan	Maronite Christian and Muslim Interactions during the Lebanese Civil War, 1972-2000
	Jacob Sparks	Inter-Religious Dialogue Between Orthodox Christians, Early Muslims, and Early Protestants
Room H	John Mark Adent	What is the Function of the Protein EutJ in Ethanolamine Catabolism in <i>Salmonella enterica</i> ?
	Caroline Glessner	Bringing the Laboratory to the High-Enrollment Undergraduate Organic Chemistry Classroom: Reaction Monitoring Remotely Using Benchtop NMR Technology
	Lauren Christine Widman	Comparison of Iodide and Thiocyanate Substrates in the Lactoperoxidase-Halide Antimicrobial System
Room I	Christina Cortes	Chemistry in the Arts: An Interdisciplinary Look at Student-Synthesized Azo Dyes
	Joshua Samuel Siar	Evaluating the Effects of Neonicotinoid Pesticides on Male Reproduction by Using a Novel <i>in vitro</i> Stem Cell-Based Model of Human Spermatogenesis
	Nettie Brown	Biomaterials for Medical Applications
Room J	Connor Lawhead	The Visual Steady State Response: Using Electroencephalography to Detect Biomarkers for Schizophrenia
	Roma Parikh	Diplomacy: A Woman's Game
	Kavi Pandian	A Confluence of Science, Philosophy, and Religion: Perspectives on Wellbeing, Happiness, Fulfillment, and Altruism

Awards and Keynote Session

Monday, 3:30 to 4:30 p.m.

Athena Room E

Welcome and Introductions

David S. Williams,

Associate Provost and Director of Honors and CURO

Remarks

Jere W. Morehead,

UGA President

Introduction to Awards

Maria Navarro,

Associate Director of Honors and CURO

CURO Research Mentoring Awards

Pamela Whitten,

UGA Senior Vice President for Academic Affairs and Provost

CURO Symposium Best Paper Awards

Rahul Shrivastav,

UGA Vice President for Instruction

UGA Libraries' Research Awards

M. Kathleen Kern,

Director of Miller Learning Center Library Commons, UGA Libraries

Introduction of Keynote Speaker

Kathryn Youngblood,

Class of 2017, College of Engineering,

School of Environmental, Civil, Agricultural, and Mechanical Engineering

Keynote Address

Jenna Jambeck,

Associate Professor, School of Environmental, Civil, Agricultural, and Mechanical Engineering,

College of Engineering

"Plastic Waste Inputs into the Ocean: Can We Come Together to Solve this Global Problem?"

Closing Comments

David S. Williams

Audience adjourns to Poster Session and Symposium reception, held in Grand Hall South.

Poster Session, Monday, 4:30 to 6:30 p.m., *Grand Hall South*

Poster 1	Kristen Nicole Gragg	Hidden Histories: The Stories that Don't Get Told
Poster 2	Abraham Johnson	The Intergenerational Queer Spirit: Grindr, God, and Where We Came From
Poster 3	Christina Lee	Interactive Show Design and Production
Poster 4	Bethany Nelson	The Effect of Gaga Training on Penché Dance Movement Kinematics, Performance Quality, and Imagery Use in University-Level Dance Students
Poster 5	Devin Blake Worthy	The Relationship Between Creativity and the Music Emotional Effect on Creativity Based Courses
Poster 6	Riley Shivitz	Internet and Social Media Impact on the Creative Process
Poster 7	Delaney Erin Givens	The Healing Influences of Built Environments: A Case Study of Healthcare
Poster 8	Anja Benson	Sensory Sensitivity Garments for Children
Poster 9	Lauren O'Neil	The Impact of FTC Review Threshold on Blocked Mergers and Markets: A Case Study
Poster 10	Jonathan Eric Hendrix	The Effect of IPOs on University Outcomes
Poster 11	Jimmy Lin	Understanding Students' Subjective Understanding with Q-Perspectives®
Poster 12	Sofiya Payne	Reducing Recidivism Through Reintegration and Reformation Programs
Poster 13	Aly Shakoor	Nursing Home or Staying Home: The Impact of Medicaid Home and Community-Based Services (HCBS) Waivers on Long-Term Care Choices
Poster 14	Abhy Kheepal	Path Dependence in Organizational Impression Management
Poster 15	Ajit Morar	Protesting Corruption on Twitter: A Topic Modeling Approach to How Bots and Cyborgs Create Awareness
Poster 16	Conner J Nations	Addressing the Growing Need for Algorithmic Transparency
Poster 17	Maria Lenore Matthews	Consumer Cognitive Biases on Oddness and Roundness of Numbers in Instances of Random Selection
Poster 18	Shuchi Goyal	Finite Mixture of Normal Distributions for Robust Bayesian Small Area Estimation
Poster 19	Rachel Ann Zilinskas	Natural Indigo-Nanocellulose Based Dyeing for Cotton Fabrics
Poster 20	Halle Brooke Hammond	Wisdom, Justice, and Moderation: The Equal Protection Clause in the State of Georgia
Poster 21	Thomas Felton Deen	Terrorism Financing and the International Drug Trade
Poster 22	Christian Barrett Pedraza	Geographic Analysis of International Border Settlement in Latin America

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Poster 23	Sunny Han	National Crisis in Korea: What is the Relationship between Media and Polarization?
Poster 24	Heng Zang	State Capacity and Contagion of Ethnic Conflict: Case Study of UK and China
Poster 25	Lyndsey Camille Jackson	The Effects of Corporate Social Responsibility on Purchase Habits of College Consumers
Poster 26	Jillian Faith Jones	The Impact of Beauty Vloggers on the Purchasing Decisions of Millennial and Generation Z Female Consumers
Poster 27	Lacey O'Brien	Shop 'til You Drop: A Closer Look at Millennial Shopping Habits Online vs. In-Store
Poster 28	Emily Starling	Let's Make it a Popularity Contest: University Health Centers or Outside Health Services
Poster 29	Caroline Knox Tompkins	A Major Decision: The Decision-Making Process of Choosing an Undergraduate Major
Poster 30	Olivia Tompkins	We Can't Get No Satisfaction from Instagram... Or Can We?
Poster 31	Hannah Weeg	A Study of the Consequences of Social Media on the Mental Health of College-Aged Millennials
Poster 32	Shawn Christian Foster	Conditioned Vowel Mergers in the American South
Poster 33	Katie Henley	Modeling Geographic Variation in Pronunciation of United Kingdom English
Poster 34	Morgan Frederick Geiser	Violence Against Protestants in Sixteenth-Century France
Poster 35	Taylor Withrow	Identity Development in Multiracial Individuals: Living between the Racial Divide
Poster 36	Sabrina Chudnow	The Economic Impact of the "Tampon Tax" on Lower-Income Households
Poster 37	Ben Butler	The Relationship between Socioeconomic Status and Normative Asset Allocation
Poster 38	Sarin Khurana	An Analysis on the Correlation between Retirement Definitions and Preparation
Poster 39	Sydney R Erickson	Examining Disparities in Accessing Services Among Populations Eligible for Early Childhood Special Education from a National Longitudinal Database
Poster 40	Mitra Kumareswaran	Evaluating Parent Perception of Circumscribed Interests Objects for Children with Autism Spectrum Disorder
Poster 41	Olivia Demario, Manya Kothapalli, Darien Aunapu	Exploring Strategies for Enhancing Learning by Teaching
Poster 42	Johanna Hoover, Pavan Sastry, Heather Digregorio	Exploring the Effects of Different Video Lesson Formats on Learning in Biology

Poster 43	Lauryn Waters	The Effectiveness of “Instructional Conversation” Pedagogy in Education for Multilingual Students
Poster 44	Sarah Renee Knapp, Sydney Spoonamore, Julie Johns, Ashley Moore, Tracy Wong, Erin Reynolds	The Effect of Augmentative and Alternative Communication Strategies on the Use and Development of Vocalizations
Poster 45	Erin Reynolds, Julie Johns, Sarah Knapp, Sydney Spoonamore, Ashley Moore, Tracy Wong, Meagan Mwanda, Keri Barrientos, Cristina Chastain, Elizabeth Medlock, Alyssa Fischer, Emily Culpepper, Rachael Zimmerman	The Impact of Parent Engagement on Language Development in Young Children who are Deaf or Hard of Hearing
Poster 46	Alexandra Harpole	Analysis of Past and Future Memory Fluency in Adults with Moderate to Severe Traumatic Brain Injury
Poster 47	Nicole Ashton Landry	Increasing Fruit and Vegetable Consumption through a Mobile School Food Pantry Partnership Model
Poster 48	Simon Chang	Exercise and Tart Cherry Effects on a High-Fat Meal
Poster 49	Brooke Datelle	The Effect of Caffeine and Carbohydrate Mouth Rinsing on Endurance Performance
Poster 50	Sohil Patel	Daily Self-Weighing and Holiday-Associated Weight Gain in Adults
Poster 51	Allison Werner Rautmann	Comparison of Postprandial Satiety Response After Consumption of Muffins with and without Walnuts
Poster 52	Laura Triana	Comparison of Blood Lipid Responses from Muffins with and without Pecans
Poster 53	Shriya Bhatnagar	Applications of <i>in silico</i> Mapping of Phenotypic Data for Cardiovascular Disease
Poster 54	Emily Rose Owen	A Genetic Basis for Age-Related Cellular Senescence
Poster 55	Elise McDonald	Primary Outcome of YOURE Fellowship
Poster 56	Marriam Elfakahany	The Effects of Childhood Maltreatment on Amygdaloid and Hippocampus Volumes: A Systematic Review and Meta-Analysis
Poster 57	Jessica Thompson	Child Maltreatment and Substance Use: A Systematic Review and Meta-Analysis
Poster 58	Stella Sim	Environmental Disasters and Mental Health: Southeast Asian Immigrants in the United States

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Poster 59	Chantel Odabi	Assessing Knowledge, Educational Needs, and Use of Brain Development Information in Expectant and New Parents
Poster 60	Savannah Lynn Carroll	Neonatal Therapy: Types, Availability, and Benefits for Children and Families
Poster 61	Adele Nicole Strother	Paternal Sensitivity and Language Development: The Influence of Gender and Ethnicity
Poster 62	Monica Karam Han	The Association between Program Fidelity and Impact: How Facilitator Engagement and Program Adherence Influence Couples Following Relationship Education
Poster 63	Trey Powell	The Olmstead Decision: Societal Isolation to Community Integration
Poster 64	Morgan White	Preparing for Productive Post-Retirement Life: LifeQuest
Poster 65	Jamarcus Gregory Mathis	The TRACStudy: An Analysis of Health Behavior with Smartphone Technology
Poster 66	Leah A Holcomb	Dating Violence: Disclosure and Perceptions Among College Students
Poster 67	Allison Michelle Vita	Sexual Violence Prevention Method Effectiveness on College Campuses
Poster 68	Mehak Ahmed	Bad Blood: Let's Talk Stigma, Periods, and Muslim Women!
Poster 69	Laurel Hiatt	University Health Center Engagement and Outcomes for Transgender and Gender Non-Conforming Students
Poster 70	Sai Nagula	Exploring the Use of UAVs in Disaster Management for Radiation Sensing after a Nuclear Event
Poster 71	Zac Adams	Pregnant and Smoking? Reducing the Low Birthweight Rate Through Maternal Education
Poster 72	Syed Hamzah Ali	Prevention of Acetaminophen Toxicity: Medication Label Reading
Poster 73	Chelsea Murphy, Gloria Andia	Arboviral Transmission Rates after a Natural Disaster Occurrence: A Systematic Review
Poster 74	Devon Elizabeth Boullion	Potential for Phytoremediation of Pharmaceutical Compounds by Emergent and Floating Plants in the Sewanee Wetland
Poster 75	Chelsea Cary	The Effects of Acute Clothianidin Exposure on Spermatogenesis
Poster 76	Emily Measel	Bisphenol AF Induces Multinucleation in Mouse Spermatogonial Cells <i>in vitro</i>
Poster 77	Elijah Scott	Examining the Racial and Economic Dimensions of Youth Arrests in Athens-Clarke County
Poster 78	Ben Giebelhausen	Analysis of the Prevalence of Task- and Relational-Oriented Leadership Behaviors in a Small Group Context

Poster 79	Alexandra Martin, Carisa Urrea, David Wyrembelski, Bethany Harmon, Jasim Mohammed	Team Dynamics: The Effect of Perceived Newcomer Ability on the Association between Positive Affect and Team Viability
Poster 80	Summer Star Fink	Persistence in Extractive Foraging by Modern Humans (<i>Homo sapiens</i>): Tools as Potential Motivators for Primates
Poster 81	Brendan Harris	Tool Use in Tufted Capuchin Monkeys (<i>Sapajus libidinosus</i>) Promotes Persistent Foraging Behavior
Poster 82	Leslie Annette Paige, Courtney H Meyer	Behavior of Wild Red and Green Macaw (<i>Ara chloropterus</i>) Chicks and Parents in the Nest
Poster 83	Jill Robinson	Sluggish Cognitive Tempo and College Students: Prevalence and Relationship with Functional Impairment
Poster 84	Smera Saikumar, Abdullah Darvesh	Reliability and Validity of Measures of Sluggish Cognitive Tempo with a College Population
Poster 85	Sarah A Cutts	Neural Correlates of Early Life Stress and Depressive Symptoms
Poster 86	Luvika Gupta	Regional Brain Morphometry and Associated Cognitive Functions in Relation to the CHA2DS2-VASc-HSF Score in Older Adults with Cardiovascular Disease
Poster 87	Aparna Kanjhlia	Relationship between Early Life Stress and Impulsive Behavior Mediated by Functional Connectivity of MCLS and Amygdala
Poster 88	Delaney Morgan Metcalf	Cognitive Interference and Sexual Risk Behavior
Poster 89	Tommy Bui, Joseph Eलगickal	Deficiencies and Improvements to Mental Health Institution in Georgia
Poster 90	Tristan Pugh, Anna Ezrine	Motivated Ignorance: How We Turn Our Greatest Skill into Our Greatest Weakness
Poster 91	Brandon Dunlap	Investigating the Role of Lutein and Zeaxanthin in Neural Efficiency: A Multi-Nutrient Comparison in Community Dwelling Older Adults
Poster 92	Christine Kaba, Abby Thomas, Neha Madangarli	Quantifying Serum Oxidative Stress in Nonresponding Participants Supplemented with Dietary Carotenoids
Poster 93	Sydney Chummar	Effects of Personality Type on Cognitive Function in Older Adults
Poster 94	Tanisha Bhavnani, Annie Somerville	Positivity Priorities: When Do I Choose Me over Us?
Poster 95	Lindsay Burr	Thinking About Your Day

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Poster 99	Daniel Woodhead	Transition Readiness and Health-Related Quality of Life in College Students
Poster 100	Lauren Ellis Arnold	Frontal Alpha Asymmetry in Youth at Clinical High Risk for Psychosis
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Poster 106	Sarah Elizabeth Spradlin	Opportunity to Experience Pushes Many College-Aged Food Security Activists to Action
Poster 107	Justin Ikenna Ikara	Fine Mapping of the <i>BR1</i> Locus to Identify the Gene Responsible for Panicle Bristle Length in Pearl Millet
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Poster 215	Nivita Sharma	Evaluating Mitochondrial Capacity and Muscle Endurance in Individuals with Parkinson's Disease
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Poster 220	Rebecca Marie Gardner	Characterization of Pectate Lyases from <i>Paenibacillus amylolyticus</i>
Poster 221	Kaitlyn Kennedy	Identification of <i>Wolbachia</i> Effector Proteins that Prevent Acidification of Yeast Vacuoles
Poster 222	Ryan James Mason	Using a Model Stream to Study Microbial Diversity and the Impact on Waterway Health in the Upper Oconee Watershed
Poster 223	Daniel Rafala	Ability of <i>Campylobacter jejuni</i> to Recognize and Metabolize Human Milk Oligosaccharides
Poster 224	Yenamala Usha Reddy	Mutational Analysis of the Potential Recognition Site between Effector Protein, VopQ, and Its Partner in Yeast, Vma3p
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Poster 247	Weston McDonald	The Conservation of Allosterity in <i>C. elegans</i> UDP-Glucose Dehydrogenase
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Poster 252	Soroosh Parsa	Structural Studies of <i>Gnt1</i> and its Potential Role in SCF Complex Formation
Poster 253	Angel Thi Pham	Role of an Upregulated Gene Cluster in Oxindole Resistance in <i>Fusarium verticillioides</i>
Poster 254	Brittany J Pioso	Role of Packing Defects in the Regulation of Human UDP-Glucose Dehydrogenase
Poster 255	Sanjana Samineni, Banks Torgerson, Jalees Naseer, Marisa Sheres, Noah Elliott, Nuzat Momin	The Effects of Personality on Group Performance and Satisfaction
Poster 256	Quan Sanders, Ben Bridges	Negative Mentoring
Poster 257	Khushboo Sarda	Determining Activity Levels of Monoclonal Antibody 109 on Various Lengths of a Fragment of a Pancreatic Ductal Adenocarcinoma Glycoprotein
Poster 258	Kendall Seese	A Secondary CRISPR-Cas9 Knockout Screening for Gene Targets Inducing Beige Adipocyte Formation
Poster 259	Jenny Tran	Determination of Large Protein NMR Assignments by Sparse ¹³ C Labeling of Valine Methyl Groups
Poster 260	Emma Tucker	Mapping Lunatic, Manic, and Radical Fringe Modifications on Delta-Like Ligands
Poster 261	Felicia Williams	Differential <i>Fusarium verticillioides</i> Gene Expression in Response to Streptomyces Bacteria Exposure
Poster 262	Holly W Presley	Assessing Intracellular A β Levels using A β -Cup1p Fusions as a Reporter System
Poster 263	Christian Adams	Understanding Cell Signaling in the Regenerating Planarian Brain
Poster 264	Max Peter Brady	Regulation of Stem Cell Mitotic Activity in the Male Gonad of the Fruit Fly
Poster 265	Branson Byers	Characterizing the Role of Inhibitory Neurons in Regulating Seizure Propagation
Poster 266	Yamini Chavan	The Role of <i>Ssdp2</i> on Regeneration of Planarian Brains
Poster 267	Arden Anne Farr	Point Mutations in Kelch 13 and Artemisinin Resistance in Malaria Parasites
Poster 268	Nicole Googe	Pack Up Your Things and Go: Photoreceptor Packing in the <i>Anolis sagrei</i> Lizard
Poster 269	Katie Irwin	Do You Have a Third Eye?

Poster 270	Hari Lakshmanan	The Effects of the Protein Placenta-Specific 8 (Plac8) on CD4 ⁺ T Cell function
Poster 271	Caroline McElhannon	Memory Immune Response to <i>T. cruzi</i> Reinfection Requires Similar Activation Time as Primary Infection
Poster 272	Zehra Rahman	Standardization of an <i>in vitro</i> Culture of <i>Plasmodium falciparum</i> CB132 Gametocytes to Evaluate Transmission into <i>Anopheles stephensi</i>
Poster 273	Amita Gavva Reddy	Tagging <i>Cryptosporidium parvum</i> Exported Protein Candidate cgd3_3460 (PEXEL 21) with Bacterial Flagellin to Elicit Higher Immune Response from the Host
Poster 274	Dylon Stephens	Clp Family Proteins and their Biological Significance in <i>Plasmodium falciparum</i>
Poster 275	Lauren Elizabeth Thompson	Role of Single Stranded DNA Binding Protein in the Regeneration of Planarian Nervous Systems
Poster 276	Shannon Walker, Ave Fouriez	Identifying the General Principles of Neural Circuit Assembly
Poster 277	Georgia McClure Wilson	The First CRISPR/Cas9-base Reverse Genetic Screen in <i>Trypanosoma cruzi</i>
Poster 278	Jacob Beckham	Collection, Isolation, and Characterization of Large Solid-Phase PAH Oligomers
Poster 279	Emerson Buck, Taylor Patterson	Development of Synthetic Pathways for Various Metal-Organic Frameworks
Poster 280	Joyce Bui	Chemical Pedagogy: Utilizing Interactive Simulations in Chemistry Learning Environments
Poster 281	Ben Crawford	Development of Biodegradable and Biosourced Microcellular Polyurethane Foams
Poster 282	Runiya Juni Dasgupta	Enantioselective [4+2] Cycloaddition of <i>o</i> -Quinone Methides and Vinyl Sulfides
Poster 283	Caroline Glessner	A Multi-Outcome Experiment Involving the Green Oxidation of Alcohols in the Undergraduate Teaching Laboratories
Poster 284	Minje Kim	Activity of Enzyme catalyzed by Pyridoxal Phosphate (PLP)-Dependent Histidine Decarboxylase from <i>Enterobacter aerogenes</i>
Poster 285	Xena Mansoura	A Multi-Outcome Experiment for the Preparation of Enamines in the Undergraduate Organic Chemistry Teaching Laboratories
Poster 286	Hannah Charlesean Schriever	Organocatalytic Synthesis of Bioactive Amines
Poster 287	Sommer Anjum	Mathematical Modeling of Left Ventricular Stresses after a Heart Attack
Poster 288	Reagan Noe Armistead	Antibacterial Properties of Nitric Oxide Releasing Microfluidic Devices
Poster 289	Bryant Oliver Bolds II	Design and Characterization of Drug-Loaded Nanoparticles for Breast Cancer Therapy

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Poster 291	Galilea Najera Garcia	Water Footprint Assessment of Food Crops
Poster 292	Juhi Mancha	Nitric Oxide Releasing PVA/Arabinoylan Composite as Antimicrobial Wound Dressing
Poster 293	Anna McClain	Engineering Pathways in Recombinant <i>Escherichia coli</i> for Volatile Ester Biosynthesis
Poster 294	Chelsea Murray	Morphological Differences between Native Fibrin Clots vs. Glycated Clots
Poster 295	Dieu Thao Nguyen	Amalgamation of Tranexamic Acid, Propolis and Nitric Oxide Releasing Antibacterial Wound Dressing to Prevent Excessive Bleeding and Infection
Poster 296	Emily Nieves	Mathematical Modeling of Renal Function Decline as a Result of Crystal Formation in Patients with Hyperoxaluria
Poster 297	Dhara Patel	Rapid Detection of MRSA Using Electrochemical Biosensing Method
Poster 298	Martin Thach Tran	Characterization of an Electrospun Nitric Oxide Donor Linked Wound Dressing
Poster 299	Alex Ross Blankenship	An Assessment of the Accelerated Bridge Construction Method
Poster 300	Ben Bullard	Reliably Regulating Fluid Pressure in a Low-Cost Platform
Poster 301	Paul Coughlin	Specific Stage Analysis of High-Order Streams
Poster 302	Caroline Dickey	Material Flow Analysis of Concrete Infrastructure Resources - Atlanta Regional Level
Poster 303	Andrea Lynn Duncan	Fabricating Multi-Barrel Capillary Tubes for the Controlled Deposition of Picoliter Droplets
Poster 304	Austin Michael Duncan	Modifying 3D Printers for Printing Droplet Interface Bilayers
Poster 305	Katy Christina House	Best Management Practices for Post-Construction Restoration of Rights-Of-Way in Saltwater Marshes, Estuaries, and Other Tidally Influenced Areas
Poster 306	Cole Howington	Microplastic Sampling
Poster 307	Chris Johnson II	Experimental Investigation: Controlling Temperature Rise due to Heat of Hydration in Mass Concrete Placements
Poster 308	Anastasia Nichole Klosterman	Estimating Trophic Structure on Coral Reefs Using Metabolic Theory and Complex Food Webs
Poster 309	George R Moll III	The Design, Construction, and Utility of Vibrations Test Articles
Poster 310	Sean Sullivan	Structural Mechanics and Vibration Phenomena Demonstrated with 3D Printed Units

Poster 311	Steven Michael Tate	Evaluation of Tire Chips and Fiber Reinforcement for Use in Concrete Barrier Walls
Poster 312	Usenmfon Immanuel Udo	Fatigue Performance Characterization of Asphalt Concrete Mixture
Poster 313	Truc Vu	Two-Dimensional Self-Assembly Experiments with Vibration Stimuli
Poster 314	Davis Wing	Evaluating the use of Metakaolin in Mass Concrete Specimens
Poster 315	Haram Lee, Daniel Snyder	Wireless Network System for Power Plant Environment
Poster 316	Daniel Snyder, Haram Lee	Wireless Sensor Network for Real-Time Power Plant Conditions Monitoring
Poster 317	Dean Barber	Understanding the Role of HIF-2 β and Identifying Potential Inhibitors
Poster 318	Wendy Cai	Design of a Micro Autonomous Vehicle for Maze Navigation
Poster 319	Anton Eduard Franzluebbers	Menu-Based versus Physical Interaction Systems in Virtual Reality for a Neurological Examination of a Dog
Poster 320	Lindsey Greenfield	Computational Research on Resveratrol Binding to DNA Polymerase
Poster 321	Mariam Hammady	Using Machine Learning to Improve the Reliability of Solar Energy
Poster 322	Austin Kinkade	Shack-Hartmann Code Optimization and Conversion to C++
Poster 323	David F Liaguno	Analysis of Radiological Properties of Woody Tissue in Chicken Breast Samples
Poster 324	Ryan Snowden	Multi-Functional Micro-Facial Alteration Toolkit for Face Recognition
Poster 325	Allen Victor Spain	Phase-OTDR Distributed Fiber Sensor
Poster 326	Kaitlyn Summey	Adaptive Optics in Light Sheet Microscopy
Poster 327	Harshitha Tadinada, Aaron Smith	3D Printed Thermochromic Resin and Its Application
Poster 328	Aaron Martinez, Matthew Wicker	Compact Tetrahedron Based RNA 3D Structure Assembly
Poster 329	Ravi Parashar	Using a Citizen Science Approach and Mobile Technologies to Assess Family Routines on Health and Obesity for Future Population Interventions
Poster 330	Megan Arogeti	Pseudo Invariant and Coastal Target Feasibility
Poster 331	Ethan Barnes	Compression and Encryption Methods for Small Satellite Communications
Poster 332	Paige Copenhaver	Antenna Theory and the University of Georgia's First Ground Station
Poster 333	Parker Ensing	Structural Analysis of Small Satellites

Poster 334	Graham Grable	Enhancement of Space-Borne Sensors through Adaptive Temperature Control and Thermoelectric Modules
Poster 335	Godfrey Hendrix	Cost Effective Thermal Vacuum Testing System
Poster 336	Meredith Herbst	Access to Food Assistance in Northeast Georgia
Poster 337	Albert Leonard Hunecke III	Exploring the Role of Plant Physiological Responses to Increasing Atmospheric CO ₂ Concentrations on Extreme Temperatures and Heatwaves
Poster 338	Bjorn Leicher	Concept of Operations in Small Satellite Functionality
Poster 339	Alexandria Lin, Casper Versteeg	Modeling the Attitude Determination and Control Subsystem (ADCS) on 3U CubeSat
Poster 340	Casper Versteeg, Matthew Hevert	Structural-Thermal Optical Performance Analysis of Small Satellite Payloads
Poster 341	Ayshia Ranjitsingh	Determination of Community Housing Problems Utilizing Kernel Density Interpolation
Poster 342	Sydney Meredith Whilden	How Beta Angle Determines CubeSat Mission Development
Poster 343	Anthony Arbise	Implications of Strike-Slip Faulting for Plate Tectonics on Europa
Poster 344	Jared Conner	Application of Biochar for Low-Cost Treatment of Agricultural Wastewater
Poster 345	Laura Dupont	Evaluating Human-Driven Environmental Change using a Stalagmite from Northwestern Madagascar: Implications for Research and Conservation
Poster 346	Bear Jordan	Changes in Clay Mineral Assemblages of Legacy Sediments in the Calhoun Critical Zone Observatory, SC: Evidence for Anthropogenic Landscape Change
Poster 347	Bear Jordan, Sydney Lee	Descriptive Mineralogy of Georgia's Barrier Island Beaches
Poster 348	Sophia Chason Sanders	The Fate of Degraded Biotites in the Deep Critical Zone: Implications for the K-Uplift Hypothesis
Poster 349	Mackenzie Joy	A Study of Formaldehyde in MBM40
Poster 350	Kinsey Lorraine Poland	Investigating the Theoretical Limit of Precision for Radial Velocity Measurements
Poster 351	Will Thompson	Investigation of the Excited-State Dynamics of Photo-ODIBO Using Transient Absorption Spectroscopy
Poster 352	Elliott Williams	Simulating Turbulence in the Magellanic Stream
Poster 353	Louise Leyi Zhuang	Effects of Thiamine Deficiency on Magnetic Resonance Images of Mice Brains
Poster 354	Meekail Zain	Basis and Metric Variations of the Fractal Image Compression Presented by Yuval Fisher

Oral Session 5

Tuesday, 9:30 to
10:45 a.m.

Athena Breakout Rooms

Room A	Marianna Hagler	"GET REAL LEGITIMATE ONLINE": Twitter Poetry's Artificial Interiors
	Rachel Renee Adornato	Social Banditry: Medieval Ballads and the Black Panther Party 1976-1982
	Julia Thompson	The Architect's True Purpose in Johann Wolfgang von Goethe's <i>Elective Affinities</i>
	Katie Lech	The Divine is in the Details: Passion Devotion and Ancillary Texts in Medieval Books of Hours
Room B	Arturia Melson-Silimon	Personality Testing and the Americans with Disabilities Act: Cause for Concern as Normal and Abnormal Personality Models are Integrated
	Isabel Carvallo, Luis Mata	Bridging the Gaps: The Role of Promotoras in Connecting Latinos to the Local Community
	Kate Ayres	Improving Mental Healthcare in Greek Refugee Camps
	Rajashri Manjunath	Socioeconomic Disparities in Mental Health and Financial Conditions
Room C	Elizabeth Ann Clerke	Emotion Regulation in the Context of Parenting: A Review and Directions for Measurement Development
	Peyton Lynch	Improvements to Cognitive Switching Tasks Following a Dual Distraction and Driving Intervention
	Nicole Schlosberg	Antisaccade Task and How it Correlates with Intelligence
	Arjun N Bhatt	The Effects of Language and Culture on Thought, Behavior, and Personality
Room D	Maisie Grace MacKnight	<i>In vitro</i> Screening for <i>Phytophthora</i> Resistance in American and Hybrid Chestnuts
	Natalie Gray Busener	Revealing the Link Between Phenotype and Micronutrient Content in Cassava
	Sarah Houtsma	The Effects and Efficacy of Fertilizer Products Processed using Nano Particle Technology
	Tina Jones	Detection of Azole-Resistant <i>Aspergillus fumigatus</i> in Agricultural Environments

Room G	Lukas T Woodyard	“Indecent” Immigration: Including “the Other” in Theatre
	Lexi Ritter	Women in Political Dramas: How Does Hollywood Depict Politicians?
	Abraham Johnson	Interpreting Queer Spirituality for the Stage
	Jianna Patricia Justice	Documenting the Ephemeral: Composition and Decomposition in the Cinema of Agnès Varda
Room H	Kristie Le	Investigation of the Formation of Gold Nanoparticles on Ancient Gilded Statues
	Tad Paulsel	Designing and Using a Multi-Outcome Diels-Alder Experiment to Gauge Undergraduate Students’ Understanding of a Diels-Alder Reaction and 1H NMR Spectroscopy
	Matthew Wicker	Feature-Guided Safety Testing of Neural Networks

Oral Session 6

Tuesday, 11 a.m.
to 12:15 p.m.

Athena Breakout Rooms

Room A	Reilly Megee	JODD: The Creation of the Journal of Digital Design
	Charlotte Fox Norsworthy	Building the Language: Analyzing the Development of Virtual Reality as a Journalistic Medium
	Noelle Christina Lashley, Brandon Janeway, Eryka Johnson	Examining the Impacts of Virtual Reality Journalism
	Allison Krausman, Wellie Delmer	Who’s We: A Documentary Study on Gentrification in Atlanta
Room B	Cecelia Giangacomo	Comparing Discrimination Methods to Amplify Bacterial DNA from Plants
	LuLu Lacy	Competitive Dynamics of Coastal Lichen Communities
	Caitlin Teuton	Longleaf Pine Restoration in Coastal Georgia
	Margaret Zacharias	Population Dynamics and Mass Mortality of the Vermetid Gastropod, <i>Ceraesignum maximum</i>
Room C	Alison Adams	Density-Dependent Selection Model for the Sociality of <i>Ceratina (Neoceratina) australensis</i>
	Nathalie Murphy	Identification of the Binding Motifs of Transcription Factors Expressed in Shoots and Roots of <i>Zea mays</i> by DNA Affinity Purification Sequencing

Room C	Neeraja Sarda	Towards Elucidation of Spore Glycan Formation
	Steven Carroll	Cell Division Cycle Regulates Kinetoplast Division
Room D	Hannah Turner	The Price of Freedom: An Analysis of Monetary Sanctions in the United States
	Jake Elijah Sandor	The Effects of Promoting Minority-Owned Businesses to Socially Conscious College Students
	Austin Emery	The Costly Legacy of Economic Sanctions
	Nina Reddy	Reducing Recidivism through Family Contact: Cutting Costs of Prison Phone Calls in Georgia
Room G	Emma Bay Dickinson	Colorful Styles: Analyzing Horn Tone Quality and Regional Tone Differences through Literature Study
	Bianca Garcia	The Ideal Feminine Beauty and Sexuality in Italian Fashion: A Comparative Analysis of Versace and Prada
	Meghan O'Keefe	Close Up Shots of Collapsing Societies: The Soviet Films <i>I am Cuba</i> and <i>The Cranes are Flying</i>
	David Forsee	Space and Meaning-Making in London Theatre
Room H	Sachi Shastri	Investigating the Role of Inflammation and Hypercoagulation in Placental Malaria
	Sierra King	Optimal <i>Anopheles quadrimaculatus</i> Larval Density for Laboratory Rearing
	Shreya Dilip Tailor, Keshni Kokliakumar, Joseph Mcdaniels	The Effects of HIV Viral Load in the Presence of Arboviral Coinfection

Oral Session 7

Tuesday, 12:30 to
1:45 p.m.

Athena Breakout Rooms

Room A	Taylor Martin	Do Dual-Use Controls Contribute to the Probability of the Pursuit or Use of CBRN Weapons by Terrorist Organizations?
	Varad R Dabke	Somalian Piracy: A Study on the Relationship Between Food Security and Violent Maritime Conflict
	Caroline Beadles	Gender Equality and Sexual Violence in Conflict
	Mauli Desai	Preventing the Arbitrary Killing and Kidnapping of Journalists

Room B	Abdullah Darvesh	Investigating the Effect of Galanin on Consolidation of Threat Learning
	Raman Shrestha	The Effects of Age on the Relation of beta-Carotene, Lutein, and Zeaxanthin on Cognitive Performance in Adults
	Rhiannon Euhus	The Effects of Studying Habits on Vitamin D Levels in Undergraduate Students
	Robert Daniel Petcu	Cognitive Reserve: A Potential Cushioning Effect Between Severity of Concussion and Memory
Room C	Katie Luedecke	Abnormal <i>N</i> -Heterocyclic Carbene Preparation via 1,2-Hydrogen Migration and BX_3 Complexation
	Alyssia Mitchell	Characterizing the Capture of Foreign DNA by a Type III-A CRISPR-Cas System
	Nathalie Murphy	Development of an N-Linked Glycan Specific Binding Reagent by Computational and Experimental Methods
	Christina Najjar	Investigation of <i>NAP1</i> as Reporter for CaaX Protein Post-Translational Modification Shunt Pathway
Room D	Evan Alexander Katz	Stopping Rules for Majority Voting: A Public Choice Experiment
	Amy Pan	Ending Modern-Day Voter Suppression in Georgia
	Bryson Culver	Political Impacts of Obama's Appellate Court Appointments on Policy Issues
	Sarah Burns	Empowering Women to Campaign for Office: How and Why Women Run
Room G	Virginia Olivier	Outdoor Physical Activity in Relation to Vitamin D Status in African American College Women
	Caroline Elizabeth Finn	Effects of Chronically Elevated Bacterial Lipopolysaccharide on the Gut-Brain Axis
	Sunny Abdelmageed	The Effect of Habituation and Stimulus Valence within IAPS
	Emily Reed Germany	Effects of Schizophrenia on Error Correction Latencies of the Minimally Delayed Oculomotor Response Eye Tracking Task

Oral Session 8

Tuesday, 2:00 to 3:15 p.m.

Athena Breakout Rooms

Room A	Clarissa Keisling	Marine Microplastics: Mapping Distributions in Estuarine Systems
	Hayley Adair Schroeder	Fall Conditions Trigger an Altered Flight Metabolic Rate in Monarch Butterflies, <i>Danaus plexippus</i>
	Elizabeth Butler	Population Connectivity of Reef Fish Between Coral Reefs off the Amazon River Plume and in the Western Atlantic
	Alizah Garvin	Using Gene Expression Analysis to Understand Marine Microbial Biogeochemistry
Room B	Taylor Walker	The American Opioid Epidemic
	Tarun Ramesh, Emma Tucker	The Deadliest Catch: Testing and Treating Sexually Transmitted Infections in Methadone Rehabilitation Facilities
	Jacob Scott Kepes	Policy Diffusion and Misdemeanor Probation in Georgia
	Rhiannon Euhus	The Health Status and Healthcare Access of Incarcerated Women
Room C	Michael Sloman	Jewish Investment in Education: Do Jewish Populations Make Different Investment Choices in Education
	Jazzy Imon Griffin	Modern Day Mercantilism: China vs. the United States
	Anthony Potts	Fortune 500 and S&P Firm Lifecycle Analysis
	Jordan Peebles	Gender Differences in STEM Major Choice: The Effects of Risk Aversion
Room D	Brooke Hull	Genomic Editing of <i>Neurospora crassa</i> as a Tool for Studying Circadian Oscillator Synchronization
	Laurel Parker	mRNA Reprogramming of Fibroblasts into Induced Pluripotent Stem Cells
	Jessica Ziling Ho	Genotype-Phenotype Correlations for Protein O-Linked Mannose <i>N</i> -Acetylglucosaminyltransferase 1 (POMGnT1) in Congenital Muscular Dystrophy
	Craig Michael Hearn	Characterization of Bacterial Genes involved in Cell Wall Synthesis

Tuesday, April 10, 2018

Room G	Zach Rinehart	Modeling Functional Group Effects on Combustion: n-Butane, 1-Butanol, and Butanone
	Caleb Wiff	Measurements of Pre-Heater Temperature-Dependence on Flow Rates for Combustion Experiments
	Jackson Bradley Willis	Diagnosis and Treatment of Asthma by Airflow Dynamics and Particle Deposition Using Heliox
	Tala Sidawi, Brian West, Jacob Ursrey, Prasant Joshi	Exploring the Development of Educational Modules in Virtual Reality through Participant Observation
Room H	Olivia Feltner	Relationship Between Post-Concussion Step Counts and Time to Asymptomatic: A Pilot Study in College Students
	Catriona Geddes	The Association Between Knowledge of Vitamin D and Blood Levels of 25-Hydroxy Vitamin D among Black/African-American College Women
	Jinu Kim	The Relation Between Critical Flicker Fusion and Functional Independence in Older Adults
	Chiamaka Ujuaku Uzuegbunam	Education Moderating the Relationship Between Personality and Impulsivity in Adults

Oral Session 9

Tuesday, 3:30 to 4:45 p.m.

Athena Breakout Rooms

Room A	Sarah Henning	Help a Sister Out: The Gendered Difference in Aid Allocation Decision Making?
	Kal Hicks	The Four Factor Model: A Realistic, Applicable, and Predictable Theoretical Framework for Understanding Modern Terrorism
	Peyton Sammons	The Growing Role of Human Trafficking as a Means for Recruitment and Funding in 21st Century Insurgencies
	Charlotte Ann Partrick	Outcomes of Insurgency: Do Women Make a Difference?
Room B	Ben Burgh	Camera-Geometry Interpenetration in Virtual Reality
	Ridge Maxson	Bioactive Scaffold Design for Bone Tissue Engineering
	Michael Buzzy	Joule Heating Analysis of Spacecraft PCBs
	Richard Becker	Acoustical Transformation of Global Energy Consumption

Room C	Kajol Patel	Making Kindness Count: Prosocial Behavior as a Treatment for Mild Depression
	Reese Dayton Antwine, Cassandra Alvarez, Elyse Sheldon	The Dopamine Hypothesis of Social Media Use
	Eli Chlan	Activity in the Anterior Cingulate Cortex: Differences across Healthy Populations and Populations with Psychosis
	Avery Warner, Arden Farr, Anthony Potts	Prevalence of Student Mental Health Issues: Implementing Awareness Training
Room D	Sarah Sadoris	SSIP1 is Required for SDG7-Mediated Trimethylation of H3K36
	Sergio Alcantar	Effects of Increased Omega-6 and Omega-3 Fatty Acids on Primary Sex Ratio in Japanese Quail, <i>Coturnix japonica</i>
	Dustin Dial	Genome Construction and Determination of Nutritional Roles of Dual-Obligate Symbionts in the Plant-Sap-Feeding Adelgidae
	Emerson Lee	Genetic Improvement of Sulfur-Containing Amino Acids by Manipulating Genetic Loci Controlling Protein Subunits in Soybean
Room G	Natalie Perkins	Workshop for the Instruction and Use of Aquaponics in a Classroom Setting
	Holly Jamieson	Effects of Weather on Northern Bobwhite (<i>Colinus virginianus</i>) Harvest
	Erin Malsbury	Density Banding Patterns and Stable Isotopes in Amazonian and Caribbean <i>Siderastrea</i> Corals
	Gloria Andia, Chelsea Murphy, Ahana Gaurav	Arboviral Transmission Rates after a Natural Disaster Occurrence: A Systematic Review
Room H	Teddy Vincent	Climate Fiction as a Response to Climate Change: A Genre Analysis
	Madison Alexandra Hogan	Standardization of the Hours of the Passion in Medieval Books of Hours
	Alexander Sheldon	The Status of Postmodern Aesthetics in Contemporary British Literature

Abstracts

The Effect of Habituation and Stimulus Valence within IAPS

Sunny Abdelmageed, CURO Research Assistant
*Dr. Brett Clementz, Psychology,
Franklin College of Arts and Sciences*

The International Affective Picture System (IAPS) is used to study emotional response and attention, and it contains pleasant, unpleasant, and neutral stimuli. General habituation effects have been found by studies monitoring the startle response within the IAPS paradigm. Additionally, studies have found abnormal habituation responses during gating paradigms in people with schizophrenia. This study uses electroencephalography (EEG) to monitor participants' neural response to stimuli during the IAPS task. Participants view 60 pictures in the chosen IAPS set three times. We will first analyze the effects of habituation and stimulus valence among healthy participants, and then compare effects to participants with psychosis from the Bipolar-Schizophrenia Network on Intermediate Phenotypes. We expect that there will be a greater habituation response to aversive and pleasant stimuli than to neutral stimuli and that these responses will be different among psychoses groups. Findings can provide insight into how psychosis impacts emotional processing and identification of certain stimulus attributes in the brain.

A Policy Analysis of Georgia's Anti-Human Trafficking Laws

Elina Acosta, CURO Research Assistant
Dr. David O Okech, Social Work, School of Social Work

Hidden, yet in plain sight, human trafficking is today's modern form of slavery. According to the U.S State Department Trafficking in Persons report, an estimate of 600,000 to 800,000 people are globally trafficked every year, with a majority of victims finding themselves in the commercial sex trade. Atlanta's booming metropolitan environment has not only brought commercial profit to Georgia but has simultaneously created a space that allows human trafficking to flourish. This has resulted in Atlanta being ranked among the top fourteen American cities to suffer from high volumes of trafficking. Human trafficking exploits vulnerable populations for monetary gain and denies victims their human right to live freely and with dignity. Collaboration and effective legislation are imperative to prevent and ultimately end this heinous crime. In this study, I will analyze current anti-trafficking law and state policy in Georgia. I will also examine current policy effectiveness, whether there are gaps in policy, and if it produces any unintended consequences. I expect to find a positive increase in prevention laws against human trafficking, but to also encounter gaps in policy that may have real effects on victims. Legislative action is vital to combat and prevent human trafficking in Georgia, to provide clear guidelines for prosecuting traffickers, to properly train law enforcement, and to provide protection and

rehabilitation for victims. By examining these policies and their inadequacies, we can begin to strategically address their shortcomings and make a significant contribution to the fight against human trafficking.

Density-Dependent Selection Model for the Sociality of *Ceratina (Neoceratina) australensis*

Alison Adams
Dr. David Hall, Genetics, Franklin College of Arts and Sciences

Ceratina (Neoceratina) australensis, the Australian small carpenter bee, is socially polymorphic with both solitary and social nests collected in the same populations. Solitary nests contain a single adult female and her developing brood and social nests contain two adult females and their brood. Research has shown that solitary nests tend to produce more offspring per female than social nests, but only when a parasitic wasp is absent. When the wasp is abundant, solitary nests suffer high levels of parasitism and loss of brood. Thus, solitary nests do worse in the presence of wasps and better in their absence. The parasitic wasp does better when solitary nests are common, and worse when they are rare. These effects are hypothesized to allow maintenance of both nest types in bee populations: when solitary nests are dense, the wasp increases in numbers, which leads to an advantage for social nests, and vice versa. To address this hypothesis, several mathematical models were developed to capture the biology of this system. The models were analyzed to determine whether a stable equilibrium with both social and solitary nests was possible. Such an equilibrium was found, which indicates that the parasitic wasp may be allowing the existence of the social polymorphism in the bee in nature.

Understanding Cell Signaling in the Regenerating Planarian Brain

Christian Adams, CURO Research Assistant
*Dr. Rachel Roberts-Galbraith, Cellular Biology,
Franklin College of Arts and Sciences*

Studying central nervous system (CNS) regeneration is significant because humans cannot regenerate their CNS after injury and disease. While CNS regeneration in humans is limited, freshwater flatworms called planarians regenerate their brain and CNS. To delineate the molecular control of regeneration, the Roberts-Galbraith lab aims to discover genes involved in planarian regeneration and to describe the mechanisms by which these genes function. Because cell signaling governs the mechanisms of many biological processes, we hypothesize that cell signaling might also control planarian regeneration. Since only a few such signals are known, our first objective is to identify novel signaling molecules involved in planarian regeneration. To do so, I will clone 30 head-expressed genes that encode proteins with signal peptides. Next, to assess the roles of these genes,

I will use RNA interference (RNAi) to target each mRNA and observe planarian regeneration. I will also perform in situ hybridization to localize each mRNA. In addition to discovering new genes, I will continue to explore the function of F-Spondin, a gene interestingly expressed in cells next to planarian stem cells. To investigate F-Spondin's function, I will produce recombinant proteins, which will be used in future protein-protein binding experiments.

Investigating the Effect of Lactamase Genes in *Fusarium verticillioides*

Lincoln Adams, CURO Research Assistant

Dr. Scott Gold, Plant Pathology,

College of Agricultural and Environmental Sciences

Fusarium verticillioides (*Fv*) is one of the primary fungal pathogens of *Zea mays* (maize, corn), a primary component of the global food supply. Exposure to *Fv* produced mycotoxins called fumonisins, is correlated with human conditions including cancers, neural tube defects, and is causal to acute toxicity in livestock animals particularly pig and horse. My research focuses primarily on a 46 member gene family of *Fv* lactamase enzyme encoding genes. I hypothesize that these lactamases confer resistance to antibiotics produced by competing organisms. However, some of these lactamases may be involved instead in secondary metabolite biosynthesis rather than xenobiotic degradation. My project has two primary goals: First, to generate deletion mutants of the lactamase gene (FVEG_08291) using the OSCAR method. Second, to examine several *Fv* mutants, each deleted for a different lactamase gene, by LC-MS/MS metabolomic analysis; based on the hypothesis that is the tested lactamase is involved in secondary metabolite biosynthesis so compared to wild type it should be increased and/or decreased in substrate and product molecule concentrations, respectively. In a preliminary experiment, I will determine the most conducive growth medium for *Fv* secondary metabolite production, in order to maximize lactamase dependent secondary metabolism. I suspect that most of the mutant strains tested will exhibit little difference from wild type *Fv*, due to there being no foreign antibiotics present, and that a significant minority of strains will exhibit significant changes in metabolic profile due to the deleted gene being involved in secondary metabolism rather than antibiotic resistance.

Pregnant and Smoking? Reducing the Low Birthweight Rate Through Maternal Education

Zac Adams, CURO Summer Fellow

Dr. Toni Miles, Epidemiology and Biostatistics,

College of Public Health

Children born in Clarke County to mothers that used tobacco during pregnancy have a higher risk of being born with a low birth weight. In the United States, eight percent

of babies that are born have low birth weights. In Clarke County, the low birth weight percentage is 9.5. There is a need for health education materials in Clarke County to teach pregnant women about the effects that tobacco use has on their unborn children. The Northeast Georgia Health Department website does not offer any materials on the effects of tobacco use in pregnant women. This research analyzed the current education materials that are available on the internet regarding maternal tobacco use during pregnancy, and it also looked at demographic data of Clarke County to make recommendation about the most effective forms of educational materials that could be utilized by the Northeast Georgia Health Department. Clarke County is made up of approximately 10.6% Hispanics and Latinos, so the programs should be targeted to both English and Spanish speakers. The programs should be more education-based than intervention based because 37.8% of all individuals in Athens are living in poverty and may not be able to afford intervention programs. Because of the current research being conducted on the success of internet-based education programs, Clarke County should seek an electronic education tool. The website the Northeast Georgia Health Department utilizes would be a strong target for implementing a new set of web pages with educational materials.

What is the Function of the Protein EutJ in Ethanolamine Catabolism in *Salmonella enterica*?

John Mark Adent, CURO Research Assistant

Dr. Jorge Escalante-Semerena, Microbiology,

Franklin College of Arts and Sciences

Salmonella enterica is an intestinal pathogen that depends on ethanolamine as a nitrogen, carbon and energy source for infection. Because of this, *Salmonella* strains unable to utilize ethanolamine have reduced fitness in the intestinal environment. Genes encoding functions involved in ethanolamine metabolism are organized into a single 17-gene ethanolamine utilization (*eut*) operon. This 17-gene operon contains genes that encode the components of a proteinaceous compartment known as the metabolosome. The metabolosome plays a key role in maintaining cofactor pools and sequestering the highly reactive acetaldehyde intermediate. Most of the functions that are encoded within this operon have been determined, with exception of the putative chaperone EutJ. In the absence of EutJ, growth of *S. enterica* on ethanolamine is sensitive to high temperature, which suggests that EutJ may play a role in maintaining the stability of enzymes in this pathway. We aim to identify the proteins that interact with EutJ. Potential EutJ interactive partners are EutE, an acetaldehyde dehydrogenase and EutG, an alcohol dehydrogenase. These enzymes convert the acetaldehyde intermediate to acetyl-CoA or ethanol, respectively. Additionally, their encoding genes flank *eutJ* in the operon. Preliminary data suggests the stability of

EutE and EutG are improved in the presence of EutJ. We will characterize EutJ by determining its protein partners, assay their activity in the presence or absence of EutJ, and attempt to purify the complex for crystallization trials. With these data, we will provide information on the last unknown function in the metabolic pathway critical for *Salmonella* pathogenesis.

Social Banditry: Medieval Ballads and the Black Panther Party 1976-1982

Rachel Renee Adornato

Dr. Ron Baxter Miller, English,

Franklin College of Arts and Sciences

My research paper discusses the evolution of the liminal identity that inherently accompanies social banditry. In particular, I compare the liminality of the theorized social bandit of the Medieval Period with the alienation of the Black Panther Party (BPP) and their conflict with the Los Angeles Police Department during the years 1966 to 1982. For this study, I am defining liminality as the existence of a person or group located outside of authoritative consideration, whom is still pressured to submit to its jurisdiction. I define the social bandit as Hobsbawm, as "a peasant outlaw(s) whom the lord and state regard as criminals, but who remain within peasant society, and are considered by their people as heroes..." I interpret the modern prison poet in the United States as a reinvention of the bandit as a benevolent, yet violent outsider. I argue that these groups, the BPP and Robin Hood with his band, exist in a liminal space or mask of violence in order to force the political agenda of the ruling patriarchy. By doing so, they subvert the longevity of classism and racism in their respective time periods.

Expanding Rural Care: Provisions to Increase Independent Rural Freestanding Emergency Departments

Nidhi Aggarwal

Dr. Micah Gell-Redman, International Affairs,

School of Public and International Affairs

Hospitals serve as the sole source of healthcare provision for many rural communities, but recent hospital closures in rural areas of the United States undermine the availability of healthcare resources for rural populations. Since 2010, 82 U.S. rural hospitals have closed, of which six were discontinued in Georgia alone. To remedy the situation, Governor Nathan Deal introduced a policy in 2014 for financially struggling rural hospitals to transition into independent rural freestanding emergency departments (IRFEDs). However, there have been no completed applications for conversion to IRFEDs from eligible facilities, due to financial limitations. Particularly, IRFEDs are not recognized as emergency departments by the Centers for

Medicare & Medicaid Services (CMS) and therefore are ineligible for reimbursements. However, if the existing policy were modified to recognize IRFEDs as emergency departments and enable facility fee reimbursements, IRFEDs would receive increased support to cover operational costs while preserving crucial emergency care. To reverse hospital closure rates, expand rural communities' access to critical nearby healthcare, and stimulate the southeastern regional healthcare economies, federal regulations should enable IRFEDs to be recognized as emergency departments and enable their eligibility to receive federal financial support.

Characterization of Ribonuclease E Substrate Specificity in Proline tRNA Maturation *Escherichia coli*

Chiso Ikechukwu Ahanotu, CURO Research Assistant

Dr. Sidney R Kushner, Genetics,

Franklin College of Arts and Sciences

Of the 86 tRNAs in *E. coli*, the three proline species are unusual in that their 3' ends are matured by a one-step RNase E cleavage immediately downstream of the CCA determinant. In contrast, RNase E processing of all the other tRNAs leaves 2-3 nucleotides downstream of the CCA. These extra nucleotides are subsequently removed by several 3' & 5' exonucleases. What is unique about the proline tRNAs is the presence of a C residue at the mature 5' end, which has been proposed to be responsible for RNase E cleavage specificity. We hypothesize that by changing the C residue at the 5' end of proline tRNA to either G, U, or A, we will alter RNase E cleavage specificity at the 3' terminus of the proline tRNAs. We will construct plasmids carrying either the *proK* or *proL* coding sequences under their own promoters. Subsequently, the C residue at the 5' end will be changed to a G residue by introducing a transversion in which a CG base pair is replaced with a GC base pair. In separate constructions the nucleotides downstream of CCA will also be altered. The processing of mutant transcripts will be analyzed in $\Delta proK$ and $\Delta proL$ deletion strains using Northern, cloning and sequencing analysis.

Bad Blood: Let's Talk Stigma, Periods, and Muslim Women!

Mehak Ahmed, CURO Research Assistant

Dr. Nathan Hansen, Health Promotion and Behavior,

College of Public Health

The stigma of menstruation is a public health issue that for many years has been ignored. The taboo associated with a woman's menstrual cycle leaves many Muslim women with psychological and physical consequences. Because menstrual issues are also seen as irrelevant by male dominated governments and leaders, some Muslim communities limit access to health resources and services increasing the risk of reproductive tract infections (RTI's), anemia and dysmenorrhea. The aim of this study was to

determine the effects of menstrual stigma on the overall quality of life among Muslim women of menstruating age. To our knowledge, this is the first review that has explored the impact of menstrual stigma on reproductive and sexual health of Muslim women. The search was conducted from September 2017 – January 2018. Four health and social science databases were searched systematically for peer – review literature. Following the PRISMA guidelines, a structured search strategy was used to identify articles relating to the research question. Forty-one (n=41) studies met the inclusion criteria. Few studies were conducted in the United States. Half of the studies conducted were cross sectional and had been conducted since 2000. Women ages varied from 10 - 85 years and included females of different races and ethnicities (Asian, Black, and White). All of the studies indicate that because women are ritually deemed “unclean” during their cycle they are unable to physically attend school, engage in religious practices, participate in social events and are shunned from their home.

Alleviating Food Insecurity in Athens-Clarke County through Public Transportation

Rachael Folakemi Akinola, Foundation Fellow
*Dr. David Williams, Religion,
Franklin College of Arts and Sciences*

In 2010, census data indicated that 1 in 5 people living in Athens Clarke County (ACC) are food insecure, especially low-income families and seniors. Because full-service supermarkets and farmers' markets are scarce in low-income areas, these residents are heavily reliant on public transit to obtain fresh food. The food insecurity issue in Athens has negative public health, economic, and social impacts. This policy proposal recommends that Athens Clarke County expand its public transportation system by increasing the frequency of service on existing bus routes to grocery stores and farmers' markets. Accordingly, there should be appropriate advertising and better services to educate ACC residents on public transportation use and new improvements. In order to finance these changes, the ACC Commission should approve the use of capital improvement funds made available through the Special Purpose Local Options Sales Tax (SPLOST) program. Since there is no portion of local tax revenue dedicated to public transportation services, ACC should make use of federal transportation grants to fund daily operational expenses that would accompany Athens Transit expansions. By expanding the operational capacities of Athens Transit, ACC will improve the efficiency and reach of its public transportation system, allow food-insecure ACC residents better access to food sources, and improve overall quality of life for residents.

Effects of Increased Omega-6 and Omega-3 Fatty Acids on Primary Sex Ratio in Japanese Quail, *Coturnix japonica*

Sergio Alcantar, CURO Research Assistant
*Dr. Kristen Navara, Poultry Science,
College of Agricultural and Environmental Sciences*

Avian species have been shown to alter the primary sex ratio of their offspring in response to a variety of environmental and social factors. One variable that has shown a strong effect is diet and food availability. For example, female Kakapo Parrots that were given supplemental food to encourage breeding laid significantly more males than females compared to those without food supplements. In another study, the nests of Lesser Black-Backed Gulls were observed, females maintained a 1:1 male:female ratio if supplemented food while non-supplemented females laid fewer males. We hypothesize that the fat content in a female bird's diet may be a major factor in the cause of sex ratio bias. Between the literature and the great desire of the poultry industry to control sex ratio without hormonal treatment there was enough support to test this hypothesis. One study showed significant effects on broiler body composition by altering omega-6 and omega-3 fatty acid ratios, so we chose to increase these specific fatty acids. For the experimental diet, we raised the standard quail diet to an oil composition of 10% using a 1:1 combination of safflower and flaxseed oil. For two weeks, fertilized eggs were collected from 83 pair-housed Japanese quail. These eggs were refrigerated and then incubated for four days, and then frozen for molecular sexing. After the two weeks, half of the quail were switched to the experimental diet, while the other half stayed on the conventional quail diet (both were fed *ad libitum*). We continued to collect and incubate eggs for four weeks. Samples are currently being processed.

Prevention of Acetaminophen Toxicity: Medication Label Reading

Syed Hamzah Ali, CURO Summer Fellow
*Dr. Toni Miles, Epidemiology and Biostatistics,
College of Public Health*

The goal of this research project is to teach people why reading labels on over-the-counter medications is important. One problem that points to a need for this research is increased acetaminophen toxicity. The American Association of Poison Control Centers reports that acetaminophen is one of the most common ingredients associated with poisoning and toxicity. In America, acetaminophen toxicity has replaced viral hepatitis as the most common cause for acute liver failure. Understanding the risk is a simple, no-cost way of preventing liver failure. An effective way to get this message out to patients is to introduce infographics that simplify medication label reading. The Federal Drug Administration (FDA) has released infographics over the past two decades

as acetaminophen toxicity has increased. However, they are too complex to understand for the common person, so they are not efficient. After thorough literature review, I created a simpler infographic that highlights the most important information on drug labels. To test the efficiency of the infographic, I created a survey to test patients' knowledge on acetaminophen. The study was conducted on patients at Athens Neighborhood Health Center. The results from the survey showed that 68% of patients found the infographic to be helpful, 16% were neutral to the infographic, and 16% disagreed that the infographic was helpful. I concluded that the infographic had a significant positive effect on patients' understanding of medication labels, yet more research needs to be conducted to understand why 32% of patients did not gain any benefit.

Investigation of Polylactide-Bovine Serum Albumin Microspheres for Drug Delivery

Kirsten Allen, CURO Research Assistant
Dr. Karen JL Burg, Small Animal Medicine and Surgery, College of Veterinary Medicine

Bovine serum albumin (BSA) was encapsulated in polymeric microspheres to study the potential of the microspheres as a protective transport system in ruminant digestion. The encapsulated microspheres will be optimized to support ruminant nutrition and health. The experiments used BSA to mimic linoleic acid encapsulation and model the degradation properties of the microspheres. The microspheres were first prepared using a polylactide (PL) solution containing BSA. Microsphere formation was facilitated using a 0.3% weight/volume (w/v) polyvinyl alcohol solution as well as a 2% w/v isopropyl solution. To simulate the conditions within the rumen digestion system, a Slyter buffer was created to serve as an *in vitro* environment for the microspheres. A mass of 100 mg of PL-BSA microspheres was collected within a 2-ml scintillation vial. A volume of 1.5 ml of Slyter buffer was added to the scintillation vial to fully surround the beads. The scintillation vial was kept at 37°C for 7 days to monitor and quantify the BSA released from the beads within 1 week. The concentration of BSA released was measured using a colorimetric Thermo-Scientific Pierce BCA (bicinchoninic acid) protein assay. The microspheres were also measured using a VWR V5MP stereoscope and analyzed using Image J software. Differential scanning calorimetry (DSC) was used to study the melting of the crystalline polymer and to find the glass transition temperature. Future studies will measure the encapsulation efficiency and determine the release rate of BSA from the microspheres.

The Effect of Prenatal Exposure to Bisphenol-A (BPA) and Other Endocrine Disrupting Chemicals on the Sprague Dawley Rat Development

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Obesity, heart disease, and diabetes are more prevalent in minority populations in the U.S. This could be due to the higher levels of exposure to endocrine disrupting chemicals (EDCs) found in plastics, the environment, and a variety of other sources. These exposures could occur anytime during the lifetime of an individual, however, exposures during the prenatal period have a greater potential for causing harm during development and in adulthood. We hypothesized that prenatal exposure to EDCs would impair development of the offspring, predisposing them to metabolic and cardiovascular disorders in later life. To test this, Sprague Dawley dams were treated orally with EDCs such as Bisphenol A (BPA; 5µg/Kg BW), Bisphenol S (BPS; 5µg/Kg BW), Bisphenol F (BPF; 1µg/Kg BW), Bis(2-ethylhexyl) phthalate (DEHP; 7.5mg/Kg BW), or a combination of BPA and DEHP from day 6-21 of gestation. These doses of bisphenols are much lower than the total daily intake doses suggested by the EPA. After weaning at 3 weeks, both male and female offspring were followed until twelve weeks of age, allowing us to observe them from when they are juveniles through adulthood. Body weights, food and water intake were measured once every week and compared to control rats. Results indicate that prenatal exposure to EDCs did not affect food or water intake in the offspring. However, there was a significant difference in body weights. When compared to control rats, females exposed to BPA + DEHP, BPS and BPF, and males exposed to BPA + DEHP, BPS and BPF weighed less on average. Depending on the gender, the endocrine disrupting chemical with the greatest effect varied. We observed that the males were most affected by BPS and the females were most affected by BPA + DEHP. These results indicate that prenatal exposure to low doses of EDCs can have long-lasting effects on the development of rats through adolescence and adulthood potentially setting the stage for non-communicable diseases in later life.

Arboviral Transmission Rates after a Natural Disaster Occurrence: A Systematic Review

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Natural disasters, such as hurricanes, floods, tsunamis, tornadoes, and earthquakes, are events that can cause long-lasting damage. In 2017, Hurricanes Irma, Harvey, and Maria affected the southern United States and several Caribbean

islands. After a natural disaster, it is possible that incidence and transmission rates of arboviruses, such as Dengue or Zika, can be affected due to fluctuations in their arboviral hosts' population. We aim to systematically review the literature regarding the effects of natural disasters on the transmission and incidence rates of arboviruses in countries with previous transmission. We conducted systematic review using PubMed and Web of Science. We included literature on West Nile (WNV), Zika (ZIKV), Dengue (DENV), Chikungunya (CHIKV), and Saint Louis Encephalitis (SLE) and made no restrictions on type of natural disaster, country, or language. Over 100 studies were reviewed for title and abstract and we reviewed the full text of 36 articles. Of those 36 studies, 11 studies met the inclusion criteria and their references were reviewed for additional sources. Population size and location varied across studies. Most of the cases showed there was not a significant change after a natural disaster. Arbovirus transmission is affected by natural disasters and surveillance should be considered a priority during the recovery period. While there is not an absolute trend, there is evidence that arboviral populations can thrive after natural disasters and relief efforts should be aware of the threat.

Analysis of Protective Effects of Prenatal Conditioning with Plastic Byproducts Following a Traumatic Brain Injury

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In a study conducted by the CDC, 95% of urine samples contained BPA or BPS, which are toxic plastic byproducts. Furthermore, DEHP, another plastic byproduct, has been found in 64% of rainwater samples by the World Health Organization. These chemicals are xenoestrogenic, which means they mimic estrogen, causing symptoms of anxiety, high blood pressure, general endocrine disruption (especially in males), depression, hyperactivity, aggression, and a higher sensitivity to addictive drugs. This study aims to analyze whether or not the stress induced by prenatally conditioning rats with these chemicals will have a negative effect on recovery after a traumatic brain injury (TBI). Rats preconditioned with BPA, DEHP or both will be subjected to controlled cortical impact (CCI). The CCI induces a TBI, creating a lesion and causing cell death in the motor cortex, specifically damaging the functions of the left hind limb. The brains will be extracted at week 4 and cryosectioned for Nissl stain to determine the quantity of neurons as well as lesion size. We hypothesize that the prenatally conditioned rat brains will display a lower quantity of neurons and a larger lesion size than the control group rats. The significance of these findings would be to further understand the effects of these prevalent chemicals on recovery following a TBI.

Analysis on the Outlooks of Alternative Protein Sources with Blind Tastings of Food Samples Containing Cricket Powder

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Crickets (*Acheta domesticas*) are interesting creatures that are helping increase sustainability while serving as another food source for the growing population. These insects are eaten by 2 billion people in the world and encompass a large amount of protein, minerals, and vitamins such as omega 3, calcium, B12, and 6 fatty acids. This research focuses on data collection on individual's views on insects as an alternative food source with a pre and post survey administered during a blind taste test. The survey will be distributed to at least one hundred participants for the analysis. Surveys will also be categorized based on an individual's prior knowledge and comfortability with insects; for example, an entomology student's form would be separated from a student that has a different major that might have less of a well-informed basis of insects. After the tasting is completed the participants will be informed of the ingredients in the food they have tasted as well as played an educational video about the growth of insects in the edible industry and their benefits to the growing population. Once this is completed the post-survey will be administered with the goal of trying to find out if exposure to insect base foods effects people's acceptance of alternative food sources.

Mathematical Modeling of Left Ventricular Stresses after a Heart Attack

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It is well-established that the heart remodels in response to changes in mechanical loads. Volume regulation is a critical component in the pathogenesis, progression, and management of congestive heart failure, and few existing models account for the interaction between cardiac function and volume regulation by the kidney and neurohumoral signaling. Eccentric hypertrophy occurs in response to volume overload, as increases in ventricular filling pressure elevate stress and stretch myocytes during diastole, causing the series replication of sarcomeres and chamber enlargement. In this study, we utilized a coupled model of cardiac mechanics and renal function. We now incorporate a mechanism for left ventricle dilatation in response to volume overload. Specifically, myocyte length is modeled as a function of end-diastolic myocyte stress, a relationship governed by a time constant. The model reflects the expected behavior of heart failure patients: reduced ejection fraction and increased left ventricle end diastolic volume, stress, and pressure. After inducing "heart

failure,” we used temporal pressure-volume data from heart failure patients in the SOLVD study to ensure that the model accurately reflects the structural and hemodynamic changes characteristic of heart failure. We used published data to establish an empirical relationship between left ventricle End Diastolic Stress and n-Type Brain Natriuretic Peptide. We then validated the model by simulating and showing agreement with changes in the pressure-volume loop in response to enalapril treatment in SOLVD. This model improves our understanding of the hemodynamic interactions and volume homeostasis and is a step toward *in silico* evaluation of new therapeutic mechanisms.

The Dopamine Hypothesis of Social Media Use

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It has been proposed that social networking platforms have evolved to hijack neurally-embedded short-term reward systems. It is well established that reward sensitivity deals especially with dopaminergic activity in the human brain. Therefore, we articulate a “dopamine hypothesis” in which behavioral architectures (reward structures, etc.) present in social networking platforms are linked to excessive dopaminergic activity. We evaluate evidence regarding this hypothesis at the neural level (physiological), the design level (ecological), the emotional level (e.g., reward), the self-regulatory level (e.g., addiction), the personality level (e.g., BIS/BAS), and the network level (social). We describe contrary and weak evidence for this hypothesis, identify benefits and costs of dopamine-based systems, and discuss how these benefits could be maximized and how costs could be minimized.

Implications of Strike-Slip Faulting for Plate Tectonics on Europa

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Jupiter’s moon, Europa, is an icy world with a global subsurface ocean. It has been proposed that Europa’s icy shell is divided into rigid plates, and that the overall tectonics are similar-in-style to plate tectonics on Earth. Structures resembling mid-ocean ridges and accretionary wedges in their surface morphologies are interpreted as extensional and contractional, respectively. We hypothesize that, if indeed plate tectonics has operated on Europa, then transform faults must also be present. Transform faults are plate boundaries showing uniform lateral displacement along their length with terminations in other plate boundaries, whereas transcurrent faults show variable

lateral offsets with terminations in fault tips. Few previous surveys have distinguished between transcurrent and transform faults on Europa. High-resolution images returned by the Galileo spacecraft were mosaicked and analyzed to assess previously and newly identified faults with lateral offset. To assess our criteria for transform faults, tectonic reconstructions of plate motions helped to determine whether the lateral motions were apparent or real and fault lengths were plotted against displacements for each structure. In total, 48 faults with clear lateral offsets were identified. Four of them met the criteria for transform faults, five met the criteria for transcurrent faults, and 39 were indeterminate. That transform faults appear so rare may suggest that Earth-style plate tectonics is not widespread. High-resolution image coverage of the entire surface, proposed to be achieved by the planned Europa-clipper mission, will better inform our understanding of the style of tectonics on Europa.

Antibacterial Properties of Nitric Oxide Releasing Microfluidic Devices

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With the progress of technology, indwelling microfluidic devices are becoming more prominent in the medical world. Microfluidic devices are used for a range of medical applications, but one of the draw backs is the potential for infections once they are implanted into the body. In the United States, there is an estimated one million infections acquired from indwelling devices each year. This medical challenge can be combated by incorporating an antimicrobial agent into the medical device materials. Nitric Oxide (NO) is an antimicrobial agent that is naturally released from endothelial cells in the body at a flux rate between 0.5- 4.1 ($\times 10^{-10}$) mol cm⁽⁻²⁾ s⁽⁻¹⁾. In this study, microfluidic devices using NO releasing material are developed. The base material, polydimethylsiloxane (PDMS), is made using photolithography. The devices are then swelled with S-nitroso-N-acetylpenicillamine (SNAP), a NO donor. The materials are fabricated using different size channels and are then tested for antibacterial properties by a dynamic method of flowing bacteria containing solutions through the channels. The solutions are then serially diluted and plated to compare bacterial viability between the inlet and outlet of the device. We anticipate to see a reduction in the viability of the bacteria that flows through the NO releasing microfluidic channels. In turn, this would decrease the chances of infection from bacteria. This study will be one of the first to analyze bacterial viability in microfluidic devices using an antimicrobial technique.

Frontal Alpha Asymmetry in Youth at Clinical High Risk for Psychosis

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The brain is functionally organized to support motivational approach and avoidance behaviors via separate neural circuits that involve different regions of the frontal cortex. The approach system is thought to support the translation of positive emotional states into reward-seeking and goal-directed activity, whereas the avoidance system is thought to facilitate translation of negative emotional states into withdrawal behaviors. One method for assessing these motivational states is via electroencephalography (EEG) and frontal alpha asymmetry power, which is inversely related to regional activity. Left frontal activity (i.e., lower left alpha power) is believed to reflect approach motivation, whereas right frontal activity (i.e., lower right alpha power) is associated with withdrawal motivation. Although youth at clinical high-risk for developing a psychotic disorder have clear motivational symptoms that are highly predictive of developing a psychotic disorder, it is unclear whether abnormalities in frontal alpha asymmetry predict motivational symptoms. This CURO project will entail data processing and analysis of resting state EEG data to determine whether youth at clinical high-risk for psychosis ($n = 25$) differ from demographically matched psychiatrically healthy controls ($n = 25$). Results will be presented at regional and national conferences.

Pseudo Invariant and Coastal Target Feasibility

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This research describes the targets required for calibration of the Spectral Ocean Color Satellite's (SPOC) sensor and the coastal targets that will be used for data collection by the satellite. Systems Tool Kit (STK), which is used for the simulation and analyses of SPOC in order to evaluate the satellite's performance in simulated time, will also provide a certain measure of feasibility for various targets. Additionally, STK will be used to analyze pass times over the desired targets. The desired targets include pseudo invariant targets, which are vital to the calibration of the satellite, and coastal targets such as Sapelo Island, which are vital to completing SPOC's mission. Through STK, a comprehensive list of targets (pseudo invariant and coastal), along with potential pass times and the feasibility of them being used during the mission, can be created. SPOC's mission is dependent on gathering data from the coastal targets. Additionally, SPOC's ability to gather high quality data from the coastal targets is dependent on being able to calibrate its sensor. Therefore,

pseudo invariant and coastal target feasibility, as well as possible pass times, would be beneficial in making the mission run efficiently and smoothly.

Effects of Salinity on Carolina Diamondback Terrapin Hatchling Growth and Behavior

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Rising sea levels and increasing salinities in coastal habitats are significant aspects of global climate change and threaten coastal wildlife. Diamondback terrapins (*Malaclemys terrapin*) are a priority species for conservation in multiple states, including Georgia. They reside within coastal salt marshes and are adapted to intermediate salinities. I hypothesized increasing salinity would have negative developmental and physiological effects on hatchling Carolina diamondback terrapins (*M. terrapin centrata*). I additionally hypothesized that hatchling terrapins would alter their behavior in response to salinity stress. I acquired 30 terrapin hatchlings from Skidaway Island, Georgia and randomly assigned each to one of five salinity treatments: 1, 5, 10, 20, 35ppt. For 120 days, I monitored behavior and appetite. Stress levels were assessed every 60 days using leukocyte profiles, and growth was measured every 30 days using carapace/plastron length and wet mass. Hatchling terrapins showed altered behavior in response to chronically high salinities. Terrapins exposed to 35ppt salinity were more likely to show freshwater-seeking behaviors than other terrapins. Other behaviors in increased salinity included spending more time out of water and soaking and drinking in freshwater when available. These behaviors suggest hatchlings raised at high salinities may show reduced growth and elevated stress levels. Growth retardation stemmed from such stress would maintain hatchlings at a vulnerable size and increase mortality in the wild. Growth data will be used to model effects of climate change on Diamondback terrapin population growth.

Effects of Instructor Gestures on Learning from a Video Lesson

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The purpose of this study is to investigate how instructor gestures can be used as a scaffold for understanding the conceptual structure of a lesson. This was tested by having undergraduate students watch a video lesson that contained different gestures and immediately taking a test on what they learned. Each student was assigned to one of four conditions. Students saw gestures that were structural, specific, structural and specific, or no gestures. Structural

gestures were characterized as hands moving to the left or right side when comparing and contrasting African and Asian elephants, whereas specific gestures were used to describe specific features of elephants (i.e., the professor moving their hands apart or together to indicate a long or short trunk). It was predicted that participants who were exposed to structural gestures would outperform other participants on the inference test; however, this was not supported by the data. Understanding which type of instructor gestures do or do not scaffold learning will help us to understand more about how gesturing improves learning outcomes.

Improving Mental Healthcare in Greek Refugee Camps

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Since 2011, the Moria refugee camp on Lesbos Island, Greece has been populated with refugees from the Middle East and North Africa (MENA), escaping conflict and instability. Currently, 5,000 refugees are living on the island in dilapidated facilities operated by the Interior Ministry of Greece. Moria was the first refugee hotspot on the island, a haven for thousands of asylum-seekers. Now, it is considered a detention center and has left residents awaiting possible deportation to Turkey. The horrific living circumstances have induced and exacerbated mental illnesses across the resident population. Initially, nongovernmental organizations (NGOs), such as Doctors Without Borders, began treating these conditions, but such groups have reduced involvement in Moria. The Greek government has neglected mental health infrastructure and services at Moria, contributing to more cases of self-harm, psychosis, violence and suicide. This proposal recommends establishing primary and mental health care in Greek refugee camps through the creation of a government agency. The new agency, the Refugee Ministry, and will be specifically designed to oversee the formation and management of refugee camps in the country by moving current responsibility from the Ministry of the Interior to a more efficient agency through the Greek Legislature. Creating a government agency to specifically handle refugee camps would improve living conditions in Moria, while creating standards for future camps in a country that will continue to be a gateway for migration into Europe.

Developmental Changes in Extracellular Vesicles from African Trypanosomes

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Trypanosoma brucei brucei, a subspecies of African trypanosomes, produces extracellular vesicles (EVs) that are released from the plasma membrane. Two developmental

stages of this parasite, the procyclic form found in the midgut of infected tsetse flies and the mammalian bloodstream form, produce nanotubes that extend from the flagellar pocket and break down into EVs. The procyclic trypanosomes also release EVs from multivesicular bodies in a form of exocytosis. Extracellular vesicles are suggested to have a variety of functions including the transfer of virulence factors between bloodstream form cells and the regulation of social motility in the procyclic form. Such differences in function make it likely that the EVs of both forms have significantly different protein contents and likely differ from the total protein samples of whole cells of their respective developmental forms. Analysis of the EVs of both forms using nanoparticle tracking analysis and the preliminary use of SDS-PAGE will be used to compare procyclic and bloodstream EVs. This will be followed by mass spectrometry of the EVs of both developmental forms to determine specific protein contents compared to the known contents of the overall organism. Extracellular vesicles from procyclic and bloodstream *T. b. brucei* will also be analyzed for the ability to fuse and deliver proteins, RNAs and lipids to mammalian and insect cells. This research will provide a better understanding of the difference in the proteomes of the developmental forms of *T. b. brucei* and their EVs and how these differences impact the various functions of the EVs.

Understanding the Role of HIF-2 β and Identifying Potential Inhibitors

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The transcriptional response of cancer cells to hypoxic condition is a topic of interest in cancer research and treatment. Hypoxia inducible factors (HIF) are the primary mediators in the transcriptional responses of cancer cells that enables the cells to survive in hypoxic environment. To date, much progress has been made, to include some discoveries toward investigating the role of HIF on proliferation and angiogenesis of cancer cells in hypoxic conditions. These findings make HIF an ideal target to regulate and inhibit proliferation of cancer cells. Here we investigate one member of the HIF human family known as HIF-2 β and its role in the survival of cancer cells in hypoxic environment. We use molecular docking and MD simulation techniques to narrow down potential inhibitors for HIF-2 β . Molecular docking, using Schrodinger Software, is used to investigate the role of HIF-2 β and determine potential inhibitors. The molecular docking technique is an inexpensive and effective method to search thousands of molecules and narrow down potential inhibitory candidates based on the interactions between the specific ligand and HIF-2 β . Then the potential inhibitory candidates for HIF-2 β

are further analyzed using MD simulation. MD simulation, using AMBER software, is used to investigate the strength of interaction between the potential ligand with HIF-2 β under a virtual laboratory. The results obtained in our investigation will be further investigated in a biological laboratory. The main objective of using computational analysis techniques is to save time and resources spent in the process of drug discoveries.

Compression and Encryption Methods for Small Satellite Communications

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CubeSats, or small satellites, are powerful spacecraft that can perform complex and informative missions in low-earth orbit in a small form-factor. Due to the nature of low-earth orbit, opportunities for communication between ground stations and these small satellites are short in terms of both time and the amount of data that can be transferred to and from the satellite. The transfer of data to and from the satellite must be efficient which can be achieved through different types of data compression. A custom compression stack must be used for small satellites, as the small-form factor of these units do not allow for processes that use much electrical or computational power. An efficient compression algorithm must be one that can effectively compress data to at least 75% of its original size without losing important data. In addition to compressing this data, it is essential that it is encrypted to prevent malicious individuals from accessing classified data. The encryption method chosen for a satellite mission must be strong enough to prevent brute-force methods of decrypting data, but also can be encrypted and decrypted in a reasonable amount of time on the satellite using as little power as possible. The combination of both compression and encryption is vital to the success of a satellite's mission.

Isolation of Mutations in the Polycomb Repressive Pathway of *Neurospora crassa*

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For proper development of an organism, genes must have varying levels of expression in different cells and at different stages in development, and post-translational modification of histones can be an effective method of epigenetic control of gene expression in eukaryotes. Polycomb-Groups proteins commonly are a cause of transcriptional repression via post-translational modification of histone tails. Polycomb Repressive Complex 2 (PRC2) establishes trimethylation of lysine 27 on Histone H3 (H3K27me3). H3k27me3 is

maintained by Polycomb repressive complex 1 (PRC1) in higher eukaryotes, however PRC1 is absent in fungi. How the silencing of Polycomb target genes is maintained and established in fungi such as *Neurospora crassa* is unknown. Loss of the H3K9 methyltransferase DIM-5, which is analogous to SUV39 in humans, results in mislocalization of H3K27me3 to regions of the genome normally occupied by H3K9me3, as well as a poor growth phenotype and genotoxic stress. I am determining possible genetic interactions with PRC2 in *N. crassa* by using results from a dim-5 genetic suppressor screen.

Characterization of Bone Collagen Fibers in a Hypophosphatasia (HPP) Murine Model using Linearly Polarized Light

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Hypophosphatasia (HPP) is a rare genetic bone disorder caused by mutations of the alkaline phosphatase (ALP) gene, leading to severely demineralized bone and numerous skeletal symptoms such as rickets, tooth decay, and abnormal chest development. We predict that because HPP is known to impact the production of ALP in the bones, the disease also affects other aspects of bone formation by impacting the organization of bone collagen fibers. We developed a new method to analyze bone that provides information about collagen fiber and lamellar sheet organization. Using linearly polarized light and two photon microscopy, we produced second harmonic generation (SHG) images in a murine model by shining 180 degree rotated polarized light onto the bone. Images were reconstructed to create 3-D pictures of bone, giving an in-depth look at collagen present in the skull. These were then used to analyze the alignment of collagen fibers within the bones of healthy and diseased patients throughout the entire thickness of the bone. This study has successfully analyzed collagen within the bone, and apparent differences in the organization of both individual collagen fibers and entire collagen sheets can be seen in both healthy and HPP diseased bone. This method can be used to evaluate collagen fibers within diseased bone before and after therapy has been applied, which will prove extremely useful in gauging future treatment plans for diseases of the bone.

Head Impact Biomechanics in Youth Tackle Football: A Preliminary Comparison Between Play Type

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Tackle football faces scrutiny and concerns regarding long-term health consequences; however, limited evidence exists on head impact biomechanics in youth. The purpose of this

study was to examine youth tackle football head impact exposure and magnitude differences between practices and games. Throughout the 2017 season, head impact (HI) sensors (Triax Sim-G) were worn by two teams ($n=27$, age= 11.0 ± 1.5 y, height= 145.8 ± 11.7 cm, mass= 45.0 ± 14.7 kg) during practices and games. Magnitude (linear [g] and angular [rads/s²] acceleration) were analyzed between event type. Athlete exposure was defined as one athlete participating in one session. Impact rates (IR) were calculated as impacts per 10 athlete exposures. 90th-percentile acceleration values are presented. Acceleration values were split into low- and high-magnitude categories (linear split at 40g, rotational split at 4,600rad/s²) and were compared between event type using Chi-square tests of association ($p<0.05$). Games resulted in 546 HIs (IR=5.87; 21.00 HIs/player) and practices produced 854 HIs (IR=13.95; 32.85 HIs/player). Game 90th-percentile linear acceleration (53.87g) was comparable to practice (51.31g), while game 90th-percentile angular acceleration (6530.00 rads/s²) was lower than practice (7050.00 rads/s²). No significant association was found between event type and linear acceleration categories ($p=0.150$; low-linear acceleration 72.2% of game impacts, 75.6% of practice impacts). There was a significant association between event type and angular acceleration ($p=0.045$) where low-angular acceleration impacts accounted for 74.2% of game impacts and 69.2% of practice impacts. Practices had greater IRs than games and 90th-percentile angular acceleration; however, event types produce similar angular acceleration HI magnitude frequencies. Practice modifications may be warranted to reduce HI rates.

The Role of Tarsi in the Courtship of *Drosophila subquinaria* and *D. recens*

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Drosophila courtship consists of a multimodal combination of acoustic, visual, olfactory, and tactile sensory signals. Some species rely more heavily on certain signals than others. For *Drosophila subquinaria* females, chemical pheromones are essential for courtship success. In the closely related *D. recens*, olfactory cues carry less weight, but visual cues are particularly important. In both species, males have been observed to use their foretarsi to tap the female. However, this behavior is far more prevalent in the courtship of *D. recens*. The nature of the tapping signal in *D. subquinaria* and *D. recens* has yet to be explored in depth. In *D. saltans* of a separate species group, males tap the female's midtarsi, and females who lack midtarsi are less inclined to mate. It is possible that a similar tapping signal has yet to be discovered in *D. subquinaria* and/or *D. recens*. This study seeks to elucidate the tapping behavior in *D. subquinaria* and *D. recens* by examining the effect of tarsal

removal on courtship success. We expect that the absence of a set of tarsi will reduce mating to a greater extent in female *D. recens* than in *D. subquinaria* because males tap more in this species. Since courtship signals are essential for interspecific discrimination, this study will provide insight into the evolution of reproductive isolation in these recently diverged species.

Diet and Culture at the Greek Colony Himera

Chelsea Batchelder

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Greek colonization was a period of intense cultural interaction across the Mediterranean, and beyond. This study aims to use diet, which reflects a personal, routine aspect of culture, to illuminate cultural heterogeneity at the Greek colony Himera. We analyzed stable carbon and nitrogen isotope ratios ($\delta^{13}\text{C}$, $\delta^{15}\text{N}$) from bone collagen of 75 skeletons. We consider sex, age, and mortuary style among the general populace ($n=38$). We also compare the general populace to skeletons associated with two battles fought at Himera (480 and 409 BC), believed from historical records, strontium, and oxygen isotope data to comprise Himeran soldiers, foreign allies, and mercenaries ($n=37$). Results show that like other Greek Mediterranean populations, diet at Himera primarily was based on C₃ plants and terrestrial animals. Low variability in isotopic ratios suggests that a fairly consistent diet, and likely cultural similarities, existed at Himera. No differences between the sexes ($p=0.212$, 1.164) nor age groups ($p=3.933$, 0.442) are found. The $\delta^{13}\text{C}$ values for soldiers in the 480 and 409BC battles differ significantly ($p<0.001$). The 480BC values are highly variable suggesting soldiers from all over the Mediterranean likely had divergent food traditions. Thus, their general Greek identity and need to protect a conceptual frontier land overcame cultural differences. In contrast, the 409BC $\delta^{13}\text{C}$ and $\delta^{15}\text{N}$ values are extremely close to those of the general populace, suggesting these soldiers had cultural affinities with the local population. These data suggest that a general overarching identity helped the Greek Mediterranean prosper.

Gender Equality and Sexual Violence in Conflict

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The cost of war has historically been measured in economic, social, political, and human terms. The goal of this research is to bring to the forefront the human cost of war in terms of sexual violence, and to examine how this is inextricably linked to levels of gender equality in a state. It is proposed that rampant gender inequality in times of peace result

in an increased propensity of a state to enter into conflict. Once embroiled in conflict, with the breakdown of law and government, levels of sexual violence skyrocket. Various measures of gender equality, including fertility rates, literacy rates, and access to formal education will be compared to levels of sexual violence and mass rape by rebel forces during intrastate war. In particular, this research draws lines of comparison between sexual violence in the Bosnian conflict, and the seemingly intractable civil war in Syria. Despite international recognition of the problem of gender-based violence during times of war, consequences for perpetrators and changes in policy have been limited. Ultimately, this research carries important implications for perpetrators of rape during conflict, issues of gender inequality, and future peace processes in Syria.

Psychosocial Functioning, Sleep, and Barriers to Adherence Among Adolescents Awaiting Solid Organ Transplants

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Adolescent solid organ transplant candidates can experience stressors (e.g., chronic illness exacerbation, uncertainty) while awaiting transplantation. Increase in stressors may interfere with adolescents' ability to obtain adequate sleep. Adolescent sleep has been previously associated with quality of life, psychosocial well-being, and physical health. The purpose of this study is to examine relations between psychosocial functioning (e.g., anxiety, depression, conduct problems) and sleep among adolescents awaiting solid organ transplant. The sample includes 45 pediatric transplant patients aged 12-20 years ($M=15.76$, $SD=2.31$) awaiting a solid organ transplant (54.1% kidney, 24.3% liver, and 21.6% heart) and their parents ($n=45$). Adolescent participants completed self-report measures of psychosocial functioning, sleep, and barriers to medication adherence at their pre-transplantation evaluation. Parents completed measures of adolescent psychosocial functioning. Parent-reported attention problems were negatively associated with maintaining sleep ($r=-.44$, $p<.001$). Parent-reported conduct problems were correlated with difficulty falling asleep ($r=-.34$, $p<.001$). Furthermore, adolescent self-reported attention problems were negatively associated with falling asleep, return to wakefulness ($r=-.42$, $p<.001$), and total sleep ($r=-.38$, $p<.001$). Adolescent reported sleep difficulties were also associated with more barriers to medication adherence ($r=-.46$, $p<.001$). This research identifies characteristics of children who are more likely to experience sleep difficulties, specifically those with higher attention and conduct problems. Further, greater sleep difficulties were associated with more barriers to medication adherence. Identification of adolescents awaiting organ transplantation who are at high-risk for nonadherence may allow for targeted interventions

to improve adherence and patient morbidity and mortality, both pre- and post-transplant.

Acoustical Transformation of Global Energy Consumption

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Dr. John R Schramski, Environmental, Civil, Agricultural, and Mechanical Engineering, College of Engineering

Technological advances, population growth, and urbanization, all fueled by exponentially increasing energy supplies has fundamental near term ramifications for humankind. One key element of energy systems and energy flow research is the dissemination of this knowledge to the greater population. At a fundamental level, human civilization is consuming extraordinary amounts of energy, but this is largely unknown or its ramifications are not understood by policy makers. Classical methods of demonstrating this knowledge through the use of energy consumption data and graphics are not sufficient and are not working. This research explores a novel in-class laboratory demonstration to clarify the world's rate of energy consumption. By utilizing the sound energy equation, which relates power consumption and area to volume, we transform human energy consumption at the country-level to a volume level rating, measured in decibels. A volume modulator is then used to acoustically demonstrate the global energy flows in nature and society over recent historical time (i.e., calibrated increasing acoustic levels increasing proportionally over time). This energy transformation can also be applied to natural ecosystems, which allows for a direct comparison between artificial and natural volume levels. In addition to helping further disseminate the role of energy in sustainability science as a novel in class laboratory, this research reveals that worldwide energy consumption is fundamentally correlated to urbanization trends, an area that we explored further. This suggests that cities play an oversized role as the primary driver of worldwide energy consumption.

Collection, Isolation, and Characterization of Large Solid-Phase PAH Oligomers

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Polycyclic aromatic hydrocarbons (PAHs) are a family of planar aromatic molecules often formed during hydrocarbon combustion in both natural and artificial sources. PAHs are well characterized systems and have been studied extensively in the last 50 years, primarily using spectroscopic and chromatographic techniques. These molecules have long been investigated as environmental pollutants, but have recently received increased interest for new

applications in solar cell research, organic light emitting diodes and organo-electronics. In our laboratory, these PAHs are commonly studied using laser-desorption-ionization time-of-flight (LDI-TOF) mass spectrometry, a technique yielding spectra remarkably free from fragmentation. In surprising new developments, laser ablation studies using pressed PAH pellets have been found to form covalently bonded PAH oligomers, known as large PAHs (LPAHs). Exploration of this photopolymerization reaction may shed light on soot formation during hydrocarbon combustion or in interstellar gas clouds. Furthermore, controlled synthesis of these oligomers may enable the formation of nanographene-like LPAH segments, possessing unique morphologies and properties. To enable further analysis of these interesting photochemical products, a method was devised to isolate desorbed gas in the solid phase. A PAH pellet (perylene - C₂₀H₁₂) was subjected to laser ablation ionization using a KrF excimer laser and the resulting plume condensed onto a quartz slide. Preliminary analysis of the resulting material showed absorption features recognizably distinct from solid perylene in a UV-VIS spectrum, indicating the formation of new products in the solid mixture. Future experiments will center on the purification of recovered material by differential sublimation.

Characterizing Nairovirus vOTUs through Biochemical and Structural Analysis

Brianna S Beldon, CURO Research Assistant
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Nairoviruses are tick-vectored viruses accountable for a diseased state in humans and animals. The viral ovarian tumor protease (vOTU) has been considered to be a virulence factor based on its ability to direct and cleave ubiquitin (Ub) and interferon-stimulated gene 15 (ISG15), which play a role in immunity. The goal of working with nairoviruses is to determine which vOTUs are able to cleave Ub and ISG15 from the host proteins through biochemical and structural analysis. In the future, this information may aid in the development of vaccinations and other treatments of nairovirus vOTUS. The methods used in this research include BL21 transformations with *E. coli*, expression, protein purification, and structural determination via X-ray crystallography. The results indicated that there is a rich diversity when it comes to vOTU substrate specificity for ubiquitin and ISG15, indicating potentially different roles of vOTUs across the nairovirdae family. Additionally, these preferences were linked to specific structural motifs within vOTUs, enhancing the ability to predict the biochemical activity of these virulence agents.

What are Aquatic Plants Made of? Determining Elemental Content of *Podostemum ceratophyllum*, a Foundational Plant in Eastern United States Rivers

Michael Bell
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The elements that plants need for growth and that are stored in their tissues can influence their role in food webs and ecosystem nutrient cycling. Specifically, plants that are higher in nutrient (e.g., nitrogen (N) or phosphorus (P)) to carbon (C) content can be higher food quality for herbivores. Plants that have higher carbon to nutrient content may create greater demand for nutrients (e.g., uptake) in ecosystems. *Podostemum ceratophyllum* is a common aquatic plant with documented declines across the eastern United States river systems, and a potentially important food resource and site of nutrient uptake in rivers. Little is known about its elemental composition. C:P and C:N ratios may differ in various sections of the plant due to differences in use and structure, may vary seasonally with available nutrients, and the two morphotypes of the species may be caused by stoichiometric differences. I will test whether elemental ratios will shift across sections of the plant (root versus leafy section), and whether the morphotypes will show different concentrations of elements between them. I will analyze *Podostemum* tissue for C, N and P content and will determine whether there are consistent patterns in C:N and C:P based on morphology and also exposure to streamwater nutrients. In light of its declines across the landscape, these questions regarding *Podostemum* are important to understanding this highly common and important species.

Sensory Sensitivity Garments for Children

Anja Benson, CURO Research Assistant
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Many children, especially those on the autism spectrum, have a heightened sensitivity to touch, sound and even light. Sensory sensitivity can affect all the senses, which causes sensorial discomfort from over stimulation. Due to the lack of fashionable garments for children with sensory sensitivities, the goal of this project was to design a clothing line for pre-school children age 3-5 diagnosed sensory sensitivity. The apparel line includes a weighted vest and a reversible top with customized flat-line seams, easily removable garment tags and hood features. These features were added carefully to accommodate children with sensory sensitivities. To select fabrics for our designs, we evaluated ten fabric's hand with the AATCC Evaluation Procedure 5 for fabric hand. Results showed that the Rayon Spandex jersey blend was the most suitable for our reversible top because it scored the highest rankings in the softness, stretchiness,

and thinness categories, which allowed for comfort as well as cooling properties that are ideal for sensitive skin. We selected the plush polyester faux fur fabric for our weighted vest because it scored the max for thickness as well as softness. These were key characteristics needed for a vest that serves to enclose the child and apply light pressure. We created a visual representation of the line using illustrations and the Pointcarre software to create digital prototypes. Our innovative designs will allow children to enjoy the clothes they wear and aid sensory overload.

Applications of *in silico* Mapping of Phenotypic Data for Cardiovascular Disease

Shriya Bhatnagar

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Cardiovascular disease (CVD) is a global pandemic, causing more worldwide deaths than any other disease. Yet despite its significant impact on millions of people, the mechanisms behind CVD remain incompletely defined. A better understanding of CVD is essential to identify at-risk patients and promote the development of improved therapies against the disease. Recent studies have linked the blood-borne protein growth differentiation factor 11 (GDF11) to the onset of age-related cardiac hypertrophy, but very little is known about that relationship. In the current study, we quantified circulating GDF11 levels in a diverse panel of inbred mouse strains, and we used *in silico* genetic mapping methods to identify candidate genes associated with the observed variation in GDF11 levels. Our future studies will test those candidates and their potential roles in CVD development.

The Effects of Language and Culture on Thought, Behavior, and Personality

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Dr. John Achee, Psychology, Franklin College of Arts and Sciences

Culture can best be conceptualized as the sum of two primary dimensions: (1) subjective dimension: values, feelings, and ideals; and (2) objective dimension: beliefs, traditions, laws, and rituals. The unique interactions between these two dimensions allow culture to be a powerful expressor and mediator of psychological processes and ultimately, behavior. However, the interactions between these two dimensions are facilitated through language; in other words, language is intrinsic to the expression of culture: it is more than a means of communication, it is the social fabric that keeps a culture's thoughts, behaviors, and attitudes well knit. Consequently, this research aims to study the effects of culture and language on human thought, behavior, and personality through a series of surveys and questionnaires for ethnic and nonethnic students at the

University of Georgia. This research is highly important today, especially in the fields of medicine, law and business, because it allows professionals to tailor their practices towards specific cultures. For example, if a doctor can draw upon the diverse perspectives represented in the varying languages of his/her patients, he/she will possess a unique insight into how his/her patients behave, think and react to their illnesses, thereby allowing him/her to treat his/her patient in the most effective way possible.

Positivity Priorities: When Do I Choose Me over Us?

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Annie Somerville

Dr. Michelle R vanDellen, Psychology, Franklin College of Arts and Sciences

This study examines people's motivational priorities when facing failure: under what conditions do they choose to boost self-esteem versus sense of belonging. Participants were recruited via the research participant pool and were required to bring a friend to the lab session. Participants and their friends completed two tasks. First, a difficult word task in which all participants were told they ranked at the 53rd percentile and got 25% of the possible points on the task, thus inducing failure. The second task involved a questionnaire asking them to rate their friend compared to themselves and to others on various traits. For this task, participants were randomly assigned to one of two conditions: private or public. In the private condition, participants were told their responses would not be read by their friend. In the public condition, participants were told their friend would read their responses. We hypothesize when participants are aware their friend will read their responses (public), they will protect their sense of belonging (by rating their friend more positively than others) rather than enhance their self-esteem. We speculate by enhancing their friend's esteem, they also promote their own self-esteem by expressing higher feelings of closeness to their friends. In the private condition, in which sense of belonging is not directly threatened, we suggest participants will enhance their self-esteem directly (rating the self more positively than the friend). The results of this study could be used to better understand how individuals recover from failure while balancing the desire to belong.

An Assessment of the Accelerated Bridge Construction Method

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Currently, there are approximately 600,000 bridges across America that rated as structurally deficient and in need of repair or complete replacement. Direct and indirect costs

of traffic detours due to bridge replacement can often exceed the cost of the structure itself. Accelerated Bridge Construction (ABC) is an innovative accelerated method of bridge replacement allowing for existing bridge removal and new bridge installation within a 56-hour period. This method helps to improve bridge safety while decreasing bridge construction times and minimizing impact on commuters. The primary objective of this research is to improve upon the ABC method in regards to the structural and material design of the replacement bridge, as well as the construction practices used during installation. Bridges constructed through ABC have shown signs of rapid, though expected, deterioration in the form of bridge deck cracking. This research evaluates bridge deck materials, elevation corrections made during construction, thermal restraints, reinforcing steel layout, and installation conditions and practices for bridges constructed using the ABC method. Upon successful completion of this research, recommendations will be provided regarding materials and structural design, and construction practices that will lead to improved service-life of bridges using the ABC method.

Analysis of Biological Problem Solving in Undergraduate Science Students

Quinton Elijah Blount, CURO Research Assistant
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One area of education research with far-reaching implications is understanding how to promote the ability to solve problems across STEM disciplines. Some of the challenges that students face in biology, chemistry, and physics have been elucidated, yet much remains to be uncovered about how students solve problems in the discipline of biochemistry. Specifically, the regulation of flux through metabolic pathways is a key idea that poses difficulties for students. This cross-sectional study addressed the research question: What are the similarities and differences among beginning and advanced life science students when solving problems about metabolic pathway regulation? Students who were enrolled in Introductory Biology (n=6) and Introductory Biochemistry (n=8) participated in think-aloud interviews that lasted for approximately an hour. Transcripts of the interviews were the data used in qualitative content analysis. The process included two iterations of developing a codebook, or a list of codes that characterized students' statements, and applying those codes to statements made during the interview. We found that while students understood many of the underlying concepts of metabolic pathway regulation, they were unable to connect concepts or apply concepts to the context of the problem. These results suggest skills that can be targeted in the future development of instructional materials.

Design and Characterization of Drug-Loaded Nanoparticles for Breast Cancer Therapy

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Breast cancer is the most common cause of death among women in the United States. Certain breast cancer subtypes, such as triple negative breast cancer, are more aggressive than others, and it has been shown that African-American women have greater prevalence for developing triple negative breast cancer than Caucasian women. Typically, breast cancer therapies target hormone receptors for estrogen, progesterone, and HER2 for delivering the drugs to the tumor cells; however, triple-negative breast cancer cells lack the three hormone receptors, and thus, cannot be treated with conventional therapies. Commonly used drug therapies are unable to permeate into the tumor cells without a receptor to mediate drug uptake. To circumvent this, drugs can be loaded into nanoparticles small enough to permeate freely through the membrane without the use of the hormone receptors. Biomaterials have long been used for a range of medical applications, including prosthetic replacements, as scaffolds for tissue engineering applications, and commonly for drug delivery via various platforms, such as drug-loaded nanoparticles. Biomaterials for any of these applications must be biocompatible, and are often prepared from degradable synthetic or natural polymers. Various materials have been investigated for preparing nanoparticles for drug delivery. In the case of drug therapy for cancer, it is particularly important to identify biomaterials that are suitable for meeting the specific requirements for a successful cancer treatment. Therefore, the objective of this work is to fabricate and characterize polymeric nanoparticles useful for treating triple negative breast cancer cells.

Effects of Temperature on Leaf Litter Decomposition and Aquatic Insect Community Structure in Southern Appalachian Headwater Streams

Charles T Bond
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Rivers receive, transform, and transport a significant proportion of the primary production from terrestrial plants. Most of the carbon in headwater streams is terrestrially-derived, and the fates of that carbon are controlled by abiotic factors such as temperature and biotic components including microbial decomposers and leaf-shredding macroinvertebrate detritivores. We investigated the effects of temperature on the rates of leaf litter breakdown in streams, and determined the relative roles of detritivores and decomposers. We also determined whether the composition and biomass of detritivore assemblages

varied across a natural gradient in temperature. Mesh bags containing leaf litter were distributed in streams across a temperature gradient at Coweeta Hydrologic Laboratory (NC, USA) and were retrieved after two months of colonization by stream biota. Macroinvertebrates from each bag were preserved, counted, and identified, detritivore biomass was estimated, and taxa distributions were statistically analyzed with respect to average in-stream temperatures. Previous research indicates that shredders may be limited by rising global temperatures due to physiological temperature sensitivity and reduced availability of food as microbial decomposition rates increase. However, higher microbial production also increases the nutrient content of the available organic matter, which may favor certain insect taxa such as early colonists that can take advantage of the nutrient-enriched leaves before they are depleted. Untangling this web is critical to understanding the effects of temperature on global carbon cycling, and this research will contribute to efforts to understand important ecosystem feedbacks in the face of climate change.

Food Waste for Thought

Mira Bookman

Dr. Marsha Black, Environmental Health Science, College of Public Health

In the United States, approximately one in seven households in 2016 was designated as food insecure, defined by the United States Department of Agriculture (USDA) as a state in which consistent access to adequate food is limited either through a lack of economic resources or other social conditions. In comparison to the national average, individuals in Athens-Clarke County (ACC) have a higher risk of food insecurity as one in five households is considered food insecure. Poverty and its associated consequences such as reduced access to nutritious food sources are primary contributors to food insecurity. Food insecurity, in turn, is linked to greater risk of adverse health conditions like obesity, diabetes, malnutrition, depression, as well as behavioral challenges, specifically in children. In order to address the overarching issue of food insecurity in Athens-Clarke County, measures should be taken to reduce food waste from retail food operations at the University of Georgia (UGA), which is one of the largest economic drivers and food waste generators in ACC. Through partnerships with local non-profit food rescues, UGA retail dining services could potentially reduce food waste while increasing donations to food redistribution centers in the ACC area. This policy proposal will take the form of a multi-step regulatory, university-wide policy that applies to retail food operations on the University of Georgia's main campus.

Potential for Phytoremediation of Pharmaceutical Compounds by Emergent and Floating Plants in the Sewanee Wetland

Devon Elizabeth Boullion, CURO Research Assistant
Dr. Marsha Black, Environmental Health Science, College of Public Health

The Sewanee Wetland was constructed to provide tertiary treatment of municipal wastewater from mostly residential sources and has removed from 0-85% of individual pharmaceutical compounds as they move throughout the three wetland basins in pilot studies. However, information on where these contaminants are sequestered after their removal is still largely uncharacterized. Phytoremediation of emerging contaminants via wetlands is a growing area of interest because most pharmaceuticals are somewhat water-soluble and therefore uptake via plant roots is likely to occur. In the proposed research, we will extract and analyze pharmaceutical accumulation in the roots, stems and leaves of two emergent plant species from the wetlands: soft-stem bulrush (*Schoenoplectus tabernaemontani*) and pickerelweed (*Pontederia cordata*) and in duckweed (*Lemna* spp.), harvested from the water surface. Compounds such as caffeine and naproxen, which have been found at high concentrations in the Sewanee Wetlands, are known to have high uptake efficiencies by plants. By measuring plant uptake of the dominant pharmaceuticals and comparing interspecies contaminant concentration to biomass ratios, we can investigate correlations between the uptake rates of different pharmaceutical contaminants, variations in the vascular systems and exposure pathways in the three plant species. While all three plant species are predicted to accumulate pharmaceuticals, we predict that the highest concentrations of the pharmaceuticals and their metabolites will be found in the root tissues of the emergent species (bulrush and pickerelweed) compared to the stem tissues.

Assessing the Impact of Abiotic Factors on the Biodiversity of *Crassostrea virginica* Reefs

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Dr. James E Byers, Ecology, Odum School of Ecology

Coastal estuarine ecosystems of southeastern United States primarily consist of soft sediment substrate. However, the species *Crassostrea virginica*, commonly known as the eastern oyster, breaks up the homogeneous landscape by building expansive reef structures in the intertidal zone. The structural complexity of oyster reefs provides habitat and refuge for a wide range of species and promotes diverse community compositions with species occupying different trophic guilds. The objective of this study was to determine the impact of abiotic factors such as adjacent water body width and wave energy on the species diversity and species abundance of different trophic guilds. We sampled thirty

oyster reef sites composed of creeks, rivers, and sounds for biodiversity using a soil corer (eighteen centimeters in diameter). We then sieved, sorted, and identified the organisms to the lowest taxonomic level. Based upon peer reviewed literature and preliminary results, we expect the diversity of species and size of individuals to decrease as wave energy increases, and that reef size will be positively correlated with species richness. We also expect that there will be fewer predators within the sound site due to intense wave energy compared to river and creek sites. This study is significant as it will help resource managers select restoration sites intended to maximize a diverse species assemblage, as well as, identify hotspots of biodiversity for conservation.

Correlative Analysis of Brain Injury to Gait and Behavioral Parameters after Ischemic Stroke

Michael Bowler, CURO Research Assistant

Dr. Steven Stice, Animal and Dairy Science, College of Agricultural and Environmental Sciences

Stroke is currently the fifth leading cause of death in the United States accruing yearly healthcare costs of \$33 billion. Despite the prevalence of stroke, a lack of FDA-approved small molecule treatment options exists. In response to the translational failure of many clinical therapeutics, Dr. Stice's lab, alongside the West lab, has worked to enhance the clinical relevance of a porcine stroke model by analyzing correlations of MRI parameters to behavioral and cognitive deficits. In this study, a right-sided middle arterial occlusion (MCAO) was invoked in 16 pig models, split into a sham and treatment group, which received neural stem cell-derived extracellular vesicles (NSCEVs), membrane-bound, inter-cellular messaging nanovesicles, at 2, 14, and 24 hours post-surgery. MRI was conducted at 24 hours and 84 days post-stroke and behavioral and gait measures were collected during the 12-week timespan. We identified a subset of MRI parameters including, T2W left hemisphere volume, T2W right hemisphere volume, and T2W lesion volume, which were significantly correlated to gait and behavior parameters on day 1 post-MCAO. We found 13/90, 20/90, and 14/90 functional parameters had significant correlations to these respective MRI measurements in our sham group, compared to only 3/90, 2/90, and 4/90 in our treated group. Similar trends across multiple time points and MRI parameters require further investigation. By developing a multiparametric test that established correlation between MRI parameters and functional deficits, our research team further analyzed the effectiveness of NSCEVs as a stroke treatment and has provided a foundational model for further stroke therapeutic experimentation.

Testing Wicking Fiber Capability: Developing a Microscope System to Observe Cell Movement in a Wicking Fiber

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Kamil Bagain

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It has been shown that fibers with non-circular cross-sections, termed "wicking fibers" can be used to separate populations of different cell types. This approach could be applied to design medical predictive tests that achieve rapid, low-cost results. The goal of this research is to develop a microscope system to observe cell movement through wicking fibers. A microscope was constructed on an optical breadboard to image vertical oriented fibers. Polystyrene microbeads were used as an analogy for cellular wicking and were suspended in phosphate buffered saline at 1×10^4 beads per mL. Three polylactide fibers measuring 0.5 mm in diameter were cut in 3.5 cm sections and a single fiber was positioned in the clamp. The bottom third of a given fiber was submerged in the bead suspension and video was captured using Infinity Capture software. Polystyrene beads successfully wicked up fiber channels and video was recorded with the microscope system. Water based solutions and polystyrene beads travel vertically up wicking fiber channels demonstrating wicking potential. Video results suggest that cellular travel can be imaged effectively using this microscope configuration. Automated tracking will be used to follow cells by moving the fiber to change the camera field of view. Motility of cancerous cells with high metastatic potential will be tested and compared to cancerous cells with low metastatic potential. Future wicking fiber studies will explore methods for measuring velocity rates of cell travel and comparing cancerous versus non-cancerous groups.

Testing Skutch's Hypothesis Using an Entirely Mechanical System

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Skutch's hypothesis, named for noted ornithologist Alexander Skutch, states that increased bird activity in and around nests increases the risk of nest predation. This hypothesis attempts to explain why birds in the tropics have smaller clutch sizes: smaller clutches lead to fewer nest visits by adults and evolved because of a large predator presence in tropical areas. Although this hypothesis was formulated in the 1940s, it has not been extensively tested, mostly because of the inability of researchers to separate nest activity from confounding variables when observing wild bird populations. It remains a controversial subject in avian population ecology. In this experiment we will design

and fabricate mechanical pulley systems to deliver artificial birds to artificial nests containing reward eggs at controlled programmable intervals. The experiment will simulate the nesting habits of Black-throated Blue Warblers (*Setophaga caerulea*) during their traditional nesting season in a part of their range at a research site in Coweeta, North Carolina. The use of artificial delivery systems and nests mimicking real nesting habits eliminates confounding variables when testing whether or not nest activity directly impacts nest predation rates, thus directly testing Skutch's hypothesis. The manipulated variable will be nest visitation rate—corresponding to nest activity—and nest predation rates will be observed and quantified using field cameras. We predict that an increase in nest visitation frequency by the dummy bird will attract more predators due to an increase in visual cues, resulting in an increase in nest predation rates and supporting Skutch's hypothesis.

Regulation of Stem Cell Mitotic Activity in the Male Gonad of the Fruit Fly

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Adult stem cells produce daughter cells to replace themselves and cells that are lost due to usage or death in a process called tissue homeostasis. Despite the importance of stem cells, little is known about the regulation of their division frequency. In my research, I use germ-line stem cells (GSC) of *Drosophila melanogaster* to address this question. GSC divide more frequently when *Drosophila* males are mated compared to their non-mated siblings. This increase is dependent on G-proteins signaling, as knockdowns of several GPCRs through UAS-GAL4 driven RNAi eliminated the increase in GSC division frequency in males upon mating. Through RNA sequencing we identified genes that are expressed at a higher level within the male gonad upon mating. RNAi-mediated tissue-specific knock-down of some of these target genes also eliminated the ability of GSCs to divide faster upon mating. I hypothesize that different GPCRs regulate the expression of different target genes and I am attempting to place the different target genes downstream of the GPCRs via qRT-PCR. Notably, the majority of the target genes encode secreted protein suggesting that GPCR signaling induces the expression and secretion of a group of proteins, which in turn feed back onto the GSCs to regulate their mitotic activity.

Inhibition of Non-Enzymatic Protein Glycation by Purple Muscadine and Other Fruit Juices

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Protein glycation refers to the formation of a covalent bond between a sugar and a protein molecule leading to the formation of advanced glycation endproducts (AGEs) and the crosslinking of proteins. Protein glycation participates in the pathogenesis of cardiovascular diseases, Alzheimer's disease, diabetes, and cancer. This study investigates the effect of commonly consumed juices (purple muscadine, cranberry, black cherry, pineapple, apple, and Concord grape) on the *in-vitro* fructose-mediated glycation of albumin, a model system of protein glycation. The purple muscadine grape juice exhibited superior inhibition of protein glycation compared to the other juices with glycation decreasing by over 85% in the presence of 10 μ L of 1:5 diluted purple muscadine juice/mL while other juices inhibited glycation by only 10-50%. Purple muscadine juice also produced greater inhibition of protein glycation than other juices when incubated at both the same phenolic concentration and the same antioxidant capacities. Sodium dodecyl sulfate–polyacrylamide gel electrophoresis (SDS-PAGE) revealed that purple muscadine, but not apple juice, protected albumin from modification by fructose. These results demonstrate that purple muscadine juice is a potent inhibitor of *in-vitro* fructose-mediated protein glycation. The inhibition of protein glycation by a great variety of fruits may be the mechanism by which fruit and vegetable consumption protects humans from a variety of disease states.

Biomaterials for Medical Applications

Nettie Brown, CURO Research Assistant
Dr. Hitesh Handa, Chemical, Materials, and Biomedical
Engineering, College of Engineering

Hospital-acquired infections are the 4th leading cause of death in the United States and cost over \$3 billion for treatment; 60% of which are related to biomedical implants. At the surgical sites, microbes propagate the forming biofilms around implants. The main microbes associated with the propagation are *Staphylococcus aureus*, *Staphylococcus epidermidis*, and *Pseudomonas aeruginosa*. We want to overcome high costs and patient morbidity associated with follow-up surgeries by using degradable materials to decrease long-term biocompatibility problems. Our goal in this study is to use zinc and copper nanoparticles to reduce nitrate to nitric oxide (NO). NO is used as an antimicrobial agent by preventing bacterial adhesion and proliferation, inhibiting platelet activation and adhesion, and aiding in wound healing. NO generating polymers have been researched and used to increase the

biocompatibility for devices such as catheters, stents, and wound healing patches. We will combine the nanoparticles with a polymer to make films for further testing. First, we are fabricating our films to formulate the right proportion of zinc to copper. Then, we will measure release profiles using a NO analyzer and bacteria test to measure antibacterial efficacy. We plan to use our material for urinary catheters since nitrate is found in urine.

Unique Pocket on Nairoviruses vOTU Dictates De-Ubiquitinase Activity

Sarah Elizabeth Brown, CURO Research Assistant
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Erve virus (ERVV) is a negative sense single stranded RNA virus in the family *Nairoviridae*. Nairoviruses, including the often fatal Crimean-Congo hemorrhagic fever virus (CCHFV), are a cause of both human and animal disease, with ERVV associated with fever and thunderclap headaches in humans. Within the nairovirus genome is encoded a viral homologue of the ovarian tumor protease (vOTU). The vOTU has been observed to reverse post-translational modification of proteins by ubiquitin (Ub) and interferon stimulated gene product 15 (ISG15), suggesting this to be a mechanism of evading the host immune response. Intriguingly, nairoviruses show variability in the ability of their vOTUs to engage these two substrates. In contrast to the CCHFV vOTU, which has high Ub activity and moderate ISG15 activity, investigation of the ERVV vOTU revealed it to possess low activity towards Ub while having potent activity towards ISG15. To uncover the molecular basis of these differences, an X-ray crystal structure of the ERVV vOTU in complex with a mouse ISG15 domain was determined to 2.5 Å. Analysis of this structure revealed the presence of a pocket dictating the ERVV vOTU's specificity for ISG15 over Ub. Overall, this work reveals key insights into factors influencing a potential viral mechanism of evading host immune responses.

Carcinogenicity of Metals in Domestic Canines

Austin Thomas Bryan, CURO Summer Fellow
Dr. Kat Loftis, Vice President for Research Services, Research Units

Our study seeks to establish whether correlations exist between diagnosed cancers and trace metal content in the blood of domestic canines. Trace metal elements have adverse and well-documented health effects in both humans and animals, including carcinogenic effects. In domestic dogs, cancer is the leading cause of death, with approximately 25% of dogs eventually dying from cancer. Many of the cancers found in dogs are also diagnosed in humans. Understanding links between toxic metals content in domestic animals and diseases such as cancer

helps veterinarians identify high risk cases and potentially lead to earlier diagnoses, and can serve to advance our knowledge of cancer development in humans alike. While several toxic metals have been identified as carcinogenic, the carcinogenicity of mercury is poorly understood. The objective of this study was to assess the prevalence of 14 elements (Li, Mn, Co, Cu, Zn, Se, Rb, Sr, Cd, Cs, Ba, Tl, Pb, and Hg) in 186 domestic canines diagnosed with various cancers, as compared with canines lacking a cancer diagnosis. Blood samples from these animals were freeze-dried prior to undergoing a nitric acid digestion in preparation for elemental analysis. For all elements except mercury, the samples were analyzed via ICP-MS. Analysis of mercury was carried out on a direct mercury analyzer. Results for the 13 elements, analyzed via ICP-MS showed no statistically significant correlations between elemental concentration and the occurrence of cancer. Analysis of the samples using the mercury analyzer is currently underway.

Development of Synthetic Pathways for Various Metal-Organic Frameworks

Emerson Buck
Taylor Patterson
Dr. Richard Morrison, Chemistry, Franklin College of Arts and Sciences

Metal-Organic Frameworks (MOFs) are molecular networks consisting of inorganic and organic linkers. The MOFs of interest in this research study were comprised of three main linkers, each of which was separately synthesized before combining together. The first of the two MOFs was a rotaxane with a 1,5-naphthalenediol centerpiece and anthracene-derived end pieces. This construction has possible applications in the undergraduate instructional laboratory and could also be used as a molecular machine. The second MOF of interest, which has potential applications in drug delivery, has a centerpiece containing a tropylium ring. The linkers for the two MOFs were successfully synthesized and microwave promotion was employed to link them together into their MOF lattice structures. Most of the linkers were made with suitable yields; however, some reactions require optimization. Recrystallization of the tropylium MOF is underway to produce a crystal that can be analyzed through X-Ray Crystallography. The data from the crystallography will be used to prove the structure and determine the possible functions for the MOF.

Prenatal BPA and DEHP Programming Effects on Behavior

Hannah Buechter
Dr. Sheba MohanKumar, Veterinary Biosciences and Diagnostic Imaging, College of Veterinary Medicine

We have previously reported that chronic exposure to low

levels of estradiol-17 β (E2) induces anxiety-like behavior in female rats. In the present study, we hypothesized that these rats would have exacerbated anxiety-like behavior when they are prenatally programmed with endocrine disruptors (EDCs). For this purpose, we exposed pregnant rats to either 5 μ g/kg BW of Bisphenol A (BPA), 7.5 mg of diethyl hexyl phthalate (DEHP), or a combination of the two EDCs. Female offspring were sham implanted or implanted with a slow release E2 pellet (20ng/day for 90 days) to mimic oral contraceptive use. 75 days later, animals were subjected to a shock probe defensive burying (SPDB), open field (OF) or elevated plus maze (EPM) test. While locomotion was unaffected by prenatal EDC exposure, it had specific effects in different tests. Controls displayed active coping behaviors while E2 treatment manifested passive coping behaviors. Prenatal BPA and B+D exposures reduced the effect of E2. Anxiogenic effects were observed in the DEHP+E2 group in the open field test and results from the EPM tests were inconclusive. These results indicate that prenatal EDC exposure can alter behavioral responses in female rats that are chronically exposed to low dose E2.

Chemical Pedagogy: Utilizing Interactive Simulations in Chemistry Learning Environments

Joyce Bui, CURO Research Assistant
*Dr. Norbert Pienta, Chemistry,
 Franklin College of Arts and Sciences*

The Department of Chemistry and Prof. Pienta have developed a new course at the University of Georgia, CHEM 1210 (Basics of Chemistry), as a means for students to bridge their high school chemistry knowledge with the goal of achieving greater success in the traditional general chemistry sequence. I am part of a team in the development and refinement of case studies to be used in this class. The tasks integrate browser-based simulations and activities that are already in existence at the National Science Foundation-supported PHET library. We are targeting four simulations and are testing how students use and learn from them by devising survey questions, interviewing the students, and using eye-tracking hardware. Eye-tracking hardware will be used to document the user's sensory experience of the simulation as well as track the approach used to complete the simulation by recording the path at which their eyes travel across the screen. Exercises using these simulations to be used in the general classroom setting have already been created and studied, and I am currently in the process of studying the use of these simulations in a more exploratory lab-based setting. This research is aimed at analyzing cognitive processes involved with the application of modern technology and teaching methods for the purpose of increasing achievement in the classroom and overall understanding of the subject.

Deficiencies and Improvements to Mental Health Institution in Georgia

Tommy Bui, CURO Research Assistant
 Joseph Elengickal
*Dr. Leonard L Martin, Psychology,
 Franklin College of Arts and Sciences*

Georgia is ranked as one of the lowest in the country regarding its psychiatric hospitals and psychiatric health programs. Fixing this issue, however, is no easy task as attempts to deinstitutionalize psychiatric care have resulted in a rise in deaths related to mental illness. The systemic nature of the problem means a solution may not be on the horizon. The study of this issue has been the topic of this research project for the past two years and as more information was gathered, potential interventions that could lead to minor improvements were found. These minor improvements focused on creating a more therapeutic environment for patients, utilizing an environmental psychology perspective to prove these theoretical interventions. The general hypothesis is that the application of natural environmental conditions to psychiatric hospitals will lead to a therapeutic landscape for patients as well as staff, allowing for more effective hospital care and improved operations. The summation of multiple minor interventions will lead to major results. With this research, the hope is that improvements to the state of psychiatric hospitals will be elucidated, proposed, and implemented in hospitals across the state of Georgia. Furthermore, this research can also be applied to any institution, including general hospitals, schools, prisons, and nursing homes.

Reliably Regulating Fluid Pressure in a Low Cost Platform

Ben Bullard, CURO Research Assistant
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The goal of this project is improving a custom droplet printer, currently capable of patterning nanoliter droplets in an oil reservoir with micron precision to form biological membranes at their points of contact. However, there is ample room to improve the capabilities of the printer, including the ability to rapidly print droplets with varying compositions. This will effectively allow the printer to move from "black and white" to "full color," allowing for more complex patterns and forms that more accurately mimic biological systems. This is accomplished by overhauling the current droplet dispensing system. The previous system used a single computer-controlled pressure supply to eject droplets at their desired locations. This pressure supply will be connected to a series of computer-controlled valves to distribute the pressure between multiple channels, allowing for selective pressurization of a collection of printing needles containing varying aqueous solutions. The

research includes designing and building the pressurization system, developing algorithms for pressure control and redistribution, and implementing the changes in the existing droplet printer. The end result is a low-cost system capable of rapidly regulating the pressure within multiple fluid solutions that may be easily integrated into existing software and equipment.

Camera-Geometry Interpenetration in Virtual Reality

Ben Burgh

Dr. Kyle Johnsen, Electrical and Computer Engineering, College of Engineering

One of the most significant challenges facing virtual reality experiences is the virtual world being misaligned from the real-world environment. This makes problems arise if a user ventures too far outward if the virtual world is larger, then the user is at risk of running into walls in the real world, and, conversely, if the real world is larger, the user is at risk of running through virtual walls. In this study, we examined the second case to figure out the best practice for handling such scenarios. We looked at ten methods that try to solve this problem, grading each method on comfort, intuitiveness, and immersion. Additionally, we looked at how many commercial experiences handle these events.

Empowering Women to Campaign for Office: How and Why Women Run

Sarah Burns, CURO Research Assistant

Dr. Charles Bullock, Political Science, School of Public and International Affairs

Within the field of political science, there is currently little to no research on why women run for public office. While researchers Jennifer Lawless and Richard Fox are answering questions of why women are currently still underrepresented in office, there still has not been a substantial study addressing why women actually make the choice to campaign for an elected seat. So what inspires women to run? Is it personal characteristics, a history of involvement in the community, a previous interest in politics? We set out to solve this by interviewing women who have run or are currently running for public office, asking questions on their interests and what has spurred them to take action and run. These questions and our predictions are based off the findings of a municipal-based 2010 study conducted by Shirley Rombough comparing the characteristics of women elected into local offices. We predict that women who have run or are running for election will specifically have engaged in risk-taking behaviors at some point in their past, although such behaviors range from sports to theater and debate. We also predict that they may have a background in law or a prior connection to politics before running and that they may have been spurred to run by issues in their community.

If these questions are answered, it will help us better understand the political climate as a whole, as well as what empowers the women around us to take part in representing their communities and how we can help.

Thinking About Your Day

Lindsay Burr, CURO Research Assistant

Dr. Michelle R vanDellen, Psychology, Franklin College of Arts and Sciences

Individual perceptions of outside events are often highly subjective, and people's motivations change the nature of these varying perceptions. These perceptions change as people strain to maintain an aura of objectivity in their decision-making; admitting bias in short-term decision-making often negates the validity of a previously established long-term goal. This conflict between maintaining motivation for a long-term goal and pursuing motivation for short-term indulgence entails much of what constitutes self-control. In our research, we examined how individuals (N = 358) alter their perceptions of a day after being tempted with an option to order takeout for dinner. We hypothesized that participants presented with the temptation to order takeout would rate a day as worse to justify indulging in the temptation of ordering food for dinner rather than cooking. The results did not support our hypothesis. In a second study, we will first ask 400 participants to evaluate their own week. After some distractor questions, participants will be exposed to either a strong or weak temptation (spending \$40 vs. \$5 on a concert ticket). We expect participants in the strong temptation condition to evaluate their previous weeks as more extreme than they previously indicated; those who considered their weeks moderately bad will re-evaluate them as extremely bad, while those who considered their weeks moderately good will re-evaluate them as extremely good. We hope to use this research to better understand how people inadvertently create justifications for indulging in short-term goal pursuits.

Revealing the Link Between Phenotype and Micronutrient Content in Cassava

Natalie Gray Busener, CURO Research Assistant

Dr. Alexander Klaus Bucksch, Plant Biology, Franklin College of Arts and Sciences

Over two billion people face "hidden hunger" in low-income countries, despite advances in plant breeding for increased yields. Hidden hunger refers to micronutrient deficiency caused by the low nutritional value of food they consume. Consequences include growth stunting, blindness, digestive diseases, and death. Hence, global hunger cannot be solved through increasing the quantity of food produced—the quality of food must also be improved. A new target to increase food security across the globe is the plant root

system, which largely drives the function and yield quality of the plant. In particular, cassava roots are a staple crop in many low-income countries because of its remarkable resistance to drought. It is an easily-propagated crop that develops carbohydrate-rich, tuberous roots below ground. Existing data reports significant variability in micronutrient content across different cassava genotypes. In our study, we observed significant phenotypic differences in cassava harvested at key developmental points. Statistical analysis of root traits computed from digital images allowed us to establish a direct link between root phenotype and micronutrient content for several cassava varieties. In opposition to many other studies, we developed the data-driven hypothesis that breeding efforts to develop early-bulking varieties for fast harvesting has reduced the ability of cassava to accumulate essential micronutrients in the edible roots. The late-bulking varieties are the genotypes that should be targeted for food security because their tubers have increased bulking and micronutrient content. Our data suggests that an increased volume of explored soil is utilized for micronutrient uptake during prolonged root development.

The Relationship Between Socioeconomic Status and Normative Asset Allocation

Ben Butler, CURO Research Assistant

Dr. Kenneth John White, Financial Planning, Housing, and Consumer Economics, College of Family and Consumer Sciences

This research focuses on whether there exists a positive correlation between socioeconomic status and the normative allocation of a household's financial assets. In doing so, it seeks to better equip financial professionals to anticipate and ask probing questions about the needs of the potential clients they serve. The research utilizes data from the 2016 Survey of Consumer Finances and adjusts the measurement of asset class diversification formula developed by Su Hyun Shin to determine the allocation of each household's financial assets. Descriptive analysis (race, age, gender, household/single male/single female, education, and urban vs. rural), quantile regression analysis, and quartile regression analysis were all used to further understand the data. We expect that households with a higher socioeconomic status will have more normatively allocated financial assets.

Population Connectivity of Reef Fish Between Coral Reefs off the Amazon River Plume and in the Western Atlantic

Elizabeth Butler

Dr. Patricia Yager, Marine Sciences, Franklin College of Arts and Sciences

Population connectivity plays an essential role in predicting future community dynamics of species. If populations

are genetically linked, effects of factors such as disease, physical shifts, or climate change at one site could affect biogeography, evolution, and viability at other locations. One way populations can be connected is through migration of their larvae. In this study, population connectivity of reef fish through pelagic larvae resettlement in the Western Atlantic was considered. Using Coles' model of surface drifter trajectories off of the Amazon River plume with other data on ocean currents, patterns were analyzed and possible routes for free-floating larvae from reefs off of Brazil to reefs in the Gulf of Mexico, the US Virgin Islands, the Dominican Republic, the Florida Keys, and the Georgia coastline were established. Fish databases were reviewed, and fish species found both in the reef off of the Amazon River Plume and reefs farther north were noted. This study concludes that population connectivity of certain reef fish among these reefs is likely. Species are possibly using stepping stones in aforementioned possible routes to travel northward over generations. Future field studies on larval connectivity should use genetic markers to quantifiably determine linkages between populations, whether through larval migration or other means.

Joule Heating Analysis of Spacecraft PCBs

Michael Buzzy, CURO Research Assistant

Dr. David L Cotten, Geography, Franklin College of Arts and Sciences

Contrary to popular belief, the cold vacuum of space isn't so cold after all. With little to no atmosphere in low earth orbit the dissipation of heat by conduction becomes impossible. Therefore, satellites can only dissipate heat through the means of radiation, which is far less efficient than the conduction we see here on Earth. In the context of electronics this becomes quite cumbersome due to the high heat output of many components. The purpose of my research is to inquire into the viability of certain printed circuit board (PCB) designs as part of the UGA Small Satellite Research Laboratory. In order to accomplish this, the PCB's schematics will be first extracted into a meaningful format in which thermal simulations can be run on them. This will be done by extracting a single layer of the PCB into AutoCAD and using AutoCAD to reconstruct a three dimensional model of the PCB. Once this is finished the three dimensional models can be moved into ANSYS. In ANSYS the PCBs will be subjected to their maximum operating voltages and a joule heating analysis will be done. The results of this analysis will be a thermal map of the board, which will reveal any areas of the PCB that cannot effectively dissipate heat. The results will then be used in the future to ensure a redesign of the PCB so that while in flight the boards will preform faithfully.

Characterizing the Role of Inhibitory Neurons in Regulating Seizure Propagation

Branson Byers, CURO Research Assistant

Dr. James D. Lauderdale, Cellular Biology, Franklin College of Arts and Sciences

Approximately 50 million people worldwide suffer from epilepsy, which is characterized by recurrent seizures with symptoms ranging from lapses in attention to convulsions and loss of consciousness. While seizures are attributed to excessive electrical discharge from groups of neurons, and the most common form of epilepsy, idiopathic epilepsy, has no known cause. The mechanisms behind seizure generation, recurrence, and control remain poorly understood. Recent advances in cellular-resolution imaging and the emergence of the embryonic zebrafish as a high-throughput model organism have allowed for the interrogation of seizure propagation throughout an entire vertebrate brain. Such progress like calcium imaging through light sheet microscopy generates large, detailed data sets. Because this complex data proves difficult to visually interpret, dimensionality reduction techniques have become important in understanding neural dynamics. We hypothesize that inhibitory neurons help control abnormal activity through an emergent, surround mechanism. To test this, we have created *gad1b* mutant zebrafish with the goal of decreasing the effectiveness of inhibitory neurons. Thus, we aim to use calcium imaging, light sheet microscopy, and dimensionality reduction to distinguish the brain activity of wild type zebrafish from mutant *gad1b* fish. We adapt principal component analysis, spectral analysis, and other rasterization techniques to interpret this complex neural data with the ultimate goal of understanding how inhibitory neurons behave in human epilepsy.

Design of a Micro Autonomous Vehicle for Maze Navigation

Wendy Cai

Dr. Wenzhan Song, Electrical and Computer Engineering, College of Engineering

In the traditional micromouse competitions, the goal is to design a small autonomous robot that will be able to navigate and map out a maze as well as be able to find the quickest path to a final destination. In this project, we will develop and demonstrate an appealing example of multi-robot coordination and navigation in the maze through distributed sensing, communication and computing. More importantly, we aim to design an education hardware and software suite for K-12 and college students to learn sensor networks, cyber-physical systems, and robotics. We will use the LEGO Mindstorm EV3 as the hardware platform and eliminate the complex problems of designing customized hardware that may be impossible for younger children, and focus on the functionalities of the sensors and robots.

The EV3 features hardware that is predesigned and easy to build, and have multiple add-on sensors that can be used to implement micromouse functions. Using a LEGO platform will be more appealing to a younger audience, which in turn will help gain interest in the field of cyber-physical systems and robotics. This will allow them to start learning about higher level concepts much sooner than before and will help children develop their critical thinking skills along with the knowledge of sensors, controllers, and networks.

Leaf Terminal Die-Back Disease of Pecan is caused by a New Fungal Species in the Genus *Neofusicoccum*

Courtney Cameron, CURO Honors Scholar, CURO Research Assistant

Dr. Marin Talbot Brewer, Plant Pathology, College of Agricultural and Environmental Sciences

Neofusicoccum, a member of the Botryosphaeriaceae family, is a fungal pathogen of woody hosts. It is a threat to pecans (*Carya illinoensis*) throughout the South, as it damages the above ground parts of plants. Terminal die-back is the most common symptom, resulting in dying or browning of terminal leaflets, and eventually entire compound leaves, scattered throughout a tree. The pathogen often remains dormant until the host's immune response is suppressed by environmental factors such as drought. Some orchards in Georgia have begun displaying terminal die-back. The causal fungus has been identified as a member of the genus *Neofusicoccum*, but the species is not yet known. Additionally, the disease has become more prevalent in Texas, and we are interested in determining if the casual fungus is the same as the species in Georgia. To determine the species of the disease, we studied the morphology and phylogenetic relationship of samples to those of known species such as *Neofusicoccum ribis*. Isolates were grown in order to examine colony morphology and subjected to UV light in order to induce and describe sporulation. For phylogenetic analyses, we sequenced a total of 9 isolates from Georgia and Texas using *ITS*, *BTUB*, *EF-1a* and *BotF15* genes. All sequences were aligned and subjected to phylogenetic analyses. Results indicated that the isolates collected from Georgia and Texas are phylogenetically similar to each other but distinct from other *Neofusicoccum* species. These results show that terminal die-back is caused by a new fungal species that needs to be fully described and named.

Petrography of the Gneisses from the Mary Lou Quarry in Clinton, SC: Implications for Quantifying Mineral Compositions in the Critical Zone

Tyler Cannida

Dr. Paul A. Schroeder, Geology, Franklin College of Arts and Sciences

The environment between tree tops and deep bedrock where

earth, air, water, and an array of living organisms interact is called the critical zone. Critical zone observatories (CZO) are site that are designed to study biogeochemical interactions that occur in time scales from seconds to geological millennia and spatial scales from microns to kilometers. The CZ is important to many terrestrial life, especially humans; however, the physical and chemical properties and their function are not always well characterized. In particular, CZ science is challenged to accurately quantify mineral assemblages that occur in the subsurface. Soil quality in terms of nutrient capacity and water availability are closely related to the parent rock material, which weathering process act upon. X-ray powder diffraction and thin section analysis are common approaches to quantifying minerals. Although the techniques are based on different principles, the quantitative results should agree. It is hypothesized that the two methods will agree in outcome, given assumptions about mineral stoichiometry. To test this hypothesis, thin sections were analyzed with an electron microprobe. Three samples were collect from the deep Mary Lou aggregate quarry to provide a basis to evaluate unaltered parent rock. Results are intended to highlight the differences in each approach and reconcile the inadequacies between the techniques. Reconciling these differences can lead to understanding the range of mineral composition variation in both small and large landscape scales.

Neonatal Therapy: Types, Availability, and Benefits for Children and Families

Savannah Lynn Carroll, CURO Research Assistant
Dr. Kimberlee Spencer, Human Development and Family Science, College of Family and Consumer Sciences

Neonatal services are organized at the state level resulting in substantial variation among states in the definition and provision of neonatal services. This research will examine types of neonatal therapy to identify services available to parents of children in the Neonatal Intensive Care Unit (NICU). Additionally, this research will survey availability of neonatal services and service utilization hinderances using Ecological Systems Theory. Benefits of neonatal services for children's long-term development and family interaction will be explored to detect needed improvements in awareness and provision of neonatal services. A large-scale literature review will be conducted using scholarly articles, textbooks, and journals. Interviews will be conducted with neonatal therapists and early intervention providers to document implementation and service provision to families in the NICU and upon discharge. This study will also explore neonatal service provision by health care providers and its correlates to family-centered care practices, parent participation in the NICU, and child outcomes. Preliminary findings suggest early neonatal services promote optimal infant development and positive parent-infant relationships.

Additionally, several demographic and societal factors, such as mobility, insurance coverage, income, marital status, education, and ethnicity/race, are implicated in the non-utilization of neonatal services following discharge. Better infant outcomes are observed with a focus on family-centered care when family resources and values are considered and respected in the provision of care. This research will inform the medical community and policymakers in fostering awareness and provision of neonatal services for development of lasting adaptations for long-term quality of life improvement in NICU children.

Cell Division Cycle Regulates Kinetoplast Division

Steven Carroll
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Trypanosoma brucei is a protist that causes fatal diseases in cattle (nagana) and humans (sleeping sickness). In *T. brucei* the mitochondrial nucleoid, called the kinetoplast, which contains the mitochondrial DNA (kDNA) consisting of concatenated network of maxicircles and minicircles. The current model of kinetoplast replication and division posits that the kDNA synthesis and division of network occur in S-phase. Recently, a study provided evidence that kinetoplast division occurs in G2. Our research seeks to determine more precisely the timing of kDNA division, by using molecular and metabolic markers of S-phase and G2. Data will be analyzed by immunofluorescence assays and microscopy of trypanosomes that are treated to execute events in the cell division cycle in synchrony. We anticipate this work will resolve the degree to which the trypanosome cell division cycle regulates division of the mitochondrial nucleoid.

Bridging the Gaps: The Role of Promotoras in Connecting Latinos to the Local Community

Isabel Carvallo, CURO Honors Scholar, CURO Research Assistant
Luis Mata
Dr. J Maria Bermudez, Human Development and Family Science, College of Family and Consumer Sciences

Scholars have noted the disparities and inability to access adequate care and resources within the Latino population in the United States. Given these experiences, promotoras/ community health workers have worked to bridge the Latino community to local community services. Researchers have noted the benefits of working with promotoras to address various concerns within the Latino community. The purpose of this study is to qualitatively examine the experiences of promotoras who engage with Latinx community members in accessing care and resources. This community based research project employs a phenomenological research methodology. Phenomenological research seeks to examine

the meanings of the lived experiences related to the phenomenon at hand. In this case, it is examining their lived experiences as promotoras in Athens-Clarke County, working with Latinx participants in our community. The overarching research question is- How does being a promotora influence their sense of self and what meanings do they attribute to this role and lived experience? In this research study, focused group interview data will be analyzed. A semi-structured interview guide was used and data will be analyzed using thematic coding methods as defined by Braun and Clarke and preliminary findings will be provided. We will also discuss implications for conducting community-based participatory research.

The Effects of Acute Clothianidin Exposure on Spermatogenesis

Chelsea Cary, CURO Research Assistant

Dr. Chas Easley, Environmental Health Science, College of Public Health

In the last 40 years, male sperm counts have significantly decreased by over 50% in Western countries such as the United States, Canada, and European nations. Currently no specific cause has been established, but if this drastic decline is not abated, infertility in Western countries may significantly rise in the near future. Exposure to environmental toxicants represent one potential cause for this severe reduction in sperm counts. Increased use of insecticides such as Neonicotinoids represent a ubiquitous exposure that may be contributing to sperm count reductions in Western men. Neonicotinoids are class of insecticides that were developed in the 1980's and are currently one of the most widely used class of insecticides. Here we assess the acute reproductive toxicity of the Neonicotinoid, Clothianidin, using an *in vitro* stem cell-based model of spermatogenesis. This model mimics human spermatogenesis and allows us to examine impacts of Clothianidin exposure on male gametogenesis. Our preliminary results show no significant impact of Clothianidin on total germ viability; however, we do observe a potential loss of haploid spermatids in the presence of Clothianidin. These results suggest that more information is needed to determine whether Clothianidin impacts human spermatogenesis and contributes to the massive decline in sperm counts in Western men.

Assessing Economic and Environmental Viability of Options Available for Reducing Food Waste in the United States

Jaiko Celka, CURO Research Assistant

Dr. Puneet Dwivedi, Forestry, Warnell School of Forestry and Natural Resources

Approximately one-third of all the food produced in the United States is lost or wasted each year. This research

analyzes the 27 solutions as proposed by ReFED (Rethink Food Waste through Economics and Data) under three separate categories (preventive, recovery, and recycling) that contribute to the reduction of food waste nationwide. We will assess tradeoffs across each subgroup of solutions regarding their diversion potential, economic value, and environmental impacts, while also developing a case study to assess the impact of the Campus Kitchen at UGA student program in addressing food waste in Athens, Georgia. We will then determine the total economic value of Campus Kitchen food recovery operations by calculating the value of avoided food waste and compare it with the value estimated for recovery solutions outlined by ReFED. Our initial analysis suggests that preventive solutions (e.g., trayless dining, consumer educational campaigns) are more economically efficient in reducing food waste. We are also finding that the economic value added by Campus Kitchen is about three times the value reported by ReFED (\$1.71) at the national level for donated food. This difference could be attributed to the scale issues. We hope that our research will help reduce food waste in the United States by promoting the adoption of economically viable and environmentally friendly food waste reduction practices.

Exploring the Evolutionary Foundation of the Relationship Between Cilia and Hedgehog Signaling Pathway Using Immortalized *Anolis sagrei* Embryonic Fibroblast

Bidushi Chandra, CURO Research Assistant

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The Hedgehog (Hh) signaling pathway is an evolutionarily conserved pathway involved in cell proliferation, cell survival, and cell fate specification during embryonic development. Recent studies have shown that the primary cilium, an antenna-like organelle that projects from the plasma membrane, is crucial in its involvement in mammalian Hh signaling; however, it not essential in *Drosophila*. The association of primary cilium to Hh signaling highlights one of the important differences in vertebrate and invertebrate Hh signaling. Furthermore, although the core components of the Hh pathway are conserved, the mechanism of the cilia regulating the pathway varies among vertebrates. Thus, a complete understanding of the primary cilium's role in Hh pathway and how the two autonomous systems became linked over the course of evolution remains elusive. To resolve how the cilia evolved to control Hh signaling, we investigate the primary cilium's role in reptiles, specifically squamates, who diverged from the mammalian lineage more recently than *Drosophila*. Preliminary experiments have established that normal *Anolis sagrei* fibroblasts are ciliated. Further studies using CRISPR-Cas9 to disrupt IFT88, a gene required for ciliogenesis in other organisms, in immortalized *A. sagrei* embryonic fibroblast

(iLEFs) is needed to test whether cilia is required for these cells to respond Hh pathway agonists. Research is ongoing but if CRISPR-Cas9 mutagenesis is possible in iLEFs, the results may have the serious implication of making *A. sagrei* the first squamate system for molecular genetic studies in addition to investigating the relationship of cilia and Hedgehog signaling in an evolutionary context.

Exercise and Tart Cherry Effects on a High-Fat Meal

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Dietary phytochemicals, such as those found in tart cherries, combined with exercise may have a synergistic effect on lowering risk factors associated with the development of chronic disease. We aim to measure the effect of tart cherry consumption combined with exercise on triglyceride levels after a high-fat meal is consumed. Thirteen healthy, active adult males (18-30yrs) were recruited to complete a double-blind, randomized, cross-over design with four different treatments and a seven day washout period in-between trials. Each visit included a high-fat breakfast meal with either tart cherry or placebo (cherry substitute) added. The four treatment conditions were cherry, placebo, exercise + cherry, and exercise + placebo. The two exercise visits consisted of a 30-minute treadmill run performed the day prior to (15h before) the high-fat breakfast meal. Blood was drawn at fasting and every hour for the first three hours postprandially. Triglyceride levels were lower following the cherry + exercise (108.9±11.4 mg/dl) vs. placebo trial (133.1±13.4 mg/dl; $p<0.05$). There were no differences in ratings of hunger or satiety between trials. Muscle pain/soreness scores showed muscle pain was increased from pre- to post- exercise (placebo: 4.46±1.90 vs. 10.23±2.66 mm, for pre vs. post, respectively; $p=0.001$; cherry: 6.85±2.26 vs. 12.77±2.75 mm, for pre vs. post, respectively; $p=0.01$), with no differences between treatments on the day of the high-fat meal. Results suggest tart cherry consumption combined with prior exercise significantly decreased postprandial triglyceride levels after consumption of a high-fat meal in healthy, active adult men.

The Role of *Ssdp2* on Regeneration of Planarian Brains

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Dr. Rachel Roberts-Galbraith, Cellular Biology, Franklin College of Arts and Sciences

Many organisms are constantly regenerating cells, but few can regenerate a whole brain. Regeneration of neurons is unique to a few species, including freshwater flatworms called planarians. Many factors control regeneration of the planarian brain, including *Ssdp2* (single-stranded DNA binding protein), which regulates brain shape during

regeneration. After regenerating a new brain, planarians lacking sufficient *Ssdp2* regenerate a single eye rather than two and a pointy head with a fused brain instead of the normal round head with a more “U shaped” brain. *Ssdp2* is a conserved transcription regulator, so to understand more about the role of planarian *Ssdp2* in regeneration, we are studying potential target genes of the protein. These targets will be explored using in situ hybridization and RNAi. Our goal is to identify mechanisms that *Ssdp2* uses to influence brain shape during regeneration.

Activity in the Anterior Cingulate Cortex: Differences across Healthy Populations and Populations with Psychosis

Eli Chlan, CURO Summer Fellow, CURO Research Assistant

Dr. Jennifer McDowell, Psychology, Franklin College of Arts and Sciences

While specific roles of the anterior cingulate cortex (ACC) in the domain of cognitive control and decision-making remain undetermined, it has been hypothesized that it plays a part in conflict processing and error detection. The antisaccade task is a popular method used in the study of cognitive control. With having a participant look in the opposite direction of a peripheral cue, it not only requires inhibition of a reflex but also the performance of a recently learned response. It prompts for a resolution of conflict between this automatic response and volitional response that is susceptible to error and thus error detection. Patients with a history of psychosis typically display greater error rates during antisaccade tasks, with reduced inhibition for looking at peripheral cues. As an *a priori* ROI, the anterior cingulate cortex is expected to have limited activity during the performance of antisaccade tasks in participants with psychosis when compared to activity in healthy participants. This is expected based on previous literature, with activity in the ACC being part of conflict and error detection as well as hypothesized reinforcement learning and performance of successful behavior. Activity within the ACC will be measured using fMRI and the observation of BOLD signal as it highlights the regions of most prominent neural activity during performance of the antisaccade task. Activity levels, if found significant in either the healthy population or population with psychosis, will then be analyzed and compared across populations.

The Economic Impact of the “Tampon Tax” on Lower-Income Households

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Dr. Travis A Smith, Agricultural and Applied Economics, College of Agricultural and Environmental Sciences

In recent years, there has been evolving discussion around the ethics of a sales tax on necessary menstrual products (MPs) colloquially known as the “tampon tax.” In many states,

governments exempt necessities such as food and medical items from sales tax, but only nine states and the District of Columbia have passed legislation specifically exempting MPs from being taxed. This research strives to answer the question: is the “tampon tax” regressive, or punitive, to low-income women? This is accomplished through the examination of the price elasticity of demand for MPs using the Nielsen Consumer Panel Dataset over a span of twelve years. We find that a 1% increase in the price of tampons yields a 0.69% decrease in the quantity demanded for tampons, and a 1% increase in the price of pads and liners yields a 0.68% decrease in the quantity demanded for pads and liners, meaning that the demand for these products is less sensitive to a change in price than most other goods. Additionally, the tax burden on lower-income households (calculated as 185% of the poverty line) is calculated to be about 3 times larger than the burden on higher-income households. Ultimately, we find that a tax applied to menstrual products is regressive.

Effects of Personality Type on Cognitive Function in Older Adults

Sydney Chummar

Dr. Steve Miller, Psychology, Franklin College of Arts and Sciences

Research shows that personality type has a significant effect on cognitive function. As neuroticism increases, cognitive function declines. In a previous study, less extraversion and conscientiousness are related to poorer working memory. Openness is positively correlated with working memory. Agreeableness has not been seen to have a significant effect on working memory. Cognitive function includes working memory, which involves temporary storage of information. To examine this relationship, a sample of older adults ($n=28$) was assessed based on the NEO Five Factor Inventory and the Letter Number Sequencing Task, a subtest from WAIS-IV. The NEO Five Factor Inventory predicts five facets of personality: neuroticism, extraversion, openness, agreeableness, and conscientiousness. The Letter Number Sequencing task asks participants to put numbers and letters in order, testing working memory. We predicted that neuroticism, openness, and extraversion are directly correlated to working memory, while conscientiousness and agreeableness are inversely related. A simple linear regression test shows Neuroticism ($F=.435, p=.516$), Extraversion ($F=.220, p=.643$), Openness ($F=1.218, p=.280$), Agreeableness ($F=.159, p=.693$), and Conscientiousness ($F=.058, p=.812$) were not significantly related to working memory in healthy older adults. These results may be due to the fact that the population consisted of healthy older adults who may have a good overall working memory with very little variability. Neuroticism and Extraversion aren't very high as age increases, but Agreeableness and

Conscientiousness increase with age. Openness is curvilinear in normative data. With this being said, the scores in this population were not high enough to indicate any significant correlation to cognitive function.

RNA Interference in *Microplitis demolitor*

Kameron Clark, CURO Research Assistant

Dr. Gaelen Burke, Entomology, College of Agricultural and Environmental Sciences

Microplitis demolitor is a species of parasitoid wasp that has evolved a symbiotic relationship with a virus in the family *Polydnaviridae*. The virus increases wasp parasitism success by direct infection and regulation of effector molecules that would otherwise kill a parasitoid. Throughout their evolution, the wasp has integrated viral genes into its own genome. RNA interference (RNAi) is a means of using double-stranded RNA to regulate gene expression. RNAi is effective in knocking down viral replication genes; however, preliminary data shows little to no success in knocking down wasp cellular genes. Another class of genes, which will be the focus of my research, are viral genes involved in virulence during parasitism. These categories of genes differ in structure, leading to the hypothesis that this underlies the differential response to RNAi. The goal of this research is to determine which characteristics of genes correlate with efficacy of RNAi by trying to knock down wasp genes and viral replication and virulence genes. Double-stranded RNA will be injected into larvae in their final instar, and after the wasps emerge from their cocoon, female wasps will have their ovaries removed and RNA will be extracted. Effect of gene knockdown will be measured using quantitative PCR. Experimental groups will be compared to EGFP injected control groups. This research could lead to a description of a biochemical mechanism for RNAi of the wasp and viral genes and may give insight on how to successfully knockdown any gene of interest.

Identification of Proteins that Regulate CRISPR DNA Uptake of *Pyrococcus furiosus*

Landon Clark, CURO Honors Scholar

Dr. Michael Terns, Biochemistry and Molecular Biology, Franklin College of Arts and Sciences

The CRISPR-Cas (Clustered Regularly Interspace Short Palindromic Repeats–CRISPR associated) system is a prokaryotic, adaptive immune system used by bacterial and archaeal organism to fight infections by viruses and other harmful invasive DNAs. These prokaryotic CRISPR-Cas immune systems have been exploited as powerful genome editing tools that work many different organisms and cells including humans. The newly developed CRISPR-based technologies are transforming medicine and science and have been used in research applications for developing

cures for certain cancers, HIV, hemophilia, etc. The functions of CRISPR-Cas systems follow three basic steps: (1) adaptation (invading DNA is integrated into the host genome at CRISPR locus), (2) crRNA biogenesis (the CRISPR locus creates mature CRISPR RNAs (crRNA)), and (3) invader silencing (mature crRNAs are associated with Cas protein nucleases that silence future foreign invaders). This research focuses on the molecular mechanisms of the first step in the pathway, adaptation. It is known that two proteins, Cas1 and Cas2, are universally conserved among all active CRISPR-Cas systems and are involved in adaptation, specifically the integration of DNA into the CRISPR locus. By using the model organism *Pyrococcus furiosus*, a hyperthermophilic archaeon, this research tests potential roles for many candidate proteins that are hypothesized to regulate DNA acquisition and/or modulate the uptake of properly sized and oriented DNA fragments into the CRISPR genome. Identifying proteins that control the uptake of DNA and CRISPR loci contribute to CRISPR-Cas systems to aid in the applications it provides, such as its molecular timeline and the genomic editing for diseases.

Climate and Collapse: An Observational Look at Climate Change's Impact on Human Experiences

Maggie Clark, CURO Research Assistant

Dr. James W Porter, Ecology, Odum School of Ecology

What are the gendered consequences of climate change? The purpose of this project is to apply a gendered lens upon the effects of climate change on water access during government collapse. The research reviews literature to apply social science theories to climate change literature in order to discover patterns and determine future implications for nations suffering from a loss of basic-needs infrastructure. The study will look at Puerto Rico as a case study in light of the recent Puerto Rican hurricane destruction and will include photos taken by the presenter. This project seeks to build upon a previous research project that focused on the effect of climate change on vulnerable populations and will provide a more specific, tailored review of one previously discussed population (women) and the effects of gender dynamics in the aftermath of natural crises. The study expects to find a direct, negative effect upon vulnerable populations caused by a changing climate but understands that its quantifiable nature is still being understood. Its comprehensive review makes the project significant in its intention of understanding how to draw connections between science and policy to create a more engaged and educated world.

Emotion Regulation in the Context of Parenting: A Review and Directions for Measurement Development

Elizabeth Ann Clerke

Dr. Anne Shaffer, Psychology, Franklin College of Arts and Sciences

Emotion regulation (ER) is a psychological construct of growing interest, due to its relevance in psychopathological outcomes, executive functions, general life success, and more specifically, its role in parenting. ER can be defined as the conscious or unconscious, cognitive or behavioral self-regulation of emotions and is centrally important to the potentially challenging demands of parenting. The purpose of this presentation will be to systematically analyze the existing measures of ER that are available specifically within the realm of parenthood and identify specific needs to guide future measure development. This will be a presentation of a literature review and assessment of the field that examines the construct of ER itself, its important role in parenting, and the lack of effective measures to capture the role of ER specifically within the realm of parenthood. This comprehensive review determined that ER is a skill that is crucial to healthy parenting, and conversely, many negative parenting behaviors are associated with ER problems. We also determined that parenting-related ER is a multi-faceted construct that requires a measure that captures each component of ER effectively in the context of child-rearing demands. While most studies of parents' ER have used existing generic measures, we propose that a measure of ER and ER strategies specific to the context of parenting is required to allow these studies to better analyze ER in this realm. We conclude by providing suggestions for the creation of such a measure to promote future research and clinical intervention regarding ER in parenting.

If It Was Important I Would Have Learned It in 'Intro to International Relations'

Madison Conkel

Dr. K Chad Clay, International Affairs, School of Public and International Affairs

A "gender gap" exists in both higher education and international relations. Female international relations professors tend to be promoted less, cited less often, and less well received by students. While many prior studies focus on the effect this gender gap on female professors' upward mobility, this research seeks to determine the influence on students. Does the gender of a professor have an effect on the topics students are exposed to in their classes? My research examines the syllabi of "Introduction to International Relations" courses at twenty-one public, research institutions. The statistical results show that female professors of "Introduction to International Relations" courses are more likely to include gender and other

“feminized” topics, such as Human Rights and International Law, in their courses. The analysis reveals that gender of a professor is an important factor in the structure and the inclusion of different subfields of international relations in an introductory course.

Application of Biochar for Low-Cost Treatment of Agricultural Wastewater

Jared Conner, CURO Research Assistant

Dr. Valentine A Nzenkung, Geology, Franklin College of Arts and Sciences

Aquatic ecosystems continue to be adversely impacted by inorganic nutrients and chemicals from agriculture and other human activities. Due to the non-point nature of agricultural pollution, remediation of contaminated soil and water is costly and difficult. A viable solution to this massive problem is a cheap, easily made, and carbon-sequestering environmental sorbent called biochar. Biochar, or charcoal produced from waste agricultural residue, has been shown to have excellent sorption capabilities for cations in aqueous solution, such as ammonium and metal ions. However, most biochars have been shown to be less effective for anion (e.g., nitrate and phosphate) removal; which are also important components of fertilizers and other manmade chemicals. This work compares various metal impregnation methods that impart anion sorption capabilities to biochars, in an effort to determine the most effective method, while also measuring the extent to which these methods impair cation sorption capabilities. A Peanut Hull Pellet Biochar made at 500°C was impregnated with Aluminum, Calcium, Iron, and Magnesium oxy-hydroxides and analyzed for abilities to remove ammonium cations and phosphate anions from anaerobically digested swine wastewater from a Concentrated Animal Feeding Operation (CAFO). These impregnated biochars are compared with control samples of the un-modified biochar in order to determine the impregnation method with the least cation sorption impairment and the most anion sorption enhancement.

Location of the Point of Contact Influences a Person's Perception of a Rod's Length

James Conners

Dr. Dorothy Fragaszy, Psychology, Franklin College of Arts and Sciences

The reattunement and recalibration of perception are universally implicated in tool use (e.g., using a hammer, screwdriver) and sports involving a wielded object (e.g., hockey, tennis). Here, we examined whether and how making contact with a target surface using a grasped object recalibrates perception of properties of that object via effortful touch. We hypothesized that the recalibration of perception of the length occurs through the vibratory waves

generated by the grasped object making contact with the surface. In experiment 1, we show that making contact with a surface recalibrates perception of the length of a grasped object. In experiment 2, we show that the location of the end-effector (i.e., the point of contact with the target)—which directly influences the propagation of vibratory waves— influences the recalibration of perception of the length of a grasped object via effortful touch. These findings imply that the location of the grasped object's end-effector dictates the recalibration of perception of length via effortful touch.

Antenna Theory and the University of Georgia's First Ground Station

Paige Copenhaver, CURO Research Assistant

Dr. David L Cotten, Geography, Franklin College of Arts and Sciences

The University of Georgia (UGA) Small Satellite Research Laboratory (SSRL) is designing and building two small satellites, known as CubeSats, to be launched in 2020. Since the SSRL is a relatively new lab, it lacks certain resources necessary to complete a successful space mission, such as a ground station to communicate with the satellites. We aim to build the first ground station at UGA, and to understand how it functions, and to understand the antenna theory behind our ground station and how it will be communicating with our satellites. We will conduct theoretical research into antenna theory to understand the physics behind satellite communications. We will then design tests to experimentally obtain results of various values of our ground station to compare with the theoretical values and models. We will demonstrate holistic knowledge of satellite communications by modeling or characterizing the radiation pattern, gain pattern, polarization, impedance, and more key values of our ground station that are important in understanding the functionality of communication systems. Liberal arts universities in the beginning stages of developing aerospace programs, such as UGA, lack some of the funding and resources that longer-existing aerospace programs have in abundance. This paper will serve as a guide to those universities that are developing ground stations and need assistance with understanding the physics that drives them, how to choose the right components, how to test the station, and more.

Chemistry in the Arts: An Interdisciplinary Look at Student-Synthesized Azo Dyes

Christina Cortes

Dr. Richard Morrison, Chemistry, Franklin College of Arts and Sciences

Multi-outcome experiments (MOEs) are commonly used in organic chemistry labs to provide an alternative to traditional “cookbook” experiments; these MOEs require

students to utilize critical thinking skills, thereby providing a unique and productive learning experience for students. Herein, second semester organic chemistry laboratory (CHEM 2212L) students will prepare an azo dye by reacting two starting materials, only one of which is known to the students. The students will be given three possible options for the identity of the unknown starting material. Upon completion of the reaction, the students will record standard measurements, such as mass and color, and use FTIR and ¹H NMR spectroscopies to identify the structure of the resulting molecule. The students will then employ their critical thinking skills to retroactively identify the unknown starting material. The multi-outcome method demonstrates the specific utility of NMR spectroscopy, which will give the students insight to the connectivity of atoms in their product. In addition to the experiment's utility for enrollees in the CHEM 2212L course, Chemistry in the Arts (CHEM 1110) students will study the product dyes to learn how light interacts with these dyes and apply them to various media, creating unique colors and eventually works of art. Both courses will engage with the same materials in vastly different ways, helping each to better understand their field's role in the process and how it is complemented by the other.

Specific Stage Analysis of High-Order Streams

Paul Coughlin, CURO Research Assistant

Dr. Brian P Bledsoe, Environmental, Civil, Agricultural, and Mechanical Engineering, College of Engineering

The mathematical relationship between a river's stage and discharge provides a key insight into its hydraulic properties. By observing long-term variations in the stage-discharge interaction (defined as specific stage) for a single measurement location, statistical trend analysis can be used to quantify persistent cross-sectional changes in the channel at that location. In this research, we intend to verify and quantify the magnitude of cross-sectional aggradation or degradation at numerous USGS measurement sites using the Mann-Kendall trend test. Sites that indicate persistent and statistically significant change will be studied further in an attempt to classify proximate and ultimate drivers of the observed hydraulic alteration.

Development of Biodegradable and Biosourced Microcellular Polyurethane Foams

Ben Crawford

Dr. Jason Locklin, Chemistry, Franklin College of Arts and Sciences

The primary goal of this experiment is to develop fully biodegradable foam-in-bag polyurethane packaging by systematically varying polyol and isocyanate formulation parameters such as functionality of precursors, filler content, catalyst choice, and concentration. High volume packaging

applications for high value products often use polyurethane foam-in-bag systems to save packaging time, labor costs, and facility footprint space. Despite their widespread use, packaging compositions that are fully biodegradable or compostable have not been fully accepted by the packaging industry. The two components of foam-in-bag polyurethanes are typically a multifunctional isocyanate precursor and a polyol precursor which polymerize upon mixing via step growth polymerization and CO₂ bubble formation. Polyurethane foams in use today are often comprised of a polyether or oxidized vegetable oil-based polyol used in conjunction with a multifunctional isocyanate component. However, economic pressures due to overconsumption of limited non-renewable resources and the trend of global urbanization will challenge the current industrial approach to packaging materials. Developing recipes that have high biosourced material content, proper viscoelastic properties, and are fully compostable is of the utmost importance. Foams will be prepared using a counter-rotating mixer. The degree of functionality of both the polyol and isocyanates, catalysts, viscosity modifiers, surfactants, and fillers of the formulations will be systematically varied to determine optimal conditions for preparation and function of products. Dynamic mechanical analysis and rheological measurements will be used to probe foam kinetics while foam uniformity will be assessed by optical and electron microscopy. Biodegradability will be assessed under composting conditions.

The Importance of CaaX Proteolysis for the Function of Pex19p

Nicole Croxton

Dr. Walter K Schmidt, Biochemistry and Molecular Biology, Franklin College of Arts and Sciences

Pex19p functions to assist the peroxisome in the degradation of fatty acids. It acts as a cystolic chaperone and an import receptor for peroxisomal membrane proteins. Pex19p is a CaaX protein, meaning that it has a COOH-terminal sequence motif. This study is focused on the CaaX sequence of Pex19p and its relevance to the protein's function. The typical CaaX processing pathway involves isoprenylation of cysteine (C), proteolytic removal of the last three amino acids of the sequence (aaX), and carboxyl methylation of the farnesylated cysteine that is exposed as the new COOH-terminal amino acid. The Pex19p CaaX sequence CKQQ is suspected to have a shunted CaaX motif, which implies that the protein only goes through the isoprenylation step. The evidence for shunting stems from analysis of the CKQQ motif on different reporter proteins, specifically the Hsp40 Ydj1p and the α -factor mating pheromone, but shunting has not been directly demonstrated in the context of Pex19p itself. We have determined that oleic acid-containing growth media can

be used to distinguish growth differences between yeast that express or lack Pex19p. In order to confirm the shunted status of the Pex19p CaaX motif and whether this status is essential for its function, a series of Pex19p mutants with shunted and cleavable CaaX motifs was created with the goal of observing whether growth differences could be observed on specialized oleic acid media. We expect our results to support the hypothesis that Pex19p is shunted and that this property is critical to its function.

Political Impacts of Obama's Appellate Court Appointments on Policy Issues

Bryson Culver, CURO Honors Scholar

Dr. Susan Haire, Political Science, School of Public and International Affairs

The Federal Judiciary ideally acts as an apolitical body; however, in an era of growing partisanship, it is not immune from political influence. Looking at the Federal Appellate Courts, this project determined that the voting behavior of judges aligns with the party of their nominating presidents. The researchers used thirty randomly selected cases from every Circuit from the years 2009-2016 and coded the judges' votes as either conservative or liberal. From this analysis, the researchers were able to determine that the presidential cohorts of judges voted more conservatively if the nominating president was a Republican and more liberally if the nominating president was a Democrat. Additional differences in voting between judges appointed by presidents of the same party were also found. The project also looks at the change in circuit composition under Obama. In 2008, only one Circuit had a majority of judges appointed by Democratic presidents. By 2016, eight of the twelve Circuits became majority Democratic appointees. Additionally, every single Circuit gained a larger proportion of minority and female judges. This research found the composition of the panel on which they sat influenced the judges' voting behavior. The presence of a Republican-appointed judge on a panel increased the likelihood of a judge appointed by a Democrat to vote conservatively.

Neural Correlates of Early Life Stress and Depressive Symptoms

Sarah A Cutts

Dr. Lawrence Sweet, Psychology, Franklin College of Arts and Sciences

Throughout postnatal neural development, which spans from birth to early adulthood, the brain is more susceptible to the influence of environmental factors. Exposure to early life stress (ELS; e.g., parental neglect, physical or sexual abuse), can alter the morphometry and function of concomitantly developing brain regions. These lasting neuroanatomical and functional changes have been associated with psychiatric

and cognitive disorders in adulthood. Changes in the morphometry of two temporal lobe structures central to affective function, the amygdala and hippocampus, have been linked to ELS, but the literature regarding their directionality remains inconsistent. Thus these changes in brain morphometry may be associated with symptoms of affective disorders and the direction of effects remains to be clarified. In order to investigate these questions, 25 young adult women from the rural southeastern United States participated in a magnetic resonance imaging study at the University of Georgia. History of ELS was assessed using an established retrospective self-report measure (Early Life Stress Questionnaire) and depressive symptoms were measured with the Beck Depression Inventory, 2nd edition. High-resolution T1-weighted anatomical scans were acquired and cortical thickness will be analyzed using Freesurfer software. It is hypothesized that bilateral amygdala and hippocampal volumes will be negatively associated with ELS in individuals with high levels of depressive symptoms compared to those who endorse low levels of depressive symptoms. Results of the present study will advance the understanding of the neural consequences of ELS and depression and suggest potential targets of intervention in the treatment of ELS.

Somalian Piracy: A Study on the Relationship Between Food Security and Violent Maritime Conflict

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Dr. Micah Gell-Redman, International Affairs, School of Public and International Affairs

This paper aims to find a solution to the problem of maritime conflict in Somalia by studying an alternative source of food production. First, I analyze ways in which sustainable food production can deter a resort to piracy. Second, I propose and assess the viability of aquacultures in generating a sustainable source of food production. Both as an alternative to coastal-fishing and as utilized by developing countries with resource depletion, aquacultures can ameliorate the root cause of maritime conflict by avoiding competition in fishing rights. The NOAA defines aquacultures as "the breeding, rearing, and harvesting of plants and animals in all types of water environments including ponds, rivers, lakes, and the ocean." While there is no data specific to Somalia regarding the efficiency of aquacultures, other countries may serve as a model for Somalia. Aquacultures in Bangladesh not only resulted in greater fish consumption for poor consumers but account for over half of fish production in the country. I expect that the use of aquaculture technology in Somalia would appease both sides of the conflict. The fishermen turned pirates would not have to wage asymmetrical warfare against well-protected international naval vessels, but the investment needed to jump-start a better equipped

fishing industry in Somalia is contingent on the diplomatic decision-making of actors. I predict that this may also be a factor in explaining the distinction between food production and food availability to Somali consumers. The analysis will ultimately address this trade off between success in eventual availability and conflict deterrence.

Effects of *Plasmodium falciparum* on Placental Expression of Inflammatory and Coagulation Factors

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Plasmodium falciparum infection during pregnancy can develop into placental malaria (PM), causing over 200,000 infant deaths annually. PM involves sequestration of infected red blood cells (iRBCs) and deposition of hemozoin (HZ) in the maternal blood space of the placenta. HZ is a toxic byproduct of the parasite's digestion of hemoglobin. The role of the syncytiotrophoblast, the outermost cell layer of the placenta, during pathogenesis remains unclear. It is hypothesized that the syncytiotrophoblast responds to infection but leads to negative outcomes including low birthweight and growth restriction. HZ is hypothesized to induce expression of tissue factor, the initiator of the extrinsic coagulation pathway, which results in fibrin deposition. Coagulation factors activate protease activated receptors (PARs) expressed on the syncytiotrophoblast. Activated PARs increase expression of tumor necrosis factor (TNF), which leads to more tissue factor expression. *In vivo* syncytiotrophoblast-parasite interactions are simulated using a human choriocarcinoma cell line, BeWo, and primary human cells, trophoblasts. BeWos and trophoblasts are unstimulated or stimulated with lipopolysaccharide (LPS; positive control), HZ, TNF, or HZ/TNF. RNA isolation, cDNA generation, and qPCR for tissue factor, PAR-1, and PAR-2 is conducted. Results to date show TNF stimulation results in 2-fold increase in tissue factor mRNA expression at 2 hours. LPS stimulation results in 2-fold increase in both tissue factor and PAR-1 expressions between 2 to 4 hours. HZ stimulation results in a 2-fold increase in tissue factor expression. Identifying the extent to which the syncytiotrophoblast is involved in PM pathogenesis will advance the understanding of how this syndrome impacts fetal development and specify potential therapeutic targets.

Investigating the Effect of Galanin on Consolidation of Threat Learning

Abdullah Darvesh, CURO Research Assistant
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Galanin is a neuropeptide that coexists with norepinephrine in locus coeruleus neurons. This neuropeptide has been

implicated in playing a major role in control of mood functions such as anxiety and fear response, and the question of treatment of patients with PTSD with galanin based medications may potentially hold validity. Since galanin is implicated in control of the fear response, we predict that galanin will most likely primarily enhance the extinction of the fear response, with it also possibly decreasing its expression. Contextual Fear Conditioning (CFC) is a rat model of PTSD that was used in this experiment. CFC is when an animal is placed in a new environment, given a threatening/painful stimulus (unconditioned stimulus, US), and then removed from the environment. After a set amount of time, the animal is reintroduced to the same environment where the exhibited behavior when reintroduced is observed. This open field test was administered to observe freezing behavior between rats administered galanin immediately after the first US, or 20 minutes before being placed into the same environment in where the US was initially received for the second time. It was found that galanin administration immediately after the conditioning trial significantly reduced freezing 24 hours later during the test trial, compared to aCSF administration, and that Intra-mPFC galanin administration immediately before the first test trial did not affect freezing 24 hours later during the second test trial, compared to aCSF administration.

Enantioselective [4+2] Cycloaddition of *o*-Quinone Methides and Vinyl Sulfides

Runiya Juni Dasgupta, CURO Research Assistant
Dr. Steven Edge Wheeler, Chemistry, Franklin College of Arts and Sciences

Chromanes are important organic compounds found in many biological systems. They act as important pharmacores and have various useful properties including antifungal, anti-inflammatory, and antiviral activities. Synthesis of chromanes is easily accomplished and well developed; however, asymmetric synthesis of chromanes still remains a challenge. One successful method of forming chromanes via asymmetric synthesis is an enantioselective [4+2] cycloaddition between *ortho*-quinone methides and olefins through a Diels-Alder reaction. However, *o*-quinone methides are highly reactive and transient in nature, which makes using them for this process difficult and little success has been achieved using this method. Recent experiments reported that a [H8]-BINOL based phosphoric acid catalyst is an efficient method for the asymmetric synthesis of chromanes. In this project, we will focus on identifying the mode of activation in this reaction and improving these results with a better designed phosphoric acid catalyst. By using modern density function theory (DFT) methods, we will focus on understanding the origin of this stereoselectivity and eventually designing a more effective chiral phosphoric acid catalyst for this reaction.

The Effect of Caffeine and Carbohydrate Mouth Rinsing on Endurance Performance

Brooke Datelle, CURO Research Assistant

Dr. Jamie A Cooper, Foods and Nutrition, College of Family and Consumer Sciences

The cephalic phase response (CPR) is the physiological response to the anticipation of initiating the digestive process. In previous research, using mouth rinsing (MR) protocols with carbohydrate solutions to stimulate a CPR has demonstrated improved performance in endurance athletes. We aim to assess effects of a caffeine MR on running performance and whether caffeine plus carbohydrate MR is more effective than caffeine or carbohydrate alone. Endurance-trained males and females completed 4 separate 12.8Km running time trials (TT) in this double-blind, cross-over design study. During each TT, participants MR solutions every 12.5% of distance completed. The 4 treatment solutions were: water alone (placebo), water plus caffeine, water plus carbohydrate, and water plus caffeine and carbohydrate. Heart rate, completion time, and rating of perceived exertion were measured. 5 runners to date (3 male, 2 female) have completed all 4 TTs. There was no significant difference in completion time between treatments A, B, C, and D (1:02:15 ± 00:06:08; 1:01:07 ± 00:05:41; 01:03:29 ± 00:07:24; 01:01:44 ± 00:05:27, respectively). There was also no significant difference in average heart rate between treatments A, B, C, and D (172.4 ± 5.6; 176.7 ± 3.7; 172.6 ± 2.3; 172.2 ± 3.2 beats/min, respectively). Treatments are still currently blinded. On 5 participants, there are no differences between treatments. However, recruitment is ongoing and 21 additional participants will be completing the study this year.

Transcending Boundaries

Bec Davis, CURO Research Assistant

Dr. Jane McPherson, Social Work, School of Social Work

Our world is growing more interconnected as people travel, technology advances and international trade expands. Increasingly, international and cultural competence is considered an important skill to be acquired from an undergraduate education. Technological advances allow for our growing world to become part of our everyday classrooms, and for students to have meaningful interactions with their peers in other nations. This paper will report on "Transcending Boundaries," a classroom-based initiative connecting social work students around the globe, specifically students from the University of Georgia with their peers at St. George's University in St. George's, Grenada, West Indies, with a goal to increase students' cultural competence. Furthermore, students will communicate with their peers through virtual exchanges from social media posts to classroom meeting spaces. Both quantitative and

qualitative data will be collected from participating students to gauge the effect of this virtual exchange. Quantitatively, students' cultural competence and human rights engagement will be measured using valid scales both before and after the virtual exchange. Qualitatively, students will be asked to reflect regularly on their experiences, and these reflections will be analyzed and coded for themes. While scholars have demonstrated that participating in virtual exchange improved students' cross-cultural communication skills, this initiative will work to replicate and expand these results by building the global competence of social work students. Virtual exchanges have the potential to engage more students in international experiences. Results from this study will add to our knowledge on the effectiveness of such virtual experience on students' cross-cultural skills.

Terrorism Financing and the International Drug Trade

Thomas Felton Deen, CURO Research Assistant

Dr. Andrew Owsiak, International Affairs, School of Public and International Affairs

Terrorism threatens state security and undermines economic development. To engage in attacks, terrorist organizations require money to acquire weapons, training, or equipment. Therefore, a terrorism counter-strategy demands understanding how terrorism funding works. In my manuscript, I will explore the research question: how do terrorist organizations generate revenue? Although there are several competing schools of thought, I will focus on the relationship between terrorist organizations and drug trafficking. The extraction and processing of narcotics has allowed terrorist organizations to finance themselves and grow extensively. Moreover, the fusion of terrorism with narcotics has created a special blend of narco-terror groups, whose extreme violence is a direct outgrowth of their finance through the drug trade. I contend that an increase in drug trafficking by a terrorist organization will see a corresponding rise in conflict levels. Using data on drug production, human rights abuse, conflict deaths, arms sales, and others, I explore the relationship between terrorist and criminal organizations in three contexts: Hezbollah, the Taliban, and FARC. I find that terrorist drug trafficking produces an increase in conflict levels.

Exploring Strategies for Enhancing Learning by Teaching

Olivia Demario

Manya Kothapalli, Darien Aunapu

Dr. Logan Fiorella, Educational Psychology and Institutional Technology, College of Education

The purpose of this study is to investigate the effect of using two generative strategies (explaining and drawing) for enhancing learning by teaching. Participants were randomly assigned to one of four conditions: drawing, learning by

teaching, drawing and learning by teaching, and control. Participants in experimental conditions were asked to study a lesson on the human respiratory system for 20 minutes in a way that would help them to explain, draw, or explain and draw the information as if they were teaching another student who does not know the information. A control group of participants was given the same 20-minute study period and asked to study the lesson in a way that would prepare them for a test. After studying, participants were given up to eight minutes to record a video in which they taught the material (by explaining and/or drawing) to a hypothetical peer or to restudy the material (control group). All groups completed learning outcome measures (retention and transfer) one week later. As data collection is still being conducted, analyses have not yet been performed. We predict that students who explain and draw will generate better quality explanations during the teaching phase, resulting in better learning outcomes, compared to other groups. Results will help us to understand what unique benefits explaining and drawing for others might provide students when studying and learning complex science concepts.

Over Expression of Wall Biosynthetic Genes in *Bacillus*

Drew Brennan Derrico, CURO Research Assistant
Dr. Maor Bar-Peled, Biochemistry and Molecular Biology, Franklin College of Arts and Sciences

My research is related to the role of surface polysaccharides in the biology of *Bacillus cereus*. *B. cereus* is a bacterial pathogen capable of producing multiple, different life forms: a cell-free, mobile, vegetative state, a flagella-less form, a sessile cell that lives in a biofilm, and a long-lasting, resilient spore. The spore is essential for the survival of the bacterium and is capable of existing for years in harsh environments. Our lab observed that the type and nature of the polysaccharides decorating the outer surface of the bacterium are dissimilar in the different growth stages. We would like to understand how this is controlled and the benefits it provides the bacterium. Our laboratory has identified several operons possibly responsible for these transitions. For this research, my objective is to study the function of genes by over-expressing each in *Bacillus*. Once the genes are over-expressed, I plan to use mass spectrometry, LC-MS/MS, to study changes at the metabolite level. To express my genes, I first need to pass my plasmids through bacteria cells that are not capable of DNA methylation. *Bacillus* will digest methylated plasmids introduced to it. The initial process consisted of verifying the six plasmids I study by mini-prep and restriction digest analyses, followed by visualization of the DNA on agarose-gel. In subsequent steps, those demethylated plasmids will be transformed to specific *Bacillus* strains and after selection, the individual strains and polysaccharides will be analyzed.

Preventing the Arbitrary Killing and Kidnapping of Journalists

Mauli Desai, CURO Research Assistant
Dr. Leara Rhodes, Journalism, Grady College of Journalism and Mass Communication

Journalists are being attacked within the United States and in the international arena leading to increasing number of kidnapping, killings, and violence committed toward them. Members of the press are being attacked by non-state and state actors for a multitude of reasons such as in attempts to coerce, silence, or remove attention on their practices. This has led to kidnappings and deaths of reporters, illegal search and seizure of information or equipment, physical attacks, intimidation, and imprisonment of journalists as well as the translators, sources, and stringers that assist with international reporting. This research will evaluate practices such as kidnapping for ransom, communication with actors that capture journalists, criminalize the financing of terrorist organizations, allowing encryption of information and countless other methods before forming safety guidelines that can be implemented regionally, nationally and internationally. Furthermore, this report will utilize data gathered by watch groups and press organizations to establish domestic and international policies that can safeguard objective and in-depth reporting. This project will evaluate policies that can be promoted and practiced by members of the press to allow for reporting on people, politics, and communities around the world. The implementation of these procedures will depend on advocacy groups, press organizations and partially on governments, more so this study will use case studies, experts in media, and recommendations by governing bodies and literature to present measures that can be employed on numerous scales to promote safety for journalists.

Generation of a Community-Informed List of Speciation Concepts Essential for Life-Science Majors to Understand

Dustin Dial
Nnaji Emetu
Dr. Tessa Andrews, Genetics, Franklin College of Arts and Sciences

Evolution is a scientific theory of great explanatory power that unifies and organizes the whole of biological knowledge. Recognized as a foundational concept in biology, it has been identified as one of five core concepts that all undergraduates in the biological sciences should understand. A recent systematic analysis of all peer-reviewed publications relevant to undergraduate evolution education revealed that there are large gaps in what we know about teaching and learning several topics. One such gap is in our collective knowledge of teaching and learning speciation. Our goal is to investigate undergraduates' thinking and

learning about speciation. We have begun this by generating a list of key speciation concepts and creating a survey that asks evolutionary biology professors to judge the concepts within the list on criteria such as relative importance, accuracy, clarity, and completeness. After obtaining survey results from a representative sample of the biology education community, we incorporated instructor feedback into our list. This work establishes a clear and community-informed list of key concepts in speciation. This will allow instructors to identify the most important speciation concepts to teach, even if they are new to teaching this topic. This work also lays the groundwork for future research in speciation education, as it is the initial step in the process of investigating student thinking and learning about speciation.

Genome Construction and Determination of Nutritional Roles of Dual-Obligate Symbionts in the Plant-Sap-Feeding Adelgidae

Dustin Dial

Dr. Gaelen Burke, Entomology, College of Agricultural and Environmental Sciences

The Adelgidae is a small family of sap-sucking insects that exhibit cyclical parthenogenesis and multigeneration complex life cycles. Plant sap is a poor nutrient source for insects to feed upon, so many insects engage in obligate relationships with bacterial endosymbionts that play nutritional roles in synthesizing nutrients unavailable or in low quantity from the plant-sap diets of their hosts. It has been observed that each major adelgid lineage possesses species that exhibit dual endosymbiotic bacteria and each lineage possesses a unique pair of symbionts. Preliminary data suggests that within each lineage, the nutritional roles of adelgids are reversed from the patterns of other insects; the older endosymbiont provides the minority of nutrient production while the younger the majority. We hypothesize that this pattern is due to fluctuating selection on insect requirements for the production of nutrients; the cycling to and from nutrient-rich and nutrient-poor diets over the course of their evolutionary history has caused symbiont genome decay and consequently multiple symbiont replacements. The work presented seeks to confirm that the pattern of the nutritional roles of symbionts is consistent over the Adelgidae family. This supports the hypothesis that symbiont replacement is a driver of adelgid life cycle evolution. We have constructed the genomes of two endosymbiont species from *Adelges cooleyi*. Upon quality checking raw Illumina sequence data, we assembled genomes with assembly software and pieced together the remaining scaffolds by performing PCR to close gaps. We found that the symbionts of *Adelges cooleyi* exhibit nutritional provisioning consistent with our hypotheses.

Material Flow Analysis of Concrete Infrastructure Resources - Atlanta Regional Level

Caroline Dickey, CURO Research Assistant

Dr. Stephan A Durham, Environmental, Civil, Agricultural, and Mechanical Engineering, College of Engineering

The United Nations reports that over 50% of the world's population lives in urban areas. Atlanta, the largest city in the state of Georgia, ranks as the 40th largest city in the United States and the 6th largest city in the southeastern region. The Atlanta Metropolitan area has over 5 million people located in the 28-county surrounding metro area despite the fact that the city of Atlanta's population is approximately 472,522. The population of the same metro area has seen a 28% increase with over 1 million new residents since 2000. Because of this significant population and industry growth, the urban environment has greatly exceeded the limits of local energy and material sources through the removal of available water, fuel, and materials from the surrounding lands. The material requirements to support our growing society can be counted as either direct flows (actual weights of products) or indirect flows (accounts for the upstream material resource requirements for manufacturing). Sustainable resource management requires up-to-date and accurate data in order to appropriately plan for the allocation and utilization of resources. This study will include three different types of material flow analysis (MFA) of relevant materials (concrete, cement, and aggregate) as they are necessary materials to maintain the growth of Atlanta's urban infrastructure. These three MFAs (computed based on national, regional, and local levels) will provide a per capita usage in tons of each material. This information will allow for assessment of the CO₂ output per capita produced by concrete and further sustainability studies concerning these materials.

Colorful Styles: Analyzing Horn Tone Quality and Regional Tone Differences through Literature Study

Emma Bay Dickinson, CURO Honors Scholar

Dr. Jean Martin-Williams, Music, Hugh Hodgson School of Music, Franklin College of Arts and Sciences

A good tone quality is the first step to musicianship, and many horn students are taught very early about the aspects of creating the distinctive mellow sound. Tone quality is an abstract concept and differs based on the brand of horn, design of the tubing, musical preference, country, and cultural history. Differences in tone are usually described using adjectives and metaphors—light, dark, broad, mellow—that do not accurately describe how these different “colors” of the horn are formed based on the overtone series. Through a literature study of books written by pedagogues from different countries and schools of playing, I want to investigate how sound preferences differ from country to

country to create tone differences. I want to look at how orchestras have preserved their distinct sound, and infer how orchestras have changed over time due to different cultural influences, and predict their change in the future. Because brass pedagogy begins very early in the education of a young musician, I would like to look at how music education in other countries in Asia, West Europe, East Europe, South America, and North America differs. Using this knowledge, I will present ideas that might help to improve music education in American public schools.

Pogo to Social Change: Activism and Violence in Bali

Sarah Jane Dillon, CURO Summer Fellow, CURO Research Assistant

Dr. J Peter Brosius, Anthropology, Franklin College of Arts and Sciences

Bali, Indonesia, though often imagined as an apolitical paradise, is, in fact, a site of intense historical violence. In the time period since Indonesian independence episodes of regular violence have been a powerful force in Bali, and have shaped the way Balinese people and activists perceive their government and attempt to enact change in their political world. Focusing on legacies from the Indonesian Genocide of 1965-66 and the repressive New Order regime that followed and lasted until 1998, I will use scoping of appropriate literature to investigate how Balinese perceptions of their government and their own agency in relation to the government have evolved through social activism, which is a topic neglected both in the literature in terms of identity within social movements, contested or otherwise, as well as in the literature on Bali. A current environmental movement in Bali known as *Tolak Reklamasi*, or "reject the reclamation" is fighting the unregulated development of Bali and simultaneously empowering Balinese youth to push against historical self-censoring legacies and to create social change through a critical re-imagining of their agency. I will research evolving Balinese government perceptions and activists perceptions of their own work using ethnographic techniques in Bali, focusing on the nexus of music and activism that has been highly salient in the *Tolak Reklamasi* movement and in Bali's political arena in general.

Coarse Grain Modeling with Artificial Neural Network Optimization

Bly Doma

Dr. Rodney D Averett, Chemical, Materials, and Biomedical Engineering, College of Engineering

Fibrinogen is a large glycoprotein that serves an important role in promoting hemostasis. Computational studies and modeling of fibrin clot polymerization is essential to understand the nano-mechanics underlying pathogenic

conditions such as venous thrombo embolism and deep vein thrombosis (DVT). Due to the size of the fibrinogen molecule and the complexity of the bio-chemical reactions involved in thrombosis, it is almost impossible to use all-atomic classical molecular dynamics simulations. However, coarse grain models have shown promising capabilities in this context. This involves conversion of the fibrinogen molecule, which consists of 31,833 atoms, into a coarse grain model of 9 beads using a combination of topology network algorithm (TNA) and self-aligning artificial neural networks (ANNs). This model is then optimized to replicate the structural properties of the atomic model using the Iterative Boltzmann Inversion (IBI) method. Currently, this iterative procedure is done manually by scaling and is inefficient. In this project, we will utilize the self-learning ANNs to optimize the search procedure. The new method will improve the current methods of coarse graining and can be applied to any large bio-molecular models.

Subcultural Merchandising Patterns and Experiences: Background and Methods (Part 1)

Mary Kate Donahue, CURO Research Assistant

Lauren Klas

Dr. Monica Sklar, Textiles and Merchandising, College of Family and Consumer Sciences

The objective of this research is to examine merchandising experiences of various subcultural groups and their approach to fashion through the lenses of socialization, subcultural learning, production, and consumption. Subcultures such as punk, goth, skateboarders, and ravers have their own position in the marketplace and distinct aesthetics, yet transform due to intermingling with other communities and wider society. Subcultural style innovators may exist firmly outside of the mainstream, or these subculture members may be early adopters of styles that are at the beginning of mass interest. The project creates a comprehensive history of retail spaces from the latter 20th century to the present, including direct sales at events, brick-and-mortar specialty stores, thrift shops, catalog ordering and ecommerce, and chronicles how people interact in these retail settings. The first step in implementing the research was an extensive review of literature. Topics ranged from subcultural history and current affairs, to fashion merchandising and trend cycles, to design and cultural concepts about appropriation and innovation. Next, social media was used to further collect data, including the creation of a Facebook page and a snowball convenience sample. An in-depth survey was also created and has resulted in personal accounts of subcultures and their clothing choices. Moving forward, we plan to further the data analysis with continued surveys and potential interviews, as well site visits to provide content depth and artifact analysis. Combined, these methods have

laid the foundation for data synthesis, resulting in theme development, journal articles, and the shaping of a book proposal.

Magnetic Resonance Assessment in a Porcine Model of Ischemic Stroke Demonstrates Reduced Diffusivity and White Matter Damage

Neil Doshi, CURO Research Assistant

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Stroke is the leading cause of disability and the fifth leading cause of death in the United States. Currently, tissue plasminogen activator (tPA) is the only Food and Drug Administration (FDA) approved treatment for ischemic stroke, however, it, along with other endovascular surgical procedures, possesses limitations in terms of regenerative potential, efficacy, and therapeutic window. Recent rodent models have failed to produce translatable treatments, thus an animal model more anatomically comparable to humans is necessary. Due to its similarities in neuroanatomy and physiology, the pig may serve as a more efficacious animal model. The present study will assess the pathophysiology of ischemic stroke through the use of *in-vivo* Magnetic Resonance Imaging (MRI); ischemic stroke will be induced by permanent middle cerebral artery occlusion (MCAO). MRI will be specifically utilized to detect clinical abnormalities 1-day post-MCAO through sequences including Diffusion Weighted Imaging (DWI), Apparent Diffusion Coefficient (ADC), Diffusion Tensor Imaging (DTI), and Fractional Anisotropy (FA). We hypothesize that stroke-induced pigs, in comparison to normal pigs, will display significantly decreased diffusivity in ischemic lesions and compromised white matter integrity in the corpus callosum and internal capsules. Collectively, this study will provide a pathophysiological assessment of ischemic stroke through which the efficacy of potential therapeutics, including induced neural stem cell (iNSC) transplantation combined with drug-loaded nanoparticles, can be assessed in promoting tissue and functional level recovery.

Supplemental Thermal Energy Storage Tank for UGA's Central Campus Chilled Water Loop

Samuel Paul Douglass Jr., CURO Research Assistant

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The University of Georgia's largest chilled water loop, the central campus chilled water loop, uses 4000 tons of cooling on an average daily basis during the summertime, costing the university an average of \$6000 per day. It is anticipated that these costs could be halved by introducing a thermal storage system to the loop that would operate by recharging chilled water during off-peak hours, when electricity is

cheap, and discharging chilled water during peak cooling hours when electricity is expensive. This study analyzes the economic and practical implications of introducing such a system to the University of Georgia's existing central campus chilled water loop by condensing historical cooling data of all current buildings connected to the loop along with historical electricity costs into a model representing a typical summer day. Simulations of this model will be used to size the chilled water tank, optimize cost savings and system reliability, and determine the effective pay-back period.

Identification of Recurrent Arbovirus Trends in Order to Inform Zika Virus Reemergence Predictions

Jessi Drew

Dr. Marianne Shockley, Entomology, College of Agricultural and Environmental Sciences

The Zika virus (ZIKV) was discovered in Uganda in 1948 and periodically appeared in small outbreaks before ultimately resurfacing in Brazil in 2015. The outbreak in Brazil quickly escalated to include 60 countries worldwide, mostly affecting countries in South America, Central America, and the Caribbean. In 2017 and early 2018, there has been relatively low incidence of ZIKV cases. As ZIKV is genetically similar to other mosquito arboviruses, which have occurred in cyclical trends, it is expected that ZIKV could follow a similar pattern. The objective of this investigation is to identify historical patterns of arboviral outbreaks to better understand the potential reemergence of ZIKV incidence. Though literature review, previously collected vector data, and spatial epidemiological methods, this study will use what is known from multiple mosquito vectored outbreaks to help inform ZIKV reemergence expectations. The results of our investigation illustrate time-trend and geographic presentation of arbovirus infection and the prevalence within the mosquito vector to forecast ZIKV outbreak cycles in the Americas. We present evidence of the possibility of a ZIKV virus reemergence in the Americas and worldwide. While ZIKV incidence and prevalence have declined since its initial outbreak in 2015, the threat of a reemergence remains high and public health policy and strategies should remain vigilant to the threat of ZIKV.

The Framing of Two Sovereignist Movements

Samuel Driggers, CURO Honors Scholar

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In September 2014, the Scottish Independence Referendum was held by the United Kingdom (UK) Government. 21 months later, the UK Government held another referendum, this time on European Union (EU) membership. While the referendums are a result of two drastically different political movements, both the 2014 Yes Scotland campaign and the

2016 Leave campaign were inherently sovereigntist. Both campaigns were founded primarily on economic and political motives, favored withdrawal from a governmental union, and vocalized rhetoric that was fervently separatist and often quite nationalist. This project examines campaign leaflets from each referendum in an attempt to better understand the contrasts and parallels between the Yes Scotland and Vote Leave campaigns. More than 250 campaign leaflets were gathered for this comparison, primarily from collections compiled by the National Library of Scotland and a London School of Economics and British Libraries collaborative exhibit. These leaflets were then subject to normative and software-based content analysis. Thus far, preliminary results reflect stark differences in the framing of each referendum's sovereigntist campaign, but also great similarity in their motives and rhetoric. This project contributes to the understanding of the two sovereigntist movements but also has important implications on the framing of rhetoric in political campaigns.

**Reese-Hancock Housing Research Collaboration:
Documenting Displacement in the Reese-Hancock Corridor**

Shannon Duffy, CURO Research Assistant
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Many low-income, black communities in the south are under displacement pressure. Residents within the historically black Hancock neighborhood in Athens have expressed concerns about the gradual displacement of their community and erasure of its history. As Athens grows and student housing complexes expand, residents experience pressure in the form of property tax increases and fear being priced out of homes their families have inhabited for generations. The research conducted this year has been a collaborative effort between students at Clarke Central High School, residents of the Hancock neighborhood, and the Community Mapping Lab to document the effects of gentrification on the historically black Hancock neighborhood. Using qualitative research methods such as the conducting of a rental survey and archival of historical documents, the research group plans to preserve neighborhood histories and gauge the pressures and anxieties facing residents in the modern day. Historic Sanborn Insurance maps of the region have been digitized for online viewing and preservation to document past businesses, community centers, and other historical locations within Hancock. Maps generated will be paired with oral history interviews conducted with residents in Hancock. Alongside these documents, the housing survey will collect data about housing history, rent burden, past evictions, and experiences of harassment by landlords/realtors/speculators (evidence of which has been gathered through participant observation to date). The concluding report will document residents' history alongside their

current experiences of displacement and pressure to leave the historic Hancock neighborhood.

Fabricating Multi-Barrel Capillary Tubes for the Controlled Deposition of Picoliter Droplets

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Droplet-based materials allow for the creation of synthetic microfluidic tissues that connect a web of biological membranes to achieve collective behaviors such as osmotic actuation and energy conversion. These applications require varying droplet compositions throughout the network, placing droplets adjacent to each other that supply an osmotic gradient for example. Droplets are often deposited through sharpened glass capillary tubes, which allow for the fabrication of micron-diameter needles providing the user a greater degree of control when working with picoliter volume droplets. These needles are often fabricated using pipette pullers, which vary the heat, time, and tension applied to the glass capillary as it is pulled into the appropriate dimensions. Current approaches require the constant changing of these needles to vary the droplet contents with the material, which is time consuming and impractical at a larger scale. To address this the focus of this research is developing a custom algorithm for reliable pulling multi-barrel glass capillary tubes. This will be accomplished by creating a new workstation for clamping the needles, providing appropriate heat to melt the glass, and providing a reliable tension to pull bundles of capillaries into fine points. These needles will then be combined with a droplet printer to aid in the rapid fabrication of droplet-based materials.

Modifying 3D Printers for Printing Droplet Interface Bilayers

Austin Michael Duncan, CURO Research Assistant
Dr. Eric Freeman, Environmental, Civil, Agricultural, and Mechanical Engineering, College of Engineering

The droplet interface bilayer (DIB) technique allows for the rapid creation of biological membranes in a modular and robust form. Aqueous droplets are dispersed in an oil reservoir with dissolved lipids, acquire a lipid monolayer coating due to their amphiphilic properties, and then are manipulated into contact to adhere into stable lipid bilayers. These lipid bilayers are able to host various transport biomolecules, and are often used to model various biophysical phenomena and interactions. It is possible to connect these in various arrangements to create synthetic tissues, where their behavior is a collective property of the transmembrane exchange between multiple droplets. However the deposition of suitably small droplets for replicating cellular activities is challenging, and requires a

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degree of automation. This work explores the possibility of overhauling an off-the-shelf 3D printer (Lulzbot TAZ 5) to deposit aqueous droplets in the desired precise patterns. This is accomplished by simultaneously controlling multiple pieces of equipment, combining GCODE, MATLAB, and serial port communication. The result is a low-cost droplet printer that allows for the rapid creation of biomolecular networks through the DIB technique.

Viral Entry and Replication of Chikungunya Virus with Extra mKate or nanoLuciferase Reporter Genes

Avery Michael Duncan

Dr. Melinda Brindley, Infectious Diseases, College of Veterinary Medicine

Chikungunya virus (CHIKV) was historically spread through *Aedes aegypti* mosquitoes found in tropical climates. Recently the virus has evolved to spread in non-tropical climates through *Aedes albopitius* mosquitoes. Currently hundreds of millions of people live in areas where CHIKV circulates and as the global climate changes, the number of people at risk increases. To facilitate studying CHIKV replication, we aimed to produce a virus that incorporated a reporter gene in the genome. The reporter product can be used to quantitatively monitor virus replication in various assays. The Brindley lab previously produced a CHIKV genome containing the green fluorescent protein (GFP) gene. CHIKV-GFP plasmid consists of the virus' genome with a GFP coding region inserted as an additional open reading frame. After viral infection, the GFP allows for direct visualization of infection and replication in cells. My goal was to produce additional CHIKV reagents and replace the GFP with the fluorescent protein mKate and luminescent protein nano-luciferase (nLuci). First, I used PCR, restriction enzyme digests, and ligations to produce a plasmid encoding the CHIKV genome with the reporter genes. I then used *in vitro* transcription and RNA transfection to recover replication competent virus. CHIKV-mKate will cause infected cells to glow bright red when light passes through the cells, and CHIKV-nLuci will enable quantitative luciferase assays to be performed to carefully quantify virus replication. In the future, Brindley lab will utilize these additional reporter viruses to compare different CHIKV mutant replication rates and examine the ability of drugs to block virus replication.

Investigating the Role of Lutein and Zeaxanthin in Neural Efficiency: A Multi-Nutrient Comparison in Community Dwelling Older Adults

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Lutein (L) and zeaxanthin (Z) are known for their links to cognitive function. Recent research has linked their density

in the neural retina to processing speed and a number of cognitive functions across the lifespan, from childhood to older age. The neural efficiency hypothesis predicts that L and Z uniquely serve this role, despite the fact that L and Z are not as densely concentrated in the brain as other nutrients. They are also not the dominant carotenoids in the United States diet. The purpose of this study was to compare the magnitude of the relationship between serum L+Z and cognitive function to the magnitudes of other serum nutrients found in higher concentration in the nervous system. 59 community dwelling older adults ($M=73.03\pm 7.41$ years) were tested. Cognitive function was measured using the CNS Vital Signs test battery. Whole blood was collected, centrifuged, and stored at -80-degrees for analysis. Retinol, L, Z, α -tocopherol, β -carotene, β -cryptoxanthin and α -carotene were measured in serum via high-performance liquid chromatography. Plasma 25-OH-D₃ was measured on a subset of participants (n=26) using liquid chromatography / mass spectrometry. While some of the nutrients measured were significant on some of the cognitive domains tested, L, 25-OH-D and retinol were significantly correlated with cognitive function across multiple domains. An analysis of β weights derived from general linear modeling showed that L levels explained more variance in cognitive function than other nutrients analyzed. Despite its lower concentration in central nervous system tissues, L appears to have a unique role in neurological health and cognitive function.

Evaluating Human-Driven Environmental Change using a Stalagmite from Northwestern Madagascar: Implications for Research and Conservation

Laura Dupont, CURO Research Assistant

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The degree and timing of human impact on the island of Madagascar has been widely debated within the paleoclimate community. Human settlement started various mechanisms of deforestation that caused the loss of nearly 80 % of the natural forest cover. The major mechanism responsible for deforestation was the implementation of *tavy*, a form of swidden agriculture Malagasy populations began to practice as they transitioned from a foraging lifestyle to an agricultural lifestyle. This study examined the carbon and oxygen stable isotope record of U-Th dated Stalagmite ANJ94-2 from Anjohibe Cave in northwestern Madagascar to reconstruct the timing and impact of human settlement, as well as environmental conditions of the region from 470 CE to the present. Results suggest that environmental pressures on the surrounding landscape were most intense from 840 CE to 1060 CE. Previous publications claim island-wide aridity was responsible for these environmental pressures. This study contradicts previous work and instead, suggests that rainfall increased

prior to the onset of swidden agriculture and through progressive steps, the transition from a foraging lifestyle to an agricultural lifestyle caused a reduction in soil and plant cover and caused a transition from the natural C₃ forests to the present C₄ palm grassland. After 1060 CE, the landscape overlying Anjohibe Cave was so degraded that by 1710 CE, Stalagmite ANJ94-2 ceased growth. Given the extent of deforestation, this study of the relationship of paleoclimate changes and human impact may aid those who aim to protect the natural resources of Madagascar.

High-Resolution Space-Time Dynamics of *Escherichia coli* in an Urban Stream System

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Dr. Erin K Lipp, *Environmental Health Science, College of Public Health*

Across urban landscapes, aging sewage infrastructure, leaky sewer lines, failing septic systems, and increasing amounts of impervious surfaces can impair water quality and affect public health via the introduction of fecal contamination (and therefore intestinal pathogens) into water bodies. Detecting these impacts requires active surveillance. In this study, a network of stream sites around Athens, Georgia (United States), an urban area home to ~100,000 people served by sewers (>100 years old), septic systems, and bounded by agricultural land, was sampled weekly for *Escherichia coli*, a fecal indicator bacteria, over a 15-month period (October 2016 to December 2017). Over this sampling campaign, 228 stream samples were collected at 9 stations. For all samples collected, *E. coli* concentrations were determined using EPA Method 1603. Over the 15-mo period, *E. coli* counts averaged 1,055 colony-forming units (CFU) 100 ml⁻¹ and ranged from a low site average of 444 CFU 100 ml⁻¹ (n = 25) in residential areas to a high site average of 1,747 CFU 100 ml⁻¹ (n = 28) on the University of Georgia campus. Additionally, two sites immediately downstream of a hospital sewer line had average *E. coli* levels of >1,300 CFU 100 ml⁻¹ (n = 28,39) as well as the highest single sample value of >12,000 CFU 100 ml⁻¹; although numbers were high year-round, the highest counts were observed during spring and early summer suggesting consistent inputs of fecal material. This 15-month surveillance was part of an effort to predictively model *E. coli*, and thus microbial water quality, in impacted urban streams.

The Effects of Childhood Maltreatment on Amygdaloid and Hippocampus Volumes: A Systematic Review and Meta-Analysis

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Exposure to adverse and traumatic childhood experiences

can have a harmful neurobiological impact on the victim. Notably, cumulating research suggests altered morphology among victims of child maltreatment. The amygdala and the hippocampus are two brain areas that have gained extensive attention in the child maltreatment literature. However, findings have been inconsistent in regards to the directionality of the associations between maltreatment and volume of the hippocampus and amygdala. The present study consists of a systematic review and meta-analysis in order to address this gap and examine potential moderators that may mask the effect of child maltreatment on amygdala and hippocampus volume. The types of adversity explored will include neglect, emotional abuse, physical abuse, and sexual abuse. We predict that childhood maltreatment will have a significant effect on hippocampus and amygdala volume. Yet due to mixed findings in the literature, we refrain from hypothesizing on a specific direction to these effects. Understanding the neurobiological effects of child maltreatment is important for interventions that aim to mitigate the negative neurobiological effect of child maltreatment.

Effects of Prescribed Fire Intervals on Carbon-Stock Conservation in the Longleaf Pine Ecosystem

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Longleaf pine (LLP) forests are highly productive ecosystems that have significant potential to mitigate the effects of climate change due to their ability to sequester carbon (C). However, the capability of these ecosystems to sequester C depends on fire management. Thus, it becomes imperative to understand appropriate fire frequencies to optimize long-term C-stocks. In my proposed research, I will determine ecosystem C-fluxes and C-stocks in LLP forests that vary in stand age and fire management, and then I will estimate the monetary value of these C-stocks. Using a four-year dataset of aboveground biomass and growth, soil C, and losses of organic matter from fire, I will quantify the net C-stock of the LLP ecosystem and how it changes over time and across fire frequencies. I hypothesize that C-stocks will reach a saturation point as stands mature, but fire frequency will influence how much C is stored in aboveground biomass, mineral soils, and the organic layer. LLP ecosystem C-stocks will be monetized using the social costs of C to determine the long-term economic contribution the optimal fire frequency provides for climate change mitigation. This study will provide incentives for investments in LLP conservation practices that are both ecologically and economically optimal.

The Costly Legacy of Economic Sanctions

Austin Emery, CURO Research Assistant
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In the decades that have followed the conclusion of the Cold War, policymakers have increasingly looked to economic coercion as an instrument of statecraft. The expanded use of economic sanctions has generated significant discussion among the academic and policy communities regarding their efficacy in producing desired policy outcomes, the necessary conditions for success, and more recently, their unintended humanitarian consequences. However, with the exception of their potential to foment criminalization, scant attention has been brought to the lasting impacts of economic sanctions. In this article, I aim to understand the aftermath of economic sanctions. I first seek to discern how sanctions regimes impact the political, economic, and societal structures of targeted countries. I then explore how these impacts are manifested in the post-sanctions environment. Through rigorous quantitative examination and a handful of brief case studies, I provide a comprehensive account of the enduring consequences of economic sanctions. By extending the appraisal of economic sanctions to the post-sanctions period, I hope to facilitate a more exhaustive discussion among scholars and policymakers regarding the overall utility of economic sanctions.

UGA's Leap to Space: Small Satellite Research Lab Testing

Niklas Endler
Dr. David L Cotten, Geography, Franklin College of Arts and Sciences

As a member of the UGA Small Satellite Research Laboratory - UGA SSRL - I am part of the team that is building UGA's first satellite. The current development is focused on two small satellites (3U), SPOC (Spectral Ocean Color Satellite) and MOCI (Multiview Onboard Computational Imager). SPOC will be the first to give UGA presence in Low Earth Orbit - LEO - and with it increase the school's technological reputation. Additionally, the data that the satellites will capture will provide UGA's science and research departments with unique and reliable information from space. MOCI will have real-time 3D mapping abilities and is furthermore special in that it will be capable of calculating large chunks of data from the onboard computer rather than having to rely on the ground for such analysis - something that is rarely seen in small satellites. On the other hand, SPOC will have an adjustable multi-spectral sensor that will be used for investigating near ocean environments including beaches, wetlands, and estuaries. To ensure the satellites are working correctly when in space they will be tested in a vacuum environment, which includes a large part of my research. Within the chamber we designed a thermal

shroud that allows for cooling, utilizing liquid nitrogen, and heating, utilizing water heating elements. The satellites will be placed within the shroud, which will then be heated or cooled for specific durations. This study will replicate extreme scenarios the satellites might encounter when in LEO depending on its position with respect to sun and earth.

Structural Analysis of Small Satellites

Parker Ensing, CURO Research Assistant
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The success or failure of satellites often depends on their abilities to complete designated tasks remotely without considerable intervention from people. Despite this, satellites need to survive their journey to prove their capabilities at all. For this reason, structural modeling, by means of finite element analysis, plays a crucial role in determining the survivability of satellites during launch and liftoff. At the University of Georgia's Small Satellite Research Lab, structural analysis was conducted on working models of the Spectral Color Ocean Color (SPOC) satellite as well as the Mapping and Ocean Color Imager (MOCI) satellite. While SPOC's funding comes from NASA and MOCI's funding comes the United States Air Force, both satellites share similarities regarding structural components, namely the 3-U CubeSat frame. Elements of each satellite such as the frame, fasteners, and structural ribs provide critical support against dangers like vibrations and inertial loading. Using the finite element analysis package ANSYS Workbench, these components, among others, were analyzed and simulated in a variety of different tests: inertial loading, modal vibration, random vibration, and response frequency. Using the data retrieved from these simulations, materials, and locations for each part were chosen and adjusted throughout the entirety of the design process.

Examining Disparities in Accessing Services Among Populations Eligible for Early Childhood Special Education from a National Longitudinal Database

Sydney R Erickson
Dr. Ashley Johnson Harrison, Educational Psychology and Institutional Technology, College of Education

A significant amount of research demonstrates the long-term benefits of early intervention (EI) and early childhood special education (ECSE) for children with disabilities. Despite the clear benefits, there is still a meaningful underutilization of these services. More research is necessary to determine the factors related to underutilization. Research has demonstrated racial and socioeconomic disparities in EI access. While similar disparities are assumed for ECSE, limited research has been conducted with this age range. The current study examines the correlation between

demographic factors including insurance status, primary language, race/ethnicity, and socioeconomic status (SES) and self-reported ECSE service usage. Data was extracted from the Early Childhood Longitudinal Study-Birth Cohort (ECLS-B) data set and includes questionnaires, parent interviews, and child assessments. The relations between demographic factors and service usage were examined among a subset of children deemed eligible for services based on direct child assessment data. Preliminary analyses using logistical regression revealed that native English speakers are 2.33 times more likely to receive services than non-native English speakers ($p > .001$). Additionally, as SES quintile increases by one unit, the odds of receipt of services will improve by a factor of 1.10 ($p < .05$). Additional analyses will involve a model examining race/ethnicity. It is important to examine the specific factors that prevent children birth to five from receiving services in order to develop future interventions that can increase the rate of access.

Effects of Hydrogen Peroxide Treatment Modifications on *Saprolegnia* Growth and Hatch Success Rate of Walleye Eggs

Guy Eroh, Foundation Fellow

Dr. Cecil A Jennings, Forestry, Warnell School of Forestry and Natural Resources

The Georgia Department of Natural Resources (GADNR) is responsible for hatching and stocking walleye (*Sander vitreus*) in North Georgia lakes. Recently, GADNR has reported poor hatching success of cultured walleye eggs. The poor hatch rates have been attributed to infestation of protozoan parasites of the genus *Saprolegnia* on the eggs. Protocols exist to treat the walleye eggs with hydrogen peroxide to reduce *Saprolegnia* spp. growth, but problems continue to occur. I hypothesize that by increasing hydrogen peroxide treatment concentration and frequency, *Saprolegnia* spp. concentrations will be reduced and walleye hatch success will improve in aquaculture systems similar to those used by the GADNR. To test this hypothesis, I have set up a controlled randomized complete block experiment at the University of Georgia Fish Labs at Whitehall Forest. Eggs hatched in McDonald-style hatching jars will be treated once or twice daily with hydrogen peroxide concentrations ranging from 0 to 1000 ppm. Water and eggs from each hatch jar will be sampled every three days during the hatching duration and *Saprolegnia* spp. abundance will be quantified using real-time polymerase chain reaction. After hatching is complete, the hatch rates for each treatment will be calculated by comparing hatched fry counts to the number of eggs initially placed in the hatching jar. This experiment may reveal a hydrogen peroxide treatment regimen that will reduce *Saprolegnia* spp. growth and increase hatch rates of cultured walleye eggs. This result would help the GADNR's walleye production program for the state.

The Effects of Studying Habits on Vitamin D Levels in Undergraduate Students

Rhiannon Euhus, CURO Research Assistant

Dr. Jennifer L Gay, Health Promotion and Behavior, College of Public Health

Vitamin D is essential for strengthening bone health and the immune system in humans. Humans intake Vitamin D primarily through sun exposure. Little is known about fluctuations in Vitamin D among college students, who may be at risk for Vitamin D deficiency when they spend a lot of time indoors (e.g.,) studying for exams. A longitudinal study was conducted to assess the intake of Vitamin D among undergraduate students, specifically black or African-American women, throughout the semester. Participants (n=19) had their blood drawn approximately every four weeks at the University Health Center to measure Vitamin D fluctuations, and they completed a survey after each blood draw to assess dietary intake of Vitamin D, studying habits and sun exposure. Because of the smaller sample size, non-parametric methods will be used for analysis. The Friedman test will be used to assess changes in Vitamin D levels across the semester. Correlations of Vitamin D with time spent indoors and outdoors will be analyzed. Mean Vitamin D levels over time will be examined against weather and studying time separately. The data is expected to show decreasing Vitamin D levels in the participants around testing periods, and increasing Vitamin D levels outside of testing periods. These findings can be used to create interventions to increase Vitamin D levels for college students during the semester, especially around testing periods. This will subsequently increase immune health and academic performance for students.

The Health Status and Healthcare Access of Incarcerated Women

Rhiannon Euhus, CURO Research Assistant

Dr. Jody Clay-Warner, Sociology, Franklin College of Arts and Sciences

The United States has the highest incarceration rate in the world with 900 in every 100,000 adults residing in prisons or jails in 2014. Although females make up a minority of prisoners—approximately 7% of U.S. prisoners—female incarceration rates have been increasing compared to males. From 2000 to 2013, the number of women under correctional supervision increased by 16.6%. This article aims to synthesize the literature on incarcerated women to describe their health status and their access to quality healthcare. A systematic literature review was conducted using the databases PubMed, MEDLINE, CINAHL, and PsycINFO. The articles were found by conducting searches with the following keywords: incarcerat*, women, prison, jail, utliz*, and health. Fifteen articles were examined in

this review. Results indicate that incarcerated women have high rates of mental and physical health problems and that compared to men, incarcerated women experience more health challenges even when controlling for age, race, education, and substance use. The barriers to health care for female prisoners are payment for health services and prior approval requirements for care. Improvements are needed in gender-specific care for women in prison, such as abortion and pregnancy-related care, in order to meet best practice standards. More research should be conducted to determine the causal relationship between the quality of prison healthcare and incarcerated women's health status, establish the generalizability of findings, and produce more studies that highlight women's voices and experiences.

Point Mutations in Kelch 13 and Artemisinin Resistance in Malaria Parasites

Arden Anne Farr, Foundation Fellow

Dr. Vasant Muralidharan, Cellular Biology, Franklin College of Arts and Sciences

Nearly half of the world's population is at risk of malaria, making parasite drug resistance a huge concern. Resistance has emerged for all clinically-available drugs, including the current front-line treatment artemisinin. Artemisinin-based Combination Therapies (ACT) are the leading treatments for *Plasmodium falciparum*, the most deadly human malaria parasite. Mutations in the Kelch 13 (K13) propeller domain were shown to be associated with delayed parasite clearance *in vitro* and *in vivo*. The purpose of our research is to explore resistance to artemisinin in malaria parasites by making mutations in the K13 gene to see if they confer resistance. Using CRISPR/Cas9 genome editing, we will introduce K13 mutations that have been identified in the field and assay the mutant parasites for artemisinin resistance. This will allow us to link known mutations in K13 to resistance to the leading malaria treatment.

Selective Inhibition of the Enzyme PRMT5 by MTA Derivatives

Corbin Farr, CURO Research Assistant

Dr. Y George Zheng, Pharmaceutical and Biomedical Sciences, College of Pharmacy

Modern scientific discovery suggests that proteomics and gene expression, as opposed to the composition of the genome itself, dictate the cell behaviors associated with many cancers as well as cardiovascular, neurodegenerative, and metabolic diseases. Significant regulation of gene expression occurs through post-translational modifications (PTMs) to the nucleosomal histones responsible for organizing a cell's DNA during interphase. Protein arginine methyltransferases (PRMTs) methylate arginine residues of protein substrates, including the fundamental units of the

histone octamer, thus influencing the transcription of DNA. PRMTs are classified as Type I, Type II, Type III, or Type IV on the basis of the methylated arginine product catalyzed. The primary foci of this experiment are PRMT1 and PRMT5, which are Type I and Type II, respectively. Both initially catalyze the production of monomethylated arginine (MMA); however, upon the second methylation, Type I produces the asymmetric dimethylarginine (ADMA) and Type II produces the symmetric dimethylarginine (SDMA). The methylation of arginine residues has been found to impact many cellular processes such as cancer development, progression, and aggressiveness, T-lymphocyte activation, and hepatic gluconeogenesis and aging. Over-expression of PRMT5, in particular, has been linked to many forms of cancer and when co-expressed with programmed cell death 4 (PDCD4), PRMT5 contributes to a progrowth phenotype. This phenomenon thus begs the question: would the knockdown of PRMT5 prove therapeutic in oncology? This study examines a series of compounds derived from the hydrolysis and subsequent nucleophilic substitution of MTA on various alkyl bromides as potent and selective inhibitors of PRMT5.

Exploring the Association Between Candidate Quality and Electoral Performance in Congressional Primaries

Matthew Fasig, CURO Research Assistant

Dr. Jamie L Carson, Political Science, School of Public and International Affairs

I am conducting research into whether there is a statistically significant association between a congressional candidate's elected or professional experience and their electoral performance. I will be examining digitally archived newspapers from 1970 through 2010 and coding available occupational information. The dataset will include approximately 35,000 congressional candidates, and empirically validate whether Gary Jacobson's dichotomous measure of candidate quality applies to congressional primaries. Expressed differently, I will investigate whether a non-quality challenger performs as well as someone with limited unelected government experience— e.g. an FBI agent or DOD analyst. I will be examining whether there are significant deviations in electoral performance based on previous candidate experience and occupation. Furthermore, I will determine whether a congressional candidate's elected experience has diminished in importance today relative to 1970-2000. Hopefully, I will be able to provide greater insight into whether the American electorate considers a candidate's elected experience and profession when voting.

Relationship Between Post-Concussion Step Counts and Time to Asymptomatic: A Pilot Study in College Students

Olivia Feltner

Dr. Julianne D Schmidt, Kinesiology, College of Education

Consensus guidelines recommend refraining from strenuous mental and physical activities following concussion until asymptomatic. Recent evidence suggests that 48 hours after concussion, individuals may gradually implement physical activity throughout recovery. However, it is currently unknown if the amount of physical activity immediately following the acute period post-concussion is associated with the time it takes to become asymptomatic. The purpose of this study was to determine the relationship between the amount of physical activity during days 3-5 post-concussion and the number of days to asymptomatic in concussed college students. Fifteen college students (8 males, 7 females) were diagnosed with a concussion by a physician within 72 hours post-injury. Participants were instrumented with a wrist-worn Actigraph GT9X Link accelerometer within 3 days of concussion and were instructed to wear continuously until their next follow-up visit when they became asymptomatic. Participants were not provided real-time measures of physical activity from the accelerometer to avoid motivation to be more active. A Spearman's Rho correlation was conducted to examine the relationship between days to asymptomatic and average step count across days 3-5. A moderate negative relationship existed on day 3 post-injury between step count and days to asymptomatic, where individuals with greater step counts ($r_s = -0.68, p = 0.005$) became asymptomatic quicker. Moderate physical activity, such as walking to class, early after concussion might benefit clinical recovery time. However, the optimal time frame for resuming activity needs further exploration. Future studies using accelerometer-assessed physical activity hold promise for generating a better understanding of relationships between activity and concussion recovery.

Evaluation of Warm-Season Annual Grasses for Southeastern Forage-Finished Beef Systems

Lindsey Fenster, CURO Research Assistant

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A problem that southeastern forage-finished beef producers face is a lack of high-quality forages during the summer months. Warm-season, perennial grasses, such as bermudagrass, dominate southern pastures from June through September and are often of insufficient nutritive value to meet the demands of growing and finishing cattle. Warm-season annual grasses, such as pearl millet, have been shown to exhibit increased nutritive values and favorable agronomic traits. Furthermore, soybean hull

supplementation has been shown to increase ruminal cellulase production, thus increasing digestibility of and animal performance on forage-based diets. A three-year study was designed to examine two varieties of pearl millet: 'Tifleaf 3' and 'Exceed,' each with and without supplementation of soybean hulls, for use in a forage-finished beef production system. Each year 16 0.81-ha paddocks were randomly assigned to 1 of 4 treatments with 4 replications. Thirty-two steers were paired by weight to minimize variability among pairs; pairs were then randomly assigned to treatment paddocks. Rotational grazing was initiated when forage sward height was 45-60 cm and terminated in September, when steers were harvested under USDA inspection. Average daily gain (ADG) and total gain were calculated from fasted weights taken at grazing initiation and termination. Carcass data were collected 24-h post-mortem. Supplemented steers exhibited greater ADG, total gain, and kidney-pelvic-heart fat percent and more youthful lean maturity and color than non-supplemented steers. Data indicates pearl millet is a viable summer forage for southeastern forage-finished beef systems and soybean hull supplementation can increase animal performance over forage alone.

Persistence in Extractive Foraging by Modern Humans (*Homo sapiens*): Tools as Potential Motivators for Primates

Summer Star Fink, CURO Research Assistant

Dr. Dorothy Fragaszy, Psychology, Franklin College of Arts and Sciences

Persistence is used to describe behavior or an aspect of personality; it is the extent to which one will continue to pursue a goal, even in the face of failure. Motives inform us about why we persist. We hypothesized that tools act as motivators for persistent behavior, especially in the cognitively complex task of extractive foraging, which is also performed by great apes and capuchin monkeys. Approximately 250 undergraduate participants were asked to open and extract seeds from a pomegranate fruit in one of five conditions ($n=50$): tool choice, crude tool, no tool, precise tool, and useless tool. Dependent variables measured include total task duration, variability in behaviors, and seed yield. We anticipate that those participants who use a tool – even an inefficient one – will be more persistent (longer duration, more variability in behavior, greater total seed mass) than those participants who do not use a tool. Results will be assessed with participants' self-reported surveys measuring GRIT, diligence, and trait self-control. We predict that those participants scoring high in the measures will also demonstrate comparable persistent behavior in the pomegranate-opening task. These results will also be compared to extractive foraging behaviors of wild capuchin monkeys (*Sapajus libidinosus*) video recorded in Fazenda Boa Vista, Brazil, in order to assess their level of persistence.

Shared persistent behavior in capuchin monkeys and humans could indicate the importance of persistent traits in the evolution of tool-use and extractive foraging.

Effects of Chronically Elevated Bacterial Lipopolysaccharide on the Gut-Brain Axis

Caroline Elizabeth Finn, CURO Research Assistant
Dr. Claire de La Serre, Foods and Nutrition, College of Family and Consumer Sciences

Recent research has shown a relationship between high-fat diet, subsequent gut microbiota changes, and impaired satiety signaling. Lipopolysaccharide (LPS) is an inflammation-inducing toxin and glycolipid component of the cell membrane of gram-negative bacteria. Chronic consumption of high-fat foods has been shown to increase LPS contents in the gastrointestinal (GI) tract. Vagal afferent neurons innervate the GI tract and transmit information on quantity and quality of nutrients in the gut to the nucleus of the solitary tract (NTS) in the hindbrain to regulate meal size. Chronic elevation in circulating LPS (metabolic endotoxemia) has been found to impair vagal function and satiety. In this study, we aimed to determine the effects of chronically elevated LPS on vagal structure. Male Wistar rats were implanted with mini-osmotic a pump that continuously secreted LPS (12.5ug/hr/kg) or saline (n=10/group) into the intraperitoneal cavity. The NTS from each rat was cryosectioned and stained with a fluorescent isolectin B4 (IB4) label to visualize vagal afferents. The LPS-treated rats showed significantly more ($p = 0.002$) IB4 immunoreactivity, indicating neuroremodeling in the NTS. Similar remodeling has previously been observed after vagal injury; therefore, we propose a new mechanism by which a high-fat diet-induced microbiota dysbiosis can induce damage to the vagus nerve, promoting vagal remodeling and potentially leading to impaired satiety signaling. Further research into the mechanism behind this apparent LPS-induced neuroremodeling is warranted, but in the context of past research, these findings begin to explain the process by which a high-fat diet impairs satiety signaling along the gut-brain axis.

Investigating Additive Combinatorics through Freiman's Theorem and Plünnecke's Inequality

Monte Fischer, Foundation Fellow, CURO Research Assistant
Dr. Georgios Petridis, Mathematics, Franklin College of Arts and Sciences

In 1994, Ruzsa gave a new proof of Freiman's theorem, a foundational result in additive combinatorics on the connection between the size of a set's sumset and the underlying structure of the set itself. Ruzsa's novel proof heightened interest in additive combinatorics at the time and continues to motivate investigations in the field. Our

research aims at understanding an extension of Freiman's theorem from the integers to high-dimensional tuples of abelian groups with exponent with special focus on the presentation given in Ruzsa's *Sumsets and Structure*. Our research has the secondary focus of improving the upper bound on sumset size given by Plünnecke's inequality, another important result in additive combinatorics. Our methods involve both conceptual generation of motivating examples and the use of computer programming to generate statistical data on the sharpness of the upper bound, as well as direct attempts to improve the bound. An improvement of the widely-known bound would, in turn, improve the bounds on many results in the field of additive combinatorics.

An Evaluation of Major League Baseball's Amateur Player Acquisition Systems

Zack Flagel, CURO Research Assistant
Nathaniel Grow, Business Law, Indiana University (formerly: Legal Studies, Terry College of Business)

While most workers in non-sports industries have the freedom to negotiate their company of employment, city of residence, job role, and contractual benefits, athletes entering the professional baseball job market – Major League Baseball (MLB) and its 30 franchises – are not typically afforded these liberties. Instead, American and Canadian high-school and college baseball players must enter the MLB via a draft that sequentially determines players' fates and limits their contractual negotiating leverage. MLB's signing day system for acquiring international amateur talent serves as a model for an alternative to the draft. On the basis of several key criteria and consequences, including player autonomy, free-market competitive principles, game parity, and team strategy, a signing day system would improve upon the negative moral and economic implications present under the current draft system.

Space and Meaning-Making in London Theatre

David Forsee, CURO Summer Fellow
Prof. George Contini, Theatre and Film Studies, Franklin College of Arts and Sciences

Theatre, as a performance form, relies on the physical location of an audience and actors to happen – and these theatrical happenings occur in abundance in the global theatre hub of London. What impact do spatial relationships, understood through cultural geography, both onstage and off have on the theatre performed throughout London? By exploring the impact of government funding structures, international touring productions, and theatre activism throughout London we can possibly develop a model of spatial dynamics integrated with performances that considers both the semiotics of the stage and the

socioeconomic position of performance, performers, and performance venues. Drawing from both existing literature in each field (performance studies and cultural geography), experiential research, and performance criticism this research seeks to develop or begin developing a new frame of reference that can allow theatre companies to quantitatively understand their impact and creatives to understand the relationship of spatial dynamics to theatre.

Conditioned Vowel Mergers in the American South

Shawn Christian Foster, CURO Summer Fellow
Dr. Peggy Renwick, Romance Languages, Franklin College of Arts and Sciences

Two conditioned vowel mergers are found more commonly in the Southern United States than in the rest of North American English. The first of these, the *pin-pen* merger, collapses the distinction between the lax vowels /ɛ/ and /ɪ/ before nasal consonants, and is widespread throughout the majority of the region. The resulting vowel has been previously described as closer to /ɪ/ than /ɛ/. The second, the *fill-feel* merger, affecting /ɪ/ and its tense counterpart /i/, is most strongly associated with the inland South, where it is still less ubiquitous than the *pin-pen* merger. This analysis examines the acoustic profiles of these mergers by providing quantitative and qualitative characterizations of the overlap and distance between the relevant vowel classes as produced by speakers of the region. We also investigate possible connections between the mergers and the general phonology of the South, especially as they relate to the so-called "Southern-Shift." This shift is a series of changes to the pronunciation of Southern Vowels, and includes, among other changes, a raising of the vowels /ɛ/ and /ɪ/ and corresponding lowering of /e/ and /i/. Our findings indicate that the realization of the vowel resulting from the *pin-pen merger* is more variable than previously believed. Several speakers were found to be producing a vowel token closer to /ɛ/ and /ɪ/, or a vowel between the two unmerged allophones that could not be readily identified with either.

Estimating Total Carbon Sequestered in Trees of the University of Georgia

William Fox, CURO Research Assistant
Dr. Puneet Dwivedi, Forestry, Warnell School of Forestry and Natural Resources; Dr. Roger Lowe, Forestry, Warnell School of Forestry and Natural Resources

At the global level, forestlands sequester about 2 billion metric tons of carbon per year, i.e., about 30% of annual anthropogenic carbon emissions. As a result, forests play a critical role in mitigating climate change. However, very little information is present on total carbon sequestered in trees located in urban areas. In this regard, this study estimates carbon sequestered in trees present in the main

campus of the University of Georgia. First, inventory data for trees located in the North and the South campuses will be collected. Second, the green weight of each inventoried tree will be calculated based on height and diameter. Third, dry weight of each tree will be estimated using the appropriate specific density of wood. Fourth, total carbon sequestered in each tree will be assessed by multiplying the dry weight of each tree with the actual percentage of carbon present in the wood. Finally, carbon sequestered in each tree will be summed to get an estimate of total carbon sequestered in the North and South campuses of the University of Georgia. The primary data and outputs will be uploaded on OpenTreeMap to reach broader communities at local, state, and national levels. We are hopeful that this project will not only help the University of Georgia in estimating her carbon footprint, but it will also contribute to our understanding on the role of trees located in urban areas in mitigating climate change.

Menu-Based versus Physical Interaction Systems in Virtual Reality for a Neurological Examination of a Dog

Anton Eduard Franzluebbbers, CURO Research Assistant
Dr. Kyle Johnsen, Electrical and Computer Engineering, College of Engineering

Traditional methods for teaching the techniques and procedures for performing a neurological examination of a small animal such as a dog rely on classroom instruction. Many institutions also have access to live examples of several disorders. A simulation of a dog with the ability to display a large variety of symptoms can broaden students' experience with neurological disorders and may improve their ability to perform these tasks on a live animal. In order to test the effects of a more interactive simulation on the performance of Veterinary Medicine students, a simulation of a dog that responds to various stimuli that are commonly part of a neurological examination was created. This study compares two different methods of interaction with the virtual dog. One of the interaction systems is a more traditional approach to interacting with a virtual patient where the participant uses a menu to instruct the system to perform each test, and the participant can observe the reaction. The other system makes use of current virtual reality systems' abilities to expand user interaction and involvement by requiring the participants to actively perform the tests themselves. Results of this research could show which system is more effective as a teaching or practice tool. It is expected to find that the interactive system generates more thorough and meaningful interactions with the dog that users will find better prepare them for a real neurological examination.

Incidence and Treatment of Pain in Canine Oncology Patients

Shannon Leigh Freeland

Dr. Rachel Reed, Large Animal Medicine and Surgery, College of Veterinary Medicine

Millions of Americans are affected by cancer every year and many of those who undergo treatment experience extreme pain and discomfort. Canines also experience a high prevalence of cancer in their population, but there is insufficient research regarding the pain they may experience during treatment, as this information is more difficult to ascertain in animals. The aim of this study was to determine the prevalence and management of pain in dogs with cancer that were undergoing treatment. The subjects were evaluated and then assigned a pain score between 0 and 5. Each patient's owner was provided a survey that asked about any changes in their dog's behavior between the time they were healthy and their current state. The data showed that there was no relationship between a dog being on an analgesic and being given a pain score of 1 or higher. While there were dogs with a pain score of 0 whose pain was being treated appropriately, there were also dogs with a pain score of 2 that were not on any analgesics. Overall, 33.7% of the dogs were experiencing some level of pain, which is lower than the prevalence seen in human cancer patients. While it is definite that the population of canine cancer patients experience pain to some degree, our ability to perceive and treat that pain appropriately is unclear. Accurate pain evaluation must be an integral part of oncologic exams so that we can ensure the best experience possible for these patients.

Testing the Effects of PAD4 Inhibitors on Neutrophil Effector Functions

Joshua Fricker, CURO Research Assistant

Dr. Balazs Rada, Infectious Diseases, College of Veterinary Medicine

Cystic Fibrosis (CF) is a genetic disease that produces a buildup of thick mucus in the lungs and other organs of the patients. This mucus blocks airways and traps bacteria, which leads to infection, lung damage, and ultimately lung failure. Neutrophils, white blood cells that lead the charge against infections, contribute to the lung damage found in CF patients. Formation of Neutrophil Extracellular Traps (NETs) represent one potential mechanism of neutrophil dysfunction in CF. Inhibiting NET formation in CF could potentially lead to improved lung function. My project focuses on novel inhibitors of the enzyme Peptidylarginine deiminase 4 (PAD4). PAD4 is highly expressed in neutrophils and is essential to mediate NET formation. In my work, I will assess the effects of these PAD4 inhibitors on neutrophil effector mechanisms. Our preliminary data show that these PAD4 inhibitors decrease NET formation

in human neutrophils. To ensure that these inhibitors do not interfere with other, essential antimicrobial functions of neutrophils, I will test the effects of PAD4 inhibitors on neutrophil-mediated killing of CF clinical isolates of bacteria, *Pseudomonas aeruginosa* and *Staphylococcus aureus*, superoxide production, phagocytosis, and degranulation. If PAD4 inhibition significantly inhibits NETs without affecting other processes of neutrophils, it will indicate its potential use as a novel NET inhibitor in CF.

A New Approach to Improved Treatment of Type 3 *Streptococcus pneumoniae*: A Purification Exploration

Nikhil Reddy Gangasani, CURO Honors Scholar

Dr. Fikri Avci, Biochemistry and Molecular Biology, Franklin College of Arts and Sciences

Bacterial pathogens express sugars called capsular polysaccharide (CPS) on their surface. If appropriately presented to the immune system, these sugars are recognized as foreign bodies called antigens, leading to a strong immune response against the bacterial pathogen. One bacterial pathogen, *Streptococcus pneumoniae* (Spn), causes pneumococcal diseases like pneumonia. There exist over ninety strains of Spn, each with a unique CPS structure. High rates of mortality from type 3 Spn (Pn3) remain despite antibiotic usage and vaccine programs. Our research has focused on a novel approach to diminishing the threat of Pn3. This approach involves a hydrolase enzyme produced by *Paenibacillus* sp. 32352 called Pn3Pase, which degrades the Pn3 CPS (Pn3P) into smaller oligosaccharide residues. While purifying Pn3Pase, we have characterized Pn3Pase, studied its interactions with Pn3P, and structurally characterized the consequent oligosaccharide degradation products. Because of its ability to shed the virulent Pn3 CPS, Pn3Pase's potential as a therapeutic against Pn3 is under investigation.

The Ideal Feminine Beauty and Sexuality in Italian Fashion: A Comparative Analysis of Versace and Prada

Bianca Garcia, CURO Research Assistant

Dr. Katalin Medvedev, Textiles and Merchandising, College of Family and Consumer Sciences

As a complex socio-cultural global phenomenon, the fashion system holds immense—yet frequently unacknowledged—societal power because it both constructs and reflects ideal notions of beauty and sexuality. However, there are often heavily enforced institutional pressures to achieve those ideals. This research examines these institutional pressures and investigates how they affect women in contemporary American and Italian societies. Using a feminist lens, I analyze and contrast two Italian fashion brands Versace and Prada to see how each upholds and promotes their respective notions of ideal feminine beauty and sexuality.

I apply feminist theories about the unnatural body, and explore the function of both the male and female gaze on women from the perspective of the two design houses, Versace and Prada. Because of the intense visual culture that permeates contemporary Western society, the crux of this research relies heavily on photographic documentation of clothing designs and advertisement campaigns from fashion publications such as *Vogue* as well as each brand's online catalogues. I treat specific articles of clothing and outfits as material objects, analyzing their socio-cultural significance and understanding them as physical representations of the respective designer's philosophy and practice. In addition to comparing Versace and Prada's differing views of female beauty, I recognize that there remains an insidious, yet pervasive institutional pressure to achieve both ideals promoted by the two designers. This phenomenon is referred to as the 'Double Venus' or the 'Madonna and Whore' dichotomy. I explore its function within the historical context of Italian fashion as well as its role in the global fashion system.

Water Footprint Assessment of Food Crops

Galilea Najera Garcia, CURO Honors Scholar
Dr. Sudhagar Mani, Chemical, Materials, and Biomedical Engineering, College of Engineering

The purpose of this research is to develop a modeling framework for estimating the water footprints of major food crops produced in the state of Georgia. The interconnections between production of food crops, water usage, and energy consumption are critical to understand the FEW (Food, Energy, Water) nexus. The recent trend in production, use of local foods and an effort to eliminate food deserts further drives the FEW nexus at the local level. Therefore, it is important to investigate the demand and supply of water for food production at the regional level. Water footprint analysis is a tool that measures total water used both directly and indirectly to produce the goods and services we use. Total water use is comprised of: (1) blue water -water that has been sourced from surface or groundwater resources; (2) green water - water from precipitation and (3) grey water -amount of freshwater required to assimilate pollutants to meet water quality standards. In this research, a systematic modeling framework to calculate water footprints of major food crops from production to its end use was developed to account for direct and indirect water consumptions. The local climate, soil conditions, fertilizer use, crop yield and water use for each crop was collected and integrated to estimate the water footprints. The impacts of various fractions of water required or used for each crop will be further examined to map the water demands and to develop strategies to assess the water resilience of food crops in the region.

Characterization of Pectate Lyases from *Paenibacillus amylolyticus*

Rebecca Marie Gardner, CURO Research Assistant
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Pectinases are enzymes that cleave pectin, an important plant cell wall polysaccharide, and are useful for fruit juice extraction and clarification, textile processing, wastewater treatment, and papermaking. An emerging application of pectinases is the production of sustainable cellulosic ethanol from agricultural waste products like citrus peels, apple pomace, and sugar beet pulp. Better understanding of these enzymes and identification of new pectinases could help improve these industrial processes. One potential source of new pectinases is the hindgut of *Tipula abdominalis* larvae, which relies on microorganisms to degrade cellulosic biomass. Two pectate lyases (a specific type of pectinase), PelA and PelB, found in one hindgut bacterium, *Paenibacillus amylolyticus*, have demonstrated broad substrate specificities, possibly replacing multiple classes of pectinases. A genomic analysis of *P. amylolyticus* identified two additional pectate lyases, Pamy_1763 and Pamy_4669. The enzymes were heterologously expressed in *Escherichia coli*. The research question of interest is: what are the characteristics of these pectate lyases? In pursuit of this answer, the optimum pH, temperature, and calcium concentration of these enzymes were evaluated using a spectrophotometric pectate lyase assay. Thin layer chromatography (TLC) was used to determine the minimum product size of the enzymes in optimum reaction condition, and any change in product size was examined when multiple pectinases were used. Exo- or endo- function of the pectinases was determined as well through TLC. Reaction kinetics was determined with purified proteins. All of these parameters help in understanding how these enzymes work as a system to enzymatically deconstruct pectin.

Using Gene Expression Analysis to Understand Marine Microbial Biogeochemistry

Alizah Garvin
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The oceanic environment is a complex system where microorganisms must constantly adapt to changing chemical, physical, and biological challenges in order to thrive. Genetic expression is an observable manifestation of a gene that reflects an organism's immediate response to its environment. Thus, gene expression analysis can aid in the understanding of microbial growth and survival strategies under shifting biogeochemical conditions in the ocean. A key methodology for tracking gene expression is real-time quantitative polymerase chain reaction (RT-qPCR). Here, I

tested 13 RT-qPCR primers one of these primers will help us understand phytoplankton responses to iron limitation, specifically the expression of ISIP3 (iron starvation induced protein) and FLDA1 (flavodoxin) in the model diatoms *Thalassiosira oceanica* and *Thalassiosira pseudonana*. Other primers that I have established protocols for will target the expression of superoxide dismutase (SOD) in *Emiliania huxleyi*. In order to test the primers, I extracted the RNA from culture samples, converted the RNA to cDNA, and ran either endpoint PCR or RT-qPCR to test for amplicon production and amplification efficiency, respectively. Overall, the major findings of this study were (1) all primer sets can successfully amplify the reference and target genes and (2) the efficiencies of most sets are not within optimal range, although several revisions are recommended.

KPT-335 Resistant in Influenza A

Erica Gattiker

Dr. Ralph A Tripp, Infectious Diseases, College of Veterinary Medicine

Influenza virus is global health concern causing some morbidity and mortality in vulnerable populations each year. Therapeutic drugs exist, including neuraminidase-inhibitors and M2 ion channel inhibitors but there has been rapid emergence of drug resistant strains rendering them less effective. A novel class of drugs known as Selective Inhibitors of Nuclear Export (SINEs), in particular Verdinexor (KPT-335), shows promise as an effective antiviral treatment against respiratory viruses such as influenza virus. Studies suggest the mechanism of action of KPT-335 is that it blocks exportin 1 (XPO1/CRM1)-mediated transport of viral proteins from the host nucleus. Another licensed antiviral drug, oseltamivir (Tamiflu) is used to treat and prevent influenza A virus (IAV) and influenza B viruses (IBV). This study aimed to better understand drug resistance to KPT-335 by relevant and circulating IAV. We compared oseltamivir-sensitive and -resistant IAV strains and development of resistance to increasing KPT-335 concentrations over the course of 10 passages of IAV in respiratory epithelial cells. IAV growth was confirmed via hemagglutination assay after each passage. Importantly, with the concentration of the drug inhibitor (KPT-335) reduced by half (>IC50) concentration we observed HA positive samples which could be indicative of the development of drug resistance. This work would help to identify viral mutations that confer resistance and help drive antiviral therapeutic drug resistance.

The Association Between Knowledge of Vitamin D and Blood Levels of 25-Hydroxy Vitamin D among Black/African-American College Women

Catriona Geddes, CURO Honors Scholar, CURO Research Assistant

Dr. Jennifer L Gay, Health Promotion and Behavior, College of Public Health

Vitamin D (25-hydroxy Vitamin D) is essential for bone health and the immune system as it aids the body in fighting off bacteria and viruses. It helps bones absorb calcium, preventing bones from becoming brittle and breaking easily. Previous research indicates that low levels of vitamin D decrease the absorption of calcium by up to 15%. Although college students are not thought of as at risk for vitamin D deficiency, the Institute of Medicine cites people with limited sun exposure and poor diet as being at increased risk of deficiency. Further, women of color are at greater risk for deficiency. This project tested the association between African American/Black female college student knowledge of vitamin D affects their vitamin D levels. Twenty-five African American female undergraduates were recruited for this project and participated in four assessments throughout the academic year. Each assessment consisted of a survey, which included questions about dietary habits, exercise, and study habits, and a serum 25-hydroxy Vitamin D blood test at the University Health Center. Analyses will include correlation analysis and will look specifically at the amount of knowledge that a participant had about Vitamin D. It is hypothesized that knowledge of vitamin D will affect vitamin D levels because a person is more likely to be proactive with regard to taking supplements and/or ensuring that they have enough vitamin D in their bodies either through diet or exposure to the sun.

Violence Against Protestants in Sixteenth-Century France

Morgan Frederick Geiser, CURO Honors Scholar

Dr. Benjamin Ehlers, History, Franklin College of Arts and Sciences

Tensions between European natives and Muslim migrants have escalated to the point where they can no longer be ignored. However, this is not the first time that religious and cultural divides have fueled social tensions in Western Europe. By studying the past bloodshed in the name of religion, we can develop a broader understanding of the problems we face today. My research seeks to explore Catholic violence against Huguenot civilians during the French Wars of Religion to study the roots of the conflict that led to the deaths of thousands of Frenchmen and women during the sixteenth century. This study was conducted by analyzing primary source accounts from both sides regarding specific acts of violence and searching for trends in behavior linked to the violence. Archival sources

at the Bibliothèque Nationale de France revealed that perceived oppression and desire for self-preservation caused the violence against civilians during the French Wars of Religion. The ways in which religion affected laypeople's thought and action shed light upon the current acts of religious violence in France and the rest of Europe. Knowing the nature of the religious conflict of the past will allow for a better understanding of the ways in which religious and cultural tensions arise and develop, and how they can be avoided in the modern world.

Play More, Worry Less

Rebecca Gemes, CURO Research Assistant

Dr. Melissa Landers-Potts, Human Development and Family Science, College of Family and Consumer Sciences

How do students at UGA spend their free time and do these habits detract from their engagement in stress-relieving play? The research is significant because it provides an assessment of students' needs and wishes with respect to activities that are stress-relieving. Depression and anxiety have been on the rise at UGA and throughout the country and play has been shown to decrease both. We will use a survey for UGA undergraduate and graduate students to assess student need and support for installing small play/recreation areas on campus. We will collect information regarding students' age, gender, academic major, and free time use, as well as how much time they devote to academics, in order to use the information to make connections between their academic success and free time habits. We anticipate that our research will show how students' time-use habits across many different avenues (extra-curricular, studying, and free time) are associated with their academic performance and how they may hinder stress relief. It will also serve to identify which underutilized areas on-campus students feel would be best on which to install play areas. We will use a Qualtrics survey that participants will access online. Study variables will include students' age, gender, academic major, time use habits, and preferences for play area location and equipment. There will also be two open-ended questions regarding the latter two variables. We will use SPSS to analyze the data that is gathered from the Qualtrics survey. For qualitative information, we will use content-analysis.

Biochemical Characterization of Missense Mutations in O-GlcNAc Transferase Found in Patients with X-Linked Intellectual Disability

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O-GlcNAc is an abundant post-translational modification of nucleocytoplasmic proteins that has been implicated

in biological processes such as transcription, cell-cycle regulation, and nutrient-sensing. O-GlcNAc transferase (OGT) catalyzes the reversible transfer of the monosaccharide N-acetylglucosamine (GlcNAc) from the donor substrate UDP-GlcNAc to serine and threonine residues on nuclear, cytosolic, and mitochondrial substrates, while the enzyme O-GlcNAcase (OGA) reverses this process. Through exome sequencing of multiple patient samples, 7 individual missense mutations in OGT appear causal for X-linked intellectual disability (XLID). However, the effect of each of these mutations on enzyme characteristics is poorly understood. To elucidate the mechanism through which each mutation causes development of XLID, the recombinant, purified OGT variants are being characterized through analyses of stability, dimerization, and enzyme activity/kinetics. We have also recapitulated several of the mutations using Cas9 technology into a human male embryonic stem cell to generate isogenic lines for further study including differentiation into neural lineages, RNA Seq, DNA methylation, and interactome analyses. Thus, we are taking a systematic approach to define the mechanism by which mutations in the gene encoding OGT lead to the XLID phenotype.

Effects of Schizophrenia on Error Correction Latencies of the Minimally Delayed Oculomotor Response Eye Tracking Task

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Saccades are rapid eye movements in response to a stimulus that can be tracked as a method of neurological evaluation. Performance on saccade-producing tasks conveys information about particular neural functioning utilized during that task. The antisaccade task involves multiple cognitive elements such as inhibition, working memory, spatial memory, and decision making. Eye tracking has been utilized to examine neurological disorders including schizophrenia and can demonstrate specific deficits in cognitive control; for instance, individuals with schizophrenia typically show higher error rates than healthy individuals on the antisaccade task due to deficits in cognitive inhibition. The minimally delayed oculomotor response (MDOR) task is an alternative task intended to isolate inhibition from other cognitive demands of the antisaccade task, but has only been tested in a limited capacity. While behavioral data expectedly reveals similar error rates for both the antisaccade task and MDOR for healthy individuals, the latencies of error corrections for MDOR have yet to be studied in either healthy or schizophrenic participants. Because MDOR error correction requires conscious error recognition as well as re-engaged inhibition prior to correction, we anticipate that individuals with schizophrenia would present longer latencies than

healthy individuals due to the efforts to discontinue the conscious re-engagement of inhibition. By evaluating the error correction latencies of MDOR, we will better understand not only the process of executing cognitive inhibition in schizophrenia, but also the accuracy of the MDOR task relative to the antisaccade task in regards to cognitive inhibition.

Immunomodulatory Effects of Cortisol, Vitamin C and Thiamine on Equine Leukocytes Function in an *ex vivo* Bacterial Sepsis Model

Shyla Cheri Giancola

Dr. Kelsey Hart, Large Animal Medicine and Surgery, College of Veterinary Medicine

Bacterial sepsis and the systemic inflammatory response syndrome (SIRS) is a leading cause of morbidity and mortality in horses and foals. Both age and illness result in immune and endocrine impairment that effects disease severity and mortality. Innate immune cells play a vital role in the initial immune response, but their function is dysregulated in sepsis and SIRS. It has been shown that immunomodulatory factors, such as cortisol, thiamine, and Vitamin C, alter leukocyte function in human models; thus, there may be potential to improve septic horse and foal outcomes with this treatment. However, the effects of these compounds on equine immune function are unknown. Therefore, the objective of this study is to determine the concentration-dependent effects of cortisol, thiamine and vitamin C individually and in concert on equine leukocyte function. Our hypothesis is that *ex vivo* exposure to bacteria in the presence of cortisol, thiamine, and vitamin C individually and in concert will differentially modulate foal and horse leukocyte function. Neutrophil production of reactive oxygen species (ROS) production in the presence and absence of physiologically relevant concentrations of cortisol, thiamine, and vitamin C will be assessed. ROS production will be quantified using a previously validated fluorometric assay. We anticipate that these compounds will regulate neutrophil function in a dose-dependent manner, and that there will be synergy between the compounds when they are used in concert. Results from this preliminary study will be used to determine effective doses for these immunomodulatory factors for future *ex vivo* and *in vivo* studies.

Comparing Discrimination Methods to Amplify Bacterial DNA from Plants

Cecelia Giangacomo, CURO Research Assistant

Dr. Jason Wallace, Crop and Soil Sciences, College of Agricultural and Environmental Sciences

Microbiomes exist beyond the depths of vision almost everywhere that we look. In agriculture, microbiomes exist on plant leaves, inside of the plants, and in the soil.

These microbes can interact with the host plant, and manipulating the microbiome could provide important health benefits to the plant. One of the most common ways to analyze the microbiome involves amplifying DNA through PCR. Conserved priming sequences and small starting percentages of microbial DNA make it difficult to discriminate plastid DNA from the host without introducing a large degree of bias. Many methods have been used to discriminate against host DNA, but there has been no comparison of the accuracy and cost-efficiency of the different methods when used on plant tissue. Three discrimination methods- anti-chloroplast primers, blocking primers and PNA clamps- were compared in their ability to discriminate against host DNA during amplification with PCR. Each discrimination method was tested on DNA samples from leaves, soil, and a known bacterial community under standard conditions. The resulting libraries were sequenced, and the discrimination methods were compared for their ability to amplify target DNA.

Subculture Merchandising Experiences: Data Analysis and Results (Part 2)

Ariana Gibson-Rivera, CURO Research Assistant

Jose Armando Pena

Dr. Monica Sklar, Textiles and Merchandising, College of Family and Consumer Sciences

The objective of the subculture merchandising experiences project is to uncover the intricacies of the production and consumption process for niche groups outside of the mainstream. Subcultures frequently build identity and community through art, music, and politics. Multiple themes and resulting projects emerged from analyzing data gathered through a mixed method of collection through Facebook, an online survey, personal discussions, and a critical literature review. First, mainstream fashion is commonly influenced by alternative cultures and there is a delicate balance between authentication versus appropriation. Data analysis highlights success stories of subcultural trends trickling their way up into mainstream society without loss of intended symbolism. Next, this research explores the spectrum of masculinity in subculture and how it has progressed in expression through men's styles, particularly their trousers. Additionally, findings reveal insights into the social educators that introduce individuals to subcultural concepts, aesthetics, and the adoption process. Furthermore, conversations and surveys construct a map of the history of these often hidden retail spaces that have served as community hubs. On the contrary, data also showcased a do it yourself strategy some subcultures employ for merchandising rather than the confined boutique and online environments. Together these studies tell the narrative of fashion outliers coming together for support while redefining what is accepted as mainstream fashion.

Analysis of the Prevalence of Task- and Relational-Oriented Leadership Behaviors in a Small Group Context

Ben Giebelhausen, Ramsey Scholar, CURO Research Assistant
Dr. Adam Goodie, Psychology, Franklin College of Arts and Sciences

Psychologists have been studying leadership behavior for over 50 years. Researchers have distinguished two separate categories of leadership behaviors: task-oriented and relations-oriented. The current research focuses specifically on situations in which a group of people has no designated leader and examines which of these categories are more prevalent in differing circumstances. This experiment consisted of placing participants in groups of four or five and asking them to perform a group task in which they planned a marketing strategy for a hypothetical product. The experimental manipulation occurred in the presentation of this marketing task. For half of the groups, the task was framed with a "prevention" mentality: their team already had a client, and they simply needed to avoid losing them. The other groups were given a "promotion" oriented prompt: their team goal was to win a new client. Both individual and group surveys were given, and all group interactions were video recorded. The video records were examined by researchers, and behaviors were categorized into task and relations oriented leadership behaviors. Participants were recruited from the University of Georgia Psychology Department research pool, and as such were all college students taking an intro to Psychology course. It was hypothesized that the values and mindset of task-oriented leaders would align more with the "prevention" groups, so those groups would demonstrate more task behaviors; the opposite is true of the "promotion" groups: relation-oriented behaviors would be promoted, so that kind of leader would demonstrate more behaviors. Results are discussed.

The Healing Influences of Built Environments: A Case Study of Healthcare

Delaney Erin Givens, CURO Research Assistant
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With the prospect of being hospitalized stressful, mentally and physically, there is an increasing need not only for better healthcare services, but also for built environments that support and nurture the wellbeing of individuals hospitalized. This qualitative research study explores the healing influence that healthcare built environments may have on the health recovery of patients hospitalized, specifically the patient waiting areas and patient rooms. With that knowledge, the study intends to highlight the findings in a design for a patient room and waiting area. Firstly, research how the present health care movement has incorporated elements of the built environment into

the design of hospitals. Elements of the built environment defined as daylight, surface materials, acoustics, sound, way finding, and windows. Secondly, the study will research architectural floor plans and furniture selections for hospitals in an effort to understand architectural and furniture trends in relation to the built environment. Thirdly, the study will interview patients in an effort to understand patient perceptions of the built environment. Lastly, a waiting area and patient room will be designed based on the study's findings. This study is significant because it provides insights into a design area that is growing for interior designers.

Bringing the Laboratory to the High-Enrollment Undergraduate Organic Chemistry Classroom: Reaction Monitoring Remotely Using Benchtop NMR Technology

Caroline Glessner, CURO Research Assistant
Dr. Richard Morrison, Chemistry, Franklin College of Arts and Sciences

A variety of laboratory techniques are utilized to follow the progress and understand the kinetics of a reaction. As monitoring a reaction *in situ* becomes more heavily explored, ^1H NMR has proven to be an effective approach. ^1H NMR does not require specific functional groups and can provide structural information about the sample. High-field NMR instruments have been used for this type of research, yet due to their large footprint and maintenance requirements, these instruments are limited to research and low-enrollment advanced undergraduate instructional settings. When considering translating reaction monitoring to the large-enrollment sophomore organic chemistry course, low-field benchtop ^1H NMR instruments are ideal. This technology can be used to monitor reaction progress and have the benefit of remote operation from a distant lecture classroom. Using this idea, classroom demonstrations displaying the reaction monitoring capabilities of the benchtop 82 MHz picoSpin NMR have been developed for reactions such as the hydrolysis of an ester and the Fischer esterification. The reaction mixture is simply injected into the capillary, and spectra are recorded at different time intervals to show the conversion of reactants to products. Analyses of produced spectra display the emergence, disappearance, and/or shift in signals. From integration values for signals, a kinetics plot can be generated to understand how rapidly the reaction occurs and where it lies in relation to equilibrium at different times. These demonstrations provide students with the unique educational opportunity of approaching ^1H NMR spectral analysis differently and expanding their knowledge regarding various applications of the technique.

A Multi-Outcome Experiment Involving the Green Oxidation of Alcohols in the Undergraduate Teaching Laboratories

Caroline Glessner, CURO Research Assistant

Dr. Richard Morrison, Chemistry, Franklin College of Arts and Sciences

In a breathalyzer, the primary alcohol ethanol is oxidized to acetic acid in an oxidative environment containing sulfuric acid, potassium dichromate, silver nitrate, and water. At the University of Georgia, undergraduate organic chemistry students perform a laboratory procedure that parallels the chemical transformations that occur in the breathalyzer instrument. However, the experiment is modified to utilize more environmentally-sustainable components, such as bleach, as the oxidizing agent. Herein is described the procedure for a multi-outcome experiment (MOE) in which one unknown secondary alcohol is oxidized to a ketone using household cleaning bleach. Students are provided with a palette of three potential unknown secondary alcohols, 2-pentanol, 3-pentanol, and 3-methyl-2-butanol, and analyze the products using FTIR and benchtop NMR spectroscopy to deduce the identity of the unknown alcohol used. Due to the large footprint, high operation costs, and maintenance requirements of high-field NMR instruments, the incorporation of this technology into the instructional laboratory is limited and typically reserved for upper-level courses. However, the use of the benchtop 82 MHz picoSpin allows undergraduate students to work with this analytical tool. This experiment will contribute to the reinforcement of lecture-learned concepts through the student understanding of the utility of NMR spectroscopy.

Determination of Pneumocystis Pneumonia Vaccine Candidates through Prophylactic Vaccination and iNKT Adjuvant Boosting

Erick Godinez, CURO Research Assistant

Dr. Karen Norris, Infectious Diseases, College of Veterinary Medicine

There are currently no clinically approved vaccines against fungal pathogens. The fungal pathogen, *Pneumocystis jirovecii*, causes Pneumocystis pneumonia (PCP) in HIV-infected and other immunocompromised persons. Our laboratory has previously demonstrated that low antibody titers against the *Pneumocystis* antigen, KEX1, predicts subsequent susceptibility to PCP following SIV-immunosuppression in a NHP model of SIV and Pneumocystis co-infection. Additionally, it was demonstrated that protection against PCP can be induced by vaccinating with a recombinant subunit of KEX1. Despite the success of KEX1 immunization against PCP, persons most susceptible to fungal infection are often already immunosuppressed and respond poorly to conventional vaccination strategies. This poses a challenge in the long-term application of

the vaccine. Given the previously demonstrated increase in antibody response against *Pneumocystis* infection, we hypothesize that KEX1 humoral responses in HIV-immunosuppressed persons may be boosted through T-independent vaccination strategies. We will assess the potential of an invariant natural killer cell adjuvant to boost anti-Kexin humoral responses during the early chronic phase of SIV-induced immunosuppression through the observation of circulating Kexin-specific antibodies. It is anticipated that the iNKT cell adjuvant boosting will yield an increased antibody response in the SIV-immunosuppressed individuals thereby demonstrating KEX1 as a potential vaccine candidate for future clinical trials.

Motherhood in Bertolt Brecht's *The Caucasian Chalk Circle*

Anna Goebel

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Bertolt Brecht (1898-1956) was a theater practitioner and playwright whose work spans from 1923 to 1956. He pioneered Epic Theatre, a theory and method that was a response to the political climate of the early 20th century. Epic theater aimed to address issues relating to contemporary existence and encouraged an objective response from the audience. Using the methods of Epic Theater, Brecht examines the construction of motherhood in his plays *Mother Courage and her Children*, *The Caucasian Chalk Circle*, and *Senora Carrar's Rifles*. In my paper, I will demonstrate that Brecht proposes that the concept of motherhood changes based on socioeconomic status and social climate the figures are in, making it impossible to define motherhood through a set of fixed attributes or characterizations.

Evaluating the Effect of Neural Stem Cell-Derived Exosomes on Neovascularization Following Traumatic Brain Injury

Morgan L Goeden

Dr. Lohitash Karumbaiah, Animal and Dairy Science, College of Agricultural and Environmental Sciences

Each year over 1.7 million people in the United States suffer from moderate-to-severe traumatic brain injuries (TBI). A TBI is defined as an injury to the brain caused by a violent blow to the head by an external force. The initial injury to the brain constitutes the primary phase of the injury and is characterized by the disruption of neurovasculature and impact-induced cell death. The secondary phase develops over an extended period following the injury and causing further damage to the tissue. There are currently no effective treatments for people affected by TBI. We hypothesize that the TBI will significantly decrease the vascular density surrounding the injury site and that the INSC derived exosome treatment will induce angiogenesis

and tissue repair surrounding the injury site. This study looks to assess the change in vascularization surrounding the injury site post-TBI and the effectiveness of neural stem cell (NSC) derived exosomes as a potential treatment for TBI. The treatments were administered via tail vein, at 12, 24, and 48h post-TBI and sacrificed at 4 weeks post-TBI. Immunohistochemical analysis of brain tissue was performed to investigate the change in vasculature density after a TBI, and assess the effect of the proposed treatment on this change. The analysis of vasculature provides a point of comparison to determine functional tissue repair and regrowth. The significance of the expected changes ($p < 0.05$) will be determined by the difference to the uninjured brain as a reference point for healthy, functional tissue.

Pack Up Your Things and Go: Photoreceptor Packing in the *Anolis sagrei* Lizard

Nicole Googe, Foundation Fellow

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Responsible for much of the finer aspects of vision, the fovea—a pit-like structure—is a specialized area of the retina with an extremely high density of photoreceptor cells. In humans, the fovea develops late in gestation first by the formation of a pit through the lateral displacement of the proximal retinal cell layers (i.e. the ganglion cell and inner nuclear cell layers). Shortly after birth, photoreceptor cells (outer nuclear layer) begin to move toward the fovea center—a process known as photoreceptor cell packing, which continues until a child is 4 years of age. In primates, photoreceptor cell packing at the fovea center correlates with the expansion and growth of the eye. To determine whether this is isolated to primates or is applicable in other foveated species, we are exploring this relationship in the bifoveated *Anolis sagrei* lizard—a new model system for developmental studies. Establishing the process by which the fovea develops is an integral step towards understanding and developing therapeutic approaches for ocular disorders and other vision impairments that affect the fovea. Ocular measurements and histological analysis were performed on eyes collected from hatchlings raised to 2, 4, and 6 months of age. These analyses will allow the determination the relationship between age, sex, size of the lizard, eye size, and density of photoreceptor cells within the foveae. I expect the results will show a direct positive relationship between the size and age of the lizard and the density of photoreceptor cells in the associated foveae.

Finite Mixture of Normal Distributions for Robust Bayesian Small Area Estimation

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National statistical offices around the world have been mandated for many years to produce reliable small area statistics for important variables such as population, income, unemployment, and health outcomes. Traditional direct estimates computed using only sampled data from individual sub-populations, called small areas, are usually unreliable due to small sample sizes, and hence model-based estimates are called for. However, standard model-based estimates, which rely on auxiliary variables, are sensitive to the presence of outliers. This research proposes a robust alternative to popular models in small area estimation. To handle outliers in unit-level data, we extend the nested error regression model to consider a two-component scale mixture of normal distributions, where outliers come from a distribution with a larger variance than non-outliers. Specifically, we suggest an alternative non-informative prior for the mixture model variance components. After developing the theory for a robust hierarchical Bayes method under non-informative priors for various model parameters, we will also develop R codes to implement Gibb's sampling to analyze data by the proposed method and compare its performance with other robust small area estimation techniques, such as those given by Sinha and Rao, and those by Chakraborty, Datta and Mandal, via extensive simulations.

Enhancement of Space-Borne Sensors through Adaptive Temperature Control and Thermoelectric Modules

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The advent of small satellites and their ability to perform orbital science on a small and relatively cost-effective basis has resulted in a near-exponential growth of the market since inception. Due to their convenience, many of these small satellites use image sensors to study the Earth and astronomical events. The small package these sensors are housed in can be degraded though, due to the higher impact of heat generation from the satellite. Past research using thermoelectric modules to cool satellite sensors has shown strong promise and interest, and has encouraged the further development of a feedback control system to optimize temperature set-point and energy consumption. The feedback system includes coding and tuning of a Proportional-Integral-Derivative (PID) controller to control the thermoelectric module to a stable and set low temperature through different environments, like extreme

vacuum. The system also integrates additional hardware, including thermocouples and processors. The combined thermoelectric and feedback system will demonstrate the ability of the system to efficiently operate the thermoelectric module within 5 degrees Celsius and low input power. The combined feedback system with the thermoelectric module has far reaching applications, from enabling higher quality cameras to faster and more efficient computers.

Development of Virus-Like Particle Based Vaccines Targeted Against Emerging Strains of H5Nx Highly Pathogenic Avian Influenza

Connor Grady

*Dr. Ted M Ross, Infectious Diseases,
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Avian influenza virus can have devastating effects on the United States' poultry industry. Although this virus predominantly resides in wild waterfowl, it commonly spills over into poultry and results in alarmingly high infection rates. Highly pathogenic avian influenza (HPAI) infection in poultry results in the culling of chickens and turkeys; this has a significant economic impact on the United States' market. Avian influenza is able to spill over into the human population and often has tragic results, causing severe upper respiratory tract infections, hospitalization, and death. HPAI infection in humans is often fatal; the mortality rate for avian influenza infection is 60%. Although HPAI in humans happens rarely and cannot be transmitted easily from one individual to another, the virus mutates at a rapid rate and has the potential to become a human transmissible agent. Therefore, the development of safe and effective vaccines against HPAI are needed to control the spread of disease in avian populations and in humans during a pandemic situation. Virus-Like Particles (VLPs) are multimeric nanoparticles engineered to express immunogenic proteins and mimic the structure of wild type virus particles. These characteristics make VLPs useful as a vaccine platform. Unlike other vaccines, VLPs are devoid of genetic material, rendering them non-infectious. Here, VLP-based vaccines were developed in order to target two strains of H5 HPAI: A/Chicken/Egypt/CAL3-RLQP/2017 (H5N1) and A/duck/Egypt/S78-RLQP/2017 (H5N8). These VLP vaccines will be tested in a mouse model to determine if they are effective in eliciting protection against HPAI challenge.

Hidden Histories: The Stories that Don't Get Told

Kristen Nicole Gragg

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In my research, I will examine the effect that the passing of time has on the authenticity of historical retellings; furthermore, I will study the lasting impact of individuals

involved in a historical event. Although the Seney-Stovall Chapel is an important cultural center for Athens and the University of Georgia, the history of the place itself and the stories of the women who built it are often forgotten or neglected. So, to focus my project, I will research the construction of the Lucy Cobb Institute, opened in 1859, and the Seney Stovall Chapel, built in 1882. My research will combine the use of primary and secondary source materials—obtained through the University of Georgia library—to determine the accuracy of the currently accepted histories of these sites, as well as the individual stories of the women involved in their creation.

The Associations Between Neuroticism, Executive Function, and Brain Volume in Older Adults

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Literature suggests that cognitive functions modestly decline in older adults specifically those related to attention, memory, and executive function. Executive function is a complex set of cognitive processes employed in making plans, initiating actions, completing goals, and inhibiting compulsory actions. Low executive function has been linked with decreases in cortical volume in the frontal lobe and the anterior cingulate gyrus in older adults. Grey matter and white matter volume correlate negatively with executive function. High scores on the personality trait neuroticism have been linked to difficulties with executive function in older adults. Neuroticism is a propensity to feel negative emotions and psychological distress. High neuroticism has been correlated with decreased volume in the anterior cingulate gyrus, dorsolateral prefrontal cortex, and orbitofrontal cortex. We predicted that cortical volume mediates the relationship between neuroticism and executive function in older adults. Imaging data from 91 older adults ages 60-89 ($M=73.49$, $sd=6.48$) were collected from 3 previous studies. The participants also completed the Delis-Kaplan Executive Function System as a measure of executive function and the NEO-FFI to assess neuroticism. Volumes of *a priori* regions of interest (anterior cingulate gyrus, orbitofrontal cortex, inferior frontal gyrus, middle frontal gyrus, dorsolateral prefrontal cortex, hippocampus), global white matter and grey matter were chosen based on previously investigated relationships in the literature. We expect that high neuroticism will be associated with lower executive function. We also predict that the association between high neuroticism and decreased executive function will be mediated by low cortical volume.

The Effect of Enhanced Mitochondrial Function on Restoration of Muscle Strength after Volumetric Muscle Loss Injury

Bethany Graulich

Dr. Jarrod A Call, Kinesiology, College of Education

Volumetric muscle loss (VML) injury results from trauma that involves severe loss of tissue and long-term muscle dysfunction. Ongoing research is attempting to find a way to combat the consequential muscle weakness. It is hypothesized that improving mitochondrial function and quality within the remaining muscle after VML could play a role in restoring muscle strength. For this study, a VML injury was performed on the left gastrocnemius muscle of 8-week old mice. Since exercise has been shown to increase mitochondrial content and function, voluntary wheel running was used as a mode of post-injury rehabilitation. The mice were randomly divided into three groups: 1) no VML injury with exercise, 2) VML injury without exercise, 3) VML injury with exercise. The uninjured right gastrocnemius muscle of each mouse was used as a control. Exercised-induced changes in mitochondrial content were assessed by an array of mitochondrial enzyme assays. Mitochondrial function was also determined by measuring the mitochondrial oxygen consumption rate. Muscle strength was assessed after four weeks of wheel running. These investigations will determine if improvements in mitochondrial content and function have an effect on muscle strength recovery following a VML injury.

Computational Research on Resveratrol Binding to DNA Polymerase

Lindsey Greenfield, CURO Research Assistant

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DNA polymerase is responsible for DNA replication and repair in order to correctly develop, maintain, and reproduce the life of organisms. The replicative DNA polymerases are template directed and often contain an exonuclease function that is regulated by a hairpin loop to correct errors in polymerization thus preventing mutations. Fidelity in the DNA replication and repair process is very important because mismatches in DNA base pairs result in dysfunctional proteins. Replicated mutations within the genetic code can lead to abnormal cell proliferation resulting in cancer. Resveratrol, a naturally found compound in plants, has an anti-proliferative mechanism to inhibit DNA polymerase. Resveratrol is a non-specific antioxidant helping in numerous mutations such as cancer, cardiovascular disease, and anti-aging. Resveratrol has been found to bind to DNA polymerase. However, the effect of resveratrol on DNA polymerase is still unclear. In the research done by the computer drug discovery lab, docking stimulations were

done through a molecular simulation program, Schrodinger. Our predicted results generate 3D representations of the locations resveratrol binds to on DNA polymerase. This reveals how resveratrol works to inhibit DNA polymerase. Understanding this opens the door for new drug candidates to control the replication and repair mechanisms of DNA polymerase

The Convention Spotlight Theory: Women at National Conventions

Elizabeth Griffin

Dr. Maryann Gallagher, International Affairs, School of Public and International Affairs

In a first-past-the-post electoral system, any “potential energy” political leaders can accrue for future campaigns and positions of leadership is very important—the most obvious source being visibility before the electorate. National conventions can create potential energy for future elections, particularly for female candidates who are much less likely to win an executive election in a first-past-the-post electoral system. This study seeks to find where the women are at national conventions and whether female politicians are given an equal spotlight with male politicians. The study compares the platform the Democratic and Republican parties offered to male and female speakers who were potential political candidates at national conventions from 2000 to 2016. It also records the number of potential female political candidates who share the spotlight with a group and speak at prime time. This study finds that neither the Democratic nor the Republican party achieve parity between female and male speakers, and neither create much of a spotlight for potential female candidates either. The Democratic party features more women, but a lower percentage of those women speak at prime time. The Republican party features significantly fewer women and few of them are potential candidates, but almost all of the potential female Republican candidates receive prime time coverage at the conventions. This study also finds that the Democratic party and Republican party effectively diminish the spotlight for female speakers, with the Democratic party staging more women in groups, and the Republican party failing to stage political leaders.

Modern Day Mercantilism: China vs. The United States

Jazzy Imon Griffin, CURO Honors Scholar

Dr. Jeff Netter, Banking and Finance, Terry College of Business

As globalization shrinks our world, trade between countries continues to change and evolve. With the United States renegotiating NAFTA, and China’s increasing involvement in trade, there has been a resurgence of mercantilism among countries. Trump’s America First Policy, as well as China’s strict FDI regulations, truly showcase these trends. This

paper will explore the idea of modern day mercantilism by examining current trading strategies deployed by the United States and China. As we dive into the rivalry between these world powerhouses we will see how the ideas of mercantilism affect global trade. Before identifying mercantilism in modern day global trade, we will examine the definition and history of the term originally coined by Adam Smith. This trading strategy can be boiled down into a simple thought “If I am winning, you are losing.” Mercantilism goes directly against comparative advantage, a trading strategy in which all participating parties benefit through specialization and trade. To understand how these strategies differ, think of the world’s wealth as one big pie. While the goal in comparative advantage is to make the pie bigger for everyone, the focus of Mercantilism is only to have the biggest slice. With these country-first ideals, global trade can become a hostile environment for all parties. In this paper, we will look at current events that mirror mercantilism ideas and examine how they affect, consumers, country relations and the global trading space as a whole.

Analyzing Specific Genes in *Bacillus cereus* that may Adapt to Different Growth Conditions

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Members of the closely related bacterium belonging to the *Bacillus cereus* group are pathogens. Some *B. cereus* and *B. cytotoxicus* are known for causing food poisoning or food spoilage. *B. anthracis* causes anthrax in animals and humans; and *B. thuringiensis* kills insects. This group of bacteria is very common in our surrounding. *B. cereus* exist in multiple forms: a free vegetative swimming cell state, sessile in biofilm, or as spores. The spores are very resilient to harsh environments and can survive for years. The long-term purpose of the project is to understand, at the molecular level, why *Bacillus* is so successful. For this, the lab has identified several operons; each carry genes that could explain transition from one growth state to another. My specific role is to assign a function to some of these genes. For this purpose, each gene (14 in total) was cloned into *E. coli* expression plasmid. A plasmid, when induced, will transcribe the gene and generates enzymes that can be further studied by different assays that the lab has developed. It is not clear ahead of time which *E. coli* strain is the best to successfully express those genes because some could be toxic. For this purpose, I am transforming the plasmids to different strains, and subsequently plan to perform biochemical assays and visualization of enzyme product by LC-mass spectrometry. This research is important not only to *Bacillus*, but also to other human pathogenic spore-forming bacterium like *clostridium difficile*.

Regional Brain Morphometry and Associated Cognitive Functions in Relation to the CHA2DS2-VASc-HSF Score in Older Adults with Cardiovascular Disease

Luvika Gupta

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The CHADS2 score is a measure designed to quantify stroke risk in individuals with non-rheumatic atrial fibrillation. Since its emergence and validation, it has been stratified to include other predictive factors to CHA2DS2-VASc-HSF. While research has validated this measure for estimating stroke risk, not much research has correlated this score with cognitive function and brain morphometry that are associated with stroke. This study aims to examine the relationship of the CHA2DS2-VASc-HSF score in regard to cognitive decline and regional brain morphometry among older adults with cardiovascular disease (CVD). 50 CVD patients and 46 age-matched controls underwent an MRI scan and neurocognitive testing using the Repeatable Battery for the Assessment of Neuropsychological Status (RBANS). Using the software program Freesurfer, we will analyze individual MRI data to determine cortical thickness in eight bilateral *a priori* regions of interest in the hippocampus (HPC), orbitofrontal cortex (OFC), middle frontal cortex (MFC), and posterior parietal cortex (PPC). These regions have been implicated in morphometry studies of executive functioning and processing speed, cognitive processes negatively impacted in individuals with CVD. Group differences will be tested using an Analysis of Variance (ANOVA). Relative to controls, it is hypothesized that a) the CHA2DS2-VASc-HSF score will negatively correlate with the RBANS immediate memory, delayed memory, and attention composite index scores and b) the CHA2DS2-VASc-HSF will negatively correlate with HPC, OFC, MFC, and PPC regional thickness. The results are expected to increase understanding of cognitive and neural changes associated with the CHA2DS2-VASc-HSF score and demonstrate its utility in predicting them.

“GET REAL LEGITIMATE ONLINE”: Twitter Poetry’s Artificial Interiors

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In 21st century poetry, a Romantic and lyric selfhood re-emerges, obscuring the language-centric sensibilities of 20th century poetics. “GET REAL LEGITIMATE ONLINE”: Twitter Poetry’s Artificial Interiors” explores the influence of the Internet and digital culture, particularly of Twitter, on the renewed interest in the lyric self in contemporary poetry. As a paradigmatic example of the interplay between sincerity and artificiality in contemporary poetics, I offer an examination of Horse_ebooks, a Twitterbot whose bizarre

literary tone captured thousands of users' interests in the early 2010s. The discussion of Horse_ebooks's poetics occasions a broader discussion of the related Alt Lit poets—certain emergent 21st century poets whose work depends aesthetically on social media. Sincerity, in the Alt Lit poem, appears increasingly possible absent subjectivity when explicitly textually constructed—an illusion that announces itself. As evidence of lyric materialities erecting these visions of selfhood, I supplement my reading of Horse_ebooks with Tao Lin's Selected Tweets, a print collection drawing from Lin's personal Twitter accounts. Selected Tweets' move from a digital medium to print reveals the blueprints for constructing a non-subjective selfhood in print as well as digital media.

Using Machine Learning to Improve the Reliability of Solar Energy

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Solar power is arguably the most environmentally friendly form of renewable energy. Even though solar energy can substitute the usage of fossil fuel as a source of power, there are a lot of challenges regarding full dependence on solar-powered photovoltaic panels for powering homes and buildings. One of the important determinants that cause solar energy to be an unstable source of power is formation of clouds. Since the amount of power production depends on the amount of direct light received by the panels, a cloudy day can result in a decline in generation of power. If we use factors such as pictures of the sky using a camera that is placed at a distant location from the panels, wind speed, and temperature, it is possible to anticipate the appearance of clouds at a given location. Building a mini weather station helps gather and store the data necessary for this procedure. The station includes a camera continuously taking pictures every 15 minutes, a wind speed sensor, and a temperature sensor. The software managing the prototype is an Arduino program that manipulates the electrical circuit. By predicting clouds, we are able to determine the time interval in the near future in which an alternate power source will be needed. Using this information, arrangements can be made to rely on power generation from industrial companies.

Wisdom, Justice, and Moderation: The Equal Protection Clause in the State of Georgia

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The Equal Protection Clause (EPC) is part of the Fourteenth Amendment of the Constitution. The EPC states that

no person shall be denied equal protection of the laws, regardless of their state of residence. With regard to criminal justice, the EPC has been used as a tool to aid victims of discrimination, such as black Americans in the South. In this project, I will examine the role that race plays in EPC cases related to criminal justice. I anticipate finding that the EPC is insufficient in protecting individuals from discrimination in Georgia. I will compare the language of the EPC to its application in 20th Century court cases in Georgia. I will complete this comparison by creating a literature review of scholarly works concerning the EPC and relevant cases. Lastly, I will further compare the relationship between race and case verdict. The EPC states that no person shall be denied equal protection of the laws, but I anticipate finding that the EPC alone is insufficient in protecting black Americans in Georgia throughout the 20th Century. The EPC is a safeguard to protect all American citizens. Throughout the 20th Century, black Americans in Georgia faced discrimination despite the passage of the Fourteenth Amendment in 1868. In the American South, criminal justice and its relationship to race must be scrutinized to ensure that all citizens receive equal treatment under the law.

The Association Between Program Fidelity and Impact: How Facilitator Engagement and Program Adherence Influence Couples Following Relationship Education

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Supported by a federal grant, Project F.R.E.E (Fostering Relationship and Economic Enrichment) provides relationship and marriage education (RME) to at-risk parents engaged in child welfare services. RME teaches principles and skills empirically shown to improve couple and co-parenting relationship quality for couples in general as well as at-risk couples. However, the impact of RME varies, often due to challenges associated with program fidelity. The current research study examined the association between program fidelity and the program experiences and perceived impact reported by individuals who completed the 4-week (8-hour) Elevate program. Program fidelity, as reflected by curriculum adherence and the quality of participant engagement, was assessed by independent coder observations during each of the weekly sessions for the 11 programs offered between January - October 2017. At the conclusion of each program, participants were asked to complete a brief survey that assessed relationship efficacy (7-items), intentions to use the skills learned (1 item), relationship satisfaction (2 items), and ratings of the facilitators (7-items) and overall program experience (8-items). Of the 172 individuals (representing 89 couples) enrolled in the program, 114 (66.3%) completed 75% of the program and 105 (61.0%) returned a completed program

evaluation survey. Preliminary analyses show high rates of curriculum adherence and participant engagement as well as positive ratings by participants on the program outcomes examined. The final presentation will share the results of analyses exploring variations across the program outcomes based on our indicators of program fidelity.

National Crisis in Korea: What is the Relationship Between Media and Polarization?

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As a countermeasure for North Korea's nuclear missiles, South Korea decided to deploy missile defense system as an effort to justify the security on the peninsula. Since then, the issue has been at the heart of Korean politics and media debates. At this point, some intriguing questions can be raised. In particular, how the Korean public opinions regarding Terminal High Altitude Area Defense (THAAD) were shaped by the media? This research examines how Korean media has framed the THAAD issue and its impact on public opinion in Korea through a survey experiment. After the basic definition and an overview, this paper reviews the literature regards to selective exposure and the process of persuasion. It then hypothesizes that the polarization in Korean public opinion regards to THAAD is the result of the how the media reported the issue. The hypothesis is tested through a survey experiment to see how the participants' opinions formulate after seeing pro-attitudinal and counter-attitudinal THAAD information. Following this study, it will address how this paper will ultimately help to understand the relationship between the media and the public opinion, especially in a national instability.

Fund Balances in Georgia's Cities

Jennifer Ashtyn Hardister, CURO Honors Scholar

Dr. Wes Clarke, Carl Vinson Institute of Government, Public Service and Outreach; Tracy Arner, Carl Vinson Institute of Government, Public Service and Outreach

Fund balances are equity in governmental funds, and their accumulation over time is determined in part by the line governments walk between their revenues and expenditures. With the issuance of GASB Statement 54 in 2009, the classification and reporting of these balances was clarified. However, there still remains a "policy void" regarding uses and amounts of these balances. One common recommendation is for governments to maintain an unrestricted fund balance of at least two months of general fund operating revenues or general fund operating expenditures. Previous research has suggested that the presence of a fund balance policy does not appear to be correlated with the amount of fund balance carried in

these cities. Following the 2008 financial crisis, municipal fund managers were faced with the challenges of funding operations of their governments despite declining revenues. This investigation will examine financial data for 2008-2016 fiscal years in order to determine how quickly these cities recovered their fund balances, whether the recession led to fund balance policy changes, and whether cities with fund balance policies had more stable fund balances following the recession.

Identification of Biomarkers Associated with *Gallus gallus domesticus* Sperm Mobility

Kathryn Harison

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Gallus gallus domesticus have been intensively selected for efficient and rapid weight gain. This selection has led to broilers, which have insatiable appetites, which is beneficial for cost-efficient meat production with minimal environmental impact. However, this selection pressure for rapid gain also presents concomitant damaging effects on the reproductive fitness of the parent stock, *Gallus gallus domesticus*. To counter this impending issue with fertility in *Gallus gallus domesticus*, there is a need to identify proteins associated with fertility that can be used as biomarkers in selection programs aimed at improved reproductive fitness in *Gallus gallus domesticus*. Previous research demonstrated that sperm mobility is a quantitative trait of the domestic fowl that can be used as the primary determinant of sperm fertilizing capacity. Sperm of low and high mobility were separated and quantified using a Percoll density gradient (PDG) centrifugation technique. Protein from the low and high mobile populations were enriched and prepared for 2-dimensional electrophoresis (2-DE). The resulting proteomic profiles between the low and high mobile sperm populations were compared and analyzed using BioRad's PD-Quest. Proteomic profiles differed with respect to mobility, low and high. Those proteins that differed in intensity between the low and high mobile groups were excised from the gel and sent to UGA's Proteomic and Mass Spectrometry Core Facility to be identified by LCMS/MS. Several proteins known to be associated with mammalian sperm mobility, such as Sperm-associated antigen-6 (SPAG6), were found to differ between the two avian sperm populations. The proteins that were more prominent in the highly mobile population can be used as biomarkers in genetic selection programs aimed at improving fertility in male *Gallus gallus domesticus*.

Analysis of Past and Future Memory Fluency in Adults with Moderate to Severe Traumatic Brain Injury

Alexandra Harpole

Dr. Katy H O'Brien, Communication Sciences and Special Education, College of Education

Episodic memory is a type of long-term declarative memory, which refers to knowledge about a specific event either in the past or the future. The futuristic aspect of this memory is referred to as episodic future thinking (EFT) and is the ability to simulate details concerning plausible future events. Due to the location in the brain and specific characteristics of this type of memory, EFT and episodic memory are frequently impaired in individuals who have sustained a traumatic brain injury (TBI). The primary goal of this study is to compare measures of EFT and episodic memory in adults with and without TBI, by examining the types of language used across tasks and how these intersect with measures of recall and future thinking. A group of individuals with moderate to severe TBI and a control group of uninjured adults of similar education level and age will be compared. A verbal fluency task and two differing personal narrative tasks will be used to identify possible between group differences in the ability to engage in episodic future thinking and episodic memory. It is hypothesized that the participants in the study with a history of TBI will produce fewer episode specific details and may rely more heavily on general semantic information across task; however, adults with TBI may have overall greater linguistic output. This study will provide further insight into the link between episodic memory and EFT as well as direct intervention approaches toward supporting past and future recall in adults with TBI.

Flexibility in Gorilla Communication: The Repertoire and Vocal Behavior of Captive Western Lowland Gorillas

Brendan Harris, CURO Research Assistant

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The goal of this project is to understand the flexibility and differences in vocal behavior between captive and wild western lowland gorillas. More specifically we aim to answer two main questions: (1) Do captive gorillas produce the same array of vocal sounds produced by wild gorillas? (2) Do captive gorillas use them in similar contexts? For this project, we conducted a total of 400 30-min focal follows of 19 gorillas of different age and sex housed in an indoor enclosure at Zoo Atlanta. During focal follows we continuously recorded the vocal behavior of the individual, and using 2-min instantaneous sampling we collected its activity and proximity to other conspecifics. Our data collection is equivalent to that used in a previous project with wild western gorillas and thus it will allow the direct

comparison of repertoires, calling rates, and use of calls (the behavioral contexts in which they are produced). We anticipate that the repertoire of captive gorillas will include most, if not all, sounds produced in the wild since primate vocal production is highly constrained. However, since captive gorillas interact not only with their caregivers but also with conspecifics that are not part of their social groups, we expect the exchange of calls and the context in which they are used to vary significantly. This study is important because it will elucidate the flexibility and intentionality of gorilla vocalizations; additionally, the results of the study could help enrich the educational experience of zoo visitors with new informative materials.

Tool Use in Tufted Capuchin Monkeys (*Sapajus libidinosus*) Promotes Persistent Foraging Behavior

Brendan Harris, CURO Research Assistant

Dr. Dorothy Frigaszy, Psychology, Franklin College of Arts and Sciences

Tufted capuchin monkeys (*Sapajus libidinosus*) are generalist omnivores, and the only New World primate to habitually use tools. Capuchins have been described as persistent in nature and motivated to practice nut-cracking using stone tools. Due to the lack of a baseline measurement, or even a definition of persistence, the term has rarely been studied as a feature of animal behavior. The goal of this research is to examine persistence as it applies to tool-use in a group of wild tufted capuchin monkeys at Fazenda Boa Vista, Brazil. We hypothesized that working with a tool would promote the development of sustained attention, and result in more persistent foraging behavior than foraging without a tool. A total of 24 extractive foraging bouts by 12 monkeys were video recorded from May to July 2015. Foraging bouts were coded, and duration and behavioral variation were compared in tool versus non-tool food bouts, and percussive versus non-percussive food bouts. We anticipate that the monkeys will spend more time foraging when the food bout requires a tool or is percussive. This finding would be indicative of tools acting as motivators to persist in goal-directed tasks in non-human primates, which may point to this feature of behavior as an important factor in the evolution of tool-use.

Spatial Early Warning Signals of Malaria Elimination in Haiti

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Although many regions worldwide are considered malaria-free, they remain vulnerable to disease resurgence due to importation from countries where malaria remains endemic. The Caribbean presents such a scenario due to the continued spread of malaria within Haiti, which reported 17,000 cases in 2014. We propose a non-parametric, statistical approach to guide malaria elimination in Haiti.

The theory of critical slowing down states that, as a disease system moves between stable transmission and stable elimination, it should exhibit a loss of resilience, or slower returns to equilibrium following small perturbations. This behavior can be quantified as increases in spatial statistics, including near-neighbor correlation, variance, and skewness. We worked with both empirical data and a stochastic coupled-map lattice Ross Macdonald simulation to test for early warning signals of disease elimination. In the R programming language, we took the values of these indicators across all months of our study and then quantified the trend in each statistic over time using Kendall's rank correlation coefficient. We calculated the significance of these values by comparing them to a null distribution, generated by performing the same tests on coarse-grained or permuted versions of the data. We examined several potential trajectories for malaria elimination in Haiti and showed how early warning signal detection can more generally guide disease elimination campaigns toward more efficient, preventative approaches.

The Rhetoric of Ariadne and the Catullan Ego

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In this project, I use a rhetorical and semiotic lens to explore the identity of the poetic voice in Catullus 64. Crucially, Catullus uses the first person in his ekphrastic narration, which is a rare usage in epic poetry: line 116f. reads, "Sed quid ego a primo digressus carmine plura / commemorem..." I argue that *digressus* positions the identity of the Catullan *ego* in a rhetorical role. Ekphrasis is at its core a rhetorical device. Following Webb's seminal work on the subject, I note that the ancients did not adhere to the modern definition of ekphrasis as a poetic description of a work of art, but as a rhetorical exercise describing any object. Conversely, rhetoric could be ekphrastic in practice. Thus, Catullus links his poetic voice, the *ego*, with *digressus*, a rhetorical term. The identification of the poetic voice with rhetoric is also verified at line 164, where Ariadne quotes verbatim the Catullan *ego* at line 116 with "sed quid ego." Understanding the nexus between Ariadne and the poetic voice as paradigmatic, I provide further enlightenment into the identity of the Catullan *ego* with the semiotic theory of Julia Kristeva, who identifies male and female subjectivity in the creation of meaning. Male subjectivity is characterized by linear, horizontal chronology, while female subjectivity is self-reflexive and cyclical. I argue that *digressio*, as a circuitous, achronological parenthesis, is a performance of female subjectivity. The *egressio* of Theseus at 64.74 stands in contrast, whose motion away from Ariadne is linear and purpose-driven.

Characterization of Bacterial Genes involved in Cell Wall Synthesis

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Every cell in nature is surrounded by a diverse set of glycan structures synthesized from nucleotide sugar precursors. In bacteria, glycans are involved in different developmental stages—particularly in the cell's transition from a vegetative state to living in biofilm or to spores upon germination. While important steps involved in biofilm formation have been characterized, there is still much to be learned regarding the role glycans play in the association of cells and colonization to diverse types of surfaces. In *Bacillus cereus* bacterium, two operons were identified to be involved in the formation of nucleotide-sugars, but the exact mechanism is still uncharacterized. This project aims to characterize the enzymes encoded by these genes. The steps include cloning of the genes to different expression plasmids; verifying the genes are correct by DNA sequencing; transforming the plasmids to BL21-derived cells for gene expression, enzyme production, and purification; and finally performing enzyme assays to characterize each enzyme. We use PIPE and PCR to clone the individual gene into a specific plasmid. PIPE takes advantage of the incomplete extension products generated in PCR by adding these overlapping sequences, which enable complementary strands to anneal. After isolating the plasmids containing the genes of interest and expression vectors, the genes are cloned into the vectors and sequence-verified. Once transformed into *Bacillus* cells for expression, the product is run through an LCMS assay for characterization to examine the role these genes play in nucleotide-sugar metabolism.

Cost Effective Thermal Vacuum Testing System

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In the field of small satellites, thermal vacuum testing is an essential phase of development. Many material properties of common electronic devices are radically different inside of a vacuum environment with large temperature swings. As there is rarely room for "redundant" parts on a small satellite, every non-flight heritage board must be modified and verified to work in these conditions. Currently, this is done using very expensive thermocouple controllers, vacuum pumps, and thermal conditioning units. Research was conducted to create a more budget friendly solution. A new, more economical thermal vacuum testing system has been designed to address these issues. It employs a cylindrical copper thermal conditioning shroud that fits around a small satellite up to 3U in size and uses predominately Arduino

based control for main operation. Cooling is accomplished by circulating liquid nitrogen through copper tubing wrapped around the outside of the shroud, while heating is accomplished via four heating elements on the inside of the shroud and a rope heater wrapped on the outside. Thermal measurements are taken via T-Type thermocouple probes that interface with an Arduino-based interface board. These measurements are then transferred to a host computer for long-term data logging. As all vacuum pumps and gauges were also chosen to be as cost effective as possible, the overall system cost is well below equivalent commercial solutions, making this a potentially disruptive advancement in the small satellite industry.

The Effect of IPOs on University Outcomes

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This paper will study the impact of local initial public offerings (IPOs) on local university outcomes. Recent research suggests that when firms issue equity through an IPO it affects local economic outcomes such as housing, employment, establishment growth, and economic growth. Firm financial decisions on capital-raising (e.g., via initial public offerings, seasoned equity offerings, or debt issuance) and investment generate potential spillover effects in the local economy. Using data collected in the National Center for Educational Statistics, Brint's Institutional Data Archive on American Higher Education, and additional sources, this study will estimate the effect that local IPOs have on the outcomes of universities in close proximity to the firm. These outcomes include national ranking, enrollment, acceptance rate, faculty, average SAT/ACT scores, endowment, budget, tuition, investment, licensing and grant revenue, as well as measures of research output. Our baseline regressions of university outcomes on measures of IPO volume test whether local IPO activity is associated with changes at geographically close universities. Subsequent analysis will establish if the effect is causal by addressing the endogeneity that arises from a firm's decision to locate close to a university. This analysis will enhance our understanding the link between corporate finance decisions and real economic activity. Additionally, this paper will contribute to findings that economic conditions affect decisions about human capital investment at the university level.

Modeling Geographic Variation in Pronunciation of United Kingdom English

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There is not just one British accent. A number of phonetic features distinguish accents of any language from one

another, one of the most salient being vowel quality. These differences in pronunciation are captured by sound waves' bands of resonance, or formants. This paper details an investigation of geographic variation of UK English pronunciation based on formant trajectories of the diphthongs /aɪ/ (as in 'five') and /aʊ/ (as in 'house'). Thousands of audio samples of these vowels were retrieved from the spoken portion of the British National Corpus (BNC), and their F1 and F2 (first and second formant) contours were compared across 89 locations within the UK. The study was designed with an expectation of a spectrum of pronunciations existing across the UK with monophthongal realizations (the vowels in 'feeve' and 'hoose') primarily found in the Northern and Western areas of the country and more diphthongization occurring in the South. After searching the BNC for phonemically aligned tokens of 'five' and 'house,' functional data, modal, and geographic analyses were conducted on the vowels in question. A strong correlation was found between speaker distance from the dataset's northernmost location and diphthongization of /aɪ/. This finding suggests that the variation in pronunciation of the vowel in 'five' is more continuous than isoglossic. By investigating formant trajectories of vowels involved in the English Great Vowel Shift, the persistence of UK language variation has been demonstrated. This linguistic variation may be attributed to both English sound change and language's role as a complex system.

Help a Sister Out: The Gendered Difference in Aid Allocation Decision Making?

Sarah Henning, CURO Research Assistant
Dr. Maryann Gallagher, International Affairs, School of Public and International Affairs

Theories of gendered differences in leadership suggest that women and men are influenced through socialization to make differing decisions. Using theories developed by previous literature, this paper researches women as decision makers in aid organizations. Focusing specifically on the program coordinators of the United States African Development Foundation (USADF) as the decision makers, this research produces an in-depth analysis of the programs funded and focus of each program. Collecting information on the aid awarded to the gender-based programming and the gender of the program coordinator. A comparative case study between two USADF grant receipt states also occurs to provide a more detailed comparison. The results show that women are not more likely in the case of USADF to allocate funds to more gender-based programs than men. The increased presence of women in decision making groups does however seem to be connected to an increase in gender-based programming overall. It is unclear from the research if this data negates the original hypothesis but rather fails to support it.

Access to Food Assistance in Northeast Georgia

Meredith Herbst

Dr. Jerry Shannon, Geography, Franklin College of Arts and Sciences

Research on food access has often focused on spatial access to retail food stores. However, food banks, which provide food assistance and improve food access, are rarely included in food access analyses, and temporal patterns are not considered. This research uses geographic information systems (GIS) to identify when and where there are mismatches between people who need food and physically available food assistance provided by the Food Bank of Northeast Georgia. The methods used provide a framework for other food banks to evaluate their work. Geographic access to food banks was measured across the food bank's service area at numerous times throughout the week and month. Results show that the Food Bank can improve access to food assistance in Northeast Georgia by seeking to establish agencies in Towns County, White County, and Hart County and by encouraging agencies to provide services on evenings and weekends. Additionally, the Food Bank of Northeast Georgia should consider ways to strengthen current food agency services.

University Health Center Engagement and Outcomes for Transgender and Gender Non-Conforming Students

Laurel Hiatt, Foundation Fellow

Dr. Nathan Hansen, Health Promotion and Behavior, College of Public Health

Transgender and gender non-conforming (TGNC) individuals face obstacles to healthcare, including limited access lack of provider competency. Previous research has found that TGNC respondents were four times more likely to delay healthcare due to discrimination, often postponing or avoiding treatment. To evaluate whether provider engagement and incumbent policy influences student outcomes at the university level, two cross-sectional online surveys are being disseminated across the country. One survey evaluates health center policy, previous training, and current confidence in treatment from providers' perspectives. The other survey assesses the experiences of university students in terms of recurrent health problems, healthcare interactions, and evaluations of university and personal support. A regression analysis will be applied to data to identify potential barriers to care at the student and provider levels. To date, approximately 63 of 150 anticipated student responses have been recorded and 44 of anticipated 100 provider responses. Current preliminary results indicate points of dissatisfaction from TGNC students, including experiences of confusion, misgendering, and forced care. Most providers reported having undergone learning modules on how to competently treat TGNC patients. Of

students reporting previously utilizing university health services, over half reported the desire to avoid disrespect as a reason for considering avoiding the health center for needed medical attention, with most of this group deciding not to pursue care. Respondents also typically stated they were unsure as to TGNC policies of their health centers. As uncertainty contributes to imbalanced power relations between patients and providers, experiences will be reviewed for potential policy implications.

The Four Factor Model: A Realistic, Applicable, and Predictable Theoretical Framework for Understanding Modern Terrorism

Kal Hicks

Dr. Leah Carmichael, International Affairs, School of Public and International Affairs

In both the academic and policy communities, there are two significant issues surrounding the study of terrorism. First, there is no consensus on the definition of terrorism within the United States intelligence community. These discrepancies in specific details, such as type of perpetrator, weaken the entire United States government's ability to provide adequate and efficient counterterrorism policy and strategy. Secondly, academic studies of terrorism have focused on terrorist activities as occurring throughout history in four large waves. Through further analysis, it appears that these waves are merely descriptive and not based on thorough, systematic studies of terrorist acts throughout history. Thus, waves offer little understanding of real-world terrorist acts and have no predictive quality, perhaps the most important element a theoretical framework of terrorism can provide. This project begins by constructing a comprehensive definition of terrorism based on four key components: perpetrator, target, tactic, and motivation. Using this definition, this project will recode historical acts of terrorism offered in the Global Terrorism database compiled by the Study of Terrorism and Response to Terrorism (START) Center hosted by the University of Maryland, indicating the types of perpetrators and targets involved, the tactics, and motivations used. Finally, this project will systematically examine if there have been trends in terrorist acts along these four factor areas. By applying this new method of understanding terrorism to hard data, academics and policymakers can determine trends essential to anticipating terrorist acts. In doing so, policymakers may better anticipate, predict, and prevent potential terrorist attacks in the future.

Developing Effective Governance Strategies in the Face of Water Scarcity

Taylor Hill, CURO Honors Scholar, CURO Summer Fellow, CURO Research Assistant

Dr. Don Nelson, Anthropology, Franklin College of Arts and Sciences

Water is a limited resource and, due to the accelerated impacts of climate change, is expected to become scarcer in the near future. Adaptive management is an iterative and interdisciplinary approach used to develop a set of guidelines to address multifaceted issues, such as that of sustainable water management. This project applies an analytical lens as a tool in the development of water governance strategies for Brazil's Vale do Jaguaribe and Paraiba do Sul watersheds, both of which face drought risks due to climate change. The goal of this current portion of the study is to assess water governance and institutional structure in order to identify possible changes necessary to deal with future climate change. This will be achieved in two phases. The first is a political-institutional analysis in order to assess the current governance strategies stakeholders are using via secondary analysis, interviews with key informants, and surveying of water basin members. The phase establishes the current state of the systems and whether "good" governance is in practice to manage the systems well. The second phase of this study comes in the form of developing guidelines for best governance practices, including developing new "state of the art" practices, running climate and water scenarios, and assessing these practices. This study contributes to global responses to water scarcity due to climate change by providing a systematic approach toward the development of adaptive and context-dependent frameworks to assess and promote effective water management and governance practices within water basins.

Genotype-Phenotype Correlations for Protein O-Linked Mannose N-Acetylglucosaminyltransferase 1 (POMGnT1) in Congenital Muscular Dystrophy

Jessica Ziling Ho, Foundation Fellow, CURO Summer Fellow, CURO Research Assistant

Dr. Lance Wells, Biochemistry and Molecular Biology, Franklin College of Arts and Sciences

Congenital muscular dystrophy (CMD) is a heterogeneous family of inherited muscle disorders. A subtype of CMD known as dystroglycanopathy is classified by hypoglycosylation of alpha-dystroglycan (α -DG), a glycoprotein responsible for connecting the actin cytoskeleton to the extracellular matrix in muscle tissues. Hypoglycosylation of α -DG can arise from defects in POMGnT1, a glycosyltransferase that catalyzes addition of GlcNAc to an O-mannose structure in the *cis*-Golgi. Mutations in the gene encoding POMGnT1

have been observed in patients with various forms of dystroglycanopathy. Our work examines the role of the R311Q, P493R, T176P, P303L, C269Y, E223K, C490Y, G502A, R605P, I287S, E156K, D395N, and D556N mutations in POMGnT1 to define a genotype-phenotype correlation. HEK293F cells were transfected with mutant plasmids, and preliminary data indicated that the R311Q, D395N, R605P, and D556N mutants maintained enzyme expression. Radiolabel transfer assays established that the R311Q, D395N, and R605P mutants were kinetically dead while the D556N mutant still exhibited transfer. Promega's UDP-Glo assay was performed on the D556N mutant, which demonstrated reduced kinetic activity compared to wildtype. A SYPRO Orange thermal shift assay revealed the aforementioned mutants to be thermodynamically stable. We are currently experimenting with the rest of the mutants and are also investigating the ability of all mutants to rescue POMGnT1 knockout cell lines for IHH6 reactivity, laminin binding, and Lassa pseudovirus entry. We also plan to map the mutants onto the POMGnT1 crystal structure. Understanding genotype-phenotype correlations in POMGnT1 will facilitate the design of more targeted treatments for individuals based on the mutation(s) they carry.

TERT Promoter Mutations in Primary Central Nervous System Tumors

Jessica Ziling Ho, Foundation Fellow, CURO Summer Fellow, CURO Research Assistant

Dr. Lance Wells, Biochemistry and Molecular Biology, Franklin College of Arts and Sciences

Telomerase reverse transcriptase (TERT) catalyzes addition of TTAGGG repeats to the ends of telomeres. Activating mutations in TERT can allow senescent to exceed the Hayflick limit and become immortal. TERT expression is regulated by an upstream promoter that contains several transcription factor-binding sites. Two mutually exclusive somatic mutations in the TERT promoter, C228T and C250T, have been proposed as driver events that contribute to oncogenesis via TERT dysregulation. Previous studies have shown that TERT promoter mutations are frequently observed in primary central nervous system tumors. The purpose of our investigation was to identify and characterize TERT promoter mutations in those specific types of tumors using droplet digital PCR (ddPCR). DNA was extracted from 133 formalin-fixed, paraffin-embedded (FFPE) patient tumor specimens, and a duplex TaqMan probe assay using Bio-Rad's ddPCR platform was run on each sample. The entire protocol was optimized for a GC-rich template, and the TERT mutant and wildtype alleles were labeled with FAM and HEX dyes, respectively. Data were analyzed using QuantaSoft software. TERT promoter mutations were shown to occur frequently in glioblastomas and oligodendrogliomas but

seldom in astrocytomas, ependymomas, and meningiomas. There was a significant inverse association between the presence of TERT promoter mutations and that of isocitrate dehydrogenase 1/2 mutations in glioblastomas. TERT promoter mutations also seemed to be inversely associated with mutations in the alpha thalassemia/mental retardation syndrome X-linked gene. This ddPCR-based TERT promoter mutation detection assay can be used as a molecular diagnostics tool with both FFPE specimens and circulating cerebrospinal fluid tumor DNA.

Standardization of the Hours of the Passion in Medieval Books of Hours

Madison Alexandra Hogan

Dr. Cynthia Turner Camp, English, Franklin College of Arts and Sciences

In fall 2016, I was in ENGL 4230, which focused on studying medieval manuscripts, specifically the University of Georgia, Hargrett MS 836, a 15th century Parisian Book of Hours. Books of Hours (BoH) were private devotional books popular among medieval laymen, with material divided by the canonical hours. A typical manuscript featured the Hours of the Virgin as the central text, but the class found that MS 836 instead contained the Long Hours of the Passion (LHotP), a far less common series of text. In fall 2017, Katharine Lech and I continued research on MS 836 and the LHotP in a CURO directed reading. We completed a survey of 215 BoH manuscripts, recording data about their contents and origins; around twenty-five manuscripts contained the LHotP. Working from this sample, I began to analyze the textual core of the LHotP in those that were digitized: Psalms and hymns. Textual analysis of these twenty-five BoHs indicates a large amount of variation in the contents as well as the location of the different Psalms in the canonical hours. Nevertheless, there was a certain amount of standardization -- I recorded a total of fourteen Psalms across the manuscripts, many of which occurred in more than one version of the LHotP. I am now continuing this textual analysis of the hymns of the LHotP, combining the results with the data on the Psalms to determine if there is standardization of the LHotP, its extent, and whether such regularity is isolated by region or time period.

Dating Violence: Disclosure and Perceptions Among College Students

Leah A Holcomb

Dr. Deanna Lynn Walters, Health Promotion and Behavior, College of Public Health

The University of Georgia states that interpersonal violence among students on their college campus is relatively low. However, sexual assault and dating violence within the context of a relationship is often overlooked. While

assaults can occur in a college bar scene, many cases of sexual assault and dating violence occur between friends or partners. Over 40% of college-aged women disclose experiencing violent and abusive dating behavior and almost 1 in 6 college women reports sexual abuse while in a relationship. With these statistics in mind, why are students less likely to disclose interpersonal violence, whether they are a survivor or a witnessing bystander, and why do students perceive dating violence as a lesser issue than sexual violence? The purpose of this dialog is to shed light on why so many University of Georgia students do not disclose instances of dating and sexual violence that occur within relationships. This presentation will include data collected from university students regarding their perceptions of interpersonal violence and their awareness of resources. While most college campus efforts around preventing interpersonal violence have focused on sexual assault by an acquaintance, little research has focused on students who are at risk for experiencing dating and sexual violence in the context of a relationship. Implications for improving educational interventions and awareness of campus resources will also be discussed.

Exploring the Effects of Different Video Lesson Formats on Learning in Biology

Johanna Hoover

Pavan Vankat Sastry, Heather Digregorio

Dr. Logan Fiorella, Educational Psychology and Institutional Technology, College of Education

This study explored the effectiveness of different formats of video lectures for learning a complex concept in biology. 128 college students were asked to view one of four versions of a short video lecture explaining how the human kidney works. All versions consisted of the same oral explanation from the instructor and provided illustrations. Students either viewed the illustrations presented on PowerPoint slides (control group), dynamically drawn on the screen without the instructor physically present (drawn group), drawn on a conventional whiteboard with the instructor present (whiteboard group), or drawn on a transparent whiteboard with the instructor present (transparent group). Transparent whiteboards allow instructors to write on the board while facing students, rather than turning their backs such as with a conventional whiteboard. Learning outcomes were assessed using immediate retention and transfer tests. Given the unique benefits of a transparent whiteboard, we predicted that the transparent whiteboard group would outperform the other three groups on the learning outcome measures. The findings suggest that the transparent whiteboard and drawn groups significantly outperformed the control and whiteboard groups when controlling for students' previous topic familiarity. There was no significant difference between the transparent whiteboard and drawn

group. This study helps us understand how students learn through different video lecture formats and contributes to the development of research-based design principles for effective online learning environments.

The Effect of Water Release on Rainbow and Brown Trout Feeding Behavior Below Buford Dam

Patrick Houlihan

Dr. Patricia Yager, Marine Sciences, Franklin College of Arts and Sciences

The waters of the Chattahoochee River below Buford Dam hold some of the state's best trout fishing. As a tailwater, water temperatures remain below 50 degrees F for most of the year, providing ideal conditions for both rainbow and brown trout. An observation was made that trout feeding activity may be positively influenced by the periodic increased water flow through Buford Dam for hydroelectric power generation purposes. In times of dam release, water level is subject to rise several feet in a very short period of time, strongly affecting the surrounding ecosystem. A series of experiments will be conducted to test the willingness of trout to feed on macroinvertebrate imitations before and after release of Buford Dam. Data will be collected over the course of the semester by fly fishing, and recorded in terms of catch per unit effort (CPUE), quantifying any change in trout feeding behavior. Data on dissolved oxygen (DO) and water temperature will also be collected at the time experiments are conducted. Rainbow and brown trout are cold water species, and thus their survival is dictated by the water temperature (and by extension the water's dissolved oxygen content). It is hypothesized that increased DO levels will be found following the release of Buford Dam, as well as a positive relationship between CPUE and DO concentration. By studying the possible effects of water release on trout behavior, a greater understanding of the dynamics behind tailwater fisheries may be reached.

Best Management Practices for Post-Construction Restoration of Rights-Of-Way in Saltwater Marshes, Estuaries, and Other Tidally Influenced Areas

Katy Christina House, CURO Research Assistant

Dr. S Sonny Kim, Environmental, Civil, Agricultural, and Mechanical Engineering, College of Engineering

The primary objective for this project will be to establish Best Management Practices (BMPs) for post-construction restoration of rights-of-ways in saltwater marshes, estuaries, and other tidally influenced areas. The focus of this research is on restoration of soil properties including density, pH, and organic content. To accomplish this research, I will review available resources, take field measurements, and sample collections such as pH, salinity, and organic matter. Lab experiments will be conducted to tests means, methods,

and materials such as particle size distribution, bulk density, and soil specific gravity. Also, I will develop a proposal for externally funded field scale implementations and develop a draft construction specification for salt marsh restoration. This study and resulting draft for standard construction specifications will provide guidance for Georgia Department of Transportation (GDOT) contractors working in coastal salt marshes regarding efficient and cost-effective restoration of prior physical conditions in these environmentally sensitive areas. The lab results will offer guidance and understanding to GDOT by providing the soil geotechnical structure of saltwater marshes throughout Georgia's coastline. These results will help reduce the time required for re-establishing vegetative cover after construction activity, improve the density and vigor of natural vegetation in disturbed areas, improve the geotechnical stability of impacted rights-of-way, and therefore result in reduced long-term cost and effort to maintain roadway infrastructure located in and adjacent to Georgia's coastal marshes and estuaries.

The Effects and Efficacy of Fertilizer Products Processed using Nano Particle Technology

Sarah Houtsma, CURO Research Assistant

Dr. Paul A Thomas, Horticulture, College of Agricultural and Environmental Sciences

I plan to test the effects of nutritional supplements, Aqua-Yield Nano-Rise, Nano-Gro, and Nano Pack on economically important greenhouse seedling crops. We wish to know if application of these products can alleviate short-term nutrient deficiencies in rapidly growing crops. The test products have undergone a patented process that breaks the salt crystals down into nano-size particles. This presumably will allow better micro-nutrient uptake. I plan on assessing the effects of the products on the plants by taking bi-monthly chlorophyll readings, end of experiment dry weight measurements, root development levels, phytotoxicity observation (if necessary), and ascertaining foliar nutrient levels by submitting foliar samples to the UGA soil test lab for analysis. My control in this study will be no nutritional supplements to be applied. Instead, there will be an application of the traditional fertilizer without Aqua-Yield products. The plants will be seed-grown and/or grown from plugs. Each treatment will have 15 replications, with the 8 economically important plant species. In addition, we will have the 3 Aqua-Yield products and the one control. Finally, we will duplicate the whole experiment for accuracy. The chlorophyll meter that I plan on using is the Opti-Science CCM. In addition, I plan on having a root development chart from 0-5 characterizing between poor root development (no roots) to well-developed roots. Finally, we will be using the normal statistical parameters on the raw data including the mean, standard deviation, and standard error and put into easy viewable charts and graphs.

***Bordetella* Manipulates Host Response by Altering Gene Expression in Response to Blood**

Katie Howard, CURO Research Assistant

Dr. Eric T Harvill, *Infectious Diseases, College of Veterinary Medicine*

Bacteria can sense and respond to a wide variety of cues and alter gene expression. We hypothesized that pathogens should be able to detect their location in the host: on healthy or inflamed mucosa, or invaded into deeper tissues. This hypothesis leads to the prediction that cues present in blood and serum, acting as a general indicator or either inflammation or invasion beneath the mucosa, would induce changes in gene expression that allow bacteria to interact successfully with immune functions. To test this prediction, we used *Bordetella bronchiseptica*, which naturally persists on healthy mucosa but occasionally causes deeper infections. When exposed to blood or serum *B. bronchiseptica* increased expression of ACT, T3SS, and FHA, and other proteins known to affect immune cells. The response to blood/ serum was not Bvg dependent, as ACT was induced by blood in a Bvg- phase locked mutant. Blood/serum induced similarly profound changes in expression of various antigenic factors including T3SS and FHA in *B. pertussis* and *B. paraptussis*, indicating that this ability is shared by all 3 species of Classical *Bordetella* species. Additionally, all three demonstrated increased cytotoxicity after exposure to blood or serum, revealing effects on interactions with host cells. Together these data demonstrate that *Bordetella* spp. sense signal(s) of increased exposure to host immunity present in blood/serum and respond with transcriptional and phenotypic changes that are likely to mediate their interactions with aspects of the host immune system.

Microplastic Sampling

Cole Howington, CURO Research Assistant

Dr. Jenna Jambeck, *Environmental, Civil, Agricultural, and Mechanical Engineering, College of Engineering*

Based upon our work of annual mass flows of plastic into our ocean compared with what has been found in the ocean, there are millions of tonnes of plastic in unknown locations. In order to understand potential impacts, it is important to try to determine the location and form of this plastic in our environment. Plastic physically degrades into smaller fragments and pieces, called microplastic, that can both transport organisms (including invasive species) and host their own microbial communities. Plastics also absorb persistent organic pollutants. Plastic debris continues to be found all over the world, and the average size of plastic particles in the ocean appears to be decreasing, but open ocean sampling published in the literature has consisted primarily of trawl collection of plastic samples 330 um and above. We analyzed open water samples collected through

filtration and fractionation on a path from the Canary Islands to Martinique, across the Atlantic, the Great Lakes, and Lake Victoria. The samples were filtered in the lab, and using a Malvern instrument, we identified and quantified the plastic found.

Effects of Increased Sediment Load on Fitness of Two Dominant Macroinvertebrate Shredders of the Southern Appalachians, *Tallaperla* and *Pycnopsyche*

Cody Austin Hufstetler, CURO Research Assistant

Dr. Catherine Pringle, *Ecology, Odum School of Ecology*

Insects that 'shred' leaves can play an important role in controlling ecosystem processes of decomposition in stream ecosystems. Here I will investigate effects of riparian forest management practices on two dominant species of insect shredders in streams draining the southern Appalachians. In order to inform best management practices, the USDA Forest Service is employing a variety of silvicultural methods to experimentally remove the native riparian shrub *Rhododendron maximum* from stream reaches in the Nantahala National Forest of North Carolina. *Rhododendron* grows densely around streams of the southern Appalachians and has been found to inhibit the growth of other riparian flora. Results indicate that the mode of *Rhododendron* removal (cutting and/or burning) can increase sediment loading to stream reaches. These elevated sediment levels can potentially negatively affect stream algae, macroinvertebrates, and fishes. In order to understand how increased sedimentation due to *Rhododendron* removal affects stream insects, I will test the effects of increased sediment load on the growth rate of two dominant insect shredders, *Tallaperla* spp. and *Pycnopsyche* sp. Macroinvertebrates will be collected from control sites and reared in mesocosms with four treatments of sediment loading. We predict that increased sediment loading will decrease growth rates of both *Tallaperla* and *Pycnopsyche*, which could potentially negatively affect the ecosystem process of leaf decomposition in streams.

Genomic Editing of *Neurospora crassa* as a Tool for Studying Circadian Oscillator Synchronization

Brooke Hull, CURO Research Assistant

Dr. Jonathan Arnold, *Genetics, Franklin College of Arts and Sciences*

Circadian rhythms are a well-characterized emergent property of the organism as a whole in *Neurospora crassa* with known responses to external factors, such as temperature and light, but the effect of intercellular communication on this system is not understood. Our group has recently demonstrated synchronicity of cells over time in interactive cell populations, but not in those that are physically barred from cell-to-cell interaction. We

therefore hypothesize cells can communicate circadian time to each other, resulting in synchronization of cell clock phase. To measure directly the synchronicity of cells over time we have engineered a second construct with yellow fluorescence. *Venus*, a yellow fluorescent protein, was introduced into the genome in codon optimized form under the control of the promoter of the *clock controlled gene 2* using CRISPR Cas9 guided homologous recombination. When used in tandem with an existing red fluorescence construct, this new strain allows visualization and direct study of circadian synchronicity in *N. crassa* on both a single cell and on a population scale.

Burqas, Bangles, and Beautiful Women: Gender Implications of the Disnification of Religion in Film

Kate Huller, CURO Research Assistant

Dr. Robert Foster, Religion, Franklin College of Arts and Sciences

Millions of Americans have seen Disney films, and many associate them with childhood due to their seemingly innocent themes and catchy songs. However, this simple perception of Disney frequently overlooks some of the more nuanced elements of gender and religion included in some of their films. Those published during the time known as the Disney Renaissance (1989-1999) are particularly intriguing because they break free of the more traditional Disney framework. This project will explore the way that Disney employed flattened forms of religion and cultural context during this era as tools to promote a “Hollywoodized” gender schema for women. In particular, it will analyze *Aladdin* (1992), *The Hunchback of Notre Dame* (1996), and *Mulan* (1998) as films that are set outside of America and thus engage in attempts at cultural representation. In this evaluation process, data will be taken not only from the films themselves, but also from critiques of the movies given by the populations that Disney attempted to portray. Through this data, a pattern of the use of religion as a tool for developing gender roles will be revealed, which will serve as a more in-depth perspective on what Disney films may be socializing young children to believe.

Exploring the Role of Plant Physiological Responses to Increasing Atmospheric CO₂ Concentrations on Extreme Temperatures and Heatwaves

Albert Leonard Hunecke III, CURO Research Assistant

Dr. Gabriel J Kooperman, Geography, Franklin College of Arts and Sciences

Heatwaves and temperature extremes pose significant threats to human health and society. The CDC estimates that there are more than six-hundred heat-related deaths per year in the United States alone; and heat-related hospitalizations often exceed two-hundred thousand per year. Unfortunately, climate change is expected to increase

the frequency and severity of these events. Therefore, it is critical that we improve our understanding of the processes that influence heat wave development. Increasing the concentration of CO₂ in the atmosphere can influence temperature in many ways. In particular, higher CO₂ enhances the greenhouse effect and leads to increases in temperatures on long time-scales. Additionally, higher CO₂ can influence temperature via its impact on the physiological properties of plants (i.e., stomatal conductance). Increases in CO₂ decrease the size of stomata on the surfaces of leaves, which lead to less evaporation into the atmosphere via lower transpiration. If the surface receives the same amount of energy (e.g., sunlight), a decrease in evaporation leads to more energy absorbed by the surface and greater warming. In this research project, we investigate the relative impacts of the Greenhouse Effect and decreased Stomatal Conductance on temperature extremes through a series of controlled global climate model simulations.

The Implications of a MERS-CoV Outbreak on the Global Health Governance Infrastructure and Politics in the Middle East

Baqar Husain

Dr. Corrie Brown, Pathology, College of Veterinary Medicine

Middle East respiratory syndrome coronavirus (MERS-CoV) is the agent of an acute respiratory illness, with the majority of cases presenting in the Arabian Peninsula. It is thought to be endemic in dromedary camels, with the agent transmitted from infected camels to humans, and occasionally between humans through respiratory secretions. This research will present a review of ongoing deliberations among stakeholders in public health institutions concerning the potential for a major MERS-CoV disease outbreak. This research will also examine the potential implications of designating MERS-CoV as a public health emergency of international concern (PHEIC), how that might affect the International Health Regulations (IHRs), and the possible consequences on the source countries, which vary significantly in capacity, economy, and political stability.

Fine Mapping of the *BR1* Locus to Identify the Gene Responsible for Panicle Bristle Length in Pearl Millet

Justin Ikenna Ikara, CURO Research Assistant

Dr. Katrien M Devos, Crop and Soil Sciences, College of Agricultural and Environmental Sciences

Previously, an F₂ mapping population of pearl millet, *Cenchrus americanus*, was generated by crossing a tall bristled accession ICMP451 (*D4D4BR1BR1*) and a dwarf non-bristled accession IP 10402 (*d4d4br1br1*). The F₂ progeny consisted of non-bristled dwarfs similar to IP 10402, tall bristled plants similar to ICMP 451, and bristled dwarfs significantly taller than the non-bristled dwarfs.

The objective of my study is to identify the *BR1* gene to further determine the components that control plant height in pearl millet. Fine-mapping of *BR1* is being done in an F₂ population homozygous for another dwarfing gene, *D2*, and segregating for the bristling gene *BR1*. The *D2* gene dwarfs plants by reducing the length of the internodes, which decreases lodging of the crop. A dwarf F₃ progeny (*BR1BR1/d2d2*) derived from a cross between the tall bristled accession ICMP451 (*BR1BR1/D2D2*) and the dwarf non-bristled accession Tift23DB (*br1br1/d2d2*) and homozygous for bristles was used as the male parent in a cross to Tift23DB. An F₁ progeny, which was heterozygous at the *BR1* locus (*BR1br1*) was self-pollinated to produce F₂ seed segregating for bristling. As a first step in identifying the *BR1* gene, I will analyze recombination events in the *BR1* region. Two genetic markers, SILP2872 and IPES0126, that were previously shown to flank *BR1*, were used for genotyping the fine-mapping population and to identify recombinant progeny. The recombinant progeny will then be used to identify markers tightly linked to *BR1*.

Discovery of a Unique Operon that is Essential for Glycan Formation in Members of the Pathogenic *Bacillus* Species

Kenny Nonso Ikebudu, CURO Research Assistant
Dr. Maor Bar-Peled, Biochemistry and Molecular Biology, Franklin College of Arts and Sciences

Bacillus cereus are a large group of known pathogenic bacteria species, and depending on the specific species can cause Anthrax, food poisoning to animals, or adverse effects toward insects. This species is very common near human setting and found spread in farm, water, and soil. This research investigates the role of glycans (sugar coated polymers) in the survival of different member of the *Bacillus cereus*. In an individual glycan, the sugar sequence and sugar composition is unique and can differ between different bacterial species. The complete reason behind these differences remains largely unknown. Recently, the lab identified two operons involved the synthesis of activated sugars in *Bacillus cereus* ATCC 14579. The activated sugars (nucleotide-sugars) are the substrates for specific enzymes (called glycosyltransferase) that recognize the sugar and attached it to a specific growing sugar polymer. The focal point of my research is to express different proteins and study their specific enzyme activities. For this purpose, I am using expression plasmids encoding different genes of these operon. These genes are expressed in *Escherichia coli* to make recombinant proteins that can be purified later using nickel affinity column. I plan to purify proteins and test their enzyme activity. I will monitor the enzyme activity using HPLC-MS/MS. HPLC chromatography will separate the enzyme components, and the analyses will be carried out by mass spectrometry (MS). Understanding the function of a specific enzyme can be used to design chemicals that inhibit

the activity. These chemicals can serve as a drug that may impact the life of the bacteria.

Sensitivity of Heterotrophic Soil Respiration (HSR) to Temperature as Mediated by Mycorrhizal Fungi

Grace Anne Ingham, CURO Honors Scholar
Dr. Nina Wurzbarger, Ecology, Odum School of Ecology

Heterotrophic soil respiration (HSR) is the largest terrestrial, non-anthropogenic source of CO₂ entering Earth's atmosphere and contributing to global climate change. A result of the saprotrophic decomposition of organic matter, HSR increases with rising temperature, thus contributing to rising atmospheric CO₂ concentrations in a positive feedback. The degree to which HSR is heightened by rising temperatures may be mediated by the presence of mycorrhizal fungi. Ectomycorrhizal (EM) fungi depress decomposition by limiting nitrogen availability to saprotrophs, while arbuscular mycorrhizal (AM) fungi stimulate decomposition as a nutrient acquisition strategy. Therefore, we hypothesized that EM fungi dampen the response of HSR to increasing temperatures, but that AM fungi further stimulate carbon loss. To test this hypothesis we sampled soils from temperate forests along a latitudinal gradient (Wisconsin to Georgia) where each forest contained a range of species presence from completely AM to completely EM. We incubated soils from plots along mycorrhizal gradients at four temperature regimes (5, 10, 17, and 25°C), and measured CO₂ loss via HSR over time. Data analysis will reveal the temperature sensitivity of HSR in relation to mycorrhizal composition of species in the source plot for soil. Our results will improve predictive models of atmospheric CO₂ concentrations, which currently use a single assumed value for HSR contributions from all ecosystems. By illuminating the way that mycorrhizal composition of an area mediates the response of HSR to changes in temperature, our research makes these models more accurate and thus inform carbon emissions policy.

Do You Have a Third Eye?

Katie Irwin, CURO Research Assistant
Dr. James D Lauderdale, Cellular Biology, Franklin College of Arts and Sciences

The lizard parietal eye, commonly known as the third eye, is remarkably well developed, possessing a lens, cornea, and retina, but little else is currently known about this organ. This project aims to compare the parietal to the lateral eye in the *Anolis sagrei* lizard, hypothesizing that parietal and lateral eye development employ similar gene networks. Because of the parietal eye's fascinating eyelike structures, understanding its development in comparison to the lateral eye will provide a unique system, not present in humans or many other vertebrates, for gaining insight

into mechanisms underlying formation of vertebrate eye structures. *A. sagrei* eggs were collected from adult lizards, and embryos were removed from their shells and assigned a developmental stage based on morphological criteria. Tissue was then dissected, fixed, and processed for paraffin wax sectioning. After sectioning, tissue was stained with hematoxylin and eosin and imaged in order to construct a timeline of morphological development encompassing each embryonic stage, the hatchling, and the adult. Indirect immunofluorescence microscopy was used to assess the expression of genes associated with eye development, including Pax6. Although the development of the parietal eye is shown to occur in a series of morphogenic events similar to those expected of eye development, differences in the histogenesis of the parietal eye compared to the lateral eye suggest a new pathway for lens induction. Further elucidating the specific roles of parietal eye regulatory networks could complement lateral eye studies to lead to better understanding of vertebrate eye formation.

Role of Phosphatidylserine in Hemorrhagic Fever Entry

Hersha Iyer, CURO Research Assistant

Dr. Melinda Brindley, Infectious Diseases, College of Veterinary Medicine

Previous studies show that many enveloped viruses rely on host cell phosphatidylserine (PS), a lipid in the plasma membrane, for entry. During budding, the virion is covered with the host cell's lipid bilayer, including surface-expressed PS. The viral particle can then initiate interaction with PS receptors on an adjacent cells and trigger internalization through macropinocytosis. We know that Ebola (EBOV) primarily uses PS receptors for entry, and Lassa (LASV) can also use these receptors, while vesicular stomatitis virus (VSV) and Measles (MeV) do not. Cells typically contain highly asymmetric membranes, with PS lipids in the inner leaflet. Cellular enzymes called flippases and scramblases mediate the asymmetric lipid distribution. Viral infection induces apoptosis and the cellular flippases and scramblases are activated/inactivated to reverse the location of PS. To determine if virus growth is altered in cells with defective PS distribution, we monitored viral growth in HAP1 cells deficient in known PS flippases and scramblases. Preliminary studies in the lab showed that VSV replication was not significantly altered when viral infection was mediated by its native glycoprotein (VSV-G). However, when VSV entry is mediated by the EBOV or LASV glycoproteins, virus replication was significantly inhibited when cells lacked XKR8 and CDC50a. To further show the specificity of this observation, I monitored Measles virus replication in the cells. Based on the MeV growth curves, there is no defect in MeV replication. This data suggests PS in the outer membrane of virions is important for specific viral glycoproteins.

Installation and Testing of an Electronically Controlled Actuator for Slow Compression of Combustion Gases

Adam Smith Jackson, CURO Research Assistant

Dr. Brandon Rotavera, Environmental, Civil, Agricultural, and Mechanical Engineering, College of Engineering

The overall goal of this research is to install and conduct compression rate tests on an electronically controlled actuator that is appended to a stainless steel compression cell in the Combustion and Atmospheric Reaction Mechanisms Laboratory (CARMEL) at UGA. The actuator is used to compress gaseous products from combustion that are extracted from a flow reactor for analysis of the chemical makeup using gas chromatography (GC) / mass spectrometry (MS). These combusted gas samples have many byproducts that require identification to enable the computational modeling of a combustion process. One goal of CARMEL is to clarify the underpinning mechanisms that form the sampled byproducts to improve modeling capabilities. To do this, a sample is drawn from the flow reactor, which operates at high pressure (20 atm), via sonic sampling into a low-pressure (0.01 atm) chamber to prevent further combustion. To analyze the gas sample using GC/MS, the sample is then compressed up to ~2 atm inside an electronically actuated gas-compression cell with independent temperature control along with control over compression rates. The output from this project will be wiring the actuator, connecting it to a computer for software control, and building an operations manual that describes how to compress the gas samples for analysis. A test plan will also be developed to measure the relationship between the compression rate of the actuator and the final pressures and temperatures of a gas sample being fed into the GC/MS, which depend on the initial pressure at which the sample is taken.

The Effects of Corporate Social Responsibility on Purchase Habits of College Consumers

Lyndsey Camille Jackson, CURO Research Assistant

Dr. Juan Meng, Advertising and Public Relations, Grady College of Journalism and Mass Communication

The purpose of this research is to identify the influence of corporate social responsibility campaigns and initiatives on the purchasing habits of college consumers. The research aims to understand college consumers' knowledge and awareness of CSR and how it determines which products and brands they purchase. The researcher used two methods to investigate the topic: (1) An online survey that was distributed to UGA students; (2) A focus groups consisting of seven college participants from UGA. Results show that although college consumers possess a strong interest in companies participating in charitable initiative, many of those consumers are unaware of CSR initiatives that

corporations promote. Results also reveal that college consumers are more likely to purchase from companies whose values align with their own. However, college consumers are not willing to sacrifice personal well-being to support CSR initiatives. Companies should develop CSR campaigns aiming towards college consumers and promote efforts through social media. It is important to reach the college consumer market as they begin to enter the workforce and make independent decisions on what they should purchase and who they should purchase from. The college consumer wants to garner their information from the palm of their hand with more outreach on digital platforms, CSR can increase a company's sales and brand awareness. The study provides insights into the current effectiveness of CSR initiatives on college consumers. The research helps companies to understand the need to improve their CSR outreach efforts to target college consumers.

Generation of Virus-Like Particles for Mouse Antibody Cross Reactive Study

Ummar Jamal

Dr. Ted M Ross, Infectious Diseases, College of Veterinary Medicine

The Influenza virus has been focused on for many decades due to its ability to cross react and infect many different hosts. Combined with the ability to mutate and antigenically drift to create novel strains of the influenza, the influenza virus poses a great threat towards pandemics. Therefore, the understanding of the pathology and infectivity of the influenza virus is essential towards the creation of effective influenza vaccines. Traditional vaccines are usually trivalent, providing protection to only three strains. However, modern research is being done in order to provide protection against a broad range of influenza strains. Through the use of Virus like Proteins (VLPs), the objective is generating larger antibody counts, which would in turn lead to greater immunity. For this project, mice sera was analyzed for antibody response via Hemagglutination Assay against different influenza strains. Through creating a broadly reactive vaccine, the research may eventually lead to greater immunity towards the influenza virus and decrease the threat of pandemic outbreaks.

Effects of Weather on Northern Bobwhite (*Colinus virginianus*) Harvest

Holly Jamieson

Dr. James Alan Martin, Forestry, Warnell School of Forestry and Natural Resources

Northern Bobwhite (*Colinus virginianus*) populations have been declining in the Southeastern United States due to habitat loss and fragmentation over the past few decades. Habitat restoration through conservation initiatives

is underway throughout much of the species' native range. Hunter success serves as an important indicator of successful habitat restoration for game species with declining populations such as the Northern Bobwhite. This project will work to determine how multiple weather variables affect the harvest of Northern Bobwhite on three different Georgia Wildlife Management Areas (WMAs). There have been no other studies solely analyzing weather effects on hunter success in Georgia. Data are being collected from Di-Lane, Silver Lakes, and Chickasawhatchee WMAs using the Georgia automated environmental monitoring network weather station closest to each WMA. Weather measurements are being recorded every hour during legal hunting hours of each scheduled hunt for the duration of the 2017-2018 Northern Bobwhite hunting season. Along with these data, historical data will be used to build predictive models of hunting success. Covey flushed per hour will be used as a measure of hunter success and will be determined from data provided by the Georgia Department of Natural Resources. Linear regression will be used as the main method of analysis. The results will not only provide valuable data to wildlife biologists about the success of their management but will also provide hunters with information on how to maximize recreational opportunities and success.

Interpreting Queer Spirituality for the Stage

Abraham Johnson, CURO Summer Fellow

Prof. George Contini, Theatre and Film Studies, Franklin College of Arts and Sciences

If "theatre is the new church," as is a common phrase with many new playwrights, then how does the stage interact with queer communities who are historically pushed out of religious communities? Through studying the exemplification and relationship of theatre with the queer (LGBTQ) community, this research explores queer theory, the history of queer spirituality as depicted onstage, and the creative opportunity in exerting my own queer spirituality in theatrical contexts. The initial process of research involved studying texts ranging in topics from queer phenomenology to radically spiritual drag queens. After collecting critical reflections, excerpts were comprised into a sort of "Queer Bible" which served as a portfolio for original and critical thought surrounding my research topic. From here, the creative exploration of these themes manifested itself through the first drafts of three original plays. These plays explored queer spirituality in a broad range of interpretation, ranging from conversations on organized religion to more external manifestations, such as nature as spiritual and inclusive spiritual setting. As a conclusive capstone to the summer research, I took these three scripts to develop at the 2017 Lambda Literary Retreat for Emerging LGBTQ Voices, which involved personal interviews with various scholars

I studied over the course of research. As continuation of this research, I am currently studying queer spirituality in intergenerational contexts.

The Intergenerational Queer Spirit: Grindr, God, and Where We Came From

Abraham Johnson, CURO Research Assistant
Prof. George Contini, Theatre and Film Studies, Franklin College of Arts and Sciences

As a continuation of past research in queer spirituality, this study explores generational differences between two queer lives—the mentor and the student. Professor George Contini and I are aiming to answer the questions: where is the queer and spiritual connection of the new queer generation? Where is that in context to the past generation that blazed our trail? In considering this sort of pathfinder relationship, the aim is to tackle these questions by relating back to queer theory texts, establishing conversation and reflection with multiple queer generations on an international scale, and ultimately embodying this research through a performance art piece exploring the synthesis, conflict, and connection between a generation that fought for our rights and the new generation who exerts them. This research is founded in theory and conventional study, but builds on that foundation through a more experiential approach. The conversations and reflections will be primarily focused on the wide span of queer generations that I experienced at the 2017 Lambda Literary Retreat for Emerging LGBTQ Voices. Through anonymous interviews and mutual exploration with some of the writers, profiles will be built around their responses and concerns. From here, the context of the conversation will be established and the foundation of our performance piece will be built. Through all of this research, we hope to build a stronger connection to and more mutual ownership of the queer spirit that runs through both our generations.

Experimental Investigation: Controlling Temperature Rise due to Heat of Hydration in Mass Concrete Placements

Chris Johnson II, CURO Research Assistant
Dr. Mi Chorzeпа, Environmental, Civil, Agricultural, and Mechanical Engineering, College of Engineering

As our transportation infrastructure begin to age and deteriorate, it is essential to discover ways in which concrete could be developed to last longer. As a result of this need, this research study aids in the improvement of mass concrete provision for the Georgia Department of Transportation (GDOT). Temperature rise due to heat of hydration is one of the major concerns involving concrete structures. Metakaolin, a supplementary material that can replace cement partially, is an abundant resource in the state of Georgia that would make a viable option. With

the addition of fly ash and slag, the objective remains to find all mixtures that don't meet the current GDOT specifications for mass concrete. Therefore, this specification will consider mixtures with a maximum temperature of 85° F. The objective of the research is to identify the maximum allowable internal temperature for concrete mix designs incorporating cementitious materials such as fly ash, slag, and metakaolin for implementation mass concrete specifications. We use different variations of slag and metakaolin. Metakaolin possesses qualities that can contribute to long-lasting concrete. Slag is used to reduce the environmental footprint of concrete. As a group, we make 2x2x2 cubes of concrete for temperature testing and 7-8 cylinders that are used for strength testing. Through this study, we were successfully able to construct 10 cube specimens and monitored the strength and temperature change in the specimens. It is concluded that ternary replacement mixtures including slag and metakaolin are effective in reducing the total heat generation in mass concrete structures.

A Mendelian Randomization Study on Depression and Alzheimer's Disease

Harrison Jones, CURO Research Assistant
Dr. Changwei Li, Epidemiology and Biostatistics, College of Public Health

Alzheimer's disease (AD) is a progressive, neurodegenerative disease that degrades memory and other important mental functions, which disproportionately affects individuals aged ≥ 65 . No cure exists in the status quo for AD; however, treatments are targeted toward the symptoms to improve quality of life. Depression is a mental health disorder that impairs daily life. Some observational studies demonstrated that depression significantly increases the risk for AD, while other studies indicated that depression was not a risk factor for AD, instead, a comorbidity of AD. Therefore, the relationship between depression and AD is inconclusive. Observational epidemiologic studies suffer from residual confounding that can distort the true relationship between depression and AD. We will conduct a Mendelian randomization (MR) study on depression and AD. The MR study will use genetic factors, namely genetic risk score (GRS), as a proxy for depression, and test association between the GRS and AD. Since genetic factors determining the risk for depression are not associated with potential confounders, our study can provide robust evidence for a causal relationship between depression and AD. Genetic loci for depression were abstracted from previous genome-wide association studies. GRS will be generated for depression among 11,400 participants of the Health and Retirement Study. Association between the GRS with depression and Alzheimer's disease will be investigated, respectively. Strength of the causal association of depression with AD

will be quantified using instrumental variable estimator. Assuming that a correlation is identified then depression would be a novel, promising avenue to clinically target and treat AD.

The Impact of Beauty Vloggers on the Purchasing Decisions of Millennial and Generation Z Female Consumers

Jillian Faith Jones, CURO Research Assistant
Dr. Juan Meng, Advertising and Public Relations, Grady College of Journalism and Mass Communication

The purpose of this research is to gain insights on the impact that “vloggers” defined as video bloggers, have on the purchasing decisions of Millennial and Generation Z females. This research aims to discover whether traditional television commercials or online vlogs hold more stature in guiding beauty product buying habits. To learn more about which messages align with these generations’ buying habits and preferences, the researcher carried out two methods of research: (1) a focus group with four female consumers and (2) an online survey of Millennial and Generation Z females. In both methods, the researcher compared a traditional TV ad for Maybelline New York’s Fit Me Foundation to a YouTube vlog reviewing the same product. The research found that Millennial and Generation Z women are more influenced by beauty vlogs because of their affinity for demonstration and authenticity. In the midst of today’s digital age, results show that Millennial and Generation Z women respect the opinions of creators on websites such as YouTube. The advertising of beauty products is experiencing a shift from traditional tactics to communication strategies designed for the digital age. Therefore, companies and brands may need to consider seeking out internet vloggers to help promote their products and services to a new audience. The research is highly important because it reveals insights into the proper messaging strategies and forms of media beauty brands and companies should align with to reach the younger generations.

Detection of Azole-Resistant *Aspergillus fumigatus* in Agricultural Environments

Tina Jones
Dr. Marin Talbot Brewer, Plant Pathology, College of Agricultural and Environmental Sciences

Aspergillus fumigatus is a fungus with the potential to cause serious lung infections in immunocompromised individuals when its spores are inhaled from the environment. This human pathogen is commonly found in soil and compost and recently, azole-resistant strains have been reported in the lungs of aspergillosis patients. In Europe, studies have linked the emergence of antifungal resistance to agricultural azoles used to suppress plant-pathogenic fungi. Our preliminary objective was to determine if azole-

resistant *A. fumigatus* is present in agricultural settings where azoles are used in Georgia. Soil and compost samples were collected from sites treated with azole-based fungicides. Samples were suspended in buffer, spread onto sabouraud dextrose agar (SDA) amended with antibiotics, and incubated at 45°C for 2 days to select for heat-tolerant *A. fumigatus*. Isolates were tested for the ability to grow on tebuconazole-amended SDA (3 µg/ml). A total of 497 isolates from soil and compost in Georgia have been collected and confirmed as *A. fumigatus* based on colony morphology. Five isolates were sequenced at the internal transcribed spacer region of the rDNA (ITS) and compared with the NCBI GenBank database to confirm they were indeed *A. fumigatus*. Twenty-two percent of the isolates we collected were determined to be putatively azole-resistant based on growth on tebuconazole-amended SDA. We will continue to collect isolates from additional sites in GA, then phenotype all isolates for sensitivity to specific azole antifungal drugs. These preliminary results show azole-resistant *A. fumigatus* isolates are present in agricultural environments treated with azole fungicides in Georgia.

Characterizing Stroke via T2W Sequences and Associated Volumetric Measurements, Including Hemisphere, Ventricle, and Lesion Volumes

Zack Jones, CURO Research Assistant
Dr. Franklin Delano West, Animal and Dairy Science, College of Agricultural and Environmental Sciences

Stroke is a leading cause of long-term disability in the United States. Magnetic Resonance Imaging (MRI) is a powerful diagnostic tool clinically used to establish stroke type and severity, therefore improving treatment methods and functional outcomes. This study aims to assess ischemic stroke pathophysiology by characterizing volumetric changes in hemispheres, ventricles, lesions, and midline shifts. Ischemic stroke will be induced via permanent occlusion of the middle cerebral artery (MCA) in adult male castrated Landrace pigs. T2 weighted (T2W) sequences will be collected pre-stroke and 1 and 89 days post-stroke. T2W sequencing is expected to reveal ischemic lesion and consequent cerebral edema. Observable ipsilateral hemispheric swelling 1 day post-stroke. Contralateral hemispheric volume reduction is predicted as the midline shifts and intracranial pressure increases. 89 days post-stroke, lesion and ipsilateral hemispheric are expected to decrease, while ventricular volume increases. With the effects of ischemic stroke clearly characterized at both acute and chronic time points, T2W sequences can be used more extensively to accurately identify variation between human clinical patients. This can improve evaluation of treatment efficacy or improve severity classification of brain trauma in clinical environments.

Changes in Clay Mineral Assemblages of Legacy Sediments in the Calhoun Critical Zone Observatory, SC: Evidence for Anthropogenic Landscape Change

Bear Jordan

Dr. Paul A Schroeder, Geology, Franklin College of Arts and Sciences

The Critical Zone Observatory (CZO) is a National Science Foundation program whose goal is to develop a model of how physical, biological, and chemical processes interact within the “living skin” of the Earth. Specifically, the Calhoun CZO examines landscape degradation as a result of agricultural processes. Calhoun, SC is an area that has historically been farmed which lead to extensive erosion and the production of legacy sediments, or sediments eroded as a result of post-European settlement farming practices. An organic-rich paleosol was identified within the Calhoun CZO at Old Rays Tributary that had been subsequently buried by legacy sediments. This paleosol defined the surface between pre-legacy sediments and the legacy sediments themselves. I hypothesized that the respective mineral assemblages in this deposit would vary across this boundary. Using X-ray powder diffraction with internal zincite and external corundum standards, descriptive mineralogies across the depth profile were produced. Results indicate that pre-legacy sediments carry a signature of amphibole and discrete micas while legacy sediments carry a signature of increased kaolin group minerals and degraded micas (i.e. clays). These findings support the hypothesis and draw into question the provenance of the two sediment groups. One possible explanation for the higher clay content of the legacy sediments is from erosion of interfluvial B-horizon material adjacent to the floodplain. The abundance of primary minerals (amphibole and mica) in the pre-legacy sediments may also reflect an allochthonous deposition due to backwater flood events.

Descriptive Mineralogy of Georgia's Barrier Island Beaches

Bear Jordan

Sydney Paige Lee

Dr. Sally Walker, Geology, Franklin College of Arts and Sciences

Georgia is bordered on the east by a series of barrier islands that demonstrate specific morphologies and beach profiles. Georgia barrier islands are located in the Georgia bight, where erosional and depositional processes give them a characteristic drumstick shape. The islands' beach profile consists of a backshore, a shallow foreshore slope, and a low tide surface exposure. Data exists regarding the bulk mineralogy of these beach sediments; however, there is little information regarding the mineralogy specific to each of the facies or comparing this distribution across islands in the Georgia barrier island chain. The goal of this study is to conduct a facies-specific descriptive mineralogy of

two adjacent barrier islands. It is expected that each island will show some mineral variation across facies, but little variation from island to island. For this study, samples were collected from each facies from two barrier islands with similar structures, Sapelo Island and St. Simons Island, and powdered for X-ray diffraction analysis. This analysis demonstrated a clear distinction in heavy mineral presence across facies on Sapelo Island, with ilmenite, rutile, and magnetite present in higher quantities in a mafic lamina located in the low tide surface exposure than at the backshore. Data collected through this study can be used when analyzing ancient sediments to better determine environments of deposition, and has potential applications for economic geology in terms of coastal energy deposits.

The Effect of High-Fat Diet on Fat Accumulation in the Liver

Abhinav Joshi

Dr. Krzysztof Czaja, Veterinary Biosciences and Diagnostic Imaging, College of Veterinary Medicine

Increased deposition of triglyceride within the liver due to the inability of the liver to remove the fat leads to Non-Alcoholic Fatty Liver Disease (NAFLD). The purpose of this study was to investigate the effect of high-fat diet on liver fat accumulation using Sprague Dawley rat as a model. We tested the hypothesis that the percentage of fat in diet and duration of the diet will affect the accumulation of fat in the liver. Sprague Dawley rats [n=43] were divided into three groups: long-term high-fat group [n=11] with 60% kcal fat diet, short-term high-fat group [n=12] with 45% kcal fat diet, and short-term control group [n=20] with 13% kcal fat diet. Body composition was measured using a Minispec LF-110, a magnetic resonance apparatus, and DEXA scan, a low power x-ray machine. The liver fat content was measured by the Minispec LF-110. Results of the study showed that long-term consumption of a high-fat diet significantly increased liver fat and body fat accumulation. Both long-term and short-term consumption of a high-fat diet greatly increased the rate of body weight gain compared to the control diet. In conclusion, the study revealed that short-term consumption of high-fat diet is not significantly damaging the liver but may lead to increased body weight and obesity. Long-term consumption of high-fat diet leads to NAFLD and obesity.

Arboviral Outbreak Prediction Following Hurricanes Irma and Maria in Puerto Rico

Andre Gabriel Jove

Dr. José F Cordero, Epidemiology and Biostatistics, College of Public Health

Puerto Rico recently escaped direct landfall by the Category 5 Hurricane Irma but was followed shortly by Category 4 Hurricane Maria. Prior to landfall, Puerto Rico already exhibited a state of economic and environmental

vulnerability to natural disasters, as the island has recently filed for bankruptcy, and a majority of the population lives in coastal municipalities and flood-prone areas. The post-impact conditions have created a concern about potential outbreaks of arboviruses including Zika, Dengue, and Chikungunya, which are endemic to Puerto Rico. We conducted a literature review to predict arboviral infection trends in Puerto Rico following the hurricanes. We reviewed the peer-reviewed literature for past outbreaks in association with the post-impact conditions following water-related disasters. No exclusions were made based on the country, year of outbreak, or population affected. We reviewed outbreaks occurring in 5 countries following water-related natural disasters (e.g. floods, tsunami, and hurricanes). Results were varied and the risk of arboviral infection increased in certain cases, as in a Dengue outbreak in Havana was observed following the landfall of Hurricane Michelle in 2001. In other instances, such as in Gonaïves, Haiti after Hurricane Jeanne in 2004, no changes were observed in the rates of arboviral infections. We hypothesize that there is an increased risk for arboviral infections in Puerto Rico. This is due to the creation of new mosquito breeding sites, the endemic nature of the arboviruses, and the destruction of infrastructure, increasing the susceptibility to mosquito exposure.

A Study of Formaldehyde in MBM40

Mackenzie Joy, Foundation Fellow

Dr. Loris Magnani, Physics and Astronomy, Franklin College of Arts and Sciences

MBM40, a high-latitude molecular cloud, has been extensively studied using different molecular tracers. Multiple studies are necessary because the different transitions trace different kinds of gas. It appears that MBM40 is composed of a relatively dense, helical filament embedded in a more diffuse substrate of low density molecular gas. In order to study the transition between the two regimes, this project represents the first mapping of MBM40 using the $1_{11}-1_{10}$ hyperfine transition of formaldehyde (H_2CO) at 4.83 GHz. We used H_2CO spectra collected from the Arecibo telescope more than a decade ago to construct this map. The results can be compared to previous maps made from carbon monoxide $J=1-0$ data to gain further understanding of the structure of the cloud. The strengths of the lines were compared to strengths of CO lines for the same lines of sight. Although a correlation exists between the H_2CO and CO emissivity, there seems to be a saturation of H_2CO line strength for stronger CO emissivity. This is probably a radiative transfer effect of the CO emission: In diffuse clouds the CO(1-0) line can be stronger than expected because the photons scatter before the molecule can collisionally de-excite and so are able to exit the cloud. We have also found that the

velocity dispersion of H_2CO in the lower ridge of the cloud is significantly lower than in the rest of the cloud. This may indicate that this portion of the cloud is a coherent structure (analogous to an eddy) in a turbulent flow.

Documenting the Ephemeral: Composition and Decomposition in the Cinema of Agnès Varda

Jianna Patricia Justice, CURO Research Assistant

Dr. Christopher Sieving, Theatre and Film Studies, Franklin College of Arts and Sciences

In May 2017, at age 89, French director Agnès Varda premiered her latest documentary, *Visages, Villages* [English title: *Faces, Places*] at the Cannes Film Festival. The film marks sixty-plus years of filmmaking for Varda, yet her career has often been overlooked and even reduced by scholars to a political or gendered analysis, as emphasized by her frequented title as 'grandmother of the French New Wave.' The goal of my research is to shift away from these analytical constraints, and instead to engage with contemporary criticism and personal observation as they pertain to Varda's technical and aesthetic artistry. In doing so, I focused my efforts towards determining how Varda uses cinema, in particular the documentary genre, as a tool of preservation, documentation, and self-portraiture. In analyzing her works from as early as 1958 to the present, I found Varda's compositions reveal an implicit interest in the notion of decomposition and loss, whether in their choice of ephemeral materials like rotting potatoes as subject matter in films like *The Gleaners and I*, or in the remembrance of her late husband, the acclaimed director Jacques Demy, in *Jacquot de Nantes*. Varda's devotion to the ephemeral on screen, at times, expresses itself as both an anxiety, a desperate need to capture moments and persons in front of the camera before they evaporate entirely, and as a fundamental awareness and acceptance of the inevitability of change and loss. In examining the documentary strategies of Agnès Varda, I engage with the inherent paradoxes and possibilities that ultimately define Varda as one of the most individualistic and compelling filmmakers.

Quantifying Serum Oxidative Stress in Nonresponding Participants Supplemented with Dietary Carotenoids

Christine Kaba, CURO Research Assistant

Abby Thomas, Neha Arun Madangarli

Dr. Lisa Renzi Hammond, Psychology, Franklin College of Arts and Sciences

Dietary carotenoids lutein (L) and zeaxanthin (Z) selectively accumulate in the retina, where they are known as macular pigment (MP). MP is a biomarker of L+Z concentration in the cortex, and MP optical density (MPOD) has been linked to improved cognitive function, across the lifespan. Supplementing L+Z in the diet can improve

cognitive function in younger and older participants, but not all participants respond equally well to dietary supplementation. The purpose of this study is to investigate biofactors that predict supplementation response rates and to answer the question of if higher oxidative stress leads to lack of MPOD response in patients. Serum (via high-performance liquid chromatography) and retinal (as MPOD) L+Z levels were measured at baseline and in four-month increments in younger ($n = 37, M = 21.50 \pm 2.69$ years) and older ($n = 36, M = 72.51 \pm 6.24$ years) participants. At baseline, other variables (such as BMI) that might influence carotenoid absorption were also collected. The FRAS 4 Evolve was used to determine free radical and antioxidant status in banked serum samples. Retinal response (an increase of 0.1 log units of more over the course of one year of supplementation) and serum response (an increase of 10% of more over the course of one year) rates were computed and compared to candidate variables. The analysis is ongoing. An understanding of the biofactors that influence response to supplementation will enable those recommending dietary supplementation to maximize chances of patient success.

Mitochondrial Capacity and Muscle Endurance in Older Adults with Type 1 Diabetes

Manasa Kadiyala, Ramsey Scholar, CURO Summer Fellow, CURO Research Assistant

Dr. Kevin McCully, Kinesiology, College of Education

Type 1 Diabetes (T1D) is an autoimmune genetic disorder that currently affects over one million Americans. A previous study on young, well-controlled people with T1D showed normal muscle mitochondrial function and endurance, with some evidence of impaired muscle blood flow. The aim of this project is to continue this study to evaluate people with T1D who are older and potentially less well-controlled. We hypothesize that older people with T1D will have reduced muscle endurance and mitochondrial oxidative capacity compared to controls. Subjects who are controls or diagnosed with T1D and 40-50 years old will be tested. Casual blood glucose and HbA1c will be measured. Near infrared spectroscopy will be used to measure mitochondrial capacity of the forearm muscles. Using near infrared spectroscopy, we will also measure the muscle blood flow as the rate of influx of oxygenated blood after five minutes of muscle ischemia. Muscle accelerometry during electrical stimulation will be used to measure endurance of the forearm muscles. We expect to test up to 15 people per group, and this should allow us adequate power to compare the two groups, as well as to perform correlations between blood measures and our muscle tests. This study has IRB approval, and practice tests are currently being performed. Participant recruitment is expected to start in February 2018. Our results should improve our understanding of how

Type 1 Diabetes affects people's health, specifically their muscle physiology.

Investigating the Effects of Diet on Larval Development in *Hermetia illucens*

Emilia Kairys

Dr. Marianne Shockley, Entomology, College of Agricultural and Environmental Sciences

Insects have been proven useful in forensic investigations involving a deceased victim, as various insects tend to colonize the corpse after death. *Hermetia illucens*, or Black Soldier Flies (BSF), are one such species. The larvae of BSF are detritivores that will feed on different types of decaying organic matter, such as animal waste, compost, and decomposing animal tissue. Because of their habit of feeding on animal tissue, the life cycle of the BSF can be useful in determining the post-mortem interval of a victim based on how old the BSF specimens are. Previous studies have looked at the effect of diet on the development and life cycle of the BSF, and found that the larvae take longer to mature when fed a grain-based diet versus a diet of animal tissue. With this experiment, I hope to find out more about the life cycle of the BSF and the effect diet has on their development. There will be three groups of BSF, being fed three different diets. One group will be fed a grain-based diet, which will serve as the control. The other two groups will be fed animal tissue, one group with cow tissue and the other, with muscle tissue from a pig. Their development through the larval stage will be monitored, taking note of final size before pupation and how long it takes to reach said point. Knowing more about the effects of diet on BSF development can provide forensic entomologists with a stronger basis for determining post-mortem interval, and eliminate the need for assumptions in forensic investigations.

Relationship Between Early Life Stress and Impulsive Behavior mediated by Functional Connectivity of MCLS and Amygdala

Aparna Kanjhlia

Dr. Lawrence Sweet, Psychology, Franklin College of Arts and Sciences

Early childhood is a critical period in a child's life when they are most vulnerable to negative events and early life stress (ELS) including physical and sexual abuse, severe domestic conflicts, family separation, and social rejection. Exposure to chronic or severe ELS has been linked with impulsive decision making and risk-taking behavior; however, the neural activity underlying these associations is poorly understood. Neuroimaging studies investigating impulsivity suggest altered resting state functional connectivity (RSFC) of the mesocorticolimbic reward system (MCLS) including the ventral tegmental area (VTA) in the midbrain and

nucleus accumbens (NA), orbitofrontal cortex (OFC) and amygdala. Altered RSFC of amygdala and the prefrontal cortex has been implicated in individuals that have experienced stress early in their childhood, yet the literature lacks evidence suggesting whether the known relationship between ELS and impulsive decision making is mediated by functional connectivity between these critical brain regions. Thus, the present study aims to investigate this relationship through an analysis of RSFC of twenty-five healthy female participants from southern United States who participated in a functional MRI resting state scan and answered questionnaires about ELS and impulsivity as a part of a larger study conducted by the UGA Clinical Neuroscience (CNS) Laboratory. ELS was measured using the Early Life Stress Questionnaire (ELSQ) and Impulsivity was measured using UPPS-P Impulsive Behavior Scale (UPPS-P IBS). Neuroimaging analyses will be conducted using Analysis of Functional Neuroimaging (AFNI) software and correlation and regression analyses will be conducted in SPSS.

The Nature of Modern Famines: An Analysis of the Four Country Famine

Brice Vincent Karickhoff

Dr. Maria Navarro, Agricultural Leadership, Education, and Communication, College of Agricultural and Environmental Sciences

Today, the world is experiencing greater agricultural output, technological advances, and interconnectedness than in any other point in history. Despite this reality, four countries in particular are being decimated by large-scale famines: Nigeria, Somalia, South Sudan, and Yemen. This paradox reveals that more so than ever before, today's famines are the results of an extremely complex set of causes, and thus necessitate thorough investigation to consider potential solutions. Through an extensive literature review, I have found that political, economic, and environmental instability each play a unique role in the Four Country Famine, and the common thread that exacerbates these problems is conflict. Furthermore, through individual case studies, I plan to unpack a few particularly destructive factors that have made these famines unique, such as internal displacement, the use of food as a weapon, and hostility towards aid agencies. Through discussing the complex nature of the problems at hand, I hope to offer two conclusions. First, by analyzing past efforts and considering unique circumstances, I will propose ways that aid agencies and other stakeholders might hope to intervene in existing crises. Second, I will consolidate the unique causes of each of the current four famines to propose generalized risk factors that may indicate that a region is in danger of experiencing famine.

Microbiome Risk Score (MRS) in the Diagnosis and Classification of Inflammatory Bowel Disease

Arjuna Karikaran

Dr. Subra Kugathasan, Human Genetics, Emory University

We used a prospectively recruited cohort of pediatric IBD patients and unrelated healthy controls to examine the spatial and temporal distribution of microbiota within the various oral microenvironments, represented by saliva, tongue, buccal and plaque, and compared them with stool. Our 16S rRNA analyses indicate that oral microbiotas differ in composition based on the region of the mouth sampled, and these differences persist temporally. Comparative analyses revealed differences in overall diversity, richness, and relative abundances of specific bacterial groups between oral and stool, and a significant difference or pronounced shifts in relative abundances between IBD cases and controls. We further demonstrated that oral microbiota can discriminate IBD patients from controls. Collectively, these data indicate the potential of using oral microbial profiles in screening and monitoring patients with IBD. Furthermore, these results support the importance of spatial and longitudinal microbiome sampling to interpret disease-associated dysbiotic states and eventually to gain insights into disease pathogenesis.

***In vitro* Expression of VAR2CSA DBL3x Binding Domains to Assess Receptor Binding**

Rahul Abhijit Katkar

Dr. David Peterson, Infectious Diseases, College of Veterinary Medicine

Placental malaria is a disease syndrome caused by *Plasmodium falciparum*, affecting pregnant women in malaria endemic countries. Malaria infected RBCs bind within the placenta, restricting nutrient delivery to the fetus causing premature birth and low birth weights. Whilst multigravid women develop an immunity to placental malaria, it seems that primigravid and secundigravid women struggle to combat the parasite. The parasite's genome has a semi-conserved *var2csa* gene, which contains DBL domains allowing the protein to bind to chondroitin sulfate A (CSA) receptors on the placenta, causing an accumulation of infected red blood cells thus disrupting the placental function. Immune women have antibodies that recognize VAR2CSA, resulting in the selection of antigenic escape variants. We hypothesize that the VAR2CSA expressed by parasites in immune women bind less well than VAR2CSA found in non-immune women to CSA receptors. To study the binding domains encoded in the *var2csa* gene, the relevant regions of the gene must first be cloned into vector plasmids using restriction enzymes and ligation. The plasmids are sequenced verified, and then translated in a wheat germ cell free protein synthesis system chosen for its high yield

and quality of translated proteins. EBA-175 is a protein akin to VAR2CSA but is not involved in binding affinity to CSA, therefore it is an excellent choice for a negative control. The proteins that are translated from these cloned genes are then run on protein gels and western blots to verify that proper proteins were translated. Binding studies with the CSA receptor will test our hypothesis.

Stopping Rules for Majority Voting: A Public Choice Experiment

Evan Alexander Katz, CURO Research Assistant
Dr. Keith Dougherty, Political Science, School of Public and International Affairs

Does the manner in which voting ends affect the outcome of decisions made by committees? Solution concepts, such as the core, often make the same equilibrium prediction regardless of how voting ends. As a result, experimentalists have used a variety of stopping rules without carefully considering the consequences. This experiment compares majority decision making in committees using one of three stopping rules: vote by a majority to adjourn, a fixed time period, and the chair decides when to adjourn. We compare these rules for groups of five subjects using two distributions of ideal points studied by Fiorina and Plott. Although we find few differences between voting to adjourn and ending after a fixed time period, we find noticeable differences between groups with the chair decides to adjourn and those without. Allowing the chair to determine adjournment produces outcomes more favorable to the chair and can make the voting process continue for more than three times as many rounds as the other two treatments. Such results should help committees improve the rules governing their decisions.

The Effect of the Endosymbiont *Wolbachia* on Its Arthropod Host

Rachel Marie Keener, CURO Research Assistant
Dr. Kelly Dyer, Genetics, Franklin College of Arts and Sciences

Wolbachia is an intracellular bacteria that infects a wide variety of arthropods and can have many different effects on its host organisms. In some host species, *Wolbachia* can increase the immune response to other pathogens, which helps with disease resistance. In other hosts, however, *Wolbachia* can have reproductive costs and decrease the fitness of its host. I have explored the consequences of *Wolbachia* infection in the host fly *Drosophila recens* on fecundity, cytoplasmic incompatibility, and lifespan. I tested both infected and uninfected flies of the same genetic background that differed only in *Wolbachia* infection. In addition, I am also asking how flies from a related but usually uninfected species *D. subquinaria* are effected by *Wolbachia* in order to understand how *Wolbachia* can affect non-native species differently than their regular hosts. I

hypothesize that the infected *D. subquinaria* will have shorter lifespans and decreased fecundity compared to their *D. recens* counterparts, but that cytoplasmic incompatibility will remain the same between both species. My results will allow researchers to better understand the effects of *Wolbachia* in an introduced species. Scientists are now utilizing *Wolbachia* as a way to reduce the transmission of human diseases by mosquitoes, and my research may indicate other unintended consequences of *Wolbachia* infection on the host organisms.

Marine Microplastics: Mapping Distributions in Estuarine Systems

Clarissa Keisling, CURO Summer Fellow
Dr. James E Byers, Ecology, Odum School of Ecology

The distribution of marine microplastic (MP) pollutants (plastics <5 mm) is under studied. As suspension-feeders, oysters (*Crassostrea virginica*) filter large quantities of particulate matter and excrete it in sediments, making oyster reefs potential hot spots for MP accumulation. Studies have shown that exposure to MPs reduces oyster fecundity, posing a threat to general reef health. Additionally, it has been shown that commercially harvested oysters contain trace amounts of plastics, which may pose direct health threats to consumers. Creating this spatial map of MP "hot spots" will help designate better areas for aquaculture and reef restoration projects by targeting areas of lower plastic accumulation. Sediment samples were collected from 30 sites in the marsh surrounding St. Catherines Island, GA; however, the standard sediment processing procedures from previous studies failed to remove the MPs from our samples. We are still working to establish a method that will effectively extract MPs from our samples. Oysters were collected from high, medium, and low tidal reef locations from the same 30 sites, to investigate differences in MP retention rates based on tidal reef location. Oysters located at higher reef elevations spend less time submerged underwater than bottom-reef oysters, and thus may have lower exposure to potential plastics. While initial results do not indicate a significant pattern between MP concentration and tidal elevation, our data suggests that microfbers are the predominant plastic particles found within oysters (project total: 150 fibers, 112 fragments, and 3 beads).

Identification of *Wolbachia* Effector Proteins that Prevent Acidification of Yeast Vacuoles

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Wolbachia pipientis is an obligately intracellular, parasitic, Gram-negative bacterium that maintains a symbiotic relationship with the pathogenic nematode, *Brugia malayi*, a causative agent of human filarial diseases. To better

understand how *Wolbachia* survives and replicates within the nematode, we attempted to identify and characterize 47 putative secreted *Wolbachia* “effector” proteins that may be responsible for altering the biology of the nematode cells to support bacterial intracellular replication. As a surrogate eukaryotic host for these *Wolbachia* proteins, we used the budding yeast, *Saccharomyces cerevisiae*, thus providing a facile genetic and biochemical system to analyze the activities of these bacterial proteins. As *Wolbachia* likely avoids degradation in the acidic lysosomes of the nematode, we chose to screen for effectors that would neutralize the normally-acidic yeast vacuole. Yeast strains unable to properly acidify their vacuoles fail to grow on neutral media buffered to neutral pH, and we therefore assayed for the ability of each effector construct to inhibit yeast growth at pH 7.5 upon induction. In this screen, we have identified wBm0014, wBm0032, wBm0044, wBm0076, wBm0284, and wBm0447 as potential *Wolbachia* protein candidates that limit the acidification of the yeast vacuole, and may play an important role in the *Wolbachia*:*B. malayi* symbiosis.

Correlation of Chronic Ankle Instability and Physical Activity Levels in Physically Active Individuals

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Chronic Ankle Instability (CAI) has been linked to decreased physical activity (PA) levels, but it is unclear how those with CAI respond to traditional questionnaires to quantify PA. We aim to determine if individuals with CAI engage in less physical activity than matched healthy controls. Participants included physically active individuals (n= 50; 24 female, 26 male, age= 23.6±3.8yrs, height= 171.5±8.8cm, weight= 71.9±12.2kg). Godin-Shephard Leisure-Time Physical Activity Questionnaire (GSLTPAQ) was used for self-reported physical activity levels for a typical 7-day period. Foot and Ankle Ability Measure (FAAM-S) Sport scale was used to determine foot and ankle function during sports activities. Point biserial correlations were used to determine associations between CAI and GSLTPAQ scores and between CAI and FAAM-S scores. An independent samples t-test was used to determine if there was a significant difference between the means of the two groups on GSLTPAQ. There was not a significant correlation ($r_{pb} = 0.086, p=0.5$) or difference in means ($p=0.5$) between the amount of PA performed and CAI. There was a significant correlation ($r_{pb} = 0.680, p=0.0$) between FAAM-S and CAI. The lack of significant correlation between CAI and physical activity levels may result from overreporting or the GSLTPAQ may not be sensitive enough to discriminate physical activity levels between CAI and controls. Conversely, it is possible CAI individuals are continuing to participate in the same amount of physical activity as those with healthy ankles despite reporting decreased foot and ankle function in sports.

Policy Diffusion and Misdemeanor Probation in Georgia

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Georgia has the most probationers per capita of any state in the United States. Most courts in Georgia contract with private companies to provide misdemeanor probation services. These private companies make a profit off of probation fees paid by people under their supervision. However, a small but notable number of Georgia courts have chosen to switch from a private probation company to an in-house, government-run probation service in recent years. Because this policy choice is against the norm, what led these jurisdictions to switch probation providers? To understand the process, I interviewed eight court actors over the phone or in person, transcribed their interviews, and analyzed the findings. I hypothesized that the court actors would cite similar reasons for the policy change, particularly media coverage of court cases filed against private probation companies and learning from other jurisdictions' decisions to start their own, in-house agencies. Further, I hypothesized that there would be similarities between jurisdictions that adopt in-house probation agencies along the lines of geographic proximity, Bayesian updating, and political ideology. Given that most people on probation for misdemeanors are supervised by a private company, understanding how and why jurisdictions may be turning away from private companies to provide probation supervision is an important trend to understand.

Path Dependence in Organizational Impression Management

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Impression management affects how a firm maintains positive evaluator perceptions, an important dimension of firm survival and success. Most scholarship in this area has focused on managing impressions after negative events. However, a firm may also engage in anticipatory strategies to manage impressions. By synthesizing arguments from anticipatory and reactive impression management, we offer a novel theoretical framework that treats a firm's impression management strategies as a path-dependent process. We also consider how firms manage perceptions around positive events, an area of inquiry that lacks sufficient attention yet carries substantial importance. Finally, we develop theory about antecedents to anticipatory impression management and thus link them to the path we explicate above. Together, our contributions illuminate how a firm approaches impression management decisions is more nuanced and more predictable than previous research has suggested.

An Analysis on the Correlation Between Retirement Definitions and Preparation

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The concept of retirement has been studied in numerous ways as retirement planning is becoming a growing issue in the United States. A majority of Americans are unaware of their specific retirement needs, and this unawareness causes many to be ill-prepared for retirement. Given this dilemma, it seems necessary to evaluate the potential dissonance between peoples' definitions, or understanding, of retirement and their retirement preparations. This research utilizes the National Longitudinal Survey of Youth 1979 (NLSY79), conducted by the Bureau of Labor Statistics, to examine 27,554 respondents' definitions of retirement and their preparation for retirement between the years 2008 and 2014. The survey gives the respondents 11 retirement definition choices and 5 retirement preparation choices to use to define their respective views and actions on retirement. The purpose of this research is to determine if a correlation exists between how people define and prepare for retirement, while providing behavioral reasoning to explain potential disparity. This analysis will first determine which explanatory variables, such as education and gender, are most predictive for both the definitions and preparation responses using logistic regression. Finally, this study will conduct multivariate analyses to assess which definition response from respondents are most indicative for each type of preparation response. Overall, this research aims to reveal any statistically significant disparity between the definitions and current preparations for retirement of these respondents and emphasize the importance of correcting this problem.

Role of PPAR- α in Free Fatty Acid Sensing, and the Effects of Oleic Acid on Monoamine Efflux

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Increased caloric intake is one of the major contributors to obesity, which is a major health crisis around the globe. Fat consumption and the subsequent release of free fatty acids such as oleic acid may alter feeding circuits in the hypothalamus by modulating neurotransmitters such as norepinephrine (NE), dopamine (DA) and serotonin (5-HT). One of the key mediators in the hypothalamus that is believed to play a role in sensing fatty acids is peroxisome proliferator-activated receptor alpha (PPAR α). We hypothesized that the free fatty acid, oleic acid, can produce changes in neurotransmitter levels by acting through PPAR α . To test the hypothesis, male Sprague Dawley

(SD) and Diet Induced Obese (DIO) rats were sacrificed and their hypothalamus removed and placed in an in vitro incubation chamber at 37°C. The tissues were subjected to 1 hour incubations and exposed to 0 (Control), 0.00132 mM, 0.132 mM, 1.32 mM oleic acid, 50 μ M MK 886 (A selective PPAR α antagonist), or 1.32mM oleic acid + 50 μ M MK 886. High-performance liquid chromatography (HPLC) was used to study the neurotransmitter efflux. Oleic acid stimulated the efflux of monoamines in a dose dependent manner, and MK 886 blocked these effects. There was no effect of oleic acid on serotonin efflux in DIO rats. These results suggest that the DIO rats do not respond to free fatty acids levels as normal SD rats due to alterations in brain neurotransmitter levels.

The Relation Between Critical Flicker Fusion and Functional Independence in Older Adults

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Critical Flicker Fusion (CFF) is a methodology found to be associated with cognitive performance in older adults. CFF is a measure that represents the visual processing speed concerning the temporal responsiveness in individuals. Similarly, cognitive performance is related to functional independence. This study examined whether CFF would be a predictor of functional independence in a sample of 46 older adults (58% female) aged 64 to 92 ($M = 73.01$, $SD = 6.45$). CFF performance measures the highest frequency that an individual perceives the flickering stimulus by representing the temporal contrast sensitivity. Contrast Sensitivity (CS) measures the ability of both the eye and the processes of the brain to distinguish between an object and its background. The Direct Assessment of Functional Status-Revised (DAFS-R) was used to measure functional independence. Linear regression was conducted with CFF as the predictor variable and DAFS-R as the predicted variable. To control for age, a hierarchical multiple regression was conducted with age entered in the first model and CFF entered in the second model to be a predictor of the DAFS-R. Results indicated that CFF explained 10.5% of the variance in DAFS-R score ($F(1,44) = 5.17$, $p = .03$). However, when controlling for age, CFF was no longer a significant predictor of the DAFS-R score ($F(1,43) = 2.30$, $p = .14$). Results suggest CFF may be associated with functional independence in older adults, but not above and beyond age.

Activity of Enzyme catalyzed by Pyridoxal Phosphate (PLP)-Dependent Histidine Decarboxylase from *Enterobacter aerogenes*

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Histamine is a chemical compound that has a physiological role in our body. Histamine, derived from histidine decarboxylase, regulates gastric acid in the stomach, which can alter a presence of acid reflux. The mechanism shows that histidine decarboxylase (*hdc*) is a catalyst in producing histamine. The gene of interest, *hdc*, was obtained from *Enterobacter aerogenes* (*E. aerogenes*). The cells for overnight culture in ZY media were previously grown at 37°C for 24 hours, but the temperature was lowered to 26°C for more efficient growth condition. The duration of the incubation is the most optimal at 28 to 30 hours for maximum consumption of glucose of the cells. The buffer to suspend the cells contained pyridoxal phosphate (PLP) since histidine decarboxylase is PLP-dependent. The ammonium sulfate ((NH₄)₂SO₄) concentration used for precipitation was maintained at 30% for optimal precipitation and purification. The protein gel was run for band observation to confirm protein presence. The band shown on the gel was approximately 55 kDa, which is a strong correlation for a presence of enzyme. Bradford reagent was used to observe color indication of protein presence. The enzyme showed little to no activity from the assay. Assay was run based with enzyme concentration of 1μL, 2μL, and 4μL, was combined with 10μL of phenol red and 100 μL of 100μM-100mM of L-histidine to observe a pH change, which indicates a color gradation showing activity. The activity was not observed through phenol red. The L-histidine concentration was altered to maintain pH balance. Assay method using T-NBS and potassium carbonate (K₂CO₃) showed optimal activity.

Optimal *Anopheles quadrimaculatus* Larval Density for Laboratory Rearing

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Mosquitoes are reared in laboratories all over the world in order for researchers to study disease-vectoring species and simulate mosquito management to protect humans and animals from these insects. Some mosquito species are most successful when the larvae are living in groups, but will experience significant mortality when overcrowded. We have attempted to determine an ideal larval rearing density for *Anopheles quadrimaculatus* in a 468 sq. cm surface area. This was determined for groups at a larval density from 100 larvae per 468 sq. cm to 800 larvae per 468 sq. cm, increasing at increments of 100. Effectiveness was defined

based on larval survival, growth rates, time of pupation, and size of emerged adults. We determined the most effective concentration of mosquito larvae is likely to be greater than 100 larvae and less than 400 larvae per 468 sq. cm. Knowing an optimal larval rearing density will save time and enhance research productivity. Based on these results, we will be able to modify our laboratory procedures to efficiently produce healthy adult mosquitoes for laboratory testing of insecticides with consistent and reliable replication.

Shack-Hartmann Code Optimization and Conversion to C++

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Here I describe optimization of the software for reconstructing an optical wavefront using a Shack-Hartmann Wavefront Sensor. The Shack-Hartmann Wavefront sensor measures the wavefront from an array of images created by a lenslet array. The Shack-Hartmann Wavefront Sensor is part of the adaptive optics system in a Light Sheet Microscope setup by Keelan Lawrence in the Advanced Imaging Laboratory in the College of Engineering at UGA. Adaptive optics is the ability to change the wavefront in an optical system to correct for aberrations in an image due to distortions in the wavefront. I will discuss the algorithm used to construct the wavefront from the Shack-Hartmann image and the implementation in C++ and show results of using the Light Sheet Microscope with the Adaptive Optics System.

Restoring Native Understory Plant Communities in the State Botanical Garden of Georgia's Restored Floodplain

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Within the past century, the invasion of the non-native grass, *Microstegium vimineum*, has greatly displaced native vegetation in forested floodplains throughout the Eastern United States. Due to *M. vimineum*'s ability to survive a wide variety of ecological conditions and reproduce quickly, the expansion of *M. vimineum*'s range poses great threats to understory native plant communities. Currently, no effective long-term management strategies exist for simultaneously eradicating large *M. vimineum* populations and reestablishing understory native plant communities. This study, conducted in the State Botanical Garden of Georgia's restored floodplain, aims to better understand plant communities within the region through three methods. First, I will conduct surveys to determine the diversity and density of the region's native and invasive plant species to inform decisions on native plant restoration efforts. In addition, I will conduct an experiment that investigates how to most effectively remove *M. vimineum* while promoting the re-establishment of native understory plants, particularly

the river oat species *Chasmanthium latifolium*. Using different combinations and frequencies of treatments such as herbicide application, invasive removal, and native seedling and seed planting, I predict that the combination of monthly native seedling planting and *M. vimineum* removal will prevent *M. vimineum*'s reemergence most effectively. The results of this experiment will allow the botanical garden personnel to develop more efficient management practices for native plant restoration. Lastly, I will create scientific illustrations of the restored floodplain's most common understory plants and share this guide with the State Botanical Garden to aid resource managers in plant identification.

Estimating Trophic Structure on Coral Reefs Using Metabolic Theory and Complex Food Webs

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Using the metabolic theory and engineering thermodynamics, we predict what trophic structure on coral reefs should be like without biomass extraction (fishing) or other human impacts. We used MATLAB to create a baseline for how coral reefs in the Caribbean would look in the absence of human impacts. Our model combines temperature and primary productivity to see what coral reefs likely looked like in the past. We show that these coral reefs should have inverted trophic structure (more biomass in larger animals) regardless of the scale of binning used. However our results assume a constant trophic efficiency of 10%. The most important source of error we have experienced has been trophic efficiency and formulating the food web. These details need to be addressed in future work.

The Effect of Augmentative and Alternative Communication Strategies on the Use and Development of Vocalizations

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Augmentative and alternative communication (AAC) strategies include high tech (e.g., electronic devices) and low tech (e.g., picture cards) approaches to remedy limitations in spoken and written communication. These strategies are used in at least two contexts relative to individuals with developmental disabilities (DD), including (a) teaching general communicative behavior, and (b) teaching appropriate, communicative behavior specifically to replace severe problem behavior. In both contexts, the use of AAC strategies has a documented history of effectiveness. AAC tools and strategies temporarily or permanently

compensate for the lack of functional speech produced by individuals with DD with significant expressive language impairments. AAC systems matched to individual profiles have demonstrated success in providing individuals with DD a means to communicate, thereby, increasing participation in daily activities. Functional communication training (FCT) is the most widely used and successful intervention for reducing severe problem behavior exhibited by individuals with DD. This approach often includes teaching individuals AAC strategies to replace severe problem behavior. One concern in both contexts is that the use of AAC strategies will interfere with the development and/or use of vocal communication strategies. However, little research systematically evaluating this concern exists. Clinically, it is important that we understand if focusing on one approach (i.e., the use of AAC strategies) will impact the ongoing use and development of vocalizations. Thus, the proposed study will provide more information regarding how AAC strategies impact vocalization use and development. The specific aims will be addressed within two different analyses. Each analysis will be conducted using a standard single-case research design involving one participant with Autism Spectrum Disorder (ASD). The purpose of this project is to conduct within subject analyses by comparing the participant's behavior across a series of assessments, variations in FCT treatments, and disruptions to FCT (e.g., extinction conditions). The focus of the investigation is on individual response patterns.

Who's We: A Documentary Study on Gentrification in Atlanta

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Documentary filmmaking has long been a tool to convey factual record and perspective to promote awareness on an issue or inspire change. The purpose of this documentary project is to develop the skills and techniques required to produce an impactful film through experiential learning. Carrying out this investigation requires intensive research into the subject matter, tactful and responsible communication with experts, proper training on handling technical equipment, and responsible portrayal of acquired information. Anticipated findings throughout the process include legal hurdles surrounding subject communication and portrayal, processes of government and industry interaction, and the sensitivities required in dealing with real life issues with stakeholders of differing opinions. Using skills developed in preparation for and during the project, an investigation will be conducted into the effects of the development of the BeltLine in Atlanta, GA on the surrounding communities. Urban development is meant to revitalize and grow a city to become more desirable and

functional to the people who live there. As cities are razed and rebuilt the question becomes who the city is rebuilt for and what becomes of the people who were there before the decision was made to make it “better.” This project aims to explore a story that matters while granting the ability to investigate the storymaking process so that the most effective product can be delivered.

Reducing Insurance Illiteracy: Teaching Health Insurance in Georgia Health Classes

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In 2015, 1.4 million or 13.9% of Georgians did not have health insurance, the third highest uninsured rate in the country. Health insurance enrollment challenges and insurance illiteracy is positively correlated with poor health outcomes. Given the passage of the Affordable Care Act (ACA) in 2010 and the possibility of another major healthcare shift following the 2016 presidential election, health insurance literacy is not only politically urgent, but is essential for patient health and financial well-being. Health insurance enrollment and literacy is lowest among individuals who are younger, less educated, of lower-income status, or minorities and those who use health care services less frequently. In the current economy, where health insurance is paramount to receiving appropriate medical care, it is imperative to address health insurance illiteracy in attempt to raise health insurance coverage and to improve health outcomes for Georgians. The Georgia Department of Education (GADOE) should amend its high school health education standards to include an element addressing health insurance. The proposed element should require all Georgia high school health curricula to provide a basic understanding of health insurance terminology, explain the variety of insurance plans available to Georgia residents, outline the process of enrolling in insurance, demonstrate the use and application of insurance in realistic scenarios, and prepare students to seek additional information on health insurance when needed. This curricular amendment could assist in alleviating disparities across student ages and education levels, ensuring that all young Georgians develop a fundamental and practical understanding of health insurance.

Outbreak Spreading: Using Gradient Boosting Machines to Predict the Chance an Incipient Outbreak Will Spread

Aditya Krishnaswamy, Foundation Fellow

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Much of the destructive potential of infectious diseases stems from the unexpected nature of the disease emergence and the uncertain dynamics of outbreaks. Due to the global economic burden and health impact of infectious diseases,

there has been a great deal of interest and research in outbreak prevention and global disease forecasting and surveillance. While some research has focused on predicting spillover events, anticipating emergence of novel pathogens, and outbreak prevention, comparatively little work has been done to identify predictors associated with the next phases of transmission. The goal of this study was to identify statistical covariates that differentiate outbreaks that lead to widespread transmission from outbreaks that are quickly suppressed, either through the natural course of stochastic extinction or intentional intervention. Outbreak events were classified by severity and propensity for spreading. Outbreak severity was based on the magnitude of the event, quantified by number of cases and deaths. Using data from the Global Infectious Disease and Epidemiology Online Network (GIDEON) and the World Bank, we constructed a dataset containing outbreak event records, epidemiological characteristics, and information on the region the outbreaks occurred in. Using these data and gradient boosting machines, we propose to develop a model to predict the chance an incipient outbreak will result in widespread transmission given information on the pathogenic agent and social, environmental, and epidemiological conditions under which the outbreak has occurred. This model can be used as a resource to direct outbreak strategy development and guide resource allocation during outbreak events.

Evaluating Parent Perception of Circumscribed Interests Objects for Children with Autism Spectrum Disorder

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Children with autism spectrum disorder (ASD) often show intense interests toward specific items, referred to as circumscribed interests (CI). While these CIs do not cause harm, children with ASD may ignore social stimuli at the expense of focusing on their CIs. The majority of information about CIs in children with ASD relies on parent report; however, less research has incorporated other methods for more directly investigating amount of child preference for CIs. This study aims to use eye tracking technology to directly quantify child preference for CIs and to compare this with parent report. Eye tracking was utilized to quantify the amount of attentional allocation children with ASD demonstrated toward personalized CI objects as compared to facial stimuli. This data will be compared to parents report on a visual analog scale where they rate how much their children prefer personalized CIs and how these CIs interfere with engagement in other activities. The proportion of time the child chose to look at each CI out of the total time the child could view the image will be compared to parent ratings. Assessing the relation between parent reported CI preference levels and the amount of

actual attentional allocation quantified using eye tracking, can help to identify discrepancies between the child's actual attention allocation and that reported by the parents to examine the validity of parent report in describing preference for children with ASD.

Competitive Dynamics of Coastal Lichen Communities

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In coastal regions of the southeastern United States, corticolous lichens are extremely diverse, especially given their narrow niche. The persistence of so many species challenges ecological theory and the role of competitive exclusion. One mechanism that can facilitate coexistence of competing species is nontransitivity. To assess the role of competition in structuring coastal lichen communities, I surveyed lichens living on *Quercus virginiana* trees at Skidaway Island State Park. I hypothesized that communities comprised of species exhibiting strong competitive dominance hierarchies have lower diversity than those with weak (nontransitive) hierarchies under the same conditions. I surveyed competitive interactions among lichen in 28x21cm quadrats placed on the northern and eastern sides of live oak trees to see if the outcome of competitive interactions changed under different environmental conditions. For each interacting species pair, I assessed winners based upon patterns of overgrowth, then recorded the relative abundance of each species. The regional diversity was very high – I recorded 32 species in total. At the quadrat level, diversity (assessed as species richness and with Shannon diversity index) was also high but did not differ between the two habitats. I am currently tallying the competitive outcomes between each species pair, so that I can construct competitive dominance hierarchies for the most common species in each habitat and compare hierarchies across habitats. This may provide insight into whether competitive dominance is a major driver of relative species abundance and whether non-transitive interaction networks help facilitate coexistence, contributing to the high level of lichen biodiversity in the Southeast.

Novel Adjuvants Potentiate the Antimicrobial Activity of Polymyxin B in Two Gram-Negative Bacteria, *Escherichia coli* and *Acinetobacter baumannii*

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Antibiotic resistance is a major threat to global health, particularly since an increasing number of bacteria are becoming resistant to last resort antibiotics like polymyxins B and E (colistin). The Trent laboratory recently used a novel robotic screen to identify 45 unique chemical compounds

with the ability to act synergistically with polymyxin B to kill a laboratory strain of polymyxin B resistant *Escherichia coli*. Interestingly, these 45 compounds manage to potentiate the activity of polymyxin B without modifying the lipid A content of *E. coli*. In this particular study, we sought to better characterize these 45 compounds by optimizing the chemical screening parameters, modifying and balancing the ratio of antimicrobial to adjuvant concentrations, and testing their effectiveness against another Gram-negative bacteria (*Acinetobacter baumannii*). In doing so, we not only identified 11 of 45 compounds as capable of acting synergistically with polymyxin B to facilitate killing both *E. coli* and *A. baumannii*, but also determined that 5 of these 11 compounds exhibit antimicrobial activity against *A. baumannii* by themselves. The remaining 6 of 11 compounds acted as true adjuvants to potentiate the activity of polymyxin B without exhibiting antimicrobial activity by themselves. Now that the list of compounds has been narrowed, it is possible to run different experiments to determine the mechanism of action of these subclasses of compounds that act synergistically with polymyxins. It is also possible to do more tests of clinical relevance to the field of human medicine.

The Effects of the Protein Placenta-Specific 8 (Plac8) on CD4⁺ T Cell function

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The adaptive immune response is important because it can eliminate pathogens through an antigen-specific manner. More specifically, T cells are capable of ridding pathogens through the production of cytokines or direct cell lysis. Because T cells are critical in resolving many diseases, scientists are working to determine specifically how T cells carry out their functions, so that they can be manipulated therapeutically. Our preliminary data indicates that a novel protein named placenta-specific 8 (Plac8) plays an important role in T cell effector function. Plac8 is found to be highly expressed by type 1 CD4⁺ T helper cells (TH1) when analyzing a CD4⁺ T cell microarray. TH1 CD4⁺ T cells require IL-12 for development and create inflammation primarily through interferon gamma (IFN γ) production, which kills a variety of intracellular pathogens like influenza. Because Plac8 was found to be highly associated with TH1 CD4 T cells, we hypothesize that Plac8 promotes IFN γ production. To test this hypothesis, we will culture wild type (WT) and *Plac8*^{-/-} CD4⁺ T cells and monitor differences in IFN γ production after being stimulated with IL-12. IFN γ mRNA production will be monitored using qRT-PCR and protein production will be evaluated using flow cytometry and IFN γ ELISAs. In addition, we will monitor *in vivo* differences using a colitis mouse model. Here, pathology is solely driven by CD4⁺ T cells, which will allow us to isolate the effect of

Plac8 on CD4⁺ T cell function. Overall, data obtained from these experiments will advance our understanding of T cell function and increase potential for therapeutic use.

Increasing Fruit and Vegetable Consumption through a Mobile School Food Pantry Partnership Model

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Childhood obesity is a major public health concern. Establishing healthy eating habits among young children and their parents is a viable strategy to decrease childhood obesity. The objectives of this study are to: 1) determine if food demonstrations enhance at-home meal preparation of mobile school food pantry (MSFP) items, and 2) assess barriers and facilitators to use of a MSFP in a variety of settings. The target audience is school and child care stakeholders and low-income families in Northeast Georgia. Methodology will include baseline data collection via surveys related to attitudes about MSFP food demonstrations, cooking self-efficacy, and fruit and vegetable (FV) consumption. Barriers and facilitators to the use of mobile food pantry in school and child care settings will also be assessed. Surveys will be administered to participants in an existing mobile school food pantry with the Food Bank of Northeast Georgia, local ECE stakeholders, and parents of young children. It is expected that the target audience will: 1) have positive attitudes about MSFP food demonstrations, 2) report that food demonstrations enhance at home preparation of food items from the MSFP, and 3) have low baseline consumption of FV and low self-efficacy for preparing FV. We also expect to gain salient data on planning an intervention to increase cooking self-efficacy using a mobile food pantry and nutrition education model. This study is significant because it adds to the dearth of knowledge about how to increase access to and preparation of healthy foods for low-income families.

Impact of ISG15 Species-Species Variation on ISG15 Structure and Viral-Host Interactions

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Unlike ubiquitin (Ub) that is almost perfectly conserved among eukaryotes, Ub-like interferon-stimulated gene product 15 is highly divergent, even among mammals. Specifically, ISG15 sequence identity is low, ranging from ~58% among mammals to as low as ~35% when a broader range of animals is compared. In addition to its diversity, ISG15 is one of the few Ub-like modifiers that is comprised of two Ub-like -grasp folded domains. Previously, structural studies on ISG15 have largely focused on human ISG15

(hISG15), or relied on the assumption that the structure of ISG15 between species would be completely analogous. Reports have also emerged suggesting that the role of the ISG15 itself may vary from species to species. In order to gain an understanding of the influence of species-species variance on ISG15, X-ray crystallography was used to obtain the full-length ISG15 structure from two non-human sources *M. musculus* (mouse; 3.25 Å) and *M. davidii* (vesper bat; 1.37 Å). Surprisingly, these first non-human ISG15 structures illustrate that diversity goes well beyond simple surface replacement and results in both secondary and tertiary differences. Beyond the impact on the ISG15 fold itself, viral proteases that seek to engage ISG15 to stymie host immune response are also shown to be sensitive to ISG15's species-species variations. Specifically, viral deISGylases from zoonotic Crimean-Congo hemorrhagic fever virus, Middle East respiratory syndrome virus, and other related viruses appear to prefer ISG15s from species they productively infect. Put together, this conceivably represents not only an evolutionary pressure on viruses to adapt, but also may be an underlying driver of ISG15 sequence diversity.

Examining the Impacts of Virtual Reality Journalism

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Brandon Janeway, Eryka Johnson
Dr. Ivanka Pjesivac, Journalism, Grady College of Journalism and Mass Communication

This research examines the effectiveness of virtual reality journalism (VRJ), a new form of storytelling. It attempts to determine if an immersive VR impacts people's emotions and their perceptions of news credibility. Participants in the study are given a virtual reality news piece or a standard news article to view or read. VRJ piece, in the form of a 360-degree video, has been consumed using the cardboard goggles, whereas the print news article has been read on a computer in the Grady VR lab. The participants completed a survey a week before the lab session, just after they consumed the news piece, and seven days after the lab session. The study began in spring 2017. So far, two data samples were collected: community sample and student sample. Participants from the community sample received a \$15 Amazon gift card for the participation in the study, whereas students received extra credit. In the community sample, we collected 137 participants in Time 1, 92 in Time 2 and 67 in Time 3. The student sample had 92 participants in Time 1, 91 in Time 2, and 54 in Time 3. The data analysis of these two samples is ongoing. We are continuing data collection this semester, on different samples and slightly modified study design. The results of the experiment will allow us to assess the differences in participants' empathic responses to VRJ content, their perceptions of news credibility, and the impact of demographic variables. The study is scheduled to end in December 2018.

Prenatal Exposure to EDCs Followed by High Fat Diet Challenge in Adulthood Effects Organ Weights in Rats

Christian R Laurent, CURO Research Assistant
Dr. Sheba MohanKumar, Veterinary Biosciences and Diagnostic Imaging, College of Veterinary Medicine

The endocrine disrupting chemical (EDC), bisphenol A (BPA) that is associated with obesity is being replaced with alternatives such as bisphenol-S (BPS) and bisphenol-F (BPF). However their effects on the body have not been studied. We hypothesized that prenatal exposure to these EDCs would interfere with development, making the offspring prone to developing metabolic disorders in adulthood when they are challenged with a high fat (HF) diet. Sprague-Dawley dams were treated orally with saline, BPA (5µg/Kg BW), BPF (1µg/Kg BW), or BPS (5µg/Kg BW) from day 6-21 of gestation. Male offspring were weaned on to a chow diet. When they were 14 weeks old, two offspring from each mom were used; one remained on a chow diet and the other was fed a HF diet (45% calories from fat) for 2 weeks. At the end of this period, offspring were sacrificed and multiple organs were weighed. Significant changes were observed in right ventricle, lung, adrenal, and pancreatic weights. Although prenatal EDC exposure by itself did not affect the weight of many of these organs, challenge with a HF diet produced marked changes in organ weights. Right ventricle and adrenal weights were reduced with BPF and BPS exposures, while pancreatic weight was increased with BPF exposure. BPA increased lung weights. These results indicate that bisphenol-based EDCs have specific effects on different organ systems. These effects are more apparent when animals are placed on a HF diet. This could reflect changes in cardiovascular, respiratory, and adrenal function.

Intersectionality and Context in Human Development across the Lifespan: A Thematic Analysis of Published Works in Social Science

Lauren Jayne Lauterbach, CURO Research Assistant
Dr. J Maria Bermudez, Human Development and Family Science, College of Family and Consumer Sciences

This presentation will explore issues related to diversity in human development across the lifespan. Diversity includes issues of race, class, gender, sexual orientation, and cultural and sociopolitical contextual factors. Historically, empirical articles and theories in human development have been written and developed without scholars being attentive to these issues. As such, our understanding of human development has been limited. The aim of this research is to gain an advanced understanding of diversity in human development from a biopsychosocial, intersectional, and contextual lens. First, articles and book chapters will be reviewed and clustered, and categorized based on eight life stages (i.e. infancy, early childhood, middle adulthood,

etc.). A minimum of 100 articles and book chapters will be reviewed and categorized. Research questions will seek to find answers on the following: articles related to diversity most found for a particular life stage, types of diversity issues missing in the literature for each or all of the life stages, my own experience conducting this content analysis, and analysis of my primary findings. Findings from content analysis and self-reflection will be presented, as well as recommendations for the field of human development and family science.

Developing a No-Cuff Method to Measure Mitochondrial Capacity

Rebekah Grace Lavender, CURO Research Assistant
Dr. Kevin McCully, Kinesiology, College of Education

The current method to measure mitochondrial capacity using Near Infrared Spectroscopy (NIRS) utilizes a blood pressure cuff. With this protocol the test is limited to limb muscles and some participants do not tolerate cuff inflation. We aim to develop a no-cuff mitochondrial test that uses Near Infrared Spectroscopy (NIRS) that can measure mitochondrial capacity of muscles. Healthy adults (n=13) between the ages of 18 and 29 were tested. The no-cuff mitochondrial test consisted of measuring the rate of recovery through oxygen saturation after a short period of exercise. The exercise consisted of squeezing a hand dynamometer with vigorous contractions for approximately 0.5 second at intervals designed to increase metabolic rate while lowering oxygen saturation to approximately 50 percent at 1 minute. The results were compared to the standard 22-cuff mitochondria test and recovery from resting ischemia. A data set of 13 participants was obtained with good recovery curves. The recovery curves obtained from the exercise only, without a blood pressure cuff, are similar to those obtained from the 22-cuff mitochondrial test. The data will be used to generate a predictive model that uses the 22-cuff data to match the no-cuff data. Enough data was obtained to develop the predictive model. More participants will be tested in the future to test the validity of the model. The no-cuff mitochondrial test has the potential to measure muscular mitochondrial capacity when cuff inflation is either not possible or not tolerated.

The Visual Steady State Response: Using Electroencephalography to Detect Biomarkers for Schizophrenia

Connor Lawhead, CURO Research Assistant
Dr. Brett Clementz, Psychology, Franklin College of Arts and Sciences

Schizophrenia is a psychiatric disorder characterized by psychotic behavior, such as delusions, hallucinations, and impaired cognitive control. This disorder is studied by

administering cognitive tasks and analyzing brain region connectivity and neural amplitude. These tasks include saccades, which track eye movement in response to a visual stimulus while measuring inhibition. Before the saccade task is displayed, there is a checkerboard image flickering at a certain frequency, acting as period of anticipation. Known as the visual steady state, this period gives evidence for impairments in cognition when neural firing is not synchronized with the flickering rate of the checkerboard. My research includes subjects with schizophrenia, subjects with low cognitive control, and subjects with high cognitive control. Each individual completed a series of saccades with increasing complexity: the first asked the participant to look toward the direction of the stimulus, the second, away from the stimulus, and the third, a mixture of both. The nature of the task is indicated by the color of the checkerboard during the steady state period. As the saccade task became more difficult, the low cognitive control group resembled the schizophrenia group during the steady state period, even though the low cognitive control group individuals have no indicators for psychosis. This reduced performance ability was measured using EEG technology and assessed by neural activity amplitude and source analysis. Ultimately, this pattern elucidates the nature of psychosis, for psychotic individuals would not be distinct from healthy individuals just from observable cognitive impairments.

Investigation of the Formation of Gold Nanoparticles on Ancient Gilded Statues

Kristie Le

Dr. Tina Salguero, Chemistry, Franklin College of Arts and Sciences

This project aims to replicate the formation of purple gold nanoparticles on ancient gilded statues and carvings. By studying the chemistry that occurred on gilded marble Roman statues during their extensive burial, we are discovering a different approach to producing gold nanoparticles. The conventional method is to use gold salts alongside a reducing agent to create a dispersion of gold nanoparticles. Therefore, the chemical formation of purple nanogold on ancient gilded surfaces is a point of interest because gilding, composed of thinly-pounded bulk gold (gold leaf), is decreasing in size to what is considered nanoscale (<100 nm) over long time periods (millennia). Transforming bulk gold in this way has yet to be thoroughly studied by scientists. We anticipate that by subjecting our samples to environmental conditions in a controlled laboratory setting, that we can better understand the mechanism through which the purple gold nanoparticles have a form on formerly gilded surfaces. To conduct these experiments, samples are made by using various combinations of calcium carbonate sources, temperatures, ball milling speeds, and additives (such as

gilding adhesives), and they are subjected to hydrothermal conditions. Then analytical techniques are used to characterize and measure the size of the gold particulates in the resulting samples, using transmission and scanning electron microscopies as well as energy-dispersive spectroscopy to identify composition.

Targeting *N*-Myristoyltransferase through Nanoparticle Encapsulated LCL4 and LCL 204

Peter Le, CURO Research Assistant

Dr. Houjian Cai, Pharmaceutical and Biomedical Sciences, College of Pharmacy

Myristoylation is catalyzed by the enzyme *N*-myristoyltransferase (NMT) and is responsible for allowing proteins to anchor to the cell membrane due to the attachment of a hydrophobic myristic acid onto the protein. This protein modification involves in activation of cell signaling pathways responsible for cell growth, viability, and proliferation. The drugs LCL4 and LCL 204 will be used to inhibit NMT to target protein myristoylation. After screening, it was shown that LCL 204 is more potent than LCL4. However, *in vitro* results indicate otherwise. This is possibly because of its inability to completely dissolve in the media due to its hydrophobicity. To resolve this, the drugs will be encapsulated inside nanoparticles. Encapsulating LCL 204 inside nanoparticles and then treating the cells should increase its ability to enter the cells and effectively inhibit myristoylation, which would demonstrate that LCL 204 is more potent than LCL4. These two drugs have the potential to become anticancer drugs. In order to monitor protein myristoylation, Src kinase, a non-receptor tyrosine kinase, is used since this protein is known to be myristoylated. Aberrant expression levels of Src have been reported in various cancers. The cell line used is SYF1 (Src^{-/-} Yes^{-/-} Fyn^{-/-}). SYF1–Src (WT) and SYF–Src (G2A) cell lines were produced through gene transduction. Nanoparticles containing LCL4 and LCL 204 were produced using the PLGA and the nanoprecipitation method. The cells were treated with the drug/nanoparticles for 16 hours and then labeled with a myristic azide probe for an additional 8 hours. Click chemistry was used to label myristoylated proteins, particularly Src kinase, and western blot was used to see the extent of myristoylation.

Novel Predictors for United States Geographic Distribution of Lyme Disease

Jenna Lea

Dr. Andrew Park, Ecology, Odum School of Ecology

Lyme disease is a complex disease vectored by *Ixodes scapularis* and *Ixodes pacificus*, the black-legged tick, in various counties nation-wide. Using R metadata analyses and CDC case count data I revealed several unexplained cases

happening in counties where the vector tick was not present. In attempt to explain these cases, I collected additional environmental, organismal, and economic county-level data to try to pinpoint predictors of Lyme disease expansion. After merging multiple databases obtained through PRISM, Socioeconomic Bureau, and Park's own white-tailed deer density data I was able to formulate two hypotheses. First, I expected to see that counties with higher socioeconomic status would have higher Lyme disease incidence and would use unemployment rate as a measure of each county's status. Secondly, I predicted that counties with intermediate deer density would have higher incidence due to the dilution effect in a major reservoir host. To test these hypotheses, I used a generalized mixed effects model to explore the relationship between county-by-year incidence and a set of environmental and economic predictors. I then ran an ANOVA on selected models to return AIC values that would measure the explanatory likelihood of each model either including deer density, unemployment rate, both or neither. The model returned that the greatest explanatory value came from the model that included both deer density and unemployment rate, confirming my hypotheses. Finally, this information allowed me to narrow down the original unexplained cases to ones that fit the novel parameters and pinpoint counties that were at risk for Lyme disease expansion.

The Divine is in the Details: Passion Devotion and Ancillary Texts in Medieval Books of Hours

Katie Lech

Dr. Cynthia Turner Camp, English, Franklin College of Arts and Sciences

The Passion narrative, which follows the suffering and death of Jesus, played a critical role in the religious lives of laypeople during the late middle ages. This research focuses on University of Georgia, Hargrett MS 836, a 15th century Parisian Book of Hours that contains a devotional sequence on the Passion, unusual for its length and coherence; over half of the 85-folio manuscript concerns the Passion. Past work on this manuscript, done by the fall 2016 English 4230 class, linked the Hargrett Hours to Sainte-Chapelle, the royal chapel in Paris built by Saint Louis in 1248 to house his Passion relics. During my directed reading course in fall 2017, I began work on the prayers within the Hargrett Hours, looking for regional specificities in the text. Textual analysis of the prayer "Domine ihesu xpiste qui hanc sacratissimam..." revealed another connection to the chapel through the prayer's rubric, which referenced an indulgence from Pope Boniface VIII, who canonized Saint Louis. Quantitative analysis of 215 continental manuscripts has thus far identified 20 instances of "Domine ihesu xpiste..." half of which include the rubric that connects the prayer to Sainte-Chapelle. Through continued work on the extensive survey of medieval Books of Hours, this project will shed light

on the contents and provenance of University of Georgia, Hargrett MS 836, likely proving a more concrete connection between the Hargrett Hours and Sainte-Chapelle.

Interactive Show Design and Production

Christina Lee, Foundation Fellow, CURO Research Assistant
Elizabeth Osborn-Kibbe, Dance, Franklin College of Arts and Sciences

Entertainment and consumer industries around the world are currently facing a crisis. With so many web-based applications successfully offering services and experiences to consumers from the comfort of home, how do traditional brick-and-mortar consumer spaces, entertainment environments, or public spaces compete? An in-depth analysis of the full consumer experience provides the opportunity to identify key interactions and redesign negative touchpoints to improve the overall consumer journey. Oftentimes, emerging technologies applied in innovative ways can offer unique, customizable experiences that provide potential solutions to faulty consumer journeys. In this project, I will craft an immersive, story-based, interactive experience. The project will fuse art and technology by employing interactive design thinking, theatrical design, projection mapping, extensive sensor input and output, radio frequency identification (RFID) tags, and programming ingenuity. The multitude of interactive elements in the environment will be controlled and triggered by micro-controller Arduinos and raspberry pi's that are connected through an extensive network of theatre control software and manipulated with creatively programmed cues. Multiple show control software and languages will be combined to create the final product. In addition to highly technical components, a comprehensive storyline is necessary when attempting to completely immerse participants in a believable, story-rich, three-dimensional environment. To this end, this project will also involve research into the essential elements of story and its immersive qualities. The complete experience will be produced in the UGA New Dance Theatre at the end of spring 2018, and participants will have the opportunity to anonymously review and critique the experience.

Genetic Improvement of Sulfur-Containing Amino Acids by Manipulating Genetic Loci Controlling Protein Subunits in Soybean

Emerson Lee, CURO Research Assistant

Dr. Zenglu Li, Crop and Soil Sciences, College of Agricultural and Environmental Sciences

Soymeal is often referred to as the gold standard among protein sources used in the feed industry for its exceptional amino acid profile. However, soybean protein is deficient in sulfur-containing amino acids cysteine and methionine,

respectively, which are needed in the animal diet for optimal growth and skeletal development. To aid in the development of soybeans with increased sulfur-containing amino acids, an F_6 RIL population ($n=368$) was developed by crossing breeding line SQ97-0263_3-1a, lacking the 7S α' , 11S A_1 , 11S A_2 , 11S A_3 and 11S A_4 soybean storage protein subunits, with high protein tofu-type cultivar 'Harovinton', possessing each of the storage protein subunits. The RIL genotype for each of the storage protein subunits in the F_6 population was characterized using flanking KASP SNP markers tightly linked to each storage protein subunits QTL and RILs were placed into one of 16 groups based on the inheritance of the parental alleles at each locus. Harvested seed from each RIL was ground and subjected to near-infrared reflectance (NIR) analysis to quantify the sulfur-containing amino acids and other seed components. Results indicate that significant differences ($P < 0.05$) were detected among genotypes for total protein (507 – 373 g kg⁻¹), cysteine (16.1 – 10.5 g kg⁻¹) and methionine (14.7 – 11.6 g kg⁻¹) and among groups for total protein (456 – 418 g kg⁻¹), cysteine (12.65 – 11.50 g kg⁻¹) and methionine (13.23 – 12.15 g kg⁻¹). Selection of RILs containing the highest cysteine and methionine concentrations will aid in the development of nutritious soymeal containing higher sulfur-containing amino acids.

Wireless Network System for Power Plant Environment

Haram Lee, CURO Research Assistant

Daniel Snyder

Dr. Leidong Mao, Biological and Agricultural Engineering, College of Agricultural and Environmental Sciences

One thing that has always plagued large factories is the inability to sufficiently and efficiently monitor and diagnose issues with large, multi-million-dollar pieces of equipment. Due to safety and financial concerns inside loud, intense factories, we have decided to implement a real-time wireless sensor monitoring network to provide up-time status and diagnose possible issues with the machinery inside a power plant. We will be using our knowledge of microcontrollers and sub-gigahertz bandwidth communication to create a mesh network of sensors that can monitor important data such as vibration, heat, and rotation. This wireless technology has benefits over hardwired technology because of its easy installation and reduced need for upkeep. The data will be displayed to the user through a graphical user interface (GUI). We can then create an application that sets calculated thresholds to let us know when machinery is in danger of malfunctioning. We expect to see a positive change in the lifespan of heavy machinery when they are monitored by our mesh network. The reason for that is because our sensors will be able to notify the users when a certain threshold is reached, prompting a repair. We expect to improve the responsiveness and accuracy of required maintenance as well. This will not only benefit our users

financially by reducing the need for newer equipment through maintenance, but this will also make extremely warm and loud power plants safer to occupy.

Concept of Operations in Small Satellite Functionality

Bjorn Leicher, CURO Research Assistant

Dr. David L Cotten, Geography, Franklin College of Arts and Sciences

The University of Georgia (UGA) Small Satellite Research Laboratory (SSRL) is developing UGA's first Small Satellites. The Spectral Ocean Color satellite (SPOC) seeks to use an adjustable multispectral imager to study Georgia's coastline, while the Multi-view Onboard Computational Imager (MOCI) aims to perform Structure from Motion (SfM) over multiple landscapes around the Earth, as well as analyze algal blooms and sediment plumes. A successful small satellite mission such as these requires a practical theory of operation, the Concept of Operations (ConOps), that accounts for all functionality that may occur throughout the lifetime of a satellite. The main purpose of the ConOps is to act as a template for both the satellite operation and the core logic/code that the satellite operates from. The ConOps should detail how the satellite will function according to a primary objective and its mission criteria. During the long process of mission development before the actual satellite deployment, the ConOps will be adjusted to satisfy any changes/development. A good ConOps will be one that is both adaptable and easily understood by the user. A poorly defined ConOps can result in major satellite malfunction, or even mission failure. My research dives deep into the specifics of the ConOps in both our MOCI and SPOC satellites, and how they will function in space.

Analysis of Radiological Properties of Woody Tissue in Chicken Breast Samples

David F Liaguno, CURO Research Assistant

Dr. Mark A Haidekker, Electrical and Computer Engineering, College of Engineering

A rising number of chicken fillets suffer from a condition known as woody breast, in which the affected muscle tissue shows hardened fibers. The condition is thought to be related to larger sized chickens, and about 5-10% of breast fillets are estimated to be affected. We are evaluating the ability of x-ray absorptiometry to identify fillets with woody tissue. A pilot study conducted by our lab has shown decreased x-ray absorption due to low radiological density of woody versus healthy tissue. However, x-ray image values show variability related to sample thickness and to water and fat content. Dual-energy x-ray absorptiometry, also known as DEXA, is known to eliminate variability caused by soft tissue in bone densitometry, and the concept can be extended to multiple energies. We hypothesize that we can eliminate thickness

influences by using two energies, and we can further eliminate fat content with a third energy. Therefore, we expect three-energy x-ray absorptiometry to provide us with more accurate radiological density values of the affected tissue. The objective of this study is not only the validation of the hypothesis, but also the determination of the optimum energy levels for imaging. The long-term goal is to develop a rapid and noninvasive quality control method for chicken breast fillets that can be used, for example, in a meat packing house. If our study is successful, x-ray imaging would be a prime candidate for such a quality control method.

Modeling the Attitude Determination and Control Subsystem (ADCS) on 3U CubeSat

Alexandria Lin, CURO Research Assistant

Casper Versteeg

Dr. David L Cotten, Geography, Franklin College of Arts and Sciences

The ADCS allows stabilization and control of satellite attitude relative to the Earth's reference frame. This is necessary to point the communications systems and relevant scientific instruments towards Earth so that accurate, interpretable data is collected for onboard experiments. In the case of one of the Small Satellite Research Lab's missions, where reconstructed models of surface landmarks must be derived from images taken at highly accurate angles, attitude control is especially critical. The CubeSat must be able to determine its attitude from sensors accurately, derive the error given the measured attitude and the desired attitude, and apply torques using actuators—such as magnetorquers and reaction wheels—to minimize the error and reorient the spacecraft. Collectively, this process comprises the ADCS. This research aims to model the CubeSat's ADCS through computer simulations to ultimately determine necessary actuators to control the spacecraft within a calculated pointing error budget—specifically, whether a single reaction wheel is needed in conjunction with four built-in magnetorquers to generate sufficient torque in a short amount of time. This research will also study the complex mathematics of describing attitude and rotational dynamics to understand the subsystem, and then develop simulations in both MATLAB and dedicated NASA software (42) using determined physical parameters of our spacecraft and the ADCS.

Understanding Students' Subjective Understanding with Q-Perspectives®

Jimmy Lin, CURO Research Assistant

Dr. Brandy B Walker, J.W. Fanning Institute for Leadership Development, Public Service and Outreach

How can teachers help students move beyond superficial responses to subjective topics? How can teachers elicit from

students more nuanced expressions of their understanding? This poster shares an instructional technology that addresses the problem, and provides greater access to a methodology that allows students to participate with instructors in mixed methods research. By combining a card sorting activity with an innovative new software that generates real-time classroom analysis, teachers can now use Q-Methodology to explore students' perspectives on any subjective topic. In addition, this technology produces worksheets that help students not only articulate the specificity of their perspective, but also to participate with the instructor in mixed methods research. This new software, Q-Perspectives®, developed at UGA through faculty and student collaboration, allows teachers to group students easily in the classroom learning. This poster will explain the teaching technique and demonstrate how the online Q-Perspectives® software works to engage both students and teachers in deeper reflection, learning, and scholarship. By using the feedback and bug report through both participant interviews, facilitator interviews, and computer error logs, Q-Perspectives® online has been improved to be more stable and more user friendly. New audiences (teachers, trainers, students) are introduced to a new instructional technology and methodology to elicit responses to subjective topics. The new real-time analysis tool has allowed greater access to q-method in community and educational settings, including over 25 communities outside of UGA, 350 undergrad students from UGA, and international audiences.

Emergent Pathogens Associated with Canine Infectious Respiratory Diseases in the United States

Ana Lorton

Dr. Susan Sanchez, Infectious Diseases, College of Veterinary Medicine

Canine infectious respiratory disease (CIRD) is an endemic syndrome with multiple respiratory pathogens associated with disease occurrence. The clinical signs caused by different pathogens are similar, which makes differential diagnosis challenging. To attain new insights into the disease epidemiology, we conducted surveillance using molecular methods. Additionally, a novel multiplex PCR was developed to simultaneously detect and differentiate two species of *Mycoplasma*. Nasal, oropharyngeal, tracheal swabs and lung tissues (n=562) were processed at Athens Veterinary Diagnostic Laboratory (University of Georgia, USA). Canine Adenovirus 2 (CAV-2), Canine Distemper Virus (CDV), Canine Parainfluenza Virus (CPIV), *Bordetella bronchiseptica*, Coronavirus, Influenza, *Streptococcus equi* subsp. *zoepidemicus*, *Mycoplasma canis* and *M. cynos* were detected by standard or Real-Time PCR. Preliminary results revealed that CPIV (29%), *M. canis* (23.6%) and *M. cynos* (24.5%) were the most commonly detected pathogens followed by

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Influenza (11.2%), *B. bronchiseptica* (9%), Coronavirus (4.6%), CAV (2.5%), CDV (2%) and *S. equi* subsp. *zooepidemicus* (0.8%). Nasal-pharyngeal and oropharyngeal swabs showed the highest percentage of positive samples. Co-infections occurred in 46 specimens, which were positive for 2 to 5 different CIRDC agents. In summary, while confirming that CPV is one of the main pathogens associated with CIRDC, this study highlights the role of emerging bacteria, such as *M. canis* and *M. cynos*. Further analysis will elucidate the role of co-infections in clinically ill and healthy dogs. Our novel multiplex PCR for *M. canis* and *M. cynos* provides an efficient diagnosis alternative that will allow for accurate disease therapy and control.

Abnormal N-Heterocyclic Carbene Preparation via 1,2-Hydrogen Migration and BX₃ Complexation

Katie Luedecke, CURO Research Assistant

Dr. Gregory Robinson, Chemistry, Franklin College of Arts and Sciences

Recently it has been demonstrated that addition of BX₃ (X = Cl, Br) to a 2,3-dihydro-1H-1,2-azaborole facilitates a 1,2-hydrogen shift resulting in a cyclic (alkyl)(amino) carbene (cAAC)-BX₃ complex. This reaction, however, had not yet been reported for an N-heterocyclic carbene (NHC). Reaction of BX₃ (X=Br, I) with a 2,3-dihydro-1H-1,3,2-diazaborole initiates a 1,2-hydrogen migration, forming an abnormal N-heterocyclic carbene (aNHC)-BX₃ adduct. Intriguingly, the carbene center coordination of the aNHC to BX₃ and the 1,2-hydrogen shift is an equilibrium process. The synthesis, molecular structure, and equilibrium dynamics of the aNHC-BX₃ complex will be discussed.

Germ Cell Migration and Gonad Development in Brown Anoles

Sherry Luo, CURO Research Assistant

Dr. Douglas Menke, Genetics, Franklin College of Arts and Sciences

Primordial germ cells (PGCs), which are the precursors of sperm and eggs, form early during development and then migrate through the embryo to arrive in the developing gonads. The regulation of this cellular migration, or movement within the embryo, is crucial for fertility in vertebrates. While this migration process has been well-studied in birds and mammals, we know relatively little about how this process works in squamates. To better understand reptile reproductive biology, we are investigating PGC and gonad development in the brown anole lizard, *Anolis sagrei*. PGCs were labeled using an alkaline phosphatase (AP) staining method. At stage 2 of lizard development, when the early gonad primordium is present, AP is first detected. By stage 3, the gonadal ridges are visible, and in later stages, the gonad is fully developed.

We have determined that relative to mouse embryonic gonads, anole embryonic gonads are much larger in size but are found in a similar location along the body axis. Our findings also show that PGC migration and gonad development in the lizard occurs early in development, similar to other model organisms-like the mouse and chick. This work in the anole represents a significant step towards understanding embryonic germ cell migration and gonad development across vertebrate species.

Characterizing the Endurance Index of the Biceps Brachii after Endurance Training

Katie Luquire, CURO Research Assistant

Ellie Pryor

Dr. Kevin McCully, Kinesiology, College of Education

Accelerometer-based mechanomyography (aMMG) and electrical twitch stimulation have been used to define the endurance index of various muscles, but not in the biceps brachii. The endurance index of the biceps brachii will show a statistically significant increase after a 5-week training program. The endurance index was determined by using electrical stimulation (25-50 mAmps) on untrained males and females 20.4±0.7 years (N=11) for 3 minutes at 2 Hz, 4 Hz, and 6 Hz. Stimulation pads were placed on opposite sides of the body of the bicep. Subjects trained their non-dominant arm for 5 weeks with a 3-5 lb weight for 20 minutes, 3-5 times per week. There was 100% compliance with the training subjects, and two subjects did not come in for post-testing. At pre-testing, there was no significant difference between the dominant and non-dominant biceps brachii. Using paired *t*-tests for 2, 4, and 6 Hz, *p*=0.72, 0.52, and 0.89, respectively. After training, there was also no significant difference after training the non-dominant arm. The *p*-values for 2, 4, and 6 Hz were 0.42, 0.21, and 0.20, respectively. We were able to measure muscle endurance of the biceps muscle. The lack of change in muscle endurance was consistent with the lack of change in muscle mitochondrial capacity from a companion study, suggesting the training stimulus was not adequate.

Improvements to Cognitive Switching Tasks Following a Dual Distraction and Driving Intervention

Peyton Lynch

Dr. Steve Miller, Psychology, Franklin College of Arts and Sciences

Executive functions of inhibition and task switching have been shown to decrease in older adulthood. However, previous cognitive intervention trials have successfully improved these abilities using cognitive interventions, including those focusing on dual-tasking or task switching. This study examined whether a dual-task distraction and driving intervention game improved the switching and

inhibition abilities of older adults. Participants were 21 community-dwelling older adults ($M=73.96$ years, $SD=5.63$ years) who participated in a larger cognitive intervention trial. Participants completed a dual-task distraction and driving video simulation intervention three times a week for four weeks, totaling 12 hours of intervention practice. Several subtests from the Delis-Kaplan Executive Function System (DKEFS) were used to assess inhibition and task switching and were measured immediately before and after the intervention. Improvement in inhibition and task switching were assessed using paired t-tests, and results were compared to reliable change indices (RCIs) to assess clinical significance. Participants showed improvements from pre-post intervention on the Verbal Fluency Switching DKEFS task, $t=-1.719$, $p=0.05$. However, the calculated RCI=0.781 did not meet the threshold of 1.96 to be considered statistically significant. There were no significant improvements on other inhibition or switching tasks. Our study was limited by the small sample size and resulting low power of the study. However, the results we observed are encouraging and show that task switching abilities in older adults could be improved using a brief, cognitive intervention. Further study using a larger sample size is needed.

Crisis Pregnancy Centers: Establishing Accuracy and Transparency in Georgia's Family Planning Services

Jessica Ma, Foundation Fellow

Dr. Andrea Swartzendruber, Epidemiology and Biostatistics, College of Public Health

Crisis pregnancy centers (CPCs), also known as "pregnancy resource centers," are nonprofit organizations that encourage clients to choose childbirth over abortion. They often offer services such as pregnancy tests, ultrasounds, and pregnancy options counseling. In 2016, the Georgia General Assembly established the Positive Alternatives for Pregnancy and Parenting Grant Program, allowing the Department of Public Health to award \$2 million in grants to qualifying CPCs in the state during fiscal year 2017. However, the law fails to regulate the accuracy or transparency of information and services provided by eligible organizations. This paper will draw from available reports and investigations to explore the current status of CPCs in the state of Georgia and in the United States, evaluating the information and services provided, clients served, and affiliations with political and religious organizations. I will also examine existing data concerning the public health implications of CPCs and the history of legal battles regarding their regulation. The findings of this paper indicate that a significant proportion of CPCs across Georgia and the United States disseminate medically inaccurate information to their clients, do not employ licensed medical professionals, and/or fail to disclose this lack of licensure. In response to these findings,

and informed by the outcomes of previous attempts to regulate CPCs, I propose an amendment to Georgia's Positive Alternatives for Pregnancy and Parenting Grant Program that would require publicly funded CPCs to provide medically accurate information and services to all clients, while explicitly disclosing the licensing status of their staff and facilities.

***In vitro* Screening for *Phytophthora* Resistance in American and Hybrid Chestnuts**

Maisie Grace MacKnight

Dr. Scott Merkle, Forestry, Warnell School of Forestry and Natural Resources

Phytophthora root rot (PRR), a disease of American chestnut (*Castanea dentata*) caused by the oomycete *Phytophthora cinammomi*, creates lesions in the base of the stem and root system that destroys the roots, killing the tree. Since 1989, The American Chestnut Foundation (TACF) has worked on a hybrid backcross breeding system with Chinese chestnut (*C. mollissima*) to develop chestnuts that are resistant to chestnut blight, a separate disease caused by *Cryphonectria parasitica*. However, over 50% of the hybrid backcross trees in the first major field test died due to PRR before they could be challenged by *C. parasitica*. TACF is now incorporating sources of *Phytophthora* resistance into their chestnut breeding program. An *in vitro* screen for resistance to PRR could greatly accelerate the selection of PRR-resistant chestnut lines. My study tested the concept of a continuous quantitative scoring system for resistance, based on the growth rate of individual stem lesions. I hope my results will contribute to the restoration of American chestnut to our eastern forests. Preliminary results indicated that the tested American line was not resistant to *P. cinammomi*. The tested pure Chinese line demonstrated resistance, relative to the American line, but was still affected by PRR. The tested transgenic lines and selected hybrid backcross genotype bred by TACF were as susceptible as pure American chestnut. The use of the growth of stem lesions to quantitatively measure each lines' resistance appears to be a useful approach. Further testing of additional hybrid backcross genotypes will be conducted.

Putting America First: Renegotiating NAFTA and Trade Implications

Hannah Mahoney

Dr. Jennifer Joelle White, International Affairs, School of Public and International Affairs

Empirically, does a decrease in barriers to trade increase social welfare? Under the theoretical framework of commercial liberalization, a more open and free transformation in international markets makes a country better off. An essential economic principle is the concept

of a comparative advantage, where one country should specialize in and trade with the efficient production of a specific good, compared to all other goods. When transaction costs between countries diminish and there exists a comparative advantage, theoretically, profit-maximization for producers and utility optimization of a country's preferences increase. Recently, the United States has transitioned from manufactured goods to a service-oriented and technology-driven economy. The natural progression has allowed the US to have a comparative advantage in knowledge capital. In President Trump's famous campaign to "Make America Great Again," one promise on the trail to victory was to bring back manufacturing jobs to millions of Americans that have been outsourced. The solution is to either renegotiate the North American Free Trade Agreement (NAFTA) or to drop out of the treaty entirely. Since its enactment nearly twenty-five years ago, NAFTA has altered certain sectors of the goods and labor markets that have trickled down to the lives of everyday American citizens. Using a combination of trade data from the US Census and peer-reviewed journals, NAFTA will be examined through cost-benefit analysis. Intuitively, the expectation is that the benefits outweigh the costs of free trade in the United States.

Density Banding Patterns and Stable Isotopes in Amazonian and Caribbean *Siderastrea* Corals

Erin Malsbury

Dr. Patricia Yager, Marine Sciences, Franklin College of Arts and Sciences

The scleractinian corals found near the mouth of the Amazon River receive limited light due to their depth and seasonal coverage by the turbid Amazon River plume. Solar-irradiance strongly determines whether habitat is hospitable for the reef-building stony corals that provide the spatial complexity necessary for tropical reef ecosystems. As Scleractinia colonies grow, they deposit calciferous skeletons. The rate of skeletal deposition depends on ocean temperature, pH, irradiance, sedimentation, and disturbance events. Different growth rates alter skeletal density and composition, so the structures and patterns of coral skeletons can provide information about the environment in which they are formed. I will use stable isotope composition analysis, specifically of $\delta^{13}\text{C}$ and $\delta^{18}\text{O}$, and x-radiography to study the density banding and calcification process of colonies of *Siderastrea* coral from the Amazon reef. I will compare these measurements from the Amazon samples to the same set of measurements taken from *Siderastrea* colonies from the Caribbean and elsewhere. It is expected that the Brazilian samples will show a disruption of the normal banding patterns and stable isotope ratios typically observed in Caribbean colonies, due to the unusual environment inhabited by the Amazon corals.

Nitric Oxide Releasing PVA/Arabinosyl Composite as Antimicrobial Wound Dressing

Juhi Mancha, CURO Research Assistant

Dr. Hitesh Handa, Chemical, Materials, and Biomedical Engineering, College of Engineering

Chronic wound and burn injuries are prone to infections and a prolonged recovery period. Such injuries significantly contribute to a rise in mortality rates and associated health care costs. Therefore, the fabrication of a unique wound dressing that incorporates three active ingredients: arabinosyl (AX), polyvinyl alcohol (PVA), and nitric oxide (NO) provide the potential to reduce infection and inflammation. AX will be chemically extracted through hydrolysis from wheat bran and blended with PVA. AX will then be covalently cross linked to the NO donor, S-nitroso-N-acetylpenicillamine (SNAP). The resulting formulation will be electrospun, a method whereby the dressing is converted into a uniform nanofiber film. This ensures the uniform integration of the active ingredients throughout the wound dressing. Each of the active ingredients were carefully selected to cater to the wound healing process. NO plays an important role in all four phases of wound healing such as hemostasis, inflammation, proliferation, and tissue remodeling. AX carries significant anti-inflammatory and hydrophilicity properties that are essential for wound healing. Similarly, PVA is a synthetic water soluble polymer that has been widely used for making biocompatible wound dressing materials and in addition also facilitates the process of electrospinning. The dressing will follow a series of characterizations: pore size, water vapor transmission, swelling index, moisture content, drug release kinetic, in vitro bacteria inhibition, and cell proliferation. Ultimately, the wound dressing will contribute in a counterattack against infections for burn and chronic wound victims, improving their quality of life, whilst providing a cost-efficient dressing.

Analysis of the Stabilizing Effects of Glycan and Amino Acid Interactions in TSP1-TSR3 Construct

Rajashri Manjunath

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Peters plus syndrome is an autosomal recessive disorder caused by a mutation in $\beta 3$ -glucosyltransferase (B3GLCT). This protein adds a glucose to a fucose that is linked to a serine/threonine in Thrombospondin Type 1 repeats (TSRs) protein motifs. The enzyme Protein O-fucosyltransferase (POFUT2) adds the fucose to TSR. Both B3GLCT and POFUT2 are located in the endoplasmic reticulum (ER) and predicted to function in quality control inside the ER. Former studies of this glycan modification from TSR3 in Thrombospondin-1 (TSP1-TSR3) show that the modification contributes to

the overall stability of the protein. We hypothesize that this glycan modification stabilizes the TSR by interacting with residues surrounding O-fucosylation sites. To test this hypothesis, we will mutate residues close to the O-fucosylation site of TSRs and conduct HPLC unfolding assays to determine the stability of mutated TSRs modified with glycans or not. Additionally, we will explore the role of glycan modifications on TSRs from ADAMTS13. While POFUT2 is required for the secretion of all TSR-containing proteins tested, B3GLCT is only required for the secretion of a subset of these targets and is not required for ADAMTS13 secretion. We hypothesize that addition of glucose does not impact ADAMTS13-TSR stability. We will test this by performing HPLC unfolding assays on fully modified (disaccharide), partially modified (fucose only) or unmodified TSRs from ADAMTS13. Our results will explain why the addition of the glucose does not impact the secretion of this protein.

Socioeconomic Disparities in Mental Health and Financial Conditions

Rajashri Manjunath

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The relationship between socioeconomic factors, financial well-being, and mental health is still unclear. Although some studies have found that high debt to income ratios contribute to perceived stress and mental health problems, others have claimed that financial strain has no impact on mental health. While some studies claim that employment has a positive effect on mental stability, others argue that mental health and work status are mutually exclusive. These mixed results necessitate a further study of these relationships. In this project, we use the theory of cumulative advantage and the human capital model as a framework. The main hypothesis states that poor self-rated mental health and actual depressive symptoms are associated with financial conditions; however, the impact may vary across socioeconomic groups. The data will be extracted from the National Health Interview Survey, which is sponsored by the Centers for Disease Control and Prevention. Each variable is selected using the IPUMS integration software (University of Minnesota). We will create separate models for each mental health indicator using the pooled data. The expected result is that historically disadvantaged groups (i.e. less educated, lower income, ethnic minorities, and women) report more mental health issues. We also predict that those who report financial worries and claim to use financial coping strategies—such as working multiple jobs and skipping meals—report lower mental health status. This study has implications for both financial and mental health counseling. Programs should specifically target those with disadvantages to raise awareness and remove stigmas

associated with both mental health and negative financial situations.

Analyzing the Effects of Stress on Recovery after a TBI in Rat Model

Haylea Marie Mannebach

Dr. Lohitash Karumbaiah, Animal and Dairy Science, College of Agricultural and Environmental Sciences

Traumatic brain injuries (TBIs) are mechanical injuries to the brain that severely disrupt neurological function. Long-term recovery rates may be limited in each case due to intracranial pressure, hypoxia, and inflammatory responses. It has been hypothesized that pre-conditioned stressors may affect recovery from a TBI, but this has not yet been tested. We aim to investigate the effect of pre-conditioned stress on recovery in a rat model. The rats were exposed prenatally to endocrine disrupting chemicals (EDCs) to model stress. The control group was not subjected to EDCs and three other groups were subjected to either bisphenol A (BPA), bis(2-ethylhexyl)phthalate (DEHP) or both EDCs. Differences in recovery between sex and stressors will be investigated using Open Field Tests (OFT) and the Morris Water Maze (MWM). Using the MWM, we will observe the effects of a TBI on motor function and spatial memory. By using the OFT, we will be able to compare stress levels before and after the TBI. We expect to see an increase in latency in the MWM among all groups but expect to see a faster recovery rate in the control group compared to the rats exposed to the EDCs. Utilizing the OFTs, we expect to see heightened stress levels in the rats prenatally exposed to EDCs before and after the TBI compared to the control group. This study may have implications in being able to create tailored treatment plans for patients affected by TBIs especially for war veterans subjected to post-traumatic stress disorder.

Lipidomic Analysis of Castration Resistant Prostate Cancer

Maryam Mansoura

Dr. Brian Cummings, Pharmaceutical and Biomedical Sciences, College of Pharmacy

Castration-resistant prostate cancer (CRPC) is a severe, metastatic form of prostate cancer (PC). Several treatment modalities were approved during the past decade by the FDA for treating CRPC patients. Patients fail to respond to these treatments for several reasons, including developing resistance. One reason for these failures is inadequate methods that allow for accurate staging of PC. This poses a diagnostic problem that limits our ability to create a patient-centered treatment plan. We addressed this problem by testing the hypothesis that an association exists between circulating lipids and clinical outcomes of CRPC. This hypothesis is based on recent studies demonstrating a correlation between plasma lipids and CRPC prognosis. To

understand this correlation, we used *in vitro* models of non-cancerous, hormone-sensitive, and CRPC cell lines combined with quantitative lipidomic analysis to study the correlation between CRPC and lipid profiles. An untargeted approach assessing cells and media indicated that ceramides, sterols, and glycerophospholipids had higher relative abundance in CRPC cells (PC-3 and DU145), and hormone sensitive cells (LNCaP), as compared to a non-cancer cell model (PNT2). These data confirm the above mentioned *in vivo* finding—that the lipidomic profiles of PC cells lines mirror lipidomic profiles in the plasma of PC patients. Further, these data provide an *in vitro* model to investigate the molecular mechanisms mediating lipidomic changes during the progression of PC.

A Multi-Outcome Experiment for the Preparation of Enamines in the Undergraduate Organic Chemistry Teaching Laboratories

Xena Mansoura

Dr. Richard Morrison, Chemistry, Franklin College of Arts and Sciences

The formation of an enamine is a useful chemical transformation, serving as a platform for other reactions such as alkylation, acylation, or halogenation. This framework can provide multi-week exploration into synthetic transformations for the undergraduate organic chemistry instructional laboratory courses (UOCLCs). Herein, we describe a multi-outcome experiment (MOE) for the UOCLCs, in which pyrrolidine is reacted with cyclopentanone to form an enamine. This enamine is then reacted with an unknown acylation reagent as part of a multi-week experiment. Students are provided with a palette of potential unknown acylation reagents and deduce the identity of the product using the benchtop NMR spectrum they obtain from their synthesized product. This MOE provides each student group with the opportunity to complete the same experimental procedure as their peers; however, different results are obtained based on the unknown acylation reagent used. The MOE leads to more individualized reports and student ownership of their laboratory experience.

A Comparison of Bioarchaeological Adult Aging Techniques Utilizing Canine Radiographs from Ancient Sicily

Katey Elizabeth Mari

Dr. Laurie Reitsema, Anthropology, Franklin College of Arts and Sciences

Bioarchaeologists utilize many skeletal indicators to estimate the age of individuals; cranial suture closure, fusion of growth plates, tooth eruption, etc. However, after the age of 18, it becomes increasingly more difficult to properly estimate age through traditional techniques

because most skeletal indicators of age are completed by young adulthood. This study is based around the adult aging methods described in both the Kvaal and the Camariere articles that provide alternative methods of estimating more exact ages of adults. The Kvaal method utilizes width measurement ratios of canines in order to estimate age, and the Camariere method utilizes the relative area of canines to estimate age. My research question investigates which method is more reliable in providing a better way to estimate adult ages. I believe that the Kvaal method will be more reliable than the Camariere method because the Kvaal method eliminates bias created by enamel wear, an issue produced by the Camariere method. For this study, I am utilizing canine radiographs from Greek colonial remains from Himera, Italy. I will estimate the age of each individual from Himera using both the Kvaal and Camariere methods, and then compare my age estimations to estimates for the same individuals done by using traditional bioarchaeological aging techniques. This study is significant because it explores a more exact and reliable way for bioarchaeologists to estimate ages of adults. More accurate age estimates for adults would allow for bioarchaeologists to better depict lifestyle, health, and demographics of people in past societies.

Potential Competitors to the Dollar Based System

Nico Marin

Dr. Leah Carmichael, International Affairs, School of Public and International Affairs

Whether it be the Romans, the British, or the Spanish, the global economy has typically and naturally coalesced around a reserve currency to facilitate the flow of trade and grease the wheels of commerce. This dynamic continues to exist today, and the reserve is currently held by the predominant hegemon. Ever since the erection of the Bretton Woods system following World War II, the US has found itself to be the pillar of the global financial system. This system has ebbed and flowed, characterized by sizeable booms and met with a plethora of busts. This system is changing, albeit at a glacial pace, right before our eyes. This presentation will commence by exploring the development of the dollar-based system, how it has evolved over the past six decades, and where it currently stands. It will delve into the system's strengths and weaknesses, the events that have brought it to where it is, and the key players involved in both preserving and challenging the current paradigm. Following the introduction, the presentation will bring to light the Sino-led competition to the dollar-based system. This competition is being driven by Chinese efforts to rebuild the old silk road trading routes and increase the usage of its own currency through the One Belt One Road infrastructure program. Further, the scale and depth of this geopolitical excursion has been severely underreported in the Western

media. This presentation will shed light on a system that lies in the shadows but dictates much of our quotidian existence.

Team Dynamics: The Effect of Perceived Newcomer Ability on the Association Between Positive Affect and Team Viability

Alexandra Martin

Carisa Urrea, David Wyrembelski, Bethany Harmon, Jasim

Sartaj Mohammed

Dr. Dorothy Carter, Psychology, Franklin College of Arts and Sciences

In all organizational structures, new members will continuously be introduced into existing teams. Because of this, understanding how this will impact group dynamics is of the utmost importance to organizations. Therefore, while it is doubtless that team viability is influenced by multiple factors, it seems likely that the positive outlook of the team as a whole contributes significantly to team viability. This relationship is then likely moderated by additional factors, such as perceptions the veteran team members may develop about the incoming group member's ability or lack thereof. In our study, we tested how a team's affect and perception of a newcomer into their group may affect the overall viability of the team and therefore success at team tasks. We expect that perception of ability of the newcomer will act as a moderator between team-level positive affect and team viability, such that team-level positive affect will be positively related to team viability when the team perceives the newcomer as having high initial ability, but the relationship will be negative if the team perceives the newcomer as having low initial ability. We test our hypothesis using a sample of 304 undergraduate participants assembled into 77 unique 4-member teams that were tasked with completing a role-based digital problem-solving task. Participants responded to self-report sociometric and psychometric measures of team coordination in relation to their teammates. We test our hypotheses using conditional process regression analysis to test for direct effects and moderation.

Spore-Trapping Combined with Real-Time PCR to Monitor Spore Dissemination of the Plant-Pathogenic Fungus *Exobasidium maculosum* in Blueberry

Frannie Martin, CURO Research Assistant

Dr. Harald Scherm, Plant Pathology, College of Agricultural and Environmental Sciences

Exobasidium leaf and fruit spot (ELFS), caused by the plant-pathogenic fungus *Exobasidium maculosum*, is a disease of significant concern to the blueberry industry in Georgia and surrounding states. Infection causes premature defoliation, reduces fruiting wood by girdling of shoots, causes premature fruit drop, and increases sorting costs in the packinghouse. To better understand spore production, spore

dissemination, and infection periods of the pathogen, spore trapping studies with a volumetric spore sampler have been initiated to monitor the seasonal and diurnal periodicity of spore dissemination by *E. maculosum*. Since propagules of *E. maculosum* are visually indistinct, a molecular quantification assay based on real-time polymerase chain reaction (PCR) was created to detect and quantify the pathogen from spore trap tapes. A set of species-specific primers and fluorescent probe were designed, tested for specificity, and evaluated for sensitivity. Additionally, the protocol for the real-time PCR cycle conditions was optimized and an extraction protocol from spore trap tapes was created to allow for an operationally feasible system. Specificity testing of the primers (EXOR & EXOI) and the probe (EXOJ) indicated 100% coverage of all tested isolates of *E. maculosum* and no amplification of other tested organisms. After initial testing, the protocol was utilized to test daily spore samples collected between February and May 2016 from a commercial blueberry planting in southern Georgia. Results corroborated evidence from symptom monitoring and trap plant infection studies during the same period, thereby evidencing the successful application of this useful diagnostic tool.

Geographic and Temporal Variation in *Wolbachia* Induced Phenotypes in *Drosophila recens*

Kelsey Martin, CURO Research Assistant

Dr. Kelly Dyer, Genetics, Franklin College of Arts and Sciences

Endosymbiotic bacteria of the genus *Wolbachia* are widely found within many arthropods and nematodes, where it can alter reproduction in host biology. In *Drosophila*, the most common form of reproductive manipulation is cytoplasmic incompatibility (CI) - crosses between infected males harboring *Wolbachia* and uninfected females result in embryonic mortality. In a previous experiment, we measured hatch rate and offspring survival for compatible and incompatible crosses between infected and uninfected *D. recens* from throughout the species range to determine strength of cytoplasmic incompatibility in various *D. recens* populations. We did not find a significant difference in the strength of cytoplasmic incompatibility measured between the two populations, suggesting little or no geographic variation in the strength of CI in *D. recens*. Additionally, we measured offspring production between infected and uninfected females. While there was a consistent trend of reduction of offspring produced by infected females, there was no statistically significant difference in offspring production between infected and uninfected females. In the current experiment, we seek to observe temporal differences in the strength of CI and offspring production, by experimenting with a *D. recens* line maintained in the laboratory for the past several decades. By conducting these experiments, we will hopefully be able to identify

geographical and temporal trends in the strength of *Wolbachia*-induced phenotypes, and how infected hosts respond to harboring *Wolbachia* infections.

Do Dual-Use Controls Contribute to the Probability of the Pursuit or Use of CBRN Weapons by Terrorist Organizations?

Taylor Martin

Dr. Amanda Murdie, International Affairs, School of Public and International Affairs

As technology advances and non-state actors continue to pose a persistent threat to security, the threat of CBRN terrorism is becoming more prominent. In order to limit the spread of CBRN weapons and materials to terrorist organizations and other non-state actors, many states have created dual-use control laws and lists that are meant to prevent the military application of civilian items. This study expands on Asal, Ackerman, and Rethmeyer's research in "Connections Can Be Toxic: Terrorist Organizational Factors and the Pursuit of CBRN Weapons," and quantitatively examines if dual-use control lists contribute to the probability of the pursuit or use of CBRN weapons by terrorist organizations. In order to determine this, I relied on the Big Allied and Dangerous Database I Lethality Data (BAAD I) from Asal, Rethmeyer, and Anderson, which includes 395 terrorist organizations and the countries they reside in, referred to as the base country. I then examined the dual-use control lists for the base countries, and recorded if the country had a dual-use control list and how many categories it contained. The findings argue that having a dual-use export control list only decreases the probability of the pursuit or use of CBRN weapons by terrorist organizations if its base country has a higher than sample average GDP. However, this study was unable to find statistically significant evidence on how the number of categories in a base country's dual-use control list affects the probability of the pursuit or use of CBRN weapons by terrorist organizations.

Compact Tetrahedron Based RNA 3D Structure Assembly

Aaron Martinez, CURO Research Assistant

Matthew Wicker

Dr. Liming Cai, Computer Science, Franklin College of Arts and Sciences

With the amount of biological data growing exponentially, the need for data mining methods that can comb through massive databases and answer important questions for biomedical research is ever more pressing. Learning of Markov networks based on observed data has been found to be a viable technique for finding and analyzing correlations among biomedical entities or processes. Last year, the RNA Informatics Lab at UGA proved that Markov networks for tree-like topologies can be learned efficiently

from biological sequence data. The ultimate goal is to discover relationships crossing two or more molecules with significant applications, most notably in RNA-RNA and RNA-protein 3D structure predictions. Similar Markov network ideas are still applied by the current project, but now a more sophisticated data analysis approach is being used which involves retrieving 3D structure motifs found in known RNA structures. A database of these motifs, generated by the RNA Informatics Lab from other known data, will aid our optimization algorithms in computing a structure prediction based on the k-tree topology. Specifically, elements such as the existence of nucleotide interactions, the types of interactions, and nucleotide pairwise distances (in Angstrom) are to be factored in when producing candidate components of the 3D structure prediction. We define a set of constraints for these components and refer to them as "compact tetrahedrons." An accurate prediction is desired, but at the very least these candidate predictions can be compared in order to obtain further information about the relationships between the data and the real 3D structure.

Evaluation of Proteins Secreted by *Toxoplasma gondii*

Matthew Martinez, CURO Research Assistant

Dr. Ronald Drew Etheridge, Cellular Biology, Franklin College of Arts and Sciences

I will conduct a research study alongside Professor Ronald Drew Etheridge that focuses primarily on the intracellular pathogen *Toxoplasma gondii*. This organism is one of the most successful protozoan parasites on the planet, infecting approximately a third of mankind. Although generally self-limiting, infections by *T. gondii* can be life threatening or fatal in individuals with immature or suppressed immune systems. Throughout the semester, we plan on targeting a variety of questions that relate broadly to the molecular tools used by the parasite to alter the host environment. This work allows me to become familiar with current molecular biology based methods including gene cloning, DNA primer design, PCR, site-directed mutagenesis, bacterial transformation, plasmid isolation, preparations for DNA sequencing, and restriction digestion followed by agarose gel electrophoresis analysis. These methods will allow me to build plasmid vectors that are needed to endogenously tag a gene and later transfect parasite cells, *T. gondii*. Along with tagging vectors, drug selection and cloning strategies will be used in order to isolate and validate the tagging and protein localization for each target. The goal of this research study is to evaluate how proteins destined for secretion are selected by the host sorting machinery and targeted to different secretory organelles. Due to the large amount of hosts of this apicomplexan it is important to understand its inner workings for medical and veterinary purposes.

Collagen as a Method for Establishing Potential of Therapeutics under Osteogenic Conditions

Ana Maslesa

Dr. Luke Mortensen, Animal and Dairy Science, College of Agricultural and Environmental Sciences

Mesenchymal stem cells (MSCs) are a promising therapy for bone diseases, however identification of potent MSCs with high osteogenic potential remains to be addressed. The largest obstacles in MSC therapy include the need for an assay capable of predicting how well a potential MSC therapeutic product performs under osteogenic conditions. Traditional techniques to measure osteogenic potency include mineralization analysis, alkaline phosphatase (ALP) production, and gene expression. However, these metrics are only useful in late-stage differentiation. To improve the prediction of osteogenic potency of donor MSCs, we developed an assay to monitor collagen production throughout the osteogenic process. Collagen alignment is a novel method of measuring early osteogenic differentiation, with more aligned fibers showing higher osteogenic potency. Here, we imaged donor cells with varying osteogenic potential as measured by mineral production after differentiation. To improve their potency and reduce donor variability, we treated differentiating cells with coumestrol, a phytoestrogen known to increase osteogenic potential of MSCs. In this work, temporal collagen production and ALP activity was studied using second harmonic generation (SHG) imaging and related to mineralization of the extracellular matrix. It is expected for osteo-inducing compounds such as coumestrol to lessen differences among donors and improve collagen production by MSCs.

Using a Model Stream to Study Microbial Diversity and the Impact on Waterway Health in the Upper Oconee Watershed

Ryan James Mason

Dr. Elizabeth Ottesen, Microbiology, Franklin College of Arts and Sciences

Bacterial species produce an array of metabolites and enzymes that are responsible for recycling and shuttling numerous nutrients and organic matter in streams and rivers. These processes are essential for the maintenance of a healthy stream; without microbes recycling and producing nutrients and organics for use by other organisms, the overall energy flow of the stream would be substantially altered. As essential as microbes are to the stream ecosystem, little is known about their abundance and diversity in temperate urban waterways. My study focuses on bacterial community assembly, composition, and seasonal dynamics in an urban waterway. As part of this work, water samples were collected quarterly from 2013-2018 from locations spanning the Upper Oconee Watershed in Athens, GA. We have extracted bacterial DNA, amplified

the V4 region of the 16S RNA gene, and used bioinformatics to generate taxonomic profiles of the bacteria present in each sample. These taxonomic profiles provide insight as to 'typical' bacterial species that thrive in the entirety of the watershed and how season and land use factors affects the community composition. Our preliminary results have shown that increasing total stream length was correlated with an increase in the relative abundance of freshwater-associated OTUs, with bacterial phyla known to populate freshwater lakes, such as *Actinobacteria*, *Bacteroidetes*, and *Proteobacteria* increasing in abundance in downstream samples. Analysis of seasonal dynamics and the role of land use is still ongoing.

The TRACStudy: An Analysis of Health Behavior with Smartphone Technology

Jamarcus Gregory Mathis, CURO Honors Scholar, CURO Research Assistant

Dr. Carolyn Lauckner, Health Promotion and Behavior, College of Public Health

Technology is prevalent in multiple areas of an individual's life. One of these areas is health. The purpose behind the TRAC Study was to explore how technology-based methods could address excessive alcohol consumption amongst individuals living with HIV/AIDS. More specifically, smartphones and mobile breathalyzers were used to monitor alcohol consumption and medication adherence for this population. Within this study, 20 participants were recruited and asked to record their alcohol consumption, medication use, and Blood Alcohol Content (BAC) levels using smartphones on a twice-daily basis for a total of two weeks. Participants also completed pre- and post-interviews for further information collecting regarding their perceptions of the study and technology. Results from this study will help to develop a technology-based alcohol reduction intervention for the vulnerable population of people living with HIV/AIDS. Through this study and similar others, health researchers and practitioners will better be able to understand the value of technology in supporting those living with certain conditions on how to live a healthier lifestyle.

Consumer Cognitive Biases on Oddness and Roundness of Numbers in Instances of Random Selection

Maria Lenore Matthews, CURO Research Assistant

Dr. Julio Sevilla, Marketing and Distribution, Terry College of Business

The cognitive theories behind decision-making in lotteries rely heavily on individual biases. From "favorite numbers" to the illusion of control, players are susceptible to a range of preferences in their selection of the numbers they believe have the greatest probability of being drawn. The random selection process used in lotteries ensures that

every combination is equally likely to be chosen, but this fact is often distorted by the players' perception that some numbers are more likely to be chosen than others. The focus of this study centers on how oddness or roundness of a number affect players' perceptions of its likelihood to be drawn in a random lottery. We hypothesize that in the case of games of chance, odd numbers and those that are not round may be seen as more tangible and therefore be selected at a higher frequency. We will gather historical data on Powerball and Mega Millions tickets sold in Georgia, North Carolina, Virginia, and Florida. We will analyze to see if there is any correlation between oddness or roundness and the numbers on tickets sold, as well as compare those sold to the winning numbers. The significance of these results will give insight that can be used to better understand the mental perceptions of modern consumers.

Bioactive Scaffold Design for Bone Tissue Engineering

Ridge Maxson, CURO Summer Fellow, CURO Research Assistant

Dr. Cheryl Gomillion, Chemical, Materials, and Biomedical Engineering, College of Engineering

Over 500,000 bone grafting procedures are performed each year in the United States alone. Autografts and allografts have historically been used to repair fractured bone; however, they present myriad complications, including limited tissue availability and rejection of donor bone tissue. Advances in tissue engineering hold the promise of providing an improved mode of treatment that will expedite the formation of new bone and eliminate the possibility of rejection. Biomaterial scaffolds provide the foundational support for cell attachment and subsequent tissue formation, and are therefore a key area of interest in tissue engineering. My research will focus on fabricating polymer scaffolds to include a combination of natural and bioactive molecules, and then assessing various formulations to identify the optimal bone supporting scaffold. The scaffolds will be composed of PLGA (poly (lactic-co-glycolic) acid), a copolymer consisting of lactic and glycolic acid. Using varying combinations of tricalcium phosphate S-Nitroso-N-acetylpenicillamine (SNAP), a donor of nitric oxide, I aim to improve the mechanical strength and cell supporting potential of these scaffolds. I will prepare the scaffolds using the porogen leaching method. The scaffolds will be characterized using a variety of techniques, including mechanical testing, *in vitro* degradation tests, and swelling studies. An *in vitro* cell study to examine the interaction of bone cells with these materials will be performed to evaluate bone cell attachment, proliferation, differentiation, and mineralization. Ultimately, I hope to develop a composite, multi-functional scaffold that addresses current limitations, mimics the properties of native bone, and supports the creation of new bone.

Addition of European Fireflies to Existing American Firefly Phylogeny Using DNA Extraction and Sequencing

Allison McCabe, CURO Research Assistant

Dr. Kathrin F Stanger-Hall, Plant Biology, Franklin College of Arts and Sciences

The many species of American fireflies, which have been well documented and studied, have had a detailed phylogeny created for them. However, their European counterparts have not been thoroughly studied, so not much is known about how the various species of fireflies in Europe are related to each other and to American species of fireflies. To help remedy this, I am generating DNA sequence data for a molecular phylogeny of 10 European firefly species. While working on this project, I have extracted DNA from fireflies, determined the concentration and purity of the DNA I extracted, and used polymerase chain reaction (PCR) to amplify three genes (*CO1*, *CAD*, and *WG*) that will be used to generate the phylogeny. Our goal is to extract and amplify three genes from at least 10 different European species. I will use a basic phylogenetic analysis to place the European firefly species on an existing phylogeny of North American firefly species. This research will help our European collaborators by determining the evolutionary relationships of their study species and aiding their ongoing taxonomic revision.

Assessing Workplace Support for Exclusive and Continued Breastfeeding among Working Mothers

Rachel McCardel

Dr. Heather M Padilla, Health Promotion and Behavior, College of Public Health

The CDC and other public health organizations in the United States recommend that infants be exclusively breastfed for the first 6 months of life and continue to be breastfed for 1 year or longer with the introduction of appropriate foods. Although most infants receive some breastmilk in their lifetime, the current rates for exclusive breastfeeding and continued breastfeeding are below the Healthy People 2020 objectives. Employment significantly impacts women's decisions about breastfeeding. Women employed full-time are less likely to initiate breastfeeding and to continue breastfeeding once they return to work. Many working mothers face a lack of support in the workplace to continue breastfeeding and face other challenges such as inflexible work hours and inadequate spaces to express milk. The purpose of this study is to examine workplace support for breastfeeding among different job industries and to identify the barriers and facilitators of breastfeeding in the workplace. A cross-sectional survey was developed to measure breastfeeding practices in the workplace, availability of breastfeeding resources, and workplace support for breastfeeding. Participants were recruited from

Amazon Mechanical Turk to achieve a diverse sample of working mothers who had given birth within the previous two years. It is anticipated that mothers who work in jobs with flexible work hours and who have access to breastfeeding resources will have higher rates and duration of breastfeeding. These findings will provide insight into workplace environments that support breastfeeding and can be used to develop programs to increase breastfeeding exclusion and continuation rates among working mothers.

Engineering Pathways in Recombinant *Escherichia coli* for Volatile Ester Biosynthesis

Anna McClain

Dr. Yajun Yan, Chemical, Materials, and Biomedical Engineering, College of Engineering

The aim of this research is to evaluate several enzymes for their ability to catalyze a key reaction in a proposed biosynthetic pathway for volatile esters methyl salicylate and methyl anthranilate. Esters give off a sweet, fruity smell making them desirable for many applications including foods and beverages, fragrances, and cosmetics. Current production methods for these compounds rely on the non-thermodynamically favorable esterification of organic acids with an alcohol. It is suggested that the addition of an intermediate step involving the transfer of coenzyme A could relieve this problem and promote esterification under ambient conditions. The enzyme that can successfully catalyze the second step in this proposed pathway is still unknown. The methods used to identify this enzyme are, first, to genetically engineer *E. coli* cells that can overproduce salicylic acid, an initial substrate in the proposed pathway. The cells are then transformed with plasmids containing both the gene encoding the known enzyme for the first step and a gene for one of several prospective enzymes needed to catalyze the final step. The success of each prospective enzyme is evaluated by measuring the resulting amount of ester compounds when all substrates are present and the pathway is allowed to proceed. The chosen enzyme will be capable of converting the intermediate product to the final volatile ester at a sufficient rate, thus completing the biosynthetic pathway. This could result in the implementation of a more economical and reproducible method for synthesizing these in-demand compounds.

Sustainable Nanocellulose Gel Dyeing of Polyester Fabric

Alexandra McCluskey, CURO Research Assistant

Dr. Suraj Sharma, Textiles and Merchandising, College of Family and Consumer Sciences

According to World Bank, the textile dyeing industry produces approximately 17-20% of the world's water pollution. Seventy-two toxic chemicals have been found in this wastewater from textile dyeing, and thirty of those

cannot be removed, which poses serious environmental and health issues. For example, dye pollution prohibits photosynthesis, negatively impacts aquatic life and soil quality, and causes illnesses and can lead to human fatality. Recent research on nanocellulose gel dyeing/coating can lower these pollutants in the wastewater by using fewer chemicals and dyes along with reduced amount of water and energy, leading the dyeing and finishing processes ecofriendly and sustainable. In this study, we will be modifying the cellulose polymer of nanocellulose gel into cellulose acetate through an esterification reaction that will allow hydrogel to be dyed by the disperse dye (insoluble dye). The nanocellulose gel disperse dyeing will be transferred to the polyester fabric by a coating process. The primary objective of this experiment is to demonstrate that polyester fabrics dyed with nanocellulose disperse dye will have a comparable colorfastness property to traditionally dyed fabric using disperse dye that requires high dye liquor and rinsing water as well as exorbitant energy utilization.

Primary Outcome of YOURE Fellowship

Elise McDonald

Dr. Silvia Giraudo, Foods and Nutrition, College of Family and Consumer Sciences

The Youth Obesity Undergraduate Research and Extension (YOURE) Fellowship was designed as an intervention to teach undergraduate students how to conduct research through a nontraditional, nonacademic model. The YOURE Fellowship program emphasized development of critical thinking and problem-solving skills, in addition to coupling research goals with employment which is more similar to real-world experiences for much of the workforce, particularly those outside of academia. A hybrid use of coaching and mentoring provided by a team of graduate students aided in breaking down power dynamics often found in undergraduate research endeavors. The YOURE Fellowship is being qualitatively analyzed through narrative inquiry, and a primary outcome of success is the completion of independent research projects by each undergraduate research fellow. Currently during this multi-year longitudinal study, the YOURE Fellowship has been successful in meeting concrete goals, such as the successful preparation of individual undergraduate findings for dissemination, an ethical obligation of research. Further findings from this study will help illuminate the definition of success in similar programs, practical applications and implementation processes, and other factors appropriate for case transfer. Furthermore, the participants in this study more immediately benefit from the experience of not only conducting and presenting their research, but may also be able to experience first-hand positive changes made in their place of employment as a result of their individual research findings.

Promoting Outdoor Recreation to Combat Childhood Obesity

Elise McDonald

Dr. Silvia Giraudo, Foods and Nutrition, College of Family and Consumer Sciences

Childhood obesity is the top health concern facing children today. Children are spending more time than ever indoors, sedentary and engaged with electronics. It is plausible that activities many children find enjoyable such as hiking, riding a bicycle, canoeing, or playing an active outdoor game are overlooked as sources of fun physical exercise, as well as gateways to a healthier lifestyle. The purpose of this study was to determine which forms of outdoor recreation children perceive as exercise, and to assess whether their participation in some of these activities at summer camp increases their association with these forms of recreation as means of maintaining physical health. This research was conducted at a summer camp. Data was collected via surveys administered to children both before the start of and upon completion of the camping week, in which children were asked questions pertaining to their personal level of time spent outdoors, assessment of which activities they considered to be exercise, and whether or not they were looking forward to or enjoyed hiking at camp. The findings of this study show that being exposed to a variety of outdoor activities such as hiking, canoeing, and playing active outdoor games successfully raised children's awareness of these things as viable options for physical activity. Studies such as these could be the key to ensuring the continued and increased incorporation of environmental education and outdoor recreation into summer camping programs, as well as lead to increased advocacy for outdoor recreation in health education.

The Conservation of Allostery in *C. Elegans* UDP-Glucose Dehydrogenase

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Nobel laureate Jacques Monod called allostery "the second secret to life." Allostery describes the process by which the proteins respond to changes in the environment. Understanding allosteric mechanisms is an important goal in controlling enzyme activity. Human UDP-Glucose Dehydrogenase (UGDH) is an essential enzyme in drug metabolism, and its activity is regulated by an atypical allosteric mechanism. The inhibitor UDP-Xylose competes with substrate for the active site, but upon binding induces the translation of an allosteric switch to inactivate the enzyme by forming a distinct, horseshoe-shaped hexamer. We defined a sequence motif and used BLAST to identify *C. Elegans* UGDH (cUGDH) as an outgroup that conserves this unique mechanism. The crystal structure of inhibited

cUGDH was solved, confirming that the inhibited state forms the same broken horseshoe hexamer. Steady-state analysis of cUGDH displayed positive cooperativity, consistent with an allosteric transition from a low affinity to a high affinity state. Sedimentation velocity studies also showed that UDP-Xylose binding forms the inactive horseshoe by a shift in oligomeric population. Surprisingly, inhibition studies showed that the affinity for the inhibitor was an order of magnitude weaker in cUGDH compared to hUGDH. We used amino acid substitutions to define structural motifs that can be used to study the evolution of the atypical allosteric mechanism of UGDHs. Recently, refining these motifs has identified changes in the hexamer interface that may explain the lower affinity. Future efforts include protein engineering to manipulate the allosteric network.

Memory Immune Response to *T. cruzi* Reinfection Requires Similar Activation Time as Primary Infection

Caroline McElhannon, CURO Research Assistant

Dr. Rick Tarleton, Cellular Biology, Franklin College of Arts and Sciences

Chagas disease, caused by infection of the protozoan parasite *Trypanosoma cruzi*, remains a major health concern in Latin America, with limited diagnosis and treatment as well as no currently available vaccine. As preventive vaccines for other infections are based on enhanced immune responses of memory cells upon antigen reencounter, a model of reinfection of chronically infected mice was developed to measure memory recall responses against *T. cruzi*. Using luciferase transgenic parasites during reinfection allowed measurement of parasite proliferation at the infection site over time. As expected, chronically infected animals showed more robust control of the infection relative to nonimmune animals. However, this enhanced control only became apparent after five days of infection, a timing similar to nonimmune mice. The timing of this response occurs after the first round of parasites are released from infected host cells. Therefore, these results suggest that, similar to a primary infection, even highly efficient memory cells in chronically infected animals have a relatively delayed response to new infection. Additionally, reinfection experiments in IFN γ deficient mice show that this cytokine, while crucial in primary infection control, is not required to control secondary infections, suggesting a different control mechanism in chronically infected hosts. Future experiments will confirm and extend these results through the study of recall immune response in animals cured by drug treatment and address the contribution of resident memory T cells at reinfection sites. Results of this research will provide insights into the immunology of *T. cruzi* infection and challenges for designing experimental immunization protocols.

Duchamp and the Consequences of the Readymade on the Art World

Emma McMorran, CURO Honors Scholar
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In 1917, the artist Marcel Duchamp submitted a piece to the American Society of Artists for an unjuried exhibition where every artist who paid the application fee was supposed to be able to display his or her work. Duchamp's work was rejected. The committee claimed that the work was vulgar in nature and plagiarized since Duchamp had not constructed the object himself. The piece in question, a urinal that Duchamp titled *Fountain*, was defended by the journalist Beatrice Wood as a piece of art because of Duchamp's decision to call the urinal art, and its position in a gallery setting confirmed its elevated status. Years later, Duchamp coined the term "readymade" to describe these choices, which he chose from other manufactured objects. Through the close analysis of texts on readymades such as reviews, exhibitions, and interviews, this research maps the changing notions of the art object. Although this research is still ongoing, preliminary findings support the argument that with the artist's intent to create a piece and in a traditional display context, readymades can rightfully be considered art. Even though viewers or readers may disagree with that conclusion, their opinions do nothing to discredit the estimated value of *Fountain*, which remains in the millions and is not expected to decline. This research will mainly examine the work of Duchamp in order to assess his specific impact on the definition of art in order to understand how one artist could so significantly impact the course of art history.

Microscopy Analysis of Trypanosome Nanotubes and Extracellular Vesicles

Hannah Paige McQueen, CURO Research Assistant
Dr. Stephen Hajduk, Biochemistry and Molecular Biology, Franklin College of Arts and Sciences

African Trypanosomes (*Trypanosoma brucei* spp.) are the causative agents of both African Sleeping Sickness in humans and Nagana in cattle. Extracellular vesicles (EVs) have previously been shown by the Hajduk laboratory to be crucial elements in cellular communication, host immune modulation, transfer of virulence factors, differentiation, disease progression, and pathology in trypanosomes. My studies built upon and advanced prior research from the Hajduk laboratory that discovered that EVs fuse with mammalian erythrocytes and cause host anemia, a main cause of morbidity in cattle suffering from veterinary trypanosomiasis (Nagana) and a contributor to morbidity in human infection. Using light microscopy with both live cells and fixed cells I have been able to visualize formation

of plasma membrane derived nanotubes that give rise to free-EVs. In the coming months, I intend to employ microscopy to examine the transfer of protein, nucleic acid, and lipids from trypanosome EVs to host cells and to obtain a morphological characterization of our cell lines. Methods include various fixations and immunofluorescence assays (IFAs) that will be imaged using differential interference contrast (DIC) microscopy. There is an enormously broad range of applications to which a furthered understanding of EVs could contribute, including the formation of new treatment approaches, toward vaccinations, and also toward diagnostic tools for otherwise difficult to diagnose conditions (namely, African Sleeping Sickness).

Bisphenol AF Induces Multinucleation in Mouse Spermatogonial Cells *in vitro*

Emily Measel, CURO Research Assistant
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BPAF is used extensively as a crosslinking agent and monomer in the plastics industry to substitute BPA. However, there is a paucity of information available about BPAF's effects on human health and the environment. Our recent *in vitro* study using mouse spermatogonial cells found that BPAF exhibited higher cytotoxicity and induced an unprecedented increase of multinucleated germ cells (MNGs) than BPA and other derivatives. The formation of MNGs is the hallmark of fetal testicular toxicity, but the mechanism is unclear. We tested the hypothesis that BPAF exposure generates MNGs via cytokinetic failure, altering pathway proteins such as proto-oncogenic Src, p190, and RhoGAP. We applied single cell-based high-content analysis of Src, p190, lamin A/C, and F-actin to examine dose and temporal alterations in mouse spermatogonia. We also utilized machine-learning based phenotypic analysis to quantitatively measure dose and temporal changes of MNGs induced by BPAF. Additionally, dose and time-dependent variations were also examined using Western Blot analysis. We found that an increase of MNGs is associated with the changes of lamin A/C, nuclear morphology, cell cycle progression, cytoskeleton integrity, and p190 expression levels. The proportion of MNGs increased as the concentrations of BPAF increased after both 8h and 24h exposure, except for at the highest concentration of 25 mM. These results suggest that the induction of MNGs associates with disruption of the actin cytoskeleton through the altered cellular pathways. There were temporal variations of expressions between 24h and 8h. These data provide mechanistic insight into reproductive toxicity using high-content analysis *in vitro*.

JODD: The Creation of the Journal of Digital Design

Reilly Megee, Foundation Fellow, CURO Research Assistant
John Weatherford, New Media Institute, Grady College of Journalism and Mass Communication

This research will analyze the world of academic journals, specifically the subset that focuses on emerging technology and design. The market is saturated with a wide variety of academic writing, but as the definition of “new media” evolves and expands, there’s an opportunity to establish a new journal in an untapped niche. Following the process of journal creation from start to finish, this research will ask three questions: What has already been done, and what topics is no one covering? What do established systems do well, and where is there room to innovate? And what is the best way to run the program given the New Media’s existing infrastructure? The findings, gained through secondary research and the experience of creating a journal, will be presented and iterated on throughout the semester, ultimately being placed in a summative essay. In examining this topic, this research has identified a new segment of the market: digital design presented in an aesthetically-pleasing and visually-stimulating manner. Throughout the semester, the research has defined the best practices of starting an academic journal in the context of the University of Georgia’s own New Media Institute and created JODD, the Journal of Digital Design, staffed by the students of an Emerging Media graduate-level course: Digital Media Design and Aesthetics. The hope is to lay the foundation to eventually establish the New Media Institute as a respected curator of relevant academic writing.

Personality Testing and the Americans with Disabilities Act: Cause for Concern as Normal and Abnormal Personality Models Are Integrated

Arturia Melson-Silimon, CURO Research Assistant
Dr. Nathan Carter, Psychology, Franklin College of Arts and Sciences

Applied psychologists commonly use personality tests in employee selection systems because of their advantages of incremental criterion-related validity and less adverse impact relative to cognitive ability tests. Although personality tests have seen limited legal challenges in the past, we posit that the use of personality tests might see increased challenges under the Americans with Disabilities Act (ADA) and the ADA Amendments Act (ADAAA) due to emerging evidence that normative personality and personality disorders belong to a common continuum. The current review aims to begin a discussion and offer initial insights regarding the possible implications of this new research for personality testing under the ADA. We review past case law, scholarship in employment law, Equal Employment Opportunity Commission (EEOC) guidance

regarding “medical examinations,” and recent literature from various psychology disciplines—including clinical, neuropsychology, and applied personality psychology—regarding the relationship between normative personality and personality disorders. Our review suggests that as scientific understanding of personality progresses, practitioners will need to exercise evermore caution when choosing personality measures for use in selection systems. We conclude with five recommendations for applied psychologists when developing or choosing personality measures.

The Effect of Mechanical Signals on Mitochondria Structure and Function

Grant Harrison Mercer, Ramsey Scholar
Dr. Jarrod A Call, Kinesiology, College of Education

My research will be investigating the effect of mechanical signals on mitochondrial networks. The hypothesis is that mitochondrial autophagy is necessary for skeletal muscle regeneration and remodeling after muscle injury. I will be maintaining a transgenic mouse line, that express green-fluorescent protein labeled mitochondria. These mice will undergo surgically induced injuries, and I will perform twice-weekly physical therapy on them through a passive range of motion. Their mitochondrial networks will be imaged with two-photon microscopy before, during, and after this period to investigate the effects of physical therapy on mitochondrial quality after skeletal muscle injury. This research could help lead to a therapy for restoring skeletal muscle function after a severe injury.

Cambodian Refugees and Agency through the Resettlement Process

Johanna Rodriguez Mercurio, CURO Research Assistant
Dr. Denise Clark Lewis, Human Development and Family Science, College of Family and Consumer Sciences

Cambodian refugees maintain agency and power as they engage in the process of fleeing their home nation and resettling in the United States. Since the early 1980s, Cambodian refugees have been settling into the United States in response to flight from communist forces that came into power during an era of civil wars occurring in the 1970s. Leaving one’s home nation to resettle in an unfamiliar culture is extremely physically, emotionally, and psychologically taxing. Our research shows that the American government inadequately aids refugees experiencing these transitional stages. The lack of state support adds another layer to complications with the resettlement process as refugees deal with obstacles, such as working through past trauma, overcoming language barriers, and adjusting to a culture different from their own. Yet, our research also reveals that refugees maintain agency

even when it might appear that their power is diminished. Data for this project are drawn from 125 in-depth interviews and participant observation conducted with members of a Cambodian community in coastal Alabama. Personal narratives document the flight of families from their homes, to refugee camps, and to resettlement in the United States. Information from the result of this research is presented within a framework of family exchange theory. This research is significant because it shows that agencies who directly impact refugees' resettlement experiences can be more adept at addressing unmet needs in a more collaborative and culturally responsive manner by focusing on refugee voices and acknowledging the power that they hold.

Cognitive Interference and Sexual Risk Behavior

Delaney Morgan Metcalf

Dr. Lawrence Sweet, Psychology, Franklin College of Arts and Sciences

The Centers for Disease Control and Prevention (CDC) reports that the prevalence of sexually transmitted infections (STIs) in the United States is growing rapidly, recording over 2 million cases of chlamydia, gonorrhea, and syphilis in 2016 alone. Engagement in sexual risk behaviors, including unprotected sexual activities and multiple frequent partners, increases the risk of contracting or transmitting an STI. To develop effective prevention and intervention programs, it is essential to understand the psychosocial and cognitive mechanisms that result in increased engagement in risky sexual behaviors. Evidence suggests that executive functions such as attention shifting, working memory, and cognitive inhibition impact decision making related to other risk-taking behaviors such as substance use and abuse. However, the direct impact of executive function on sexual risk-taking behavior is poorly understood. The present study involving 25 young women aims to better understand this relationship. Our research group has developed a novel Sexual and Emotional Stroop task to assess participants' ability to appropriately allocate attention while ignoring task-irrelevant sexual and emotional word stimuli. Performance on the novel task was assessed through participant response times during correct responses and accuracy throughout the task. Sexual behaviors were assessed using a series of self-report questionnaires. In accordance with the findings of previous studies, we hypothesize that higher levels of attention bias towards sexual words (i.e., slower response times when presented with sex-related words compared to neutral words) will be similar to the bias expected for salient emotional distractors and associated with more self-reported risky sexual behavior.

Acculturation and Refugee Health: A Scholarship Review

Prabhjot Minhas, Ramsey Scholar

Dr. Susan Tanner, Anthropology, Franklin College of Arts and Sciences

Migrant and refugee health is an increasingly important topic in healthcare and anthropology. Scholarship on migrant and refugee health often considers acculturation, or the process by which one group adopts and is exposed to the cultural practices and behaviors of another, usually dominant, group. While acculturation is relevant in refugee nutrition and diet, more research into the definition, measurement, and use of acculturation as a model to explain diet and nutrition changes in refugees is needed. We conducted a literature review with the keyword search "refugee health united states" on PubMed to examine major themes in research on nutrition and diet within the larger context of refugee health in the U.S. Within the relevant literature, research themes concerning refugee diet and nutrition were food insecurity, intervention and educational programs, post-resettlement health/nutrition changes, and acculturation. Although present, there is less attention to refugee experience like migrant's perception of diet and nutrition changes. The studies covered a large breadth of populations (over 25 regions of origin) and came from diverse fields of study. The literature also suggested that nutrition and diet changes in resettled migrants, and subsequent generations, are influenced by interactions of culture, history, language, ethnicity, and social relationships. A comprehensive model of acculturation would allow for more effective policies, interventions, and education programs to improve refugee health.

Malaria-Infected Red Blood Cell Lysis Using the Constrained Peptide STAD-2

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Dr. Eileen Kennedy, Pharmaceutical and Biomedical Sciences, College of Pharmacy

Constrained peptides are promising new biological tools that serve to mimic the binding interfaces of protein-protein interactions and thus block processes such as signal amplification from occurring. To avoid the likely degradation of the peptide due to the low energetic favorability of binding to the target as well as through proteolytic cleavage of the amide bonds, a hydrocarbon staple can be introduced in to the sequence to maintain the helical secondary structure. The staple is created by integrating two non-natural amino acids in the sequence which contain olefinic moieties that are joined together through on-resin ring-closing metathesis. One such constrained peptide, STAD-2, originally designed to interrupt the interaction between Protein Kinase A and A-kinase Anchoring Proteins, has shown antimalarial properties. The peptide was synthesized with

solid state synthesis and analyzed and purified using mass spectrometry and high-performance liquid chromatography. Human erythrocytes infected with *P. falciparum* in isotonic Na⁺-based saline were dosed with STAD-2 and lysis kinetics, as well as dose response, were measured. It was found that STAD-2 -treated infected cells were lysed, while uninfected cells retained normal function, and that this effect is dose dependent. The exact mechanism by which this occurs is still unclear and warrants further research, which could provide a rapid and targeted treatment for malaria.

Characterizing the Capture of Foreign DNA by a Type III-A CRISPR-Cas System

Alyssia Mitchell, CURO Honors Scholar

Dr. Michael Terns, Biochemistry and Molecular Biology, Franklin College of Arts and Sciences

Just like humans, prokaryotes have an adaptive immune system that functions to defend themselves from viral infections and other invading genetic elements. This adaptive immune system called CRISPR-Cas (clustered regularly interspaced short palindromic repeats and CRISPR associated proteins) builds a chronological memory of foreign DNA sequences that have infected the cell. This is accomplished by capturing short segments of the invading DNA, typically injected by bacteriophages, and inserting them into the CRISPR locus of the bacterial genome. These invader DNA sequences are subsequently expressed as short CRISPR RNA molecules that specifically identify the foreign nucleic acid and destroy it using the nuclease activity of associated Cas proteins. This study focuses primarily on characterizing the initial stages of foreign DNA capture and integration into the CRISPR locus, using a Type III-A CRISPR-Cas system of the bacterium, *Streptococcus thermophilus*. Two major proteins hypothesized to be involved in the integration step, Cas1 and Cas2, were purified and tested *in vitro*. Using a DNA integration assay previously established in the lab, the reaction condition requirements and preferences of these proteins are beginning to be revealed. The characterization of this specific system is novel due to the fact that it has the capability to defend against both DNA and RNA invaders. More broadly, CRISPR-Cas is a very influential system as it is being utilized as a genome editing tool. Specific applications of this groundbreaking biotechnology have included research to cure diseases such as cancer, HIV, cystic fibrosis, and sickle cell anemia.

Optimizing Success Strategies for Entrepreneurship Incubators

Simran Modi, CURO Research Assistant

Don Chambers, Management Information Systems, Terry College of Business

There are approximately 550-600 independent incubators and accelerators in the United States run by non-profit, for profit and pseudo government entities while upwards of 700-750 universities have similar programs. Most programs of any type seek to provide a variety of resources such as shared space, maker space, mentoring, education, and access to information with the desired goal of assisting startup ventures with successful commercialization. Yet a growing body of research suggest that these programs fail at an alarmingly high rate. This research will uncover and state the reasons for failures as well as identify practices that led to successes and then compare and contrast the efforts of University versus non-University programs. The research will focus on what practices are most likely to lead to commercialization with an end goal of designing a new paradigm for how such programs ought to serve its constituents. The significance of this research is that it will allow incubator and accelerator programs to be developed in a way that will help entrepreneurs to develop their businesses. This project will be conducted in conjunction with the UGA Innovation Gateway, Four Athens, and the UGA Entrepreneurship Program.

The Design, Construction, and Utility of Vibrations Test Articles

George R Moll III, CURO Research Assistant

Dr. Ben Davis, Environmental, Civil, Agricultural, and Mechanical Engineering, College of Engineering

Vibration is the periodic motion of a rigid or elastic body or medium forced from a state of equilibrium, and it is a very common phenomenon engineers must account for when designing a mechanical system. Vibration has many technical applications, but in most engineering applications, vibration is undesirable because it may result in the failure of a critical component. For this reason, engineering students must have a strong understanding of mechanical vibrations before entering a related field. I am designing and constructing vibrations test articles out of metals and acrylics to demonstrate various concepts and phenomena in mechanical vibrations. These desktop devices will be used for research and teaching opportunities in the College of Engineering. Upon completion, students can use the various test articles in conjunction with current curriculum to explore mathematical relationships in mechanical vibrations, observe concepts in motion rather than visualize them, and compare theoretical calculation with experimental results.

Protesting Corruption on Twitter: A Topic Modeling Approach to How Bots and Cyborgs Create Awareness

Ajit Morar, CURO Research Assistant

Dr. Elena Karahanna, Management Information Systems, Terry College of Business

Activists around the world now have the potential of reaching a global audience to express dissatisfaction and elicit change by utilizing technology, specifically social media. In researching the use of Twitter during a social movement in Brazil, known as the 20-cents cause, we identify that some protesters were actually bots – automated accounts on online social networks. We analyze the bot-generated content using topic modeling to identify the types of topics the bots broadcasted. We then analyzed the relationships among the topics and the cause to better understand how bots can be designed to reach a broad audience and raise awareness about the cause. Finally, we identify cyborg accounts (accounts that are part bot, part human), analyze their messages through topic modeling, and compare their topics to those of bot accounts. This comparison enables us to identify differences in how bots and cyborgs create awareness.

Evaluation of *Populus* Sucrose Transporter Gene Function in Transgenic *Arabidopsis* Mutants

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Plants utilize either apoplastic or symplastic phloem loading to facilitate long distance transport of carbohydrates from source leaves to sink tissues. The two mechanisms are modulated by different types of sucrose transporter (SUC/SUT) family proteins. As an apoplastic loader, *Arabidopsis* relies on Type I plasma membrane-localized SUT (AtSUC2) for active uptake of sucrose from the apoplast into phloem companion cells. Accordingly, AtSUC2 is specifically expressed in companion cells, and mutation of AtSUC2 is lethal. In symplastic loading species, such as *Populus*, sucrose loading is dependent upon diffusion via the plasmodesmata, driven by a concentration gradient from the mesophyll to the phloem. We asked whether Type I *PtaSUT1* and *PtaSUT3* from *Populus* have equivalent function when introduced into *Arabidopsis* loss-of-function *suc2* mutants. The *Agrobacterium*-mediated method was used to transform *PtaSUT1* and *PtaSUT3*, driven by a constitutive promoter, into heterozygous *Arabidopsis* mutants. Genomic DNA was screened via polymerase chain reactions to confirm the transgenic genotype. If *PtaSUT1* and *PtaSUT3* have similar functions as AtSUC2, we would expect normal transgenic plant growth in *suc2* homozygous background. Among T2 transgenic plants, the *PtaSUT1* or *PtaSUT3* transgene can only be detected in AtSUC2/*atsuc2* heterozygous background; none of the *PtaSUT1/PtaSUT3*-positive transgenic plants

were homozygous for *atsuc2* in two independent mutant backgrounds. This suggests that *PtaSUT1/3* are unable to complement *atsuc2* function. However, other experimental complications could not be excluded. Ongoing work includes advance generation screening and confirmation of *PtaSUT1/3* expression in the transgenic lines to understand the functional conservation or diversification of *Populus* Type I SUTs.

Identifying Candidate Resistance Genes in Cultivated Sunflower using Comparative Genomics

Liana Mosley, CURO Research Assistant

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Plant disease represents a continuous threat to global agriculture. One of the most effective approaches to combat bacterial plant pathogens is by using a host genetics approach based around the plant's own immune detection and defense responses. All plants encode a diverse set of immune receptor *R* genes coding for NBS-LRR proteins. Cytosolic NBS-LRR proteins recognize pathogen effector virulence proteins that have been delivered into the plant cells. Recognition of an effector by an NBS-LRR results in a potent immune response that halts pathogen proliferation. Therefore, the identification *R* genes that recognize core bacterial pathogen effector proteins is a favored strategy for the control of bacterial plant disease. The bacterial effector HopQ (from *Pseudomonas syringae*) and its xenologs XopQ (*Xanthomonas* spp.) and RipB (*Ralstonia solanacearum*) are distributed broadly among diverse bacterial pathogens, which makes them an ideal target for *R*-gene mediated control. In this project, we will take advantage of the natural genetic variation in cultivated sunflower accessions and score virulence phenotypes with or without the *hopQ* effector gene to identify sunflower accessions that can or cannot recognize HopQ1. Using comparative genomics techniques, we will identify candidate *R* genes in sunflower responsible for the recognition of HopQ.

Canine Ocular Melanomas and Melanocytomas

Adrea Mueller, CURO Honors Scholar

Dr. Paige Carmichael, Pathology, College of Veterinary Medicine

According to the literature in veterinary and human pathology, the term melanocytoma refers to benign neoplasm of melanocytes originating from the epidermis in the skin. These benign neoplasms can occur both focally and multifocally and rarely progress to malignancy. In veterinary pathology, a melanoma is a term used to refer to malignant neoplasms of melanocytes in the skin. These neoplasms have similar biological behavior to the human counterparts. In ocular veterinary pathology, the terms melanoma and melanocytoma have been used interchangeably.

The hypothesis is that although ocular melanocytes are unassociated with epidermis, it is valid to use the term melanocytoma to describe a benign neoplasm of ocular melanocytes. The goal of this study is to evaluate clinical cases to determine if the parameters used to define a dermal melanoma and a dermal melanocytoma translate to similar neoplasms of the eye. Between 2007 and 2017, there were 25 cases diagnosed as canine ocular melanomas and melanocytomas that were submitted to University of Georgia Diagnostic Ocular Pathology Service. These 25 cases were evaluated histopathologically for criteria that would allow categorization into either melanoma or melanocytoma. The results of this study will allow for better pathology-based prognosis of ocular melanin-containing neoplasms.

Investigation of Yeast Rce1 Cysteine Residues

Rohit Munagala, CURO Research Assistant

Dr. Walter K Schmidt, Biochemistry and Molecular Biology, Franklin College of Arts and Sciences

The Rce1 protease is found in all branches of life. In humans, Rce1 is considered an anti-cancer target because of its role in the post-translational modification of CAAX proteins. The only structure available for Rce1-related investigation derives from the extremophile bacterium *Methanococcus maripaludis* (*MmRce1*). The Schmidt lab investigates eukaryotic Rce1 (e.g. yeast, human, worm, etc.) and has discovered that yeast Rce1 specifically contains multiple cysteine residues that play an important role in its activity. Curiously, mutation of these cysteines substantially decreases *in vitro* activity while not affecting *in vivo* activity. The project will explore the tolerance of yeast Rce1 to mutation at these cysteine residues to address the hypothesis that these naturally occurring cysteines are buried residues and can only be substituted by amino acids with non-polar character. These mutants will be expressed in yeast and analyzed/compared for both *in vivo* and *in vitro* activity. The results will be used to assess structural predictions of yeast Rce1 derived from structural modeling guided by the *MmRce1* structure. Ultimate determination of yeast Rce1 structure will help us better understand human Rce1 structure, which may help guide potential anticancer drug designs.

Arboviral Transmission Rates after a Natural Disaster Occurrence: A Systematic Review

Chelsea Murphy, CURO Research Assistant

Gloria Andia

Dr. José F Cordero, Epidemiology and Biostatistics, College of Public Health

Natural disasters, such as hurricanes, floods, tsunamis, tornadoes, and earthquakes, are events that can have far-reaching damage and devastation beyond their initial

impact. In 2017, Hurricanes Irma, Harvey, and Maria affected the southern United States and several Caribbean islands, including Puerto Rico and Dominca. After a natural disaster, it is possible that incidence and transmission rates of arboviruses, such as Dengue or Zika, can be affected due to fluctuations in their arboviral hosts' population. This is because after an initial decrease, mosquito populations tend to surge following natural disasters, specifically floods and tropical storms. We conducted systematic review using PubMed and Web of Science. We focused on West Nile (WNV), Zika (ZIKV), Dengue (DENV), Chikungunya (CHIKV), and Saint Louis Encephalitis (SLE) and made no restrictions on type of natural disaster. Flood was the most common natural disaster. Other natural disasters included droughts and hurricanes. Over 100 studies were reviewed that were narrowed down to 36 studies and then narrowed to 11 studies. The majority of included studies mostly focused on the mosquito populations, rather than human cases of arboviral infection. Population size and location varied, allowing us to speculate about whether location affects transmission and incidence rates. Most of the cases showed there was not a significant change after a natural disaster. It is clear that arbovirus transmission is affected by natural disasters and surveillance should be considered a priority during the recovery period. While there is not an absolute trend, there is evidence that arboviral populations can thrive in the wake of a natural disaster and relief efforts often overlook their threat.

Development of an N-Linked Glycan Specific Binding Reagent by Computational and Experimental Methods

Nathalie Murphy

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Enzymes evolve substrate affinities sufficient to allow for catalysis then release of product, meaning they need to have rapid turnover, which suggests that they have low binding affinities. However, enzymes can be altered to both remove their catalytic function and increase their affinity for their ligands, yielding binding reagents specific to the substrates of the scaffold enzyme. This process of protein engineering begins with the computational methods molecular dynamics (MD) simulations and molecular mechanics and generalized Born surface area (MM-GBSA) calculations. These methods generate a per residue decomposition of energetic contributions to binding. Residues in the binding site of an enzyme may contribute favorably or unfavorably to binding. Traditionally residues in the binding site are mutated to improve the performance of an enzyme; however, we are mutating them to enhance the affinity of the inactive enzyme. We hypothesize that residues making weakly favorable contributions can be mutated to other residues that could make stronger interactions, thus

improving the overall binding capacity of the protein. Here this hypothesis will be applied to the enzyme PNGase F-II. PNGase F-II catalyzes the cleavage of N-linked glycans from glycoproteins, whether or not the glycan is α -1,3 or α -1,6 core fucosylated. Three residues in the binding site of PNGase F-II were considered viable for mutation for the purpose of developing a reagent that could specifically bind to N-linked glycans or glycopeptides. A library of mutants will be constructed for each residue (selected computationally), after which each mutant will be expressed in *Escherichia coli* and purified. The mutants will then be assayed to identify those that resulted in an enhanced binding capacity. Therefore, if these experiments successfully identify mutants that enhance binding, they will constitute a novel strategy of developing similar carbohydrate binding reagents.

Identification of the Binding Motifs of Transcription Factors Expressed in Shoots and Roots of *Zea mays* by DNA Affinity Purification Sequencing

Nathalie Murphy

Dr. Bob Schmitz, Genetics, Franklin College of Arts and Sciences

DNA Affinity Purification sequencing (DAP-seq) provides an alternative to Chromatin Immunoprecipitation sequencing (ChIP-seq) for identifying the binding sequences of desired DNA binding proteins, such as transcription factors (TFs). Unlike ChIP-seq, DAP-seq does not require the use of antibodies specific to each protein to be studied. It involves the exposure of genomic DNA fragments to fusion proteins composed of the desired DNA binding protein and a HALO tag. The fusion protein will bind to the DNA fragments that contain its binding sequence. The HALO tag will then be used to isolate the DNA-protein complex, and the bound DNA is purified and sequenced to identify the binding sites of each DNA binding protein. Here DAP-seq will be employed to identify the binding motifs of 192 transcription factors expressed in shoots and roots in *Zea mays*. This will be accomplished through initial construction of *Z. mays* genomic DNA libraries to be used in the DAP-seq procedure and the synthesis of TF-HALO tag fusion proteins. Once DAP-seq is completed, the results will be computationally analyzed to determine the binding motifs of each transcription factor. The results of these experiments will be made publicly available for use in future studies.

Morphological Differences Between Native Fibrin Clots vs. Glycated Clots

Chelsea Murray

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Patients with diabetes have commonly been known to exhibit abnormally higher pro-coagulant activity as

opposed to those unaffected by diabetes. Consequently, these differences exponentially increase their chances of developing various thrombotic disorders and cardiovascular disease. In particular, patients with Type II diabetes are more prone to experience pro-thrombotic events that have been shown to distinctively affect the coagulation cascade and ultimately the fibrin clot structure. In this study, we examine the mechanical and morphological differences of normal fibrin clots (blood clots) in comparison to clots that are glycated (simulated clots from diabetic patients). Fluorescence microscopy images of native and glycated fibrin networks (including normal and glycated red blood cells) will be obtained. The fluorescence imaging technique will include the staining and imaging of proteins and cells in both the native and altered states, as well as collecting a compilation of images displaying real-time activity. Computational imaging analysis of the fibrin clots will be conducted to quantify pore size, density, and fractal characteristics. From these images and analyses, we expect to see significant differences between the native and altered states that indicate the relation between glycated clots and thrombotic disorders. The results will be used to elucidate how and why fibrin mechanisms are altered in persons living with diabetes and will help to explain the high rate of comorbidities due to hyper-coagulable plasma conditions.

Elucidation of the Critical Residues of the Mumps F and HN Proteins in Cell-Cell and Virus-Cell Fusion

Kaito Nagashima

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Mumps virus (MuV) is a neurotropic pathogen that causes meningitis and swelling of the parotid glands. Vaccinations have decreased the incidence of mumps cases; however, large outbreaks have been noted since 2005. MuV utilizes the fusion (F) and hemagglutinin-neuraminidase (HN) proteins in fusion events, including fusion of virus and cells and fusion of neighboring cells. Although an interaction between F and HN is believed to produce membrane fusion, the residues involved were previously unclear. In this study, we identified critical residues involved in cell-cell and virus-cell fusion. The F and HN proteins from the vaccine strain, Jeryl-Lynn (JL), and from a strain isolated from an outbreak in Iowa, Iowa/06 (IA), were examined. Possible critical residues in IA-F were mutated to matched residues in JL-F and those in JL-HN were mutated to matched residues in IA-HN; the resulting fusion/syncytial phenotypes, including those with other MuV strains, such as the highly neurotropic 88-1961 strain, were assayed. Furthermore, viruses unable to cause cell-cell fusion containing IA-F and JL-HN were passaged; sequencing syncytial mutants allowed for identification of residues involved in cell-cell fusion. The mutated residues that produce syncytial or non-syncytial phenotypes from otherwise non-syncytial or syncytial F and HN combinations,

respectively, are expected to be the critical residues in the F-HN interaction. Because these residues are expected to contribute to the tropism and virulence of mumps, their elucidation may ultimately be useful in reducing the incidence of MuV infection.

Exploring the use of UAVs in Disaster Management for Radiation Sensing after a Nuclear Event

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Our research seeks to expand the field of drone usage in disasters, by pioneering the use of radiation detectors on drones. After a nuclear event, precious time and human resources are expended getting response workers into a radiation area. By outfitting a consumer brand drone with a radiation sensor, specifically the RadEYE B20, we can save time and ensure the safety of those human resources in a nuclear response. They will no longer need to expose themselves to dangerous levels of radiation, nor will they have to attempt to enter a radiation area for measurements, when they can just use a drone for the purpose. Our research question will attempt to see if the use of UAV's in radiation response will improve response times and worker safety in the field of disaster management. In our research, we have a two-tiered experiment. Initially, we will optimize the attachment of the RadEYE sensor onto to the DJI Inspire drone, using various configurations to test which method is the best for in-flight maneuvers and the security of the sensor. Next, we will move onto detection experiments, where the drone will fly through a test area that has radiation sources hidden among obstacles, simulating a post nuclear setting. The drone will take measurements, and will transmit the data to the pilot, who is a safe distance away, to see how accurate the measurements are against the control setup of a human worker manually taking measurements on foot. With successful results, we could further the advancement of drone technology in disaster management settings.

Investigation of *NAP1* as Reporter for CaaX Protein Post-Translational Modification Shunt Pathway

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All nuclear genetic material in eukaryotes is packaged into nucleosomes, a process necessary for compacting DNA and modulating gene expression. The nucleosome is composed of several histone proteins. Assembly of the histone 2A and 2B heterodimer requires a chaperone protein, the Nucleosome Assembly Protein 1 (Nap1) that is encoded by the *NAP1* gene. Limited evidence suggests that Nap1 can be

categorized as a CaaX protein and thus potentially subject to the 3-step post-translational modification pathway typically associated with CaaX proteins: isoprenylation, proteolysis, and carboxymethylation. In plants, AtNap1p is known to be isoprenylated, specifically farnesylated. It is unclear whether proteolysis and carboxymethylation occur. In humans, Nap1L1 is inferred to be farnesylated. This study investigates the post-translational modification of yeast and human Nap1, especially in light of the recent discovery that some CaaX proteins avoid the second and third post-translational modification events after initial isoprenylation. This project explores the potential use of Nap1 as a reporter for this alternative pathway (i.e. shunt pathway). Plasmid expression constructs encoding wildtype and mutant versions of Nap1 were designed as experimental tools to determine the post-translational modification status of Nap1. Constructs contain various CaaX combinations (CKQS, SKQS, CTLM, CVIA, CASQ) and affinity / localization tags (i.e. His₆, GFP) for use in biochemical, genetic, and cell-based assays. Thus far, farnesylation of yeast Nap1 (Nap1p) has been confirmed and current studies are underway to establish the impact of CaaX mutations on function and localization of Nap1.

Differences in Stress Axis Activation in a Rat Model of Acute and Chronic Diabetes

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Diabetes is a metabolic disorder characterized by increased stress axis activity. Although hypothalamic norepinephrine (NE) plays a key role in activating the stress axis, it has not been studied in detail. The purpose of this study is to determine differences in NE levels and stress axis activity in acute and chronic diabetes. Adult, male Sprague Dawley rats were treated with vehicle (control) or streptozotocin (STZ; 65mg/kg BW). Animals were further divided into two groups. One group was sacrificed 3 days after STZ or vehicle (Acute group) and the other group was sacrificed 2 weeks later (Chronic group). Body weight, pituitary weight, and adrenal weight were measured. Serum and brain were collected and frozen. Corticosterone and leptin levels were measured in the serum by radioimmunoassay. The paraventricular nucleus (PVN) in the brain that contains neurons for stress activity was dissected and analyzed for NE using HPLC-EC. Body weight and leptin levels decreased significantly in the diabetic groups compared to controls. Corticosterone levels were higher in the acute group compared to the chronic group and diabetic animals had higher corticosterone levels. However, NE was elevated only in the chronic diabetes group. These results indicate that corticosterone was able to suppress noradrenergic activity in the acute diabetes group suggesting an intact negative feedback mechanism.

The persistent increase in NE in the chronic diabetes group suggests a lack of negative feedback and/or involvement of other mediators that may increase NE levels.

Addressing the Growing Need for Algorithmic Transparency

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Algorithmic transparency is the openness about how personal data and algorithms are used to generate information, make decisions, and take decisions. The use and power of algorithms in today's business environment, social fabric, and everyday interactions has continued to increase exponentially. Therefore, literature designed to increase collaboration and understanding of the topic can lead to favorable consumer and business value outcomes. This study dives into backgrounds, attitudes, trends, and first-hand experiences of leaders involved in algorithmic transparency at different levels. The research contains intense student and faculty current research review into the topic area, and subsequent translation into standardized language. The understanding will be compared against the experiences of professionals and leaders in key industry areas through phone and in person interviews. Respondents will provide material that will be developed into industry best practices on how to address the topic of algorithmic transparency in industry and in the mind of a consumer. Lastly, this piece will pose questions to be answered in further discussions and research into the growing, dynamic topic of algorithmic transparency.

The Automated Analysis of Constructed Response (AACR)

Project: Analysis of Faculty Learning Community Meetings

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Undergraduate students find learning many key biology concepts challenging. It is difficult to assess learning of these complex concepts with multiple-choice questions, because students are only required to select a single response. The use of constructed-response (CR) questions can provide professors with a better understanding into their students' thinking. However, grading CR questions for large-enrollment classes is very time consuming. The Automated Analysis of Constructed Response (AACR) project provides faculty with CR questions that can be quickly examined through computer-based analytics. The use of AACR questions during class provides faculty with insightful data about their students' conceptual understanding, allowing faculty to adjust their teaching to their students' needs. The AACR project, consisting of seven research-intensive institutes, works to provide professional

development (PD) to faculty to support their use of student data. Local faculty are a part of faculty learning communities (FLCs) that meet to discuss inventories of AACR questions and reports generated from students' open-ended responses. We are interested in what topics are discussed during FLC meetings and how faculty respond to student data. Using transcribed FLC meeting recordings, we developed a code list for topics that were discussed. We then systematically applied those codes across all meeting discussions. From this, we were able to quantify time spent on different topics. We will continue to qualitatively analyze FLC meetings to characterize how faculty use student data to modify their teaching practices. By studying FLC discussions, we can identify effective PD strategies to support lasting change and essentially improve undergraduate biology education.

The Effect of Gaga Training on Penché Dance Movement Kinematics, Performance Quality, and Imagery Use in University-Level Dance Students

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Dance students constantly seek to improve their physical and aesthetic levels of performance, including lower extremity range of motion (ROM). Mental Imagery (MI) is a recommended, yet under-researched component in dance training. Gaga is an improvisational- and MI-based movement language aimed at enhancing dance performance and preventing injuries. Thus, Gaga training holds potential to enhance dancers' ROM and self-perceived performance level. The penché is a multi-segmental ballet movement that utilizes dynamic postural alignment in order to reach maximal ROM. It is a foundational movement for dance students at all ages and levels of expertise. The goal of this study was to explore the effect of a series of Gaga classes on penché kinematics (i.e., ankle height, hip and ankle ROM), self-reported performance quality, and MI use in university-level dance students. Participants gave informed consent prior to the study. The intervention consisted of five consecutive Gaga classes (120 minutes each). Data were collected pre- and post-intervention using 3-Dimensional motion capture (Ariel Performance Analysis System; APAS[®]), self-reported reflections, and imagery questionnaires. Descriptive statistics and paired-samples t-tests with a p value set at .05 were used for data analysis. The results suggested statistically significant improvements in ankle height ($p < .05$), self-reported performance quality ($p < .05$), and MI use ($p < .05$). These findings suggest that Gaga may be an effective training method for improving lower extremity ROM, self-perceived level of performance, and imagery use in university-level dancers. Further research is needed for exploring Gaga's beneficial effect in other dance populations, as well as its mechanisms of effect.

Amalgamation of Tranexamic Acid, Propolis and Nitric Oxide Releasing Antibacterial Wound Dressing to Prevent Excessive Bleeding and Infection

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Globally, trauma accounts for more than 5 million deaths, equivalent to 10% of all the deaths, annually. Uncontrollable hemorrhages and excessive bleeding, common components of trauma, are the primary causes of deaths within the first 6 and 4 hours, respectively, among patients who are admitted into medical facilities. Infection is also among the leading causes of fatalities in trauma patients, being the second most common cause of death in patients who have experienced trauma more than 72 hours prior. It is crucial to fabricate an innovative wound dressing with antibacterial and coagulation properties. In the current research, the wound dressings were fabricated using Carbosil, a polyurethane that provided a breathable compound and an intricate matrix for the following components; S-nitroso-N-acetylpenicillamine (SNAP), a nitric oxide donor which has been associated with reduction of bacteria adhesion to the wound surfaces; Propolis, a beeswax, providing an adhesive matrix to encompass the major components of the wound dressing as well as providing a resinous surface to adhere to the wounded site; lastly, Tranexamic acid (TXA), an anti-fibrinolytic agent, which stabilizes blood clots. The wound dressing had a 99.3% reduction in *Staphylococcus aureus* and 97.1% in *Acinetobacter baumannii*. Real time platelet study showed an increase of platelet adhesion, and there was no cytotoxic response when tested with mouse fibroblast cells. Overall, there is strong evidence demonstrating the benefit of the wound dressing as an innovative technology to decrease mortality rate, decrease the health care cost and provide better alternatives for patients.

Mathematical Modeling of Renal Function Decline as a Result of Crystal Formation in Patients with Hyperoxaluria

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Hyperoxaluria is a disease characterized by elevated levels of oxalate. Oxalate is naturally produced as a byproduct of metabolism, but in patients with hyperoxaluria the liver produces additional oxalate by way of a faulty gene. Oxalate is filtered out of the blood and excreted through the kidneys. If the concentration within the kidney reaches above saturation however, calcium oxalate kidney stones may form and damage the kidney. This damage can lead to a reduction of GFR (glomerular filtration rate) and decrease the amount of oxalate that can be excreted. This in turn

may increase plasma oxalate levels. If plasma oxalate levels reach above saturation, crystal deposition in other parts of the body may occur. To investigate the factors that contribute to supersaturation of calcium oxalate in the blood and kidney, a mathematical model was created. This model will also be used to eventually analyze how much oxalate production has to be lowered under various conditions to restore concentrations to normal. The model calculates the concentration of oxalate in the blood and different sections of the nephron and accounts for nephron death due to crystal formation. Although work on the model is still ongoing, the model can demonstrate the trends we see in clinical data, namely the relationship between GFR, oxalate production levels, and oxalate concentrations in the kidney and blood.

Investigating an Alternative to the Current Influenza Vaccine: The Virus-Like Particle Vaccine

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The Influenza virus is responsible for nearly 250,000 deaths per year, worldwide. The part of the virus that initiates the infection is the surface glycoprotein, Hemagglutinin (HA), which enters the human host cells by binding to the sialic acid receptors. These surface glycoproteins undergo antigenic variations that alter their genetic material rendering the vaccines of previous seasons useless. This necessitates a seasonal re-formulation based on a prediction of which strain of the virus will become most virulent. Even these predictions can greatly vary in accuracy and an unpredicted antigenic variation could trigger epidemics or pandemics. Additionally, since the current vaccine production process requires live or attenuated virus, production of the vaccine, itself, can be time-consuming, and expensive. Therefore, my work involves creating and purifying a plasmid that will produce a safer and more efficient alternative to the live or attenuated virus vaccine, the Virus-like particle (VLP) vaccine. The VLP contains the antigens necessary for the body to generate epitopes through the humoral immune response with a greater efficiency than the current vaccination method. In addition, there will be no viral genome present within the particle eliminating any potential risk of the live or attenuated virus reverting back to its infectious form. Furthermore, the increased modifiability of the plasmid would allow for more seamless integration of a variety of antigens allowing for broader immunity. This VLP vaccine alternative could ultimately allow for the production of an influenza vaccine that is more effective at combatting a variety of influenza variants.

Building the Language: Analyzing the Development of Virtual Reality as a Journalistic Medium

Charlotte Fox Norsworthy

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As a journalism and political science undergraduate student at the University of Georgia, I have been taught to embrace change in my fields. In journalism specifically, I have learned that it is best to keep one's fingers on the pulse of emerging media storytelling in news. In 2017, the news compass points towards immersive journalism. For my undergraduate thesis, I sought to understand the difficulties news professionals face with virtual reality. In order to do this, I examined both recent efforts of news organizations to create virtual reality content and academic studies, which discuss the effects of the medium on the industry. I then was able to write, produce, edit, and finalize a short 360-degree documentary, entitled "Leaping Water," as my fine arts thesis project. During this process, I was able to experience firsthand the strengths and weaknesses the medium brings to the field of journalism.

Shop 'til You Drop: A Closer Look at Millennial Shopping Habits Online vs. In-Store

Lacey O'Brien

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The purpose of this research is to determine whether college students' shopping habits follow the same buying trends as Millennials in general. Millennials constitute a large portion of the United States population and have enormous spending power, making their shopping preferences extremely important. College students, a smaller subset of the Millennial generation, could have shopping preferences that differ from the rest of the generation due to their unique campus circumstances. This topic was researched through an online survey and a focus group. Students were recruited to participate through Facebook, text message, and word-of-mouth. The online survey received 103 completed responses and 9 members participated in the focus group. The research suggests that college students' decision to shop online or in a physical store depends on what products they are purchasing. Most college students prefer to shop in a physical store when purchasing clothing and food. For small electronic devices and textbooks, college students prefer to shop online. The results are significant because they indicate that the Internet plays an important role in college student shopping tendencies. Companies should maintain interactive and comprehensive online platforms to succeed in the college market. However, for the clothing category, Millennials prefer to purchase in-store. This is significant for retailers because

it demonstrates that while websites are important, it is essential for these companies to maintain well-run, polished physical stores to uphold their Millennial customer base. The information gathered gives insight as to why college students prefer to shop at certain establishments. With this information, the following is discovered: how to effectively communicate with Millennials, what advertisements and campaigns are the most appealing, and how to correctly target Millennial expense habits.

Close Up Shots of Collapsing Societies: The Soviet Films I am Cuba and The Cranes are Flying

Meghan O'Keefe

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This paper addresses the cinematic portrayal of two collapsing societies, Fulgencio Batista's Cuba and Nikita Khrushchev's Soviet Union, in two films, 1957's *The Cranes Are Flying* and 1964's *I Am Cuba*. Both were directed and filmed by Mikhail Kalatozov and Sergey Urusevsky, the latter of whom is remembered as having possessed some of the greatest camera skills of all time. I argue that Urusevsky's distinctive filming style was not merely a sign of his talent, but was an attempt to capture the rising tensions and social problems present in the collapsing Soviet and Cuban societies. I achieve this through the analysis of selected scenes, which I have categorized as representing one of four societal currents: violence, death, hope, and desperation. As a result of this analysis, I find that Urusevsky's choices of certain angles and shots can be interpreted as having been meant to embody the emotional stress felt by citizens living under declining regimes. This paper finds meaning in the subtle nuances of cinematography and offers my perspective as to how filmmakers can use their craft to criticize their governments and societies.

The Impact of FTC Review Threshold on Blocked Mergers and Markets: A Case Study

Lauren O'Neil

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This project seeks to examine the threshold amount set by the Federal Trade Commission to review mergers and acquisitions. This will be executed through a case study of 3 blocked mergers over the past 15 years because there are limitations and assumptions to be made based on the vast amount of merger cases settled out of court. The three blocked mergers include Whole Foods Market, Inc. and Wild Oats Markets, Inc., Staples and Office Depot, and Dollar Tree, Inc. and Family Dollar Stores. To choose each of these mergers, I considered factors such as the market definition by the Federal Trade Commission, the amount of the merger, and the availability of data on the firm. While the data

examination is still in progress using FactSet data for the six companies, the final results will include the discretion between the value of the merger, the FTC threshold, and the implications of the blocked merger on the corporations and their respective markets. Currently, the FTC threshold for merger review is \$80.8 million; however, the threshold is adjusted each year for inflation. This allowed a comparison of the value of merger and the current threshold in the year of the deal. Additionally, the data includes the market capitalization in the 2 years leading up to and after the attempted merger and will seek to find the financial impact on the firms. Finally, using FactSet data of market cap of competitors in similar markets, I will analyze the firms that the FTC deemed encroached upon by the merger.

Pro-Inflammatory Response to Combined Neural Stem Cell and Nanoparticle Treatment of Ischemic Stroke in an Adult Porcine Model

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Stroke is the fifth leading cause of death worldwide with currently no long-term, effective treatment. Neuronal death mounts after the initial infarction in response to the acute inflammatory events of the secondary injury cascade. Upregulated pro-inflammatory cytokines propagate this response and are ultimately detrimental to cell health. Decreases in cytokine activity will make joint neuroprotectant and tissue replacement treatments like induced neural stem cells (iNSCs) more effective. Cytokine activity can be attenuated acutely via anti-inflammatory drugs packaged more effectively in nanoparticles. We hypothesize that the combined therapy of iNSCs and anti-inflammatory-loaded nanoparticles will reduce cytokine activity, including activity of tumor necrosis factor alpha (TNF α), interleukin 6 (IL-6), and interferon gamma (IFN- γ). Studies will be performed in porcine subjects, as porcine brains are more similar in anatomy and physiology to human brains than rodents. Stroke will be induced in 6 pigs via permanent middle cerebral artery occlusion (pMCAO). One hour post-stroke, nanoparticles will be administered via intracisternal injection. Five days post-stroke, 1×10^7 iNSCs will be transplanted into the penumbra region. Blood will be drawn at 10 time-points and samples will be quantified via enzyme-linked immunosorbent assay (ELISA) to observe temporal changes in cytokine activity. We expect the highest fold-decrease of cytokines in nanoparticle and iNSC treated pigs. Reduction in inflammatory cytokine activity due to nanoparticle treatments will lead to reduced neuroinflammation, decreased damage to infarct regions, and enhanced survival and integration of transplanted iNSCs.

Assessing Knowledge, Educational Needs, and Use of Brain Development Information in Expectant and New Parents

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The prenatal period of brain development can be influenced by environmental factors such as the mother's diet, exposure to toxins, and maternal stress. Better Brains for Babies is a collaboration among organizations in Georgia that aims to educate adults on this information through various accessible materials. The purpose of this study is to assess expectant mothers' needs and preferences for educational materials related to prenatal brain development. This will be done in order to evaluate the most useful content and formats to deliver this information to expectant mothers. Data collection and analysis will take place between February and April 2018. The study will use mixed methods combining qualitative focus groups with quantitative surveys. The focus groups will assess pregnant women's perceptions of the challenges of pregnancy and information they would like to acquire. Participants will be asked multiple questions, each with optional probes used if needed to elicit further information. The quantitative surveys will measure the participants' current level of knowledge on fetal brain development. Focus group data will be analyzed to identify common themes, topics, and preferred communication methods. Results of the study will be used to guide development of additional Better Brains for Babies educational materials on prenatal brain development.

The Effect of Ivermectin on Different Strains of *Caenorhabditis elegans*

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Ivermectin is one of the prominent antiparasitic drugs that is used for Mass Drug Administration in elimination programs for neglected tropical diseases. Despite this widespread use, we still do not understand exactly how they work. *C. elegans* is a free-living nematode that has the essential biological structures of parasitic species; therefore, they are commonly used as research models. The objective of this project is to determine what concentration of ivermectin affects the mortality of different strains of *C. elegans*. The strains used were selected based on previous data obtained following ivermectin treatment of a human parasite, *Brugia malayi*. The strain RB653 is mutated in the gene *ogt-1*, which is expressed in embryos, exhibiting nuclear and punctate perinuclear localization. LP172 is mutated in the *hmr-1* gene and LP191 is mutated in the *unc-119* and *hmp-1* genes. The N2 is the non-mutated control strain. *C. elegans* grew within 3 days, were synchronized with 20% hypochlorite solution

and hatched overnight. The L1 (the first larval stage) were counted to ensure the same concentration of worms. Worm movement and survival were analyzed 24 hours post drug administration using computer high definition video analyses. Using Prism, the data was further analyzed to obtain IC_{50} values for each strain. As of now, the aim is to perform sufficient replicates of the experiment to get reliable and reproducible data.

Outdoor Physical Activity in Relation to Vitamin D Status in African American College Women

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Dr. Jennifer L Gay, Health Promotion and Behavior, College of Public Health

Vitamin D is essential for the body because it assists in absorption of calcium and phosphorus, promoting bone strength. It also aids in immune function by helping combat invading microorganisms. There is a lack of research on Vitamin D levels among college students, especially with respect to physical activity. However, existing studies suggest a high prevalence of Vitamin D deficiency in college students. In addition, in populations such as healthy adults, multiple sclerosis patients, and cancer survivors, studies have associated increases in physical activity, particularly outdoors, with increases in circulating Vitamin D. As African Americans are at higher risk than Caucasians for deficiency, the purpose of this study is to examine the association of outdoor physical activity with levels of 25-hydroxy Vitamin D in African American college women. At four different time points, four weeks apart, participants have completed blood draws testing Vitamin D levels. At each time point, they have also completed surveys assessing time spent outdoors in various weather conditions and outdoor physical activity. The primary data analysis will be repeated measures analysis of variance (ANOVA) to examine the unique contribution of physical activity outdoors compared to other time spent outdoors. Given the combined impacts of physical activity and sunlight exposure, it is anticipated that physical activity outdoors will have a greater association with Vitamin D levels than other time spent outdoors, dietary intake, and other factors. The results of the study may inform future interventions for Vitamin D deficiency in this population.

Detecting Persistent Reactive Gliosis Following West Nile Virus Infection

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Dr. Daniel Mead, Population Health, College of Veterinary Medicine

West Nile virus (WNV), a mosquito-borne flavivirus, can cause severe neurological disease in humans. Approximately half of these cases result in debilitating neurologic sequelae, including memory loss, depression, and paralysis. Although

well studied, the pathological basis of these sequelae remains uncharacterized. During acute neurologic WNV infection, the virus enters and activates astrocytes and microglia, inducing a condition known as reactive gliosis. Activated astrocytes and microglia produce pro-inflammatory cytokines, perturbing neuronal homeostasis. Persistent reactive gliosis has been linked to neurodegenerative disorders including Alzheimer's disease and Parkinson's disease. A connection between WNV-induced persistent reactive gliosis and behavioral changes is being investigated using a C57BL/6 mouse model. Immunohistochemistry protocols probing for GFAP (an astrocyte marker) and Iba1 (a microglia marker) were developed and optimized in brains taken from acutely infected mice. Immunohistochemical staining for Iba1 showed microglial proliferation and morphological changes in infected animals, while hematoxylin and eosin staining showed meningitis, perivascular cuffing, and microglial nodules. This pathology is consistent with acute WNV encephalitis, indicating that these protocols accurately detect reactive gliosis. This will enable the detection of persistent reactive gliosis in mice affected by neurological sequelae in future studies.

Evolutionary Analysis of West Nile Virus in Georgia, 2017

Isabel Ott, CURO Honors Scholar, CURO Research Assistant

Dr. Daniel Mead, Population Health, College of Veterinary Medicine

West Nile virus (WNV), a mosquito-borne flavivirus, was introduced to North America in 1999. Following the replacement of the original North American strain by the variant WN02 genotype in the early 2000s, circulating virus genotypes have remained relatively stable, with moderate levels of regional variation occurring. The Southeastern Cooperative Wildlife Disease Study has conducted West Nile virus (WNV) surveillance in Chatham County, Georgia since 2000. Although the Chatham County Mosquito Control Program successfully eradicated local WNV transmission in 2007, the virus was reintroduced in 2011 and has continuously circulated in the region since. Previous work analyzing genetic variation in Georgia WNV isolates from 2001-2011 determined viruses circulating in 2011 were introduced from the Northeastern United States. After several years of relatively limited virus detection, a significant increase in WNV transmission was observed in 2017, potentially marking the introduction of a novel genetic variant. Current efforts aim to characterize WNV isolated from mosquito pools in 2017 using reverse transcriptase polymerase chain reaction (RT-PCR), short-read Sanger sequencing, and maximum likelihood phylogenetic analysis of the genes encoding viral pre-membrane (prM) and envelope (E) proteins. Results of this analysis will help elucidate the current role of genetic variation in maintaining WNV circulation in the Southeastern United States.

Abstracts

A Genetic Basis for Age-Related Cellular Senescence

Emily Rose Owen

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Aging drives an increase in senescent cells, which are defined by a permanent state of growth arrest. Cellular senescence serves as a protective mechanism against cancer development, but in high numbers, senescent cells disrupt local tissue environments and interfere with normal organ function. Furthermore, cellular senescence appears to be a basic mechanism that links the aging process and chronic disease onset, yet the mechanisms responsible for age-related cellular senescence remain poorly defined. In this project, we used a forward genetics approach to define the role of genetic background on cellular senescence. Tissues from old mice representing 19 genetically diverse inbred mouse strains were isolated, and senescence was assessed via qRT-PCR. Heritability of senescence markers was estimated, and from these results, future studies will identify the specific genes responsible for age-related cellular senescence.

Behavior of Wild Red and Green Macaw (*Ara chloropterus*) Chicks and Parents in the Nest

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The nest behavior of the Red-and-Green Macaw (*Ara chloropterus*; the largest species in the genus) in the wild is largely unknown and undescribed in the literature. We provide the first description from direct observation of wild macaws in the nest. Our objectives are to document the behavioral repertoire of nestlings, to examine behavior of the parents in the nest and to determine nestling behavior in the presence vs absence of an adult. Video footage, recorded from approximately 6AM to 6 PM within one nest over 6 days between August and October 2013, recorded the behavior of four individuals (two adults and two nestlings) when the nestlings were approximately 25-83 days old. The nestlings increased their overall activity, including self- and mutual preening, across days and it is apparent that by day 83 they were approaching fledging. Although analyses are not yet complete, the results thus far show that nestlings vocalize more frequently than adults and there is indication that nestlings increase vocalizations during feeding. Adults spent 20% of the time they were in the nest feeding nestlings. Feeding rates and visitation rates will become more precise as data from the fourth and fifth days are analyzed. Understanding parental care and nestling development is important for management of wild birds. Our study will contribute to knowledge of the reproductive

biology of this species, and by extension, of its close relatives.

When Famine is an Opportunity: Examining the Effects of Drought on al Shabaab Attack Patterns in East Africa

Bailey Palmer, Foundation Fellow

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The decline and subsequent resurgence of al Shabaab following the 2011 Somali drought raised questions on the effect of weather shocks on al Shabaab. In order to inform humanitarian and counterterrorism professionals, this study evaluates whether negative rainfall shocks increase the tempo or severity of al Shabaab attacks in East Africa. With rainfall data from NASA and conflict data from ACLED, I use a fixed effects model that allows for heterogeneous seasonal effects. I find that detrimental weather shocks, meaning drought during a rainy season or excessive rainfall during a dry season, increase the tempo of attacks in the short and long run and increase the severity of attacks in the long run. A favorable shock can, however, increase the short-term probability of a major attack. To prevent future violence, the Kenyan army should crack down on al Shabaab's sugar trade, which allows it to turn drought into an opportunity.

Developing a Diagnostic Test for African Trypanosomiasis: A Study of Extracellular Vesicles Produced by African Trypanosomes

Margot Perrin Palmer

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African trypanosomes are parasitic protozoa that cause African sleeping sickness in humans, and nagana in cattle. These parasites produce membranous nanotubes, which bud off of the flagellar membrane and vesicularize into extracellular vesicles, which contribute to virulence, host immune evasion, and erythrocyte clearance (anemia) corresponding with disease. There is currently a lack of diagnostic methods able to differentiate the different forms of bloodstream trypanosomes, thus our lab postulates that the production of these extracellular vesicles during infection can serve as a sensitive biomarker to allow detection of infection with different forms of trypanosomes before parasitemia. Our aim is to identify proteins on the surface of extracellular vesicles produced by the different bloodstream forms of trypanosomes, so that we can differentiate between different forms to develop diagnostic assays. The proposed studies, which are currently underway, will be using a combination of biochemical approaches to identify EV proteins to use in the diagnostic assays and animal studies to assess the sensitivity of the assays in trypanosome-infected mice.

Ending Modern-Day Voter Suppression in Georgia

Amy Pan

Dr. Brittany Bramlett, Political Science, School of Public and International Affairs

Throughout the past decade, Georgia has continuously implemented some of the nation's most restrictive voting laws. Most recently, voting rights were dealt a major blow in summer 2017, when Secretary of State Brian Kemp's office illegally purged the registrations of over 380,000 voters in metro-Atlanta counties. Violating both state and federal law, these purge notices were sent to registered voters who had moved *within the same county*. In addition to mailing these notices, the office also submitted shared voter data to President Trump's federal commission on alleged "voter fraud." Research will show that these actions perpetuate voter suppression among groups of lower socioeconomic status. This proposal recommends that the Secretary of State's office take immediate steps to rectify the unwarranted voter roll purges through corrective and educational measures. Based heavily on the Georgia ACLU's steps to remedy the "intimidation and confusion" caused by the clearing of active voter rolls, this policy focuses on assuring, updating, and educating voters. Under the proposal, the Secretary of State's office must supervise counties in three areas: 1) immediately updating voter lists when voters change residence within the same county; 2) sending follow-up-letters to previous notice recipients explaining the error; and 3) informing future inter-county movers that their registration information will be updated automatically in advance of any address change. Outside the immediate goal of rectifying illegal purge notices, long-term implementation of this policy aims to increase transparency, political efficacy, and voter turnout.

A Confluence of Science, Philosophy, and Religion: Perspectives on Wellbeing, Happiness, Fulfillment, and Altruism

Kavi Pandian, Foundation Fellow

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What makes a person feel happy or fulfilled? What contributes to a person's general wellbeing? Does altruism really exist? These questions have plagued humanity for millennia, and religion and philosophy have long been some of the most popular avenues through which people have sought to answer them. In recent decades, however, scientists have begun to make forays into answering these questions as well. Psychologists, economists, neuroscientists and more have all contributed to a large body of research seeking to address these questions and get to the root of some of humanity's most fundamental, longest-held questions. Through conducting an extensive literature review, this research has identified where religion, science,

and philosophy have all come to similar conclusions about what contributes to wellbeing, happiness, fulfillment, and altruism. This research holds significant implications for how people can better improve their lives as well as encourage greater altruism in others.

Using a Citizen Science Approach and Mobile Technologies to Assess Family Routines on Health and Obesity for Future Population Interventions

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Healthcare is one of the largest and fastest-growing industries in the world. As the average annual income rises around the world, people are becoming increasingly health-conscious. Sophisticated technologies are arriving on the market every day to assist humankind in its desire for longevity. This study aims to implement a mobile app that will alert the user of daily habits, specifically those that may contribute to obesity. An interdisciplinary analysis has revealed that familial mealtime patterns can reveal much about obesity risk. In-built phone sensors, such as the microphone, will be used to gather this data, which will then be interpreted by the app. Furthermore, GPS tracking will notify the user when he or she is too close to particularly unhealthy restaurants or other locations. Extra sensors will be placed in the home, at the discretion of the user, to determine how much time is spent sleeping, watching TV, etc. The spatiotemporal data collected will be stored securely. The success of the app will likely be determined by a metric such as percentage of weight lost after downloading the app. The implications of this study will reveal the extent to which mobile applications can increase health awareness and healthy habits. The results of the study will be presented with the aid of a poster.

The Intersection of Queerness and Mental Health on the Stage

Zachary Pareizs

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Most of the plays from the established queer canon in theatre find themselves inherently marked by tragedy. Someone comes out and is ostracized by friends and family. Someone is murdered or brutalized because of homo or transphobia. Someone struggles with an AIDS diagnosis. However, in these plays, the external tragedy is often tied to an internal tragedy, ranging from self-hatred to depression. Why is queerness and mental health so intrinsically linked in our theatre, and what does this connection mean for the future of queer theatre? This research is based in extensive readings of literature on queer history and performing

queerness on the stage as well as mental health issues in the queer community. This research also encompasses embodied research through the live readings of selections from plays that both exemplify the connection of these two issues and explore how theatre can begin to break out of the limitations this intersection can force onto queerness. This research is still in progress but should result in a greater understanding of the historical circumstances that have connected mental health and queerness, as well as the performance of this intersection on stage.

Diplomacy: A Woman's Game

Roma Parikh

Dr. Maryann Gallagher, International Affairs, School of Public and International Affairs

This research paper is interested in how gender affects outcomes when women are put into political roles. If there are differences in norms, perspectives, and abilities of men and women, then how can women use this 'gendered difference' to their advantage? In order to evaluate the hypothesis that if a woman is a diplomat she will be more effective, this research analyzes crises in Bosnia and Rwanda and the diplomats' roles and successes. Despite the theory that women have advantages in feminine traits and negotiation approaches as well as being more qualified once they reach the post of diplomats, the analysis of the case studies ultimately finds that gender of the diplomat did not affect effectiveness. However, the paper further proposes that while gender does affect a diplomat's success, men and women performed in unique and distinct ways which may prove to be useful and important for US diplomacy and diplomacy of the 21st century.

mRNA Reprogramming of Fibroblasts into Induced Pluripotent Stem Cells

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Leigh's Syndrome (LS) is an often fatal mitochondrial disease targeting the infant population. It is characterized by the accumulation of mutant mitochondrial DNA (mtDNA), developmental impairments, and chronic lack of energy. Fatality results from excess accumulation of mutant mitochondrial DNA leading to respiratory failure, usually occurring within two years. There is no current cure for LS or adequate model for understanding the rapid fatality that is associated with it. In this study, we will reprogram skin fibroblasts that were derived from patients that suffer from LS, thus generating patient-specific stem cells that provide opportunities for drug discovery or transplantation therapy. This will be accomplished through the use of mRNA reprogramming factors that will efficiently reprogram the

fibroblasts into induced pluripotent stem cells (iPSCs). The markers OCT4, SOX2, and NANOG will be tested for to evaluate if reprogramming has occurred and iPSCs were created. We expect the patient fibroblasts carrying the mtDNA mutation to differentiate into iPSCs, containing the markers we will be testing for. With this method, more information will be known about mutations in mtDNA, differentiation potential, and mitochondrion function of isogenic iPSC clones, as well as potential treatment therapies for this devastating disease.

Structural Studies of *Gnt1* and its Potential Role in SCF Complex Formation

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Skp1 is an adaptor protein in the SCF class of E3 ubiquitin ligases. It helps mediate degradation of proteins by the 26S proteasome through polyubiquitination. One function of protein turnover in cells includes mediation of life cycle stages by ensuring the fidelity of the proteome via degradation. In the model organism, *Dictyostelium discoideum*, Skp1 is subjected to hydroxylation followed by linear pentasaccharide formation. Emerging evidence suggests that the pentasaccharide helps formation of the complex by enhancing Skp1 binding to the F-Box protein which subsequently recognizes and binds the degradation candidate. Understanding the regulation of glycosylation in the cell will provide insight into how the pentasaccharide contributes to Skp1's role in ubiquitination. Here, we analyze *Gnt1*, which transfers the first sugar, *N*-acetylglucosamine, onto hydroxyl-Skp1. We are employing X-ray crystallography to gain further understanding about the enzyme's mechanism of action and properties relating to its specificity in recognizing the acceptor. *Gnt1* was expressed using recombinant strategies, purified using chromatography, and screened for suitable crystallization conditions via high throughput analysis, with optimization trials currently underway. Mass Spectrometry is being used to assess the homogeneity of the protein, and comparison with distantly related enzymes residing in the animal Golgi apparatus will serve as a reference to interpret the features found. We seek to understand whether *Gnt1* recognizes the monomer or dimer form of Skp1, the conformation of Skp1 that is recognized, and evolutionarily conserved and diverged features that correlate with its unique characteristics.

Outcomes of Insurgency: Do Women Make a Difference?

Charlotte Ann Partrick

Dr. Maryann Gallagher, International Affairs, School of Public and International Affairs

There is robust research on the impact women have on

peace negotiations, and vast evidence that their increased presence results in longer lasting peace. Armed with this knowledge, I set out to research how one can then increase women's presence in peace negotiations by exploring what factors cause that vital increase in women's participation in peace talks. My case study of the Zapatistas in Mexico, known for their high presence of women in peace talks and positive peace outcomes, exposes the source as a high presence of women both within the insurgency and in leadership roles throughout the organization. However, I also present an outlier case of the Palestinian Liberation Organization in Palestine, where one is able to witness a high presence of women in the insurgency but no women involved in peace negotiations. I utilize this case study to investigate the question of what caused that lack of women in negotiations, and to showcase an example of the neglect of women in peace talks and the inevitable result of unstable peace and potential of another uprising. I argue that if we truly value the idea of peace, then we must start valuing women and recognizing how vital their increased participation in each realm of the public sphere really is.

Rapid Detection of MRSA Using Electrochemical Biosensing Method

Dhara Patel, CURO Research Assistant

Dr. Ramaraja P Ramasamy, Chemical, Materials, and Biomedical Engineering, College of Engineering

Methicillin Resistant *Staphylococcus Aureus* (MRSA) is a pathogen frequently responsible for fatal infections in hospital settings. Because of its high mortality rate, there is still a need for better methods of detection of the bacteria in the health industry. The purpose of this project is to immobilize a bacteriophage specific to MRSA on a carbon-nanotube-based (CNT) electrochemical biosensor. Using a reliable method for oriented immobilization of bacteriophages on the CNT, this technique will allow for the rapid detection of whole-cell bacteria. Immobilization will be achieved by using electric field-induced, charge directed immobilization. Electrochemical impedance spectroscopy (EIS) will be used to monitor the changes in the interfacial impedance due to the binding of MRSA to phage on the CNT-modified electrode. This approach will allow for a high loading of bio recognition molecule on the transducer surface and increased sensitivity in the biosensor. The presence of the immobilized bacteriophage will be confirmed by disk-diffusion technique to detect bacteria cells captured on the sensor. The method of detection used in this project is highly selective and has a lower detection limit compared to current biosensors. These biosensors can be applied in the healthcare industry for the detection of pathogens on hospital equipment.

Making Kindness Count: Prosocial Behavior as a Treatment for Mild Depression

Kajol Patel, CURO Research Assistant

Dr. Lillian T Eby, Psychology, Franklin College of Arts and Sciences

Depression is one of the most prevalent mental illnesses in the United States. Currently, the treatment protocol for depression emphasizes self-care methods, and current treatment proves to be time-consuming and costly. Prior research has found engaging in prosocial behavior increases psychological well-being. The aim of this study is to assess the effectiveness of a prosocial behavior intervention on depression, and to identify three potential mechanisms—cognitive, affective, and social—through which this intervention affects depression. Approximately twelve hundred participants will be administered a screening questionnaire to assess their levels of depression. Those who score mildly depressed or higher will be randomly assigned into a prosocial behavior condition, a self-kindness treatment, or a neutral control condition. It is expected that the participants in the prosocial behavior condition will show significantly decreased levels of depression over a six-week period compared to the self-kindness and neutral control conditions. Moreover, I expect these effects to occur through cognitive, affective, and social mechanisms. This study will provide a potential cost-effective self-directed treatment option for people with depressive symptoms.

Examining the Epigenetic Landscape of Undifferentiated SAM Stem Cells

Krishna Patel

Eva Lauren Rodriguez

Dr. Xiaoyu Zhang, Plant Biology, Franklin College of Arts and Sciences

Plant development is characterized by continuous organ formation and growth throughout the life cycle. This is primarily achieved via two small groups of self-renewing stem cells at the shoot and root apical meristems (SAM and RAM, respectively). In the SAM, stem cells are maintained in a central zone and daughter cells move laterally to peripheral zones where they differentiate into lateral organs, such as leaves. Despite the biological importance of plant stem cell maintenance and differentiation, the underlying mechanisms of stem cell self-maintenance and differentiation remain outstanding questions in plant biology. This gap in our understanding derives largely from the technical difficulty of performing chromatin analyses on the small number of cells in the SAM. To resolve this gap, we have used cell-type specific fluorescent lines, coupled with fluorescence-activated cell sorting, to acquire homogenous samples of stem cells and cells of young leaf primordia. In the previous year, we were able to obtain an adequate amount of stem

cells to carry out efficient experiments. With this, we plan to use Immunoprecipitation (IP) to map accessible chromatin and transcription factor binding sites genome-wide. To do this we have created corn with a recombinant H4 that contains a Biotin Ligand, a 3C domain, and a Myc Tag. We have optimized a method for dissecting SAMs and processing for fluorescence-activated cell sorting. Now we plan to carry out IP to selectively purify cross-linked chromatin from the undifferentiated stem cells and examine its properties.

Efficiency of Induced Pluripotent Stem Cell Derived Neural Stem Cells to Differentiate and the Effects of DiR-Labeling on Cell Viability and Cytotoxicity

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Stroke is a devastating, often permanently debilitating disease that consists of a complex network of primary and secondary injury processes. The secondary injury processes are centered on inflammation and contribute to the severity of neurologic dysfunction and inversely to recovery. A previous study in West Lab, presented that induced pluripotent stem cell derived neural stem cells (iNSCs) transplantation in a translational ischemic stroke pig model provided neural protection, regenerative mechanism, and differentiation into neurons, found in gray matter, and oligodendrocytes, found in white matter. For the current study, we will be determining and comparing the differentiation ability of human iNSCs to functionally differentiate into different neural lineage cell types in the pig stroke model. The iNSCs will be divided into three groups and differentiated for 2, 4 and 8 weeks. Immunocytochemistry will then be done to characterize the differentiated cells and cell specific markers will be used to identify different neuronal cell types. To confirm the presence of transplanted cells in the brain, a lipophilic, near-infrared fluorescent cyanine dye, DiR will be used to label the iNSCs prior to transplantation. To determine the cytotoxic effect of DiR labeling on iNSCs viability a colorimetric assay, MTT assay, will be used. It is widely used for assessment of cytotoxicity, cell viability, and proliferation studies in cellular biology for assessing cell metabolic activity. This study will be helpful in determining the differentiating capability and viability after DiR labelling of the iNSCs, which will be used to transplant in the pig stroke model.

Daily Self-Weighing and Holiday-Associated Weight Gain in Adults

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Previous studies report 0.4-1.5kg of weight gain during

the holiday season, which is shown to be preserved and may contribute to yearly weight gain in adults. Dining with other people, longer eating sessions, and easy access to food during the holidays are among probable factors that may lead to weight gain. We aim to test whether daily self-weighing (DSW) prevents weight gain during the holiday season. 111 adult men and women with a body mass index (BMI) of at least 18.5kg/m² were randomized into either a control or a DSW intervention group. All participants completed 2 testing visits: A pre-holiday visit (v1) and a post-holiday visit (v2). Measurements at v1 and v2 included height, body weight, and body composition using DEXA. For the intervention, subjects assigned to the DSW group were given digital Wi-Fi scales and were asked to weigh themselves each day between v1 and v2. They were also instructed to try not to gain weight above their baseline body weight at v1. A significant increase in body weight and BMI was observed in the control group from the pre- to post-holiday (v1 to v2) (weight= 66.9±1.8kg to 70.0±1.8kg; BMI= 23.9±0.5kg/m² to 25.0±0.5 kg/m², respectively; p<0.001). However, there was no change in either weight or BMI in the intervention group (weight= 66.7±1.6kg to 66.6±1.6kg; BMI= 23.6±0.4kg/m² to 23.7±0.4 kg/m² for v1 to v2, respectively). Daily self-weighing was effective at preventing holiday-associated weight gain in adults.

Effect of Age on Plasma Protein Binding of Pyrethroids in Sprague Dawley Rat Plasma

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The use of pyrethroid insecticides has become widespread in household and commercial applications. Although considered to be safe, pyrethroids can be introduced to our body and cause acute toxicity, notably in children. Children are more susceptible due to increased contact with treated surfaces and more hand to mouth activity. Additionally, they have lower levels of metabolic enzymes, an immature blood-brain-barrier, and lower levels of plasma proteins than adults. All of which may increase pyrethroid levels in the brain, a target organ for toxicity. The research we conduct aims to quantify protein binding of pyrethroids to adult and juvenile Sprague Dawley's rat plasma. The pyrethroids we are studying are Deltamethrin, Cis-Permethrin, and Trans-Permethrin. We spike the rat plasma with the ¹⁴C-labeled pyrethroids and incubate for 3 hours to achieve a steady state in binding. Then we perform a three-step solvent extraction method to separate the free concentration, lipoprotein and albumin bound concentration. We will generate saturation curves of free vs bound concentration to calculate B_{max} and K_d using Graphpad Prism. Our interest is in the free concentration because this is where pyrethroids are pharmacologically active. We have noticed that the

free fraction increases as the concentration of pyrethroids increase.

Designing and Using a Multi-Outcome Diels-Alder Experiment to Gauge Undergraduate Students' Understanding of a Diels-Alder Reaction and 1H NMR Spectroscopy

Tad Paulsel, CURO Research Assistant

Dr. Richard Morrison, Chemistry, Franklin College of Arts and Sciences

A multi-outcome Diels-Alder reaction was developed and given to a group of undergraduate students to perform. Given a standard diene (cyclopentadiene), and a dienophile (either a dimethyl or diethyl ester of acetylenedicarboxylate) whose identity was unknown by the students, students performed the Diels-Alder reaction using a carefully-developed protocol, and then used analytical laboratory equipment (1H NMR and IR spectrometers) to determine the identity of their product. With the supposed identity of the product, students were asked to identify the dienophile that they were given at the start of the experiment. The answers provided by students via Google Forms allowed for analysis of the students' understanding of analytical laboratory equipment. A total of 59 students responded to the survey, and revealed that the majority of students (88.13%) were able to correctly identify their dienophile. Ongoing research attempts to create and purify more dienophiles to diversify the experiment's potential outcomes, further emphasizing the importance of 1H NMR spectroscopy to students.

Reducing Recidivism through Reintegration and Reformation Programs

Sofiya Payne

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Currently there are approximately two million people imprisoned in America. The number of incarcerated American citizens has increased at an incredibly high rate; over the past forty years, the number of prisoners has increased by 500%. As it costs over 31,000 dollars annually to incarcerate the average prisoner nationwide, the size of our prison system is unsustainable. High recidivism rates are a significant contributor to the size of America's prison system. Five years after a prisoner's release there is an over 75% chance that they will be imprisoned again. To decrease recidivism America needs to implement widespread reformation and reintegration programs both within and outside of prisons to help prisoners transition back into society by addressing the issues faced by the formerly incarcerated upon their release. Some of the main struggles that people must face when leaving prison include lack of education, poverty, unemployment, and housing issues. I will read peer-reviewed research and evaluate a variety

of reformation programs to determine which programs effectively reduce recidivism and which programs can be implemented in large scale. I hypothesize that using effective reform programs will significantly reduce the rate of recidivism for participating previous offenders and decrease the amount of taxpayer money that is used to fund the prison system.

Life Cycle and Behavior of Flower Mantids

Linden Pederson

Dr. Marianne Shockley, Entomology, College of Agricultural and Environmental Sciences

Mantids are beautiful and interactive insects, used for research, biological control, and educational outreach. However, there is limited in-depth life cycle and behavior research on mantids. *Creobroter gemmatus* and *Pseudocreobotra wahlbergii* are both flower mantids in the family *Hymenopodidae*. In this study, *P. wahlbergii* and *C. gemmatus* mantids will be reared from nymphs to survey their molting and feeding behavior. In order for an insect to grow they must go through a molting process called ecdysis, shedding their old exoskeleton. Often in mantids the female molts an additional time. However, there can sometimes be variation in the number of molts to adulthood within the same sex and species of mantid, leading to larger individuals better suited to capture larger prey and possibly attract more mates. The number of molts to adulthood and the length of time in-between these molts will be recorded to better understand the growth process of these two species of mantids. To further study developmental patterns of these mantids, the body size of the mantids will be measured with each molt. The abdomen increases in size relative to the amount of food ingested, so instead the length of the pronotum (a structure behind the head), a highly sclerotized (hardened) part of the exoskeleton that only increases in size with molting, will be measured. Collecting data on the process of mantid growth and behavior could prove beneficial for those rearing them for outreach or further research.

Geographic Analysis of International Border Settlement in Latin America

Christian Barrett Pedraza

Dr. Andrew Owsiak, International Affairs, School of Public and International Affairs

By what process do states delimit their borders? Using geographic information systems (GIS) technology, alongside qualitative data, I address this question by mapping the various delimitation agreements signed by Latin American neighboring states over the past 200 years. The early 19th century saw a domino effect of Latin American states declaring independence from their Spanish and Portuguese

colonizers; the lack of officially delineated and demarcated borders made it difficult to define each of the new states as they arose, leaving many questions unanswered about the exact placement of their borders. Despite this uncertainty and strong incentives to clarify their borders, neighboring states did not draw these borders in one stroke, but rather settled them in segments. This ultimately leads one to question why they addressed segments in the order and at the time that they did. I propose that the physical, geographic features of the disputed area helped determine this ordering and timing – most notably, features such as rivers, forest cover, mountain ranges, and natural resources. Using GIS software, combined with historical maps and narrative data of political conflict and land transactions, I map the settlement of Latin American boundaries over time, geo-referencing historical maps to the current geographic reality, and symbolizing the data in the context of topographical features to visually portray the effect of geography on Latin American border settlement.

Gender Differences in STEM Major Choice: The Effects of Risk Aversion

Jordan Peoples, CURO Research Assistant

Dr. Christopher Cornwell, Economics, Terry College of Business

The demand for STEM skills is high and rising, yet the supply of college graduates with STEM degrees lags behind. The weak supply-side response is concentrated in women, who enroll in engineering, computer sciences, physical sciences, and mathematical programs at less than half the rate of men while comprising more than half of all college graduates with Bachelor's degrees in the United States in recent years. The gender disparity in STEM enrollments has been linked to a number of factors. In this paper, I focus on the role of risk aversion. Using student course enrollments and grades, I construct measures of performance in STEM courses relative to other courses in other disciplines. I then estimate probit models of STEM major choice and persistence as a function of relative STEM course performance, controlling for a range of student characteristics. Based on the behavioral economics literature on gender differences in risk aversion, I expect females to be more sensitive to STEM grade shocks, reducing their relative propensity to choose a STEM major or persist in a STEM field.

Workshop for the Instruction and Use of Aquaponics in a Classroom Setting

Natalie Perkins, CURO Research Assistant

Dr. Kris M Irwin, Forestry, Warnell School of Forestry and Natural Resources

In recent years, agricultural educators in Georgia have expressed increased desire to use aquaponics in their

classrooms. However, they have shown through various data-collection methods that they lack knowledge and confidence in constructing and maintaining the systems, as well as using aquaponics to meet Georgia education standards. Our research seeks to fill those knowledge gaps through a two-day professional development experience for in-service agricultural education teachers in order to increase confidence for teaching aquaponics in their classrooms. The design of the workshop focuses on previously collected information from surveys of educators and studies done in the area. A survey will be created and implemented at the end of the workshop to assess changes in participant knowledge, attitude, and behavioral intent surrounding the topic of aquaponics. We anticipate that participants' knowledge and confidence in construction and maintenance of an aquaponics system will increase, attitudes towards teaching with aquaponics will improve, and behavioral intent will move towards knowledge gained in the workshop being utilized within their classrooms.

Cognitive Reserve: A Potential Cushioning Effect Between Severity of Concussion and Memory

Robert Daniel Petcu, CURO Research Assistant

Dr. Steve Miller, Psychology, Franklin College of Arts and Sciences

Studies show severity of concussion (SC) to be negatively associated with memory performance. Additionally, research has found a positive relation between cognitive reserve (CR), which explains why those with higher IQ show less severe cognitive changes, and memory performance. This study examined CR as a moderator for the relation between SC and memory following a concussion in 45 adults aged 36-68 ($M=51.09$, $SD=7.93$). Participants (89% Caucasian) had 15.22 years of education ($SD=2.15$). SC was grouped into two categories: individuals who experienced either no concussion or a concussion with no memory lapse or loss of consciousness, and those who experienced a concussion with either of the aforementioned symptoms. CR was determined by the Wechsler Test of Adult Reading (WTAR). Memory performance was determined by the Trial 1-5 Free Recall (T1-5FR), Short Delay Free Recall (SDFR), and Long Delay Free Recall (LDFR) subtests of the California Verbal Learning Test-II (CVLT-II). A simple linear regression with one-tailed p -values was run to determine whether SC was negatively related to memory. SC predicted SDFR ($F(1,43)=4.56$, $p=0.02$ (one-tailed)), T1-5FR ($F(1,43)=3.43$, $p=0.04$ (one-tailed)), and LDFR ($F(1,43)=3.42$, $p=0.04$ (one-tailed)). A hierarchical moderation analysis was conducted with SC, WTAR, and SC X WTAR as predictors of each memory assessment. The interaction was not significant for SDFR ($F(1,41)=2.09$, $p=0.08$ (one-tailed)), LDFR ($F(1,41)=0.94$, $p=0.17$ (one-tailed)), or T1-5FR ($F(1,41)=0.28$, $p=0.30$ (one-tailed)). It appears that SC predicts memory and CR

approaches a moderating effect for SC and SDFR, but may not further buffer individuals from impairments in the other memory assessments following a concussion.

Role of an Upregulated Gene Cluster in Oxindole Resistance in *Fusarium verticillioides*

Angel Thi Pham, CURO Research Assistant
Dr. Scott Gold, Plant Pathology, College of Agricultural and Environmental Sciences

My research involves various approaches and methods that impinge on antifungal drug discovery for a mycotoxin producing fungus *Fusarium verticillioides*. My primary hypothesis is that a cluster of genes induced by a drug will confer resistance to that drug. By using a gene deletion construction method called the OSCAR protocol (One Step Construction of Agrobacterium Ready-Plasmids), I designed primers and generated a deletion plasmid for a cluster of 5 genes (FVEG_08770 through FVEG_08774) that were all earlier found to be induced (up to 152-fold) by the potential antifungal compound oxindole. The OSCAR protocol involved PCR amplification of the cluster flanks, a BP recombinase reaction, *E. coli* transformation, plasmid mini preps, and verification of construct structure by sequencing. Once the correct structure of the deletion plasmid was confirmed by sequencing, I proceeded to transform *Agrobacterium tumefaciens* with the deletion plasmid. I then carried out *Agrobacterium tumefaciens* Mediated Transformation (ATMT) of *F. verticillioides*. This involved induction with acetosyringone of the plasmid containing *A. tumefaciens* strain to transfer the deletion construct to *F. verticillioides*. Out of 58 fungal transformants, 3 have been identified as deletion mutants by diagnostic PCR. These deletion mutants will be tested for altered growth when exposed to oxindole as compared to the wild type fungus.

Observed Asymmetry in Individuals with Chronic Ankle Instability

Haley Pierce
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Asymmetry, or the loading of one lower limb more than another, occurs in movement tasks and is thought to occur after injury. However, there is little evidence to support if people with Chronic Ankle Instability (CAI) do exhibit asymmetry. We aim to determine if there are differences in asymmetry among CAI individuals and healthy matched controls in a squat task. Participants included volunteers aged 18-34 with self-reported CAI or no previous ankle injuries ($n=18$; 9 CAI, 9 controls; age= 23.2 ± 3.68 yrs; height= 170.76 ± 8.22 cm; weight= 71.94 ± 11.53 kg). Participants completed 10 consecutive double-limb squats with each foot on a separate force plate. Maximum asymmetry ratio was calculated based on peak vertical ground reaction

force (vGRF) of the unstable ankle to the stable ankle in CAI participants and matched limbs of controls. Independent samples *t*-test was used to determine if maximum asymmetry ratio means were significantly different between CAI and control participants ($\alpha=0.05$). Dependent samples *t*-test was also completed to compare the average peak vGRF between limbs of each participant. Those with CAI do not demonstrate greater asymmetry in a squat task ($t(16)=1.22$, $p=0.24$, Cohen's $d=0.58$, power($1-\beta$)= 0.21). Similar average peak vGRF between limbs were observed for controls ($t(11)=1.06$, $p=0.31$) and CAI individuals ($t(10)=1.81$, $p=0.10$). Current results indicate those with CAI did not demonstrate greater asymmetry, meaning each limb was loaded similarly to controls. However, our results were underpowered and a larger sample size may change our findings.

Shifting Sources: Food Consumption Patterns and the Nutrition Transition in Rural Amazonia

Hannah Pike, CURO Research Assistant
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Nutrition transitions, or global changes in consumption patterns, have been associated with increased rates of overweight and metabolic disorders such as diabetes and heart disease. Currently, rural people throughout the Americas, including Amazonian communities, are rapidly experiencing lifestyle and dietary transitions. Given that diabetes is increasing in Amazonia along with adult and child overweight, it is important to understand how scholars operationalize nutrition transitions in unraveling the complexity of human health. We conducted a literature review using keywords "Nutrition Transition" and "Amazon" and identified twenty articles. We then coded literature on nutrition transitions in the Amazon, which employs data on consumption, physical activity, or body composition. We then used a case study focused on Tsimane' living in Bolivia to provide a more comprehensive perspective on the biological consequences of market integration. In the larger Amazon, researchers are focused on studying the downstream effects of the nutrition transition through anthropometric analysis, rather than quantifying the upstream causation, such as dietary and physical activity patterns. Researchers who study consumption often do not consider dietary diversity. However, the case study found that purchased foods are connected to dietary diversity scores. This study shows that research to date has focused on a small number of measures to study nutrition transitions in the Amazon and additional attention to dietary diversity is needed. A better understanding of dietary diversity in nutrition transitions may reveal why nutritional changes are associated with rapid changes in health.

Role of Packing Defects in the Regulation of Human UDP-Glucose Dehydrogenase

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Glucuronidation is an important drug metabolism pathway that can produce drug resistance in some cancers. This drug resistance can be inhibited by limiting the availability of the essential glucuronidation substrate, UDP-glucuronic acid. Human UDP-Glucose dehydrogenase (hUGDH) oxidizes UDP-glucose to produce UDP-glucuronic acid. Understanding how hUGDH is regulated could lead to new therapies for combatting drug resistance. hUGDH activity is regulated by an allosteric switch that controls the structure and activity of the enzyme. The binding of UDP-glucose induces the enzyme to slowly isomerize (hysteresis) into an active conformation (E state). In contrast, the binding of the inhibitor UDP-xylose induces the allosteric switch to change conformation and produce an inactive, horseshoe shaped enzyme complex (E^o). The movement of the allosteric switch appears to require cavities in the protein core which, when filled, restricts movement of the allosteric switch and prevents isomerization between the two different states (E to E^o). To lock hUGDH in the E state, one such cavity was filled in our Double Mutant (hUGDH_{S158YS216A}) by two amino acid substitutions. hUGDH_{S158YS216A} was crystallized with UDG and NADH, and structural analysis showed the protein in the E conformation. Another cavity was filled by two different substitutions (hUGDH_{I109VA136M}) to lock the protein in the E^o state. For I109V, the structure formed when I109V was crystallized with UDX was in the E^o conformation and kinetics indicate a lack of hysteresis in this enzyme. This shows that these substitutions stabilize hUGDH and lock the allosteric switch in their respective conformations.

Development of Methodology to Determine the Temporal Expression of Pax6, Rax, Lhx2, Six3 and Otx2 in Embryonic Mouse at the Developmental Stage when Eye Field Specification is Occurring

Darlington Degraft Pobee

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The eye field, comprised of a group of cells in the ventral forebrain of the early mouse embryo, is the source of tissues comprising the eyes later in development. Our research seeks to investigate the gene regulatory mechanisms that instruct the specification of the eye field in the developing mammalian embryo. Previous research has explored the regulation mechanisms, development, and instruction of the eye field transcription factors (EFTFs) in invertebrates such as *Drosophila melanogaster* and vertebrates such as *Xenopus laevis*. However, far less is understood of the

regulation mechanisms and relationships among these EFTFs in mammals. This project uses whole mount *in situ* hybridization approach to establish methodology that will be used to define the temporal expression of five EFTFs in embryonic mice—Pax6, Rax, Lhx2, Six3, and Otx2. Subsequently, we aim to test whether ectopic expression of a specific cocktail of TFs (such as those used for eye specification in *Xenopus laevis*) is sufficient to induce “eye” fate in mammalian embryonic stem cells in culture.

Mental Health Training in the Georgia Police Force

Karan Ajit Pol, Ramsey Scholar

Aditya Krishnaswamy, Anita Qualls

Dr. David Williams, Religion, Franklin College of Arts and Sciences

Law enforcement officers serve as the gatekeepers to mental health and criminal justice systems. One quarter of all police shootings in 2015 involved encounters with mentally-ill individuals who are sixteen times more likely to be killed than those without mental illness. Poor police training results in an instinct to draw guns in an encounter where a weapon or uncooperative individual is present, which leads to casualties and incarceration. CIT Training is a nationwide program available to all sworn law enforcement officers that provides specialized training on mental health calls. CIT training was established with the goal of bringing together police, mental health providers, emergency departments, and other relevant parties to improve resources available for the mentally ill. Georgia offers CIT training at the state's Public Safety Training Center at no cost to officers, providing classes in various counties throughout the state, but this remains optional. In Georgia, 1.4 million adults have some form of mental illness. Nationally, mental illnesses are present in about 20% of the prison population. Taxpayers, mental health professionals, the mentally ill, and law enforcement are the primary stakeholders in this situation. These key stakeholders are negatively affected by poor mental health training, demanding immediate action in the face of rising mental illness, where numbers have doubled since 1980, with clear and steady increases since the 1930s. The Georgia General Assembly should mandate Crisis Intervention Team (CIT) Training for all law enforcement officers prior to certification.

Investigating the Theoretical Limit of Precision for Radial Velocity Measurements

Kinsey Lorraine Poland

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Radial velocity is a fundamental property of stars that is used to learn more about them and their systems. However, there is some level of uncertainty that must

be considered when measuring radial velocity. My goal is to determine a theoretical limit of precision for radial velocity measurements using simulations in the Python programming language. To do this, I first simulate a 1D spectrum that approximates the spectral lines of a fake star. This is best done using the Voigt line profile, which has a corresponding function in the Astropy package for Python. I define a peak position (x_0) at some wavelength where an absorption line would be located and plot an array of points. To mimic Doppler shifts caused by the radial velocities of real stars, I create several sets of simulated spectra, adding noise at various levels and shifting wavelengths different amounts. I cross-correlate some of these spectra (reference spectra) against some target spectra. The width of the cross-correlation function corresponds to the uncertainty of radial velocity measurements. I then need to show this comparison for different possible star spectra which can be done by shifting the pixels of the Voigt profile by varying degrees. Pixel shift can be estimated by a Fourier transformation. When all this is done, a theoretical limit of precision for a star's radial velocity as a function of signal to noise ratios and number of available stellar absorption lines (i.e. number of simulated Voigt line profiles) can be determined.

Characterization of PTHCre;R26iMyc Mice through Parathyroid Growth

Chynna Lee Politt, CURO Research Assistant
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Parathyroid glands are responsible for the regulation of serum calcium homeostasis. Parathyroid hormone (PTH), secreted from parathyroid glands, plays an important role in the constant exchange of calcium between the blood and bone tissues. Hyperparathyroidism, usually resulting from parathyroid adenoma, occurs when the parathyroids produce an excessive amount of PTH. In this study we generated a PTHCre;R26iMyc mouse model in which parathyroid cell proliferation was increased in these mice during embryonic development. Expression of Cre in parathyroid cells leads to Myc overexpression, therefore causing an increase in proliferation. This initial study observed the phenotypic effects resulting from an induction of Myc in parathyroid cells: large parathyroids, cell-type abnormalities, poor survival rate, skeletal abnormalities, and improper separation of the parathyroid from the thymus. After characterizing this mouse through parathyroid growth, this preliminary data will determine if this model will be appropriate for future studies concerning parathyroid fate and instability.

Fortune 500 and S&P Firm Lifecycle Analysis

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We hypothesize that more technology-focused Fortune 500 and S&P companies will remain ranked on each index for longer spans of time. Furthermore, technology-focused firms on these indices, we hypothesize, remain on the lists for a shorter duration now than in the past. Lastly, we postulate that technologically-focused companies will fall further down on each index relative to less technologically-driven companies in years of recession, with the reverse occurring in years of growth. We have compiled a database of companies' revenue, market capitalization, gross profit, SIC classifications, and ticker symbols dating back to the creation of both indices in the 1950s. To strengthen the robustness of our conclusions, annual economic measures were additionally compiled for each year. Computer languages, R and SQL, were utilized to scrape electronic data from multiple data sets as well as merge and compile the data. Statistical software, Stata, will be implemented to trace the collected data and realize the intrinsic trends. The completion of this comprehensive study of Fortune 500 and S&P companies will give us the insight to better analyze and predict performance and lifecycle processes of companies existing on both indices, in turn building more robust business analytics and fostering more informed investment decisions.

The Olmstead Decision: Societal Isolation to Community Integration

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Throughout the 20th century, many citizens with mental or intellectual disabilities were institutionalized in state hospitals and psychiatric centers across the country. In 1990, the Americans with Disabilities Act (ADA) was passed and prohibited discrimination due to disability. Despite the advances brought with the ADA for the rights of citizens with physical disabilities, it failed to improve the conditions and livelihoods of many people with mental disabilities. In Georgia, many of those with mental disabilities remained isolated in state institutions, often against the patients' will and their doctor's wishes, by order of the state. In these facilities, health conditions and quality of life were poor. In the 1999 *Olmstead v. L.C.* case, known as the Olmstead Decision, the Supreme Court ruled that citizens with mental disabilities were entitled to the rights established in the ADA. This ruling identified the "unjust isolation" of a person due to a disability as discrimination and in violation of Title II of the ADA. The Olmstead Decision allowed many

citizens institutionalized due to a mental disability to rejoin their communities by receiving medical treatment and care in a more integrated setting. This research focuses on the transition from societal isolation to community integration that people experienced as a result of the Olmstead Decision including employment opportunities, civic engagement, community involvement, and quality of life.

Assessing Intracellular A β Levels using A β -Cup1p Fusions as a Reporter System

Holly W Presley

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A hallmark of Alzheimer's Disease (AD) is the buildup of amyloid-beta (A β) plaques in the brain. It is not yet resolved whether the A β monomer, oligomer, fibrils, or amyloid itself is responsible for killing neurons and disrupting cognitive function, but recent studies suggest that the A β oligomer is the toxic agent. Several enzymes can cleave A β *in vitro*, rendering it unable to form oligomers. Two such enzymes are the insulin-degrading enzyme (IDE) and Ste24. The *S. cerevisiae* orthologs of these enzymes, Ste23p and Ste24p, respectively, can cleave various amyloid peptides *in vitro*. This study tested the ability of an A β -Cup1p fusion to serve as a reporter for intracellular A β levels with the expectation that this reporter could eventually be used to assess the impact of Ste23p and Ste24p on amyloid formation. Cup1p is normally required for copper tolerance, and the A β -Cup1p fusion was expected to form an amyloid that sequesters Cup1p activity, rendering cells more sensitive to copper. Strains of *S. cerevisiae* that express different lengths of A β attached to Cup1p were created and evaluated using genetic tests for copper tolerance. We observed that Cup1p alone could provide tolerance to copper containing media, while A β -1-40 and 1-42 had reduced tolerance. Shorter fusions of A β resulted in intermediate tolerance. The results of this study suggest that the ability of the A β -Cup1p reporter to form amyloids may impact Cup1p activity, even in the presence of Ste23p and Ste24p.

Oral Oxycodone Self-Administration Protocol for Male and Female Rats

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Prescription opioid abuse is a significant public health problem. Prescription opioids like oxycodone are typically administered orally, but few preclinical studies have examined oral opioid self-administration. Furthermore, women have an increased risk for prescription opioid abuse, yet only one study has included female rodents. Including female subjects is essential to understanding the sex

differences in oxycodone abuse. The study conducted here develops a protocol for oral oxycodone self-administration in male and female rats. Additionally, we examine the effect of a neurokinin 1 receptor (NK1R) antagonist on oxycodone self-administration. We trained Wistar rats to orally self-administer oxycodone for different oxycodone concentrations. To assess the motivation for oxycodone, we used a progressive ratio test following fixed ratio 1 (FR1) schedule of self-administration at each concentration. Finally, we systemically administered an NK1R antagonist L822429 prior to FR1 self-administration sessions of 0.1 mg/ml oxycodone to determine the effects of NK1R antagonism on oxycodone self-administration. Our results showed that female rats self-administer more oxycodone than male rats and have a higher breakpoint in the progressive ratio test. This suggests that female rats have a higher motivation for oxycodone than male rats. There was no effect of NK1R antagonism on oxycodone self-administration, suggesting that NK1Rs are not involved in oxycodone self-administration at the doses of oxycodone and NK1R antagonist used. Alternatively, the differential effects of NK1R antagonism for high versus low responders or dependent versus non-dependent subjects could have obscured the results.

No Longer Used: Designing Non-Exploitative Communication Methods to Represent Survivors of Human Trafficking

Emma Katherine Protis, CURO Research Assistant

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When people who are trafficked are rescued from the life of slavery, they often can be in danger of being re-trafficked. Even if they do not return to their former circumstances, they still face the threat of exploitation after recovery by the way nonprofit organizations tell their stories, however well-meaning the intent. Because communicative exploitation often happens unintentionally, this project, "No Longer Used," seeks to define ethical guidelines around telling trafficking survivors' stories. The guidelines apply Sherry Baker and David L. Martinson's "The TARES Test: Five Principles for Ethical Persuasion" to parameters that dignify and protect survivors when working with media, serving as organizational spokespeople or having their stories widely communicated to the public. Through in-depth interviews from trafficked survivors and anti-trafficking experts, this research identifies what communicative perspectives are ethical and honor the lives of survivors. The interview analyses and results suggest ways to protect survivors before going public, explain why a picture of pity is destructive, and provide creative, alternative approaches to creating compelling communications.

Project Monarch Health: Insights from a Decade of Citizen Science Monitoring of Parasite Infections in Monarch Butterflies

Cody Prouty

Dr. Sonia Altizer, Ecology, Odum School of Ecology

Monarch Health is a citizen science project based at the University of Georgia that tracks the spread and prevalence of a debilitating protozoan parasite, *Ophryocystis elektroscirrha* (OE), in North American monarch butterflies. This project enhances awareness of monarch biology and conservation through the coupling of citizens and scientists. The 2016 season marked 10 years of citizen science monitoring, providing exciting insights into long-term trends in disease. We compiled a decade of monitoring data, representing 39,000 samples collected by over 1,000 volunteers. Infection prevalence increased from early to late in the breeding season each year, and fluctuated from year to year. Most notably, infection prevalence dropped sharply immediately following the monarch population crash in 2013-14, and remained low in subsequent years, as might arise from a transmission threshold for the parasite based on monarch population size. We also georeferenced sample collection sites to map infection prevalence per county across the United States. In the majority of the country where monarchs are migratory and breed only during the summer month, infection prevalence rarely exceeds 25%. However, in the southern United States where resident populations are able to breed year round due to the presence of non-native milkweed, infection rates surge to 75-100%. Owing to the dedicated monitoring efforts of citizen scientists in building a 10-year continent-wide data set, we can better understand how seasonal migration influences animal-pathogen interactions, and the potential for human introduced exotic species to alter patterns of disease prevalence in wild populations.

The Effects of Endurance Training on the Mitochondrial Capacity of the Biceps Brachii Muscle

Ellie Pryor, CURO Research Assistant

Katie Luquire

Dr. Kevin McCully, Kinesiology, College of Education

Near infrared spectroscopy (NIRS) has been used to measure mitochondrial capacity of various muscles, but not specifically the biceps brachii. We aim to measure mitochondrial capacity using NIRS in the dominant and non-dominant arms of young healthy adults pre and post-endurance training. We hypothesize that the mitochondrial capacity of the biceps brachii will show a significant increase after a 5-week training program. Twelve untrained subjects (mean age 20.4 ± 0.7 years) were tested. Mitochondrial capacity was measured in the supine position with a NIRS device placed in the middle of the

biceps brachii muscle. Electrical stimulation (6 Hz, 25-40 mAmps) was used to activate the muscle. A blood pressure cuff was placed proximal to the NIRS device and used for arterial occlusion. The protocol consisted of measuring resting metabolism, measuring the reoxygenation rate after three minutes of ischemia, and two mitochondrial capacity tests. The mitochondrial capacity test measured the rate of recovery of muscle metabolism after exercise. Exercise consisted of electrical stimulation followed by twenty-two repeated ischemic cuffs lasting 5-10 seconds. Eight subjects underwent a 5-week endurance training protocol, training 3-4 times a week. Six trained subjects completed post-testing. There was no difference in mitochondrial capacity between the dominant and non-dominant arms (Non-Dom $R_c = 1.44 \pm 0.20$, Dom $R_c = 1.41 \pm 0.23$, $P = 0.73$). There were no significant differences between pre and post-training (Pre $R_c = 1.43 \pm 0.21$, Post $R_c = 1.55 \pm 0.38$, $P = 0.26$). We found no evidence for differences in mitochondrial capacity between the dominant and non-dominant biceps brachii, nor did we find a difference between non-dominant biceps brachii muscles pre and post-training.

Variations in Gestural Communication Across and Within Captive and Wild Sub-Adult Western Lowland Gorillas (*Gorilla gorilla gorilla*)

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Dr. John Maerz, Forestry, Warnell School of Forestry and Natural Resources

Nonhuman primates use vocal communication as a response to evolutionarily urgent events such as predator avoidance, group travel, or food discovery. Gestural communication, however, is used mainly in social contexts such as play, grooming, or agonistic encounters, and can show great variation. This project focuses on the diversity in gestural communication in a captive population of juvenile (<7 years) western lowland gorillas (*Gorilla gorilla gorilla*). A behavioral ethogram was constructed to record the gestures of the five juvenile gorillas at Zoo Atlanta. The frequencies of these gestures will be analyzed in order to establish which gestures are most commonly used, and which individuals are using the greatest variability of gestures. This allows us to look at gesture use at both a group and individual level. The behaviors observed from the captive group will be used to make a presence-absence data sheet, which will be sent to various field sites to determine how many of the gestures used in captivity are also used in the wild. Many studies have been conducted on the gestures of the other great ape species; however, less is known about the gestures of gorillas. This study will advance our knowledge of communicative gestures in gorillas, and inform areas of the evolution of primate information transmission. Though data analysis is still underway, it is expected that the

captive individuals will use different gestures at variable frequencies. It is also expected that the captive population of gorillas will use a greater variability of gestures than wild gorillas.

Motivated Ignorance: How We Turn Our Greatest Skill into Our Greatest Weakness

Tristan Pugh

Anna Ezrine

Dr. Leonard L Martin, Psychology, Franklin College of Arts and Sciences

People routinely guide their behavior by a story in their head rather than by the reality immediately in front of them. When people are on a diet, for example, they focus on the slim self they could be in four weeks rather than on the donut they want right now. Similarly, people may hate school, yet attend for 20 years in the hopes of getting a good job. Similarly, people may sacrifice their entire life to attain a positive afterlife. The ability to focus on stories rather than on reality is an amazing skill that helps people attain many important goals. This skill may be harmful, though, when it is misapplied. It may lead people to ignore aspects of reality they should attend to, and sometimes this ignorance is intentional. We are exploring the way in which people's motivations to defend their stories can lead them to distort reality. We will start by measuring aspects of the stories people use to guide their life (e.g., religion, politics, long-term goals). Then, we will measure the discrepancy between their conscious and unconscious self-esteem. The larger this discrepancy, the more defensive people are. Next, we will present people with summaries of research studies that contradict their stories and ask them to evaluate the studies as well as report on their confidence in their stories. We expect people with large conscious/unconscious discrepancies to be more likely to derogate the research and actually believe more strongly in their initial story despite reading disconfirming evidence.

Elucidating the Relationship Between Skeletal Muscle Injury-Induced Inflammation and Mitochondria

Anita Qualls, CURO Summer Fellow, CURO Research Assistant

Dr. Jarrod A Call, Kinesiology, College of Education

Previous studies on dermal burns and sepsis have demonstrated a systemic inflammatory response related to skeletal muscle and mitochondrial dysfunction. However, the effect of inflammation from localized stress, such as skeletal muscle injury, on mitochondrial function remains largely unknown. In this review, we have identified four significantly upregulated cytokines (chemokine (C-C) motif ligand 2, chemokine (C-X-C motif) ligand 1, Interleukin-6, and Interleukin-1) from inflammatory gene array data across

three skeletal muscle injury models (freeze, volumetric muscle loss, and eccentric contraction). We describe each cytokine's function in the inflammatory response based on the literature, such as functioning as chemoattractants to tissue damage, and highlight evidence of these pathways directly impacting mitochondrial function and structure, such as IL-6 induced reactive oxygen species (ROS) accumulation, leading to mitochondrial oxidative damage. Ultimately, we postulate that the inflammatory response from a skeletal muscle injury acts as a "stressor" that the mitochondria are sensitive to and react by initiating downstream effects that result in dysfunction of overall physiological relevance, such as negatively impacting skeletal muscle recovery and regeneration.

Ability of *Campylobacter jejuni* to Recognize and Metabolize Human Milk Oligosaccharides

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Campylobacter jejuni is a leading cause of bacterial diarrheal disease worldwide. The organism has been linked to the development of Guillain-Barré Syndrome, now the most common cause of paralysis since the decline of polio. Additionally, severe *C. jejuni* infection has been associated with growth stunting in infants under the age of one in low resource countries. Previous studies *in vitro* and in animal models have suggested that oligosaccharides in breast milk are protective against *C. jejuni* infection. However, studies in developing countries report similar *C. jejuni* infection rates in infants regardless of whether children have been breast fed or not. The Szymanski laboratory has received *C. jejuni* isolates and infant fecal DNA from the Global Enteric Multicenter Study (GEMS) group from infants under the age of one with moderate to severe diarrhea and from age-matched controls. We are now interested in comparing the bacterial microbiota from these two populations to look at correlations in microbial composition between children with and without enteritis through 16S rRNA profiling. We are also developing high throughput binding and growth assays to compare the ability of the *C. jejuni* isolates to recognize and metabolize various human milk oligosaccharides. Binding comparisons will be done through the application of glycan arrays and thermophoresis. These studies will help to better understand why breastfeeding is not protective against *C. jejuni*-induced diarrhea in low resource countries.

Standardization of an *in vitro* Culture of *Plasmodium falciparum* CB132 Gametocytes to Evaluate Transmission into *Anopheles stephensi*

Zehra Rahman, CURO Research Assistant

Dr. Dennis Kyle, Cellular Biology, Franklin College of Arts and Sciences

Malaria is a vector borne disease caused by a blood-borne parasite *Plasmodium*, and is transmitted to humans by an infected mosquito during a blood meal. The injected sporozoites are carried to the liver where they divide and enter the bloodstream. During the blood stage of infection, the malaria parasite will undergo repeated cycles of red blood cell invasion, called the asexual stage. A small population of the blood-stage parasites will sexually differentiate to form male and female gametocytes. When the gametocytes are taken up by the mosquito, a drop in temperature, pH change, and exposure to xanthurenic acid trigger maturation into gametes in the mosquito midgut. The male and female gametes fuse to form a diploid zygote called an ookinete. Ookinetes cross the midgut wall and invade the midgut basal lamina where they develop into oocysts, which rupture to release haploid sporozoites. These sporozoites migrate to the salivary glands where they reside until the mosquito takes a blood meal to complete the life cycle. Through *in vitro* culturing techniques, we can produce *Plasmodium falciparum* gametocytes *in vitro*. This enables us to do transmission studies and to use the resultant sporozoites in drug discovery assays. Since human serum is essential for the development of gametocytes, our goal is to test different batches of serum for their ability to support gametocyte growth and maturation and for the successful transmission of these gametocytes into *Anopheles stephensi*.

The Deadliest Catch: Testing and Treating Sexually Transmitted Infections in Methadone Rehabilitation Facilities

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Emma Tucker

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The indirect effects of the opioid abuse public health emergency have led to increased rates of chlamydia and syphilis across the nation. In 2006, the Centers for Disease Control and Prevention (CDC) deemed syphilis 'close to eradication,' with an approximate 40% reduction since 2000. However, since 2007, the CDC has reported a steady rise in syphilis nationwide. Between 2011 and 2015, the rate of new syphilis infections in Georgia increased by 75.2% for men and 25.3% for women. These startling increases necessitate research to determine effective early intervention strategies to combat rates in particularly vulnerable populations such as intravenous drug users, who are affected by both crises. This research looked at primary and secondary analysis of early intervention strategies along with governmental approaches to propose a series of steps that the Georgia Department of Public Health can follow to implement critical infrastructure in Methadone rehabilitation facilities, balancing public health concerns with appropriate budgetary constraints. The

research provides a comprehensive policy proposal with implementation support to help combat both the economic and health consequences of observed growth in STI levels. After analysis, Georgia should mandate rapid STI screening as a precondition to entrance into methadone rehabilitation facilities and the treatment of STIs as a corequisite to methadone treatment in federally deemed 'high-risk' areas for opioid abuse.

Determination of Community Housing Problems Utilizing Kernel Density Interpolation

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Dr. Jerry Shannon, Geography, Franklin College of Arts and Sciences

The Georgia Initiative for Community Housing (GICH) is a three-year program allowing communities across Georgia to better plan for affordable housing. In partnership with this program, the Community Mapping Lab has been working on software to facilitate online housing assessments. This allows communities to use tablets rather than pen and paper and to visualize results without technical background in GIS. Utilizing ArcMAP, a GIS mapping software, summary analysis was conducted of data previously collected by members of the Community Mapping Lab. Focusing on four communities in Georgia (Rockmart, Pine Mountain, Millen, and Monroe), the top five housing problems faced by residents in these areas were compiled. Analysis of the data included the creation of twenty kernel density maps, a form of hotspot map that indicates issue concentration. The results of this research will inform best practices for crowdsourced data collection on housing using open source software.

Comparison of NeuroBasal Complete Media and NeuroCult Media for Neural Stem Cell Culture

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Dr. Franklin Delano West, Animal and Dairy Science, College of Agricultural and Environmental Sciences

Stroke is a leading cause of death and disability in the United States. Our lab specifically looks at how induced neural stem cells (iNSC) can be used to treat stroke. Prior to transplantation, however, the iNSCs must be proliferated. The media that is used to proliferate the cells should be consistent each time it is prepared and must contain the proper elements to ensure that the iNSCs grow at a desirable pace without bacteria. In the past, our lab has used a media formulation from Global Stem called "Neurobasal Complete Media," which is mixed by lab personnel. Recently, however, a different media for iNSC proliferation has been brought to our attention called "NeuroCult Media" by Stem Cell Technologies. It contains all of the necessary ingredients for iNSC growth, while also being pre-made, consistent, and up-to-date. Through this experiment, we hope to compare

cell proliferation, quantified using doubling time, and cell viability, quantified using cell counting, for the two media types. It is hoped that both measures will yield either similar or better results for the NeuroCult media, allowing our lab to confidently switch to using the NeuroCult media for all iNSC cell proliferation needs.

Comparison of Postprandial Satiety Response after Consumption of Muffins With and Without Walnuts

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Dr. Jamie A Cooper, Foods and Nutrition, College of Family and Consumer Sciences

Walnuts are a popular health food, but most research focuses on English walnuts. Black walnuts, another variety produced in the United States, offer more protein and less carbohydrate and fat than English walnuts. We aim to determine whether consumption of walnut-containing muffins is more satiating than a muffin without nuts, and to evaluate which muffin has greater sensory appeal. This was a randomized, double-blind design with three study visits. The three treatments were high-fat muffins containing butter (control), English walnuts, or Black walnuts. Twenty-five normal-weight adults (n=9 males, n=16 females) consumed one of three muffins per visit. Each muffin had the same calorie, sugar, and fat contents, differing only in fatty acid and protein contents. Visual analog scales (VAS) measured overall appetite, hunger, and fullness at fasting and 0.5, 1, 2, and 3 hours postprandially. A separate questionnaire evaluated the sensory appeal of each muffin. For all muffins, males had significantly higher postprandial appetite scores compared to females ($p < 0.05$). There were no other significant differences in the VAS. Muffin A received a significantly higher overall acceptability rating than muffins B and C (8.210.13, 7.830.16, 7.600.28, $p < 0.05$). Muffin C had a significantly lower taste preference compared to muffins A and B (7.120.32, 8.040.15, 8.040.22, $p < 0.05$). Acceptability scores range from 1 (dislike extremely) to 9 (like extremely). Walnut-containing muffins did not significantly decrease appetite more than the control. For sensory evaluation, muffin A was the most acceptable. Since the study is ongoing, un-blinding of treatments has yet to take place.

Tagging *Cryptosporidium parvum* Exported Protein Candidate cgd3_3460 (PEXEL 21) with Bacterial Flagellin to Elicit Higher Immune Response from the Host

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Cryptosporidiosis is one of the world's foremost enteric diseases caused by the parasite *Cryptosporidium spp.* This disease is most prevalent in children, frequenting underdeveloped countries such as Africa, as well as

more advanced countries like the United States through the contamination of water sources. The details of the transmission modality of *Cryptosporidium* are fairly unknown due to the poor immune response elicited by the host after infection by the parasite. Reasons for this poor immune response could be attributed to where the parasite resides in the host cell. The parasite lives in the host cell away from immune cells in the blood, but not within the cytoplasm where the immune detectors reside, meaning it is well hidden from the body's immune system. My research will focus on attempting to elicit a stronger host immune response to the parasite by tagging the potential *Cryptosporidium* exported protein cgd3_3460 (Pexel 21) with the gene *FliC* using CRISPR/cas9 technology. The gene *FliC* originates from a bacterial flagellin, and when expressed, serves to elicit a stronger immune response from the host. We predict that tagging this exported protein with the *FliC* gene insert will boost the host's immunity to allow the host to both recognize and clear the parasite more quickly without further medication. While Pexel 21 was not found to be an export protein, there is a great amount of evidence proving the existence of exported proteins in *Cryptosporidium*, and further research on these proteins can provide insight on the parasite's function.

Reducing Recidivism through Family Contact: Cutting Costs of Prison Phone Calls in Georgia

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The prison phone market currently exploits individuals, as prison phone companies maintain exclusive monopolies over state prisons, resulting in exorbitant call pricing. The market especially discriminates against socioeconomically disadvantaged persons who have no comparable, alternative method of communicating with family. This policy research project reviews and analyzes relevant literature and research in order to investigate the ways in which the prison phone monopoly takes advantage of low-income individuals least able to sustain additional expenses, as well as examines the established link between family contact during incarceration and reduced rates of recidivism. In order to address the barriers excessive calling rates pose to society, I propose a policy alternative under Georgia state law that prohibits Georgia prisons and contracting authorities from accepting commissions from contracting with prison telephone companies, requires all correctional facilities to carefully assess contractual fees for legitimacy, as well as prohibits correctional institutions from contracting with telephone companies that lack full transparency. The policy paper evaluates the effectiveness of similar policy changes in other regions, the feasibility of enacting this policy change, as well as the cost-benefit analysis associated with

dismantling prison phone monopolies. Most significantly, the paper explores the societal advantages that result from improving family contact during incarceration, including reducing rates of recidivism as well as improving parent-child contact after release.

Mutational Analysis of the Potential Recognition Site Between Effector Protein, VopQ, and Its Partner in Yeast, Vma3p

Yenamala Usha Reddy

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Vibrio Outer Protein Q (VopQ) is an effector protein secreted by the type III secretion system of the opportunistic pathogen *Vibrio parahaemolyticus*, a bacterium that remains a leading cause of seafood-borne gastroenteritis globally. When expressed in the highly conserved model eukaryotic organism, *Saccharomyces cerevisiae*, or yeast, VopQ is toxic and causes cell death, much as it does in human cell lines. Further studies show that VopQ interacts with the V_o domain of the vacuolar H⁺-ATPase (V-ATPase) and requires the presence of a specific subunit of the V-ATPase, Vma3p, for toxicity in yeast and its ortholog in mammalian cells. Yet the recognition motif or binding site of Vma3p required by VopQ remains unknown. To determine if there is a specific recognition site required by VopQ, site-directed mutagenesis of *VMA3* was performed and generated *VMA3* mutants were subjected to the expression of *VOPQ* in yeast. Those mutants that survive in the presence of VopQ may suggest a potential recognition site for VopQ. Here we show that although several single mutants were examined, none show both resistance to VopQ expression and maintain a functional V-ATPase in yeast. Further mutagenesis analyses are underway with multiple mutations to determine if there is a series of amino acids in Vma3p required for VopQ recognition. Identifying the recognition site required by VopQ in yeast would elucidate yet unknown aspects of the pathogenicity of *V. parahaemolyticus* and how VopQ aids in successful *V. parahaemolyticus* infection in humans.

The Wellbeing Economy and Cooperative Market Economics: Backcasting a Future from Within and Beyond Neoliberalism

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Our current economic system is one primarily focused on chasing economic growth and GDP rise, with the resulting effects on humanity and the environment counted as externalities. The growing momentum of a chorus of recent voices and alternative ideas from around the world has demonstrated that our global economy needs to reform to a focus on wellbeing and the thriving of societies and the ecosystem as opposed to an obsession with GDP rise.

Through in-depth case studies, this research will analyze the alternative economic framework shifts currently being proposed and implemented, with an investigative methodological framework focusing on the dissemination level within society; the viability of the approach within current legal and economic systems; and the level of economic and political will of those in power. This research will focus on cooperative market economics as a needed economic paradigm alternative that both appropriates neoliberal ideals while operating within them, and how to increase the momentum of this paradigm shift as it gains more traction across the United States and globally.

The Impact of Parent Engagement on Language Development in Young Children who are Deaf or Hard of Hearing

Erin Reynolds

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Dr. Sandie Bass-Ringdahl, Communication Sciences and Special Education, College of Education

It is widely accepted that children develop language socially, via exposure to language being used in naturalistic contexts. Children who are deaf or hard of hearing (DHH), however, are at a disadvantage in the area of language acquisition due to a lack of access to this natural exposure. The widespread implementation of newborn hearing screening has greatly reduced the age of identification, resulting in earlier entry into intervention. This earlier provision of services has been shown to improve language outcomes for children who are deaf or hard of hearing. However, many factors continue to impact the success of newborn hearing screening programs in improving language outcomes. The present study seeks to identify potential factors that influence language outcomes for DHH children under the age of four who have received intervention, particularly the effects of parent engagement. This retrospective study analyzes existing data from the Georgia PINES database for children who began intervention between 1/1/2014 and 9/1/2017. Data will be analyzed for the presence of functional relations between independent variables (including parent engagement in intervention, age of onset of intervention, and degree of hearing loss) and language outcomes as measured by the SKI-HI Language Development Scale and MacArthur-Bates Communicative Development Inventory. The results of the analysis may provide insights into factors that contribute to language outcomes for children who are DHH and have the potential to inform clinical practice and set the stage for future prospective research in the field.

Benthic Macroinvertebrate Communities in Carolina Bay Wetlands

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Wetlands are important as they protect and improve water quality, provide habitats for wildlife and fish, and store floodwaters. Carolina Bays are elliptical-shaped depressional wetlands scattered along the East Coast of the United States, including Georgia. The purpose of this study is to identify the predator interrelationships among and factors affecting benthic macroinvertebrate communities in depressional wetlands. The data sampling occurs in March, July, and November, in ten wetlands located in a Georgia Wildlife Management Area in east-central Georgia each year. To sample, a D-net is used to collect sediments, leaf litter, and invertebrates at each of the wetlands, which is placed into a bag filled with 95% ethanol to preserve the benthic macroinvertebrates. The samples are then processed in the lab, separating the organic and inorganic material from the benthic macroinvertebrates. The benthic macroinvertebrates are classified to family or genus and analyzed for taxa richness and abundance. The data will be analyzed using a statistical analysis software called R, which will compare and rank factors, such as hydroperiod, habitat, size, and water chemistry, relating their effect on the benthic macroinvertebrate communities, as well as assessing the predator-prey interrelationships among different invertebrate groups. After all of the results are analyzed and compiled, we plan to draw conclusions about how each factor plays a role in shaping benthic macroinvertebrate communities. In doing so, we will be able to assess how both the physical factors and biotic interrelationships contributed to the maintenance of invertebrates and overall ecology of Carolina Bay Wetlands.

Modeling Functional Group Effects on Combustion: n-Butane, 1-Butanol, and Butanone

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The goal of this research project was to perform computer simulations on the effect of functional groups on combustion using the three different fuels: *n*-butane, 1-butanol, and butanone. A motivating factor is that the successful design of combustion devices that operate more cleanly (i.e. lower emissions) and more efficiently (i.e. higher mpg) require accurate multi-physics simulations that span enormous scales of length (10^{-9} – 10^{-3} m) and time (10^{-15} – 10^{-3} s), and combine chemical kinetics, fluid dynamics, heat transfer, mass transport, and thermodynamics. These areas of science all come together inside of combustion

systems, thereby requiring immense levels of computational rigor to model appropriately. The results from this project address chemical kinetics aspects of this larger scientific challenge, and is achieved by analyzing simulated reaction mechanisms to determine what differences exist between the three fuels. Computer simulations were conducted from 1 – 50 atm and 400 – 1000 K. For a given pressure, mole fractions of products from the three fuels were plotted as a function of temperature. The results revealed how different the reaction pathways are for the fuels studied, including what intermediates and products are preferentially formed and at what rates these processes occur. For example, it was found that many butanone combustion products are not formed at lower temperature and increase sharply at higher temperatures, which indicates this biofuel may be best utilized as a gasoline additive. The results of this work will be useful in planning future experimental work in the Combustion and Atmospheric Reaction Mechanisms Laboratory (CARMEL) at UGA and connects more broadly to ongoing research efforts on renewable, clean energy technologies.

Women in Political Dramas: How Does Hollywood Depict Politicians?

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How are female and male politicians depicted in fictional television shows and does this reflect societal norms? The manner in which men and women are portrayed in televised political dramas may be important in understanding how gender roles are reflected and perpetuated by television. To study the role of network television in norm entrepreneurship, two political dramas (“Madam Secretary” and “Designated Survivor”) were analyzed for their characterization of a protagonist with stereotypically feminine and masculine traits, as well as the amount of time spent by the protagonist in private and professional spheres. This study hypothesized that a female protagonist will show more stereotypically feminine traits and feature more plots covering her private life, while a male protagonist will display more stereotypically masculine traits and will have plots that center more heavily around his professional life. The study found that, relative to the male protagonist of “Designated Survivor,” the female protagonist of “Madam Secretary” spent more time at home and with her family and friends; however, both shows featured a large amount of time focused on the professional lives of the two protagonists. Both characters mostly demonstrated stereotypically masculine traits, but the female protagonist exhibited more feminine traits than the male protagonist. The results indicate a bias towards presenting fictional politicians as more masculine, while also perpetuating the

stereotypical roles of females in the domestic sphere and males in the professional sphere.

Sluggish Cognitive Tempo and College Students: Prevalence and Relationship with Functional Impairment

Jill Robinson

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Sluggish cognitive tempo (SCT) is a new construct in the attention-deficit/hyperactivity (ADHD) field. The symptoms of SCT include daydreaming, mental fatigue, and under activity. The purpose of this study was to examine the prevalence of SCT symptoms within a large college population ($N=885$), their relation to the inattentive and hyperactive-impulsive symptoms, and their incremental validity in predicting functional impairment beyond ADHD symptoms. Participants were assessed with the Barkley Adult ADHD Rating Scale-IV and the Barkley Functional Impairment Scale. Results indicated that SCT symptoms are relatively common among college students. Over 20% of participants reported experiencing four or more SCT symptoms, which is the criterion for clinical determination of SCT. SCT symptoms were strongly correlated with inattentive symptoms and moderately correlated with hyperactive-impulsive symptoms. SCT was significantly correlated with functional impairment, but only predicted a small amount of variance when controlling for ADHD symptoms. ADHD symptoms predicted significant impairment, as expected, but SCT symptoms only accounted for a small amount of additional impairment. These findings indicate that the suggested cutoff of four symptoms for determining clinically significant SCT likely needs to be adjusted for college students. Additionally, these findings suggest that most cases of clinically significant SCT will not have functional impairment associated with these symptoms, which further brings into question the validity of the SCT construct within the college population.

Determination of Transfluthrin in Rat Plasma and Brain Tissue Using Negative Chemical Ionization Gas Chromatography-Mass Spectrometry

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Transfluthrin is a relatively non-toxic rapidly-acting synthetic pyrethroid insecticide. It is widely used in household and hygiene products. A sensitive and accurate bioanalytical method is required for studies to assess its health effects and toxicokinetics in mammals and for quantification of its concentration in plasma and its potential target organ, the brain. Rat plasma and brain samples were prepared by liquid-liquid extraction. Gas chromatography mass

spectrometry (GC-MS) analysis was performed for the determination of transfluthrin in biological samples with an overall method run time of 15 min. Transfluthrin was quantified using selected-ion monitoring (SIM) in the negative chemical ionization (NCI) mode. Chromatographic separation was achieved using a Zebtron[®] ZB5-MS GC column operating with 1 mL/min constant flow helium. *cis*-Permethrin was used as the internal standard. The method was validated to be precise and accurate within the linear range of 1.0 - 400.0 ng/mL in plasma and 4.0 - 400.0 ng/mL in brain homogenate, based on a 100 μ L sample volume for both matrices. This method was applied to samples following administration of a 10 mg/kg oral dose to male adult rats. The plasma concentrations were observed to be 11.70 ± 5.69 ng/mL and brain concentrations 12.09 ± 3.15 ng/g when measured 2 h post-dose.

The Effect of Directed Reading of Scientific Literature on Comprehension and Writing Ability

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All college students should achieve scientific literacy; however, the ability to read peer-reviewed original scientific research is particularly important in the STEM fields. Though important, this skill is often underdeveloped, possibly because the task is daunting and students may not be receiving sufficient instruction on how to do it effectively. We assessed how much exposure students have had with reading scientific literature, as well as, whether they have received instruction on this task. We also evaluated the effectiveness of explicit instruction on improving comprehension of peer-reviewed research in the field of psychopharmacology. Our study included 53 University of Georgia Psychopharmacology students, predominantly junior and senior psychology and biology majors, who received extra credit for participation. Students read a research article, wrote a summary, and completed a comprehension quiz either before or after participation in an instructional session on how to read a research article. Questionnaires assessed previous experience with research articles and perceived effectiveness of the instructional session. Preliminary data suggest that although the majority of students had read more than ten research articles for course credit, only approximately half of them had received instruction. We anticipate finding that students who received instruction either previously or during the instructional session will perform better on the article summary and quiz, indicating superior comprehension. The findings of this study will inform future teaching regarding scientific literature because they will show importance of not only assigning articles, but also providing instruction on how to read them to improve scientific literacy.

SSIP1 Is Required for SDG7-Mediated Trimethylation of H3K36

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Histone modifications in eukaryotic organisms are required for normal gene expression and development. In plants, methylation of histone H3 lysine 36 (H3K36me) is the most abundant histone modification within genic regions, but the least understood. Two partially redundant enzymes, SET DOMAIN GROUP 7 (SDG7) and SDG8, are responsible for the deposition and maintenance of H3K36 di- and trimethylation (H3K36me_{2/3}) in *Arabidopsis thaliana*. Previous studies have shown that SDG8 is recruited by methylation of histone H3 lysine 4 (H3K4me). The mechanisms that target SDG7, however, remain unknown. Using in vivo pull-down and mass spectrometry assays, a PHD Zinc Finger protein (SDG SEVEN INTERACTING PROTEIN 1, SSIP1) was found to interact with SDG7, indicating that this protein could be responsible for targeting SDG7. ChIP-seq results revealed that *sdg7* and *ssip1* share the same patterns of H3K36me₃ loss, indicating that SSIP1 is required for SDG7 function. Experiments to further characterize the SSIP1-SDG7 interaction and the function of SSIP1 are ongoing.

Reliability and Validity of Measures of Sluggish Cognitive Tempo with a College Population

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Abdullah Darvesh

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Sluggish cognitive tempo (SCT) is a recently introduced construct within the field of attention-deficit/hyperactivity disorder (ADHD). Research findings have been mixed as to whether SCT simply co-occurs with ADHD or represents a separate syndrome. The identification of SCT symptoms is largely based on self-report, yet little is known about the reliability and validity of the self-report measures used to identify SCT. The purpose of the current study was to investigate the psychometric properties of the two main measures – Barkley Adult ADHD Rating Scale (BAARS) and Adult Concentration Inventory (ACI) – used to assess SCT symptoms. Participants (N=735) were undergraduates at a large university. Results indicated good to excellent reliability for both the BAARS and ACI, but the ACI was found to have slightly stronger reliability than the BAARS. For both measures, current symptom reliability was stronger than childhood symptom reliability, although reliability was adequate for both periods. The reliability of SCT symptom ratings was generally equivalent to the reliability of ADHD symptom ratings. The BAARS and ACI were more correlated

with each other than they were with ADHD symptom ratings, supporting their convergent validity. Strong evidence for divergent validity was not found, given that SCT symptom ratings were also very highly correlated with inattentive symptom ratings. Overall, these findings indicate that both SCT measures demonstrate adequate reliability and convergent validity, but that future research is needed to determine whether SCT symptoms are meaningfully distinct from inattentive symptoms. Of the two measures, the ACI demonstrated slightly stronger psychometric properties.

The Effects of Personality on Group Performance and Satisfaction

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Banks Torgerson, Jalees Naseer, Marisa Sheres, Noah Elliott, Nuzat Momin

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Group work is a widespread strategy for promoting student learning. In undergraduate science classrooms, working in groups has been shown to have a positive effect on student performance and success. However, not all groups are created equal, and some function better than others. Research conducted in workplace settings indicates that the configuration of personalities in a group affects the group's performance as well as their willingness to work together in the future. Whether these same patterns are observable in undergraduate science courses is unknown. We aim to address this gap by examining how the personality configurations of groups in undergraduate life science courses relate to their performance, measured by grades, and their satisfaction, measured by self-report survey. We have collected personality data using the "big five" model and we have collected group grades and levels of group satisfaction from a total of 214 groups to date. We have conducted preliminary analysis using linear regression with mean personality trait as a predictor and grades or satisfaction as the outcome. Our results thus far show no conclusive relationships, but power analysis indicates that we need to collect data from 250 groups for the analyses to be sufficiently powered. Thus, we are continuing data collection this spring.

The Growing Role of Human Trafficking as a Means for Recruitment and Funding in 21st Century Insurgencies

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Following the September 11th attacks, terrorist organizations have pursued new strategies and tactics to bolster their networks and achieve their aims. Though most of the scholarship on terrorism has focused on the

terrorist acts themselves, less research has focused on how globalization has provided opportunities for terrorist organizations to use open borders to illegally traded goods, and even people. Since 2009 human trafficking has become one of the largest sources of income for the Islamic State (ISIS), generating an estimated \$35 million annually. This research will examine the motivations and challenges presented to terrorist organizations in using human trafficking as a source of revenue as well as a psychological tactic. It will then explore how programs to counter human trafficking and terrorism must coordinate efforts to combat the continuously changing dynamic of terrorist organizations.

DNA Methyl Transferase 1 Knockout in Female *Oncopeltus fasciatus*

Zachary C Sanchez

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Recently, there has been a push to study more about the epigenetics of hexapods after the recent discovery of methylation of several insect genomes. Previously, there was an assumption that methylation epigenetics was non-existent to insects because *Drosophila*, the most researched insect, has an unmethylated genome. *Oncopeltus fasciatus* was found to have a highly methylated genome, which makes it an ideal candidate to study epigenetics. Studying the genome, the insect was found to have a gene encoding DNA methyl transferase 1, which is responsible for methylating hemi methylated DNA. To discover the role of this gene, a knockdown of *DNMT1* via double stranded RNA was performed to test the function. Immunocytochemistry is being used to visualize the effect, if any, on superstructure of the ovary as it relates to fertility. It was hypothesized that this knockout will shorten the lifespan of the insect as well as reduce egg viability based on the role of methylation in development of offspring. It was found that by knocking out the *DNMT1* gene, lifespan was decreased as well as egg viability. More research is being done to find the effect of this gene in males as well as the effect of a different methyl transferase, *DNMT3*.

Negative Mentoring

Quan Sanders

Ben Bridges

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Undergraduate research experiences benefit undergrads in numerous ways, including academic, professional, and personal growth. Mentoring by a faculty member, postdoctoral researcher, or graduate student is a critical component of the research experience, and numerous studies have documented the outcomes of positive

mentoring experienced by undergraduate researchers. Conversely, there is little research on the negative and/or problematic aspects involved in the mentoring of undergraduate students in a research context. Additionally, research in workplace settings indicates that negative mentoring can have a greater influence on individuals than positive mentoring experiences. In spite of that, the impact of negative mentoring in undergraduate research is unknown. The purpose of this study is to investigate the different types of negative mentoring experiences that occur while undergraduate students work in an academic research environment in the USA. We collected data about negative mentoring experiences via online, open-ended surveys and in-depth interviews. Additionally, we analyzed survey, journal, and interview data from a national study performed by a collaborator. Our preliminary results show a range of negative mentoring experiences, some which have also been reported in studies on workplace mentoring and some experiences that appear to be unique to mentoring in academic research. Based on our findings, we present a model of the types of negative mentoring experiences that undergraduate researchers report, give a preliminary examination of student outcomes resulting from negative mentoring experiences, and discuss the implications our study has on understanding the effects of negative mentoring in undergraduate research experiences.

The Fate of Degraded Biotites in the Deep Critical Zone: Implications for the K-Uplift Hypothesis.

Sophia Chason Sanders

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The Calhoun, South Carolina Critical Zone (CCZO) research site provides valuable insight into the interactions between all biotic and abiotic components of an area. The critical zone encompasses everything that spans from the top of impermeable bedrock to the top of the trees, where geology meets biology. Biotites ($(K(Mg,Fe)_3AlSi_3O_{10}(OH)_2$) collected from a deep core in this research site are able to reflect the cycling of potassium, a factor of plant nutrition, at various depths. As biotite weathers and its compositional iron oxidizes, potassium is released from the mineral in order to satisfy a charge balance. More intensely weathered biotite is hypothesized to contain lower relative abundance of potassium due to higher levels of oxidation. In connection, potassium content of biotite near the surface will be less abundant, as these layers are more heavily weathered. Using the TENEON[®] Scanning electron microscope, oriented, sand-sized biotite grains were analyzed for chemical composition using energy dispersive spectroscopy (EDS) and imaged at a magnification of 5000x. Notably, weathered biotite grains displayed "frayed" ends when viewed perpendicular to the principle c-axis. Analysis of these weathered ends in

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comparison to less weathered grains yielded less relative percentage of potassium in the chemical composition. Resultant persistence of unfixed potassium in the near surface suggests that the degraded biotite can still serve as a stock for nutrient cycling. This leads to a new idea, whereby in the oscillating, reducing, and oxidizing cycle there is the potential for these degraded biotites to act as refugia for potassium in the near surface.

The Effects of Promoting Minority-Owned Businesses to Socially Conscious College Students

Jake Elijah Sandor, CURO Research Assistant
Dr. Jenny Gaver, Accounting, Terry College of Business

The purpose of this research is to investigate the effect of promoting minority-owned businesses to college students interested in social welfare. We believe this is an important initiative because in Athens it often feels as though there is a disconnect between the Athens community and UGA students. We feel that a great way to bridge that gap and promote values of social justice is to make students aware of the wealth of minority-owned small businesses Athens has to offer. To do this, we devised an advertising campaign that asserts that patronizing small businesses and businesses run by historically marginalized groups advances goals of social justice and community development to a target audience of socially-responsible college students at UGA. We are partnered with Mokah Johnson of the Athens Anti-Discrimination Movement, and will be advertising on behalf of the Athens Black Market; a monthly community event meant to showcase local black owned businesses within Athens. We will promote the event to students via fliers, websites, press release, radio promo, t-shirts, and other forms of advertising. Our data will consist of tracking the Athens Black Market's number of goods sold, gross sales, and average purchase price over a three month period. We will then cross-analyze the data collected with the influence of our ad campaign, with previous Athens Black Market events, which will act as a control group.

Non-Invasive Assessment of Tree Roots in a Suburban Environment

Tierra Sanford
Dr. Daniel Markewitz, Forestry, Warnell School of Forestry and Natural Resources

Root systems are vital for the uptake of water and nutrients to vascular plants, and often, trees located in urban settings experience disturbances that could damage their roots, and thus, their health. In order to identify the extent of root systems in urban areas, Dr. Markewitz has been testing the use of electromagnetic induction (EMI) and electrical resistivity (ERT). Six trees were previously sampled in the Bartlett Arboretum in NC including EMI, ERT, and root

excavations. Data were analyzed for a single tree to see if the locations of large, lateral roots could be predicted. For this project, the data for the remaining five trees will be analyzed and incorporated into a final analysis. Composites of multiple root images taken during excavations are overlaid with EMI and ERT data to determine if these non-destructive methods can be used to assess root locations. Initial analysis of one willow oak (*Quercus phellos*) found only weak correlations between geophysical measures and root locations.

Autophagy and VSV in Vero Cells

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Autophagy is a cellular recycling mechanism, enabling cells to degrade and reuse some of their components. Many viruses take advantage of autophagy for efficient replication. While others have observed that virus replication benefits from autophagy, the specific cellular requirements for optimal virus growth are not well defined. To better understand the requirements of cellular autophagy that viruses require, we utilized a panel of drugs that are known to induce or inhibit cellular autophagy. We hope to use these results to further our understanding of how a natural cellular process can be manipulated to yield decreased viral titers. We used vesicular stomatitis virus (VSV-G) and vesicular stomatitis virus (VSV) pseudo particles expressing the Lassa virus glycoprotein (VSV-LASV) to determine if the autophagy inducers/inhibitors altered virus production in Vero cells. Our first experiments used a reporter gene, luciferase, as a surrogate of virus infection. Approximately 15 compounds decreased luciferase activity below 20% of control. To confirm they inhibit virus replication and not just prevent reporter gene expression, secondary screening examined the ability of the compounds to decrease VSV titers. Once confirmed to block VSV replication, we performed time-of-addition assays to determine the step in the viral life cycle that the drug is inhibiting. These studies are currently ongoing. This will ultimately provide us with sufficient data to determine wherein the viral life cycle our molecules are inhibiting viral production and provide further insight into how the virus uses the autophagy process during replication.

Determining Activity Levels of Monoclonal Antibody 109 on Various Lengths of a Fragment of a Pancreatic Ductal Adenocarcinoma Glycoprotein

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Carcinoembryonic antigen cell adhesion 6 (CECAM6) has been identified as a glycoprotein that is unique to Pancreatic

Ductal Adenocarcinoma (PDAC) cells. Further research of CEACAM6 and C6f1, a fragment of CEACAM6, was done in order to determine if the glycoprotein could be used as a diagnostic marker for PDAC. Inhibition assays were done to determine the lowest concentration at which monoclonal antibody 109 (MAB109) could recognize and bind to C6f1. Multiple truncations for C6f1 were made to determine where on the glycoprotein sequence the antibody binds. The truncated versions of C6f1 were tested using inhibition assays to determine if MAB109 could still bind to the glycoprotein. Inhibition of C6f1 by MAB109 was seen until the concentration of C6f1 was reduced to 0.0062 ug/ul. This shows that MAB109 can be used as an effective diagnostic technique since it can detect C6f1 at low concentrations. Inhibition activity was seen when the 6' truncation of C6f1 was used but inhibition was lost when the 10' and 11' truncation were tested. The loss of inhibition shows that there are key amino acids on C6f1, which MAB109 binds to in the section that was deleted.

Towards Elucidation of Spore Glycan Formation

Neeraja Sarda, CURO Research Assistant

Dr. Maor Bar-Peled, Biochemistry and Molecular Biology, Franklin College of Arts and Sciences

My research investigates the glycans on the extracellular matrix of the bacteria endospore. Glycans are polymers of different types of sugars and are involved in cell-to-cell signaling, cell protection, recognition, and adherence. The spores of some bacteria consist of an outer layer element that is composed of various types of glycosylated-proteins, glycoprotein. Although considerable progress was made, the exact function of all spore glycoproteins remains elusive. Research of the structure, synthesis, and function of the unknown glycans enables the understanding of the biological role of these glycans. The laboratory has identified several genes involved in the synthesis of glycoproteins in spores. My research objective is to clone the genes, express the proteins in *E. coli*, purify and study their enzyme specificity. PIPE cloning is the method I am using to clone the individual genes from *Bacillus cereus*. The genes will be cloned into expression plasmids that can be induced to express the genes in *E. coli*. The PIPE cloning primers will be designed to express a single gene or a combination of different known genes in the pathways. Following cloning, the analyses of an individual protein or several proteins will be determined by liquid chromatography mass spectrometry, LC-MS/MS. It is possible that the spore glycoproteins enable endurance to bacteria and or help in the infection process. Spores are not unique to *Bacillus* and other harmful human bacteria like *Clostridium difficile* also produce glycoproteins. This research will provide new insights to the process.

Antisaccade Task and How it Correlates with Intelligence

Nicole Schlosberg

Dr. Jennifer McDowell, Psychology, Franklin College of Arts and Sciences

Saccades, which are rapid eye movements between fixation points, are used to study the influence of cognitive processes, and the antisaccade task is used to test the executive function of inhibition. In the antisaccade task, the participant focuses on a fixed target, and a stimulus appears either to the right or left of the fixed target. The participants naturally want to look in the direction of the stimulus as it is a reflex-like action, but they must look in the exact mirror location of that stimulus. The antisaccade task tests the brain's ability to inhibit the reflexive saccade. These saccades are measured with infra-red eye tracking equipment. This study utilized the Mini-Mental State Examination (MMSE), which is a set of common questions used to test general knowledge. The participants recorded their grade point average (GPA), which converts academic grades into a numerical scale ranging from 0.0 to 4.0. This study investigated the correlation between antisaccade tasks, MMSE scores, and GPAs of undergraduates at the University of Georgia, which were recruited through the undergraduate research pool using SOMA. It is hypothesized that the participants with higher GPAs will have higher MMSE scores, and those participants with higher GPAs and MMSE scores will do better on these antisaccade tasks. This is scientifically relevant because it shows how the antisaccade task assesses measurements of higher order cognitive processes including inhibition and thus gives insight into how general fluid intelligence relates to cognitive control.

The Application of the Odious Debt Doctrine to the Debts of the Maduro Regime in Venezuela

Jillian Schmidt

Tim Samples, Insurance, Legal Studies, and Real Estate, Terry College of Business

Venezuela is undergoing a full economic, political, and social collapse. As the government misses payments on external debt obligations—including debts owed to China, Russia, and Wall Street investors—a crucial element of this crisis is coming into focus. Venezuela's debt defaults will have important geopolitical, financial, and humanitarian implications. Expected to exceed 1,000% in 2017, hyperinflation is raging out of control. 93% of Venezuelans cannot afford regular food, which has led to dramatic weight loss and outright starvation. Restructuring the country's unsustainable debt burdens is key to Venezuela's recovery. Some have proposed that a successor government to the current regime could invoke the odious debt doctrine to avoid repaying illegitimate debts raised by the Maduro administration. In this paper, I discuss whether debt incurred

by the Maduro regime of Venezuela could in fact be categorized as odious and, thus, be repudiated. In analyzing both the original odious debt doctrine and precedent situations, I find that the doctrine would, in theory, apply to Venezuela's situation. Despite this, the practical application of the doctrine is highly complicated and unrealistic. Extensive resources are needed to adjudicate the odious debt doctrine question, accurate records for making debt-by-debt distinctions are scarce, and long-term negative externalities loom large. In Venezuela's restructuring efforts, I recommend a narrow application of the odious debt doctrine. In negotiations with creditors, Venezuela could use the odious debt doctrine to obtain greater debt relief in eventual restructuring deals.

Effects of Parkinson's Disease on Neural Network Interactions and Motor Activity

Margaret Schroyer, Ramsey Scholar

Dr. Tarkesh Singh, Kinesiology, College of Education

Neurological conditions such as Parkinson's disease (PD) cause changes in the subcortical and cortical structures of the brain that affect interactions between different neural networks. This has a direct effect on motor function. In this project, I will study electrophysiological activity and motor function in healthy individuals and individuals with PD. A KINARM robot (BKIN Technologies, ON, Canada) integrated with eye-tracking and virtual-reality will be used to measure motor function. Experiments will be developed in MATLAB using the PsychToolbox package. Additionally, in a second experimental paradigm, a 143-channel magnetoencephalography system (Brain Imaging Research Center, UGA) will be used to track electrophysiological activity in the brain. This research will aim to identify the effects of structural changes in the brain during PD on the dorsal and ventral visual streams of the brain. The dorsal stream processes the location of objects in the field of vision, while the ventral stream identifies those objects. The focus of the research will be the interaction between the two streams during planning of reaching movements. We expect that, in individuals with PD, motor deficits will occur as a result of disruptions in online interactions between the dorsal and ventral streams. This research will contribute to the body of knowledge about the interaction between the dorsal and ventral visual streams and will have implications for patients with PD and other neurological problems.

Organocatalytic Synthesis of Bioactive Amines

Hannah Charlesean Schriever, CURO Research Assistant

Dr. Douglas M Jackson, Chemistry, Franklin College of Arts and Sciences

Neurotransmitters can be readily synthesized by the decarboxylation of naturally occurring amino acids. Most

ketones and aldehydes have the ability to decarboxylate amino acids, however many are toxic and produce significant byproducts. The UGA Research Foundation has been awarded a full utility patent for the production of these target compounds using the green organocatalyst carvone, commonly known as spearmint oil. Carvone replaces toxic catalysts, which are the current industry standard, providing a faster, safer route for the production of neurotransmitters, such as dopamine and serotonin, and other pharmaceutically relevant bioactive amines, like histamine and cadaverine. This reaction has the potential to synthesize amines that, in combination with advancements in nanoparticle drug delivering technology, may be used to treat conditions like Parkinson's Disease, schizophrenia, and depression. The present work attempt to explain carvone's greater selectivity relative to other ketones, to determine the rate limiting step, and to investigate the effects of electron withdrawing substituents on the rate of reaction. These goals were pursued through the application of computational chemistry methods to determine electrostatic properties of key intermediates and to compute the free energy path of decarboxylation for the catalysts carvone and five para-substituted acetophenone derivatives. These data will inform synthetic efforts in the laboratory, where microwave synthetic techniques will be used to test these various catalysts on the target amino acids with the goal of catalyzing the decarboxylation of L-DOPA and 5-hydroxytryptophan to synthesize the neurotransmitters dopamine and serotonin.

Fall Conditions Trigger an Altered Flight Metabolic Rate in Monarch Butterflies, *Danaus plexippus*

Hayley Adair Schroeder, CURO Research Assistant

Dr. Sonia Altizer, Ecology, Odum School of Ecology

Long-distance migration requires physiological changes to prepare for and sustain energetically costly movements. Some migrants, such as the monarch butterfly (*Danaus plexippus*), atrophy reproductive organs and enter reproductive diapause prior to undertaking their fall migration. It is likely that other physiological changes accompany this diapause to allow migratory monarchs to survive the 3,000-km migration each year from breeding sites as far north as Canada to wintering sites in Central Mexico. A previous study found that North American migratory monarchs demonstrated a lower flight metabolic rate than monarchs from resident populations in Costa Rica and South Florida that breed year-round and do not migrate. In this study, I investigated whether similar differences in flight metabolism are present between migratory vs. non-migratory monarch generations within the eastern North American population, which might indicate plasticity in flight metabolic rate. I reared monarch caterpillars in incubators set to conditions that mimicked temperatures

and photoperiods of either fall (migratory) or summer (non-migratory) generations. As adults, the monarchs were tethered to a flight mill to induce 10 minutes of continuous flight. Oxygen consumption was measured immediately post flight as a proxy for metabolic rate. Results showed that monarchs reared under fall conditions demonstrated a significantly lower flight metabolism than monarchs reared under summer conditions. There was no statistical difference in resting metabolic rate. These findings suggest that the pre-migratory physiological state is associated with changes that conserve energy during flight, and that monarchs are able to undergo trans-generational shifts in flight metabolism.

Environmental Enrichment of a Captive Colony of Wild-Caught White Ibis

Kenzie Schwartz

Dr. Sonia Hernandez, Forestry, Warnell School of Forestry and Natural Resources

Environmental enrichment is applied to promote freedom to express normal behaviors with the assumption these behaviors play a key role in keeping animals healthy. When conducting research, specifically with wild-caught animals, we have a legal and ethical responsibility to optimize an animal's overall well-being. As part of a comprehensive research project involving a captive colony of American White Ibis (*Eudocimus albus*), we examined multiple methods of nutritional environmental enrichment that would encourage their natural foraging probing behavior. We supplied the birds with two naturalistic enrichment devices, (tub of sand and tub of water), and an artificial item (cardboard puzzle-box with holes). We hypothesized that 1) ibises would prefer items that mimic natural items, 2) the more these enrichment items were used, the more the ibises would engage in natural behaviors that indicated lower levels of stress, and 3) factors including sex, age, and size would influence the frequency of item use due to competition and social order. We observed 24 ibis over the course of three months, recording their behaviors. We also observed the birds using the enrichment items, recording how often each bird used each item. Our results indicated that ibises preferred the sand tub over the water tub or the cardboard puzzle-box. Furthermore, the size of the birds and if ibis were male were both positively correlated with the frequency with which they used enrichment items. Age did not influence how often enrichment was used. Surprisingly, the use of enrichment did not influence the expression of natural behaviors.

Examining the Racial and Economic Dimensions of Youth Arrests in Athens-Clarke County

Elijah Scott, Foundation Fellow, CURO Research Assistant
Dr. Sarah Shannon, Sociology, Franklin College of Arts and Sciences

Minority youth, especially African-American youth, are overrepresented in the juvenile justice system nationwide. Previous studies have assessed whether such trends are consistent in certain urban and rural environments and for specific types of crimes. This paper's scope of analysis is unique in four ways. First, this paper studies first-time youth offenders, a subset of the population in the criminal justice system that has rarely been examined. Second, while some studies focus on certain types of crimes exclusively such as violent crimes or drug crimes, this paper studies offenses that are minor misdemeanors, as defined by the standards of a local diversionary youth program. Third, this paper examines Athens, Georgia, a setting that is often overlooked as most studies explore urban or rural areas. Fourth, this paper compares both the offender's home address and offense location to measures of child poverty and racial segregation to identify the relative importance of neighborhood effects and place-based policing strategies, respectively. In this way, this paper seeks to contribute to the literature on the spatial ordering of crime and indicators of disadvantage via neighborhood effects for first-time youth offenders in a college town. This paper finds that there is a statistically significant positive correlation between a first-time youth offender's home address and measures of child poverty and racial segregation. The correlation between offense location and measures of child poverty and racial segregation is statistically insignificant, mainly due to the fact that offense addresses exhibit strong clustering around schools, shopping malls, and commercial locations.

The Effect of a Cognitive Task on Gait Velocity and Reaction Time during Planned and Unplanned Gait Termination

Kendall Scott

Dr. Robert C Lynall, Kinesiology, College of Education

The dual-task gait paradigm combines a cognitive and motor task and has been used to invoke motor deficits during gait; particularly in multiple sclerosis patients and individuals with head trauma. Transitional gait states, such as termination, are more challenging than steady-state walking. We aimed to identify differences in gait velocity and reaction time during planned and unplanned gait termination with and without a cognitive task. Participants performed four types of gait protocols; planned termination (stopping at a predetermined location) with and without a cognitive task (counting backwards by 6's or 7's), and unplanned termination (stopping at an audible tone) with and without a cognitive task. We hypothesized that the slowest reaction

times and velocities would be observed during unplanned termination with a cognitive task. After analysis, significantly slower reaction times ($p < 0.001$; cognitive: 0.35 ± 0.02 s; no cognitive: 0.26 ± 0.01 s) and velocity ($p < 0.001$; cognitive: 0.91 ± 0.03 m/s; no cognitive: 1.05 ± 0.04 m/s) were observed during cognitive task trials as compared to no cognitive task trials. There were no significant differences between planned and unplanned termination ($p > 0.633$). It is likely that the significant differences in velocity and reaction time in dual-task scenarios are caused by conservative gait adaptations to the additional cognitive task. However, the same effects were not seen during unplanned gait termination, suggesting that transitional gait states such as termination may not cause the same effect.

A Secondary CRISPR-Cas9 Knockout Screening for Gene Targets Inducing Beige Adipocyte Formation

Kendall Seese

Dr. Hang Yin, Biochemistry and Molecular Biology, Franklin College of Arts and Sciences

Obesity has reached epidemic proportion in the United States and become the number one risk factor for type 2 diabetes, stroke, and cardiovascular diseases. White adipose tissue (WAT) mainly functions to store energy and is abnormally accumulated in obese people. In contrast, brown adipose tissue (BAT) consumes energy thermogenically and hence holds promise to prevent obesity. Adult humans have very limited amount of BAT. However, it has been shown that “brown-like” adipocytes (also known as beige adipocytes) can be induced within WAT. Beige adipocytes are thermogenic cells that express uncoupling protein 1 (Ucp1). An increase of beige adipocytes protects against the development of obesity and type 2 diabetes in animal models and improves glucose tolerance in humans. However, how to safely and efficiently induce beige adipocyte formation remains largely unknown and warrants further study. Previously, the Yin lab conducted a genome-wide CRISPR-Cas9 knockout screening for gene targets that involve in the differentiation of WAT progenitor cells into Ucp1⁺ beige adipocytes. Of ~16,000 gRNAs in the library of the primary screening, 14 gRNAs were identified and bioinformatically predicted to target (knockout) 10 candidate genes. A secondary screening for these gene targets that putatively control beige adipocyte formation is currently being performed to confirm the efficacy in inducing beige adipocytes. Lentiviral constructs for each gRNA are made individually and packaged lentivirus is being used to infect primary cell lines of WAT progenitor cells. The result from testing the first gRNA is promising: a qPCR analysis of beige adipocyte markers in differentiated progenitor cells revealed increased expression levels of *Ucp1* as well as mitochondrial markers, indicating robust induction of beige adipocytes *in vitro* by the gRNA. The efficacies of other 13 gRNAs will be tested by the same approach.

Protein Expression of *bclA* Gene in *Bacillus cereus*

Patrick Thomas Seethaler, CURO Research Assistant
Dr. Maor Bar-Peled, Biochemistry and Molecular Biology, Franklin College of Arts and Sciences

My research involves the study of *Bacillus cereus*, a pathogenic bacterium that leads to food diseases and belongs to a larger group of highly similar bacteria that cause the horrific anthrax or kill insects. This bacterial group is very successful, and they can be found everywhere: in soil, water, animal and human bodies, vegetation, rice seeds, or powder milk. Very common for these bacteria is the formation of resilient spores, the infectious vehicle. The outermost surface of the spore consists of a layer of proteins that are decorated by sugars, so called glycoproteins. The nature of the glycoproteins and their sugar sequences vary and some structures remain unknown. Some sugars are modified by methylations. We hypothesize that different sugar decorations may sustain the bacteria to its host. The BclA glycoprotein in particular is the most abundant outer-layer spore protein and is shown to contribute greatly to *Bacillus cereus* infection. The sugar methylation has remained largely unknown up to now. In my research, I identify *B. cereus* genes encoding enzymes involved in methylation. I purify each corresponding enzyme by an affinity column and test the specific activity using various substrates. The enzyme product(s) are separated by HPLC and monitored by mass spectrometry after HPLC separation. So far the preliminary data showed that my research had identified unique methyl transferase that will be characterized during the funding period. This research may have an impact related to biology of other notorious spore-producing human pathogens.

Nursing Home or Staying Home: The Impact of Medicaid Home and Community-Based Services (HCBS) Waivers on Long-Term Care Choices

Aly Shakoor, CURO Honors Scholar

Dr. Meghan Skira, Economics, Terry College of Business

Long-term care for the elderly in the United States takes place in a variety of locations, including the home, assisted living facilities, and nursing homes. When surveyed, most elderly individuals state that they would prefer to receive such care at home rather than in an institutional setting. Home and Community-Based Services (HCBS) Waivers provide opportunities for Medicaid beneficiaries to receive long-term care services in their own home or community. States develop their own waiver programs and determine the eligibility requirements and services offered (e.g., assisted living care, formal home health care, caregiver respite). We exploit variation in these waiver programs both across states and within states over time to investigate how the availability and features of these waiver

programs impact the long-term care choices of the elderly. Exploiting this variation requires first finding, organizing, and categorizing information on different state programs, a task that is currently in progress using state applications to the Centers for Medicare and Medicaid Services. Significant results from this study have the potential to impact the design of future waiver programs, which in turn could influence the future care choices of the elderly.

Evaluating Mitochondrial Capacity and Muscle Endurance in Individuals with Parkinson's Disease

Nivita Sharma, CURO Honors Scholar, CURO Research Assistant

Dr. Kevin McCully, Kinesiology, College of Education

Parkinson's disease (PD) is a neurodegenerative disease that leads to progressive deterioration of motor and mental function. Participants with PD experience muscle tremors, and there is evidence for mitochondrial dysfunction in the pathology of the disease. We hypothesize that participants with PD will have decreased skeletal muscle endurance and mitochondrial capacity. Participants with PD and one healthy matched control were recruited and tested. Skeletal muscle endurance in the dominant forearm was determined from changes in twitch contraction acceleration using electrical stimulation at 2, 4, and 6 Hz and a tri-axial wireless accelerometer. Mitochondrial capacity in the dominant forearm was measured as the rate of recovery of muscle metabolism after electric stimulation exercise using near-infrared spectroscopy and a series of arterial occlusions. Data from four participants with PD and one healthy matched control have been analyzed. The mitochondrial capacity rate constant for participants with PD was $1.29 \pm 0.35 \text{ min}^{-1}$ (95% CI: 1.03, 1.54) and the rate constant for the healthy control was 1.91 min^{-1} . The rate constant for the healthy control was greater than the 95% CI, suggesting that participants with PD have impaired mitochondrial capacity. In conclusion, we are continuing recruitment and testing of participants. In addition, we will include a measure of muscle endurance in our results. Few studies have measured skeletal muscle metabolism in participants with PD. Our study can improve the understanding of the role of mitochondria in the pathology of PD.

Examining the Effects of a Diabetes Foot Care Intervention Program in Fiji

Nivita Sharma, CURO Honors Scholar, CURO Research Assistant

Dr. Paula Davis-Olwell, Epidemiology and Biostatistics, College of Public Health

Fiji has the third highest rate per capita of diabetes in the world and has the largest number of diabetes related amputations in the Pacific Islands. Diabetes Fiji Inc.

implemented an intervention program in rural and urban communities throughout Fiji to raise awareness and educate diabetic patients about foot care and diabetic complications in the feet. To evaluate how successful the intervention program was, assessments measuring knowledge, attitude, and practice toward foot care were administered to 110 diabetic patients in the Central Division of Fiji before and after the intervention program was implemented in their communities. Paired *t*-tests of the responses to the assessment questions revealed that there was a significant increase (all *p*-values < 0.01, except for one *p*-value, which was less than 0.05) in the scores of the responses indicating improved knowledge, attitude, and practice toward foot care. Regression analysis controlling for patient demographics demonstrated that the intervention program was successful in increasing knowledge, attitude, and practice toward foot care. Further steps must be taken to determine if the intervention program has reduced the number of diabetes related amputations and hospital visits. The overall success of this intervention program suggests that other countries can implement similar public health models to educate diabetic patients about foot care.

Investigating the Role of Inflammation and Hypercoagulation in Placental Malaria

Sachi Shastri, CURO Honors Scholar

Dr. Julie Moore, Infectious Diseases, College of Veterinary Medicine

Despite global efforts toward elimination, malaria continues to pose a significant public health risk for pregnant women in Sub-Saharan Africa. Placental malaria (PM) is a severe manifestation of malaria infection caused by the parasite, *Plasmodium falciparum*. PM often leads to the development of adverse maternal-fetal outcomes such as maternal anemia, preterm delivery, and pregnancy loss. These outcomes are driven by the sequestration of infected red blood cells in the placenta, which impairs nutrient exchange between mother and child. Dr. Julie Moore's laboratory is interested in the impact that key host responses to infection may have on pregnancy loss. Thus, we use our own mouse model of PM as a tool to investigate how inflammation and hypercoagulation contribute to malaria-induced pregnancy loss. My work involves the use of various molecular techniques to address the hypothesis that gene expression of the major proinflammatory cytokine, tumor necrosis factor (TNF) and major mediator of coagulation, tissue factor (TF) will be elevated in the conceptuses of infected, pregnant mice. The findings from my work could potentially advance our understanding of the key mediators involved in PM associated fetal compromise as well as inform future *in vitro* and *in vivo* studies within the lab.

The Status of Postmodern Aesthetics in Contemporary British Literature

Alexander Sheldon

Dr. Adam Parkes, English, Franklin College of Arts and Sciences

The heritage of literary modernism has been mapped out extensively, in pivotal critical works such as David James' 2011 work, *The Legacies of Modernism*, yet contemporary fiction's relationship to postmodernism in many ways remains to be explored. My research seeks to clarify the trajectory of the novel over recent decades by identifying conventions shared between the postmodern and contemporary eras. A vital link between the periods will be established through juxtaposing the contemporary novelist Tom McCarthy with the postmodern writers J.G. Ballard and Jean Baudrillard. McCarthy's unconventional narrative style continues his predecessors' efforts to unhinge language and reality from the persistent binaries on which modernist art turns: fake and real, surface and depth, commercial and artistic. However, McCarthy deviates from his antecedents' commitment to passive, neutral observation of the postmodern phenomena of simulation and simulacra; McCarthy's narration bears palpable traces of trauma in the face of simulated existence, which collapses notions of depth and history. To examine the subtler threads of postmodern aesthetics within contemporary literature, my research will probe novelist Kazuo Ishiguro, whose work combines elements of realism with postmodern narrative techniques. Ishiguro's narrators speak in precisely stylized patterns that conflict with conventional lexical and syntactic usage. Furthermore, the reader of Ishiguro often finds no tangible division between the mind of the narrator and the external world. Considered together, these four authors add vital detail to the genealogy of English literature, allowing us to see how postmodern aesthetics continues to shape British fiction in the twenty-first century.

Internet and Social Media Impact on the Creative Process

Riley Shivitz

Dr. Lilia R Gomez-Lanier, Textiles and Merchandising, College of Family and Consumer Sciences

Today we live in a digital age where the internet and social media are omnipresent. The internet and social media have become dominant roles in higher education due to the increased availability of resources for students in the past decade. The fast-paced and continually advancing web and media environment students live in is impacting their creative processes and decision making. The goal of this research is to determine how the internet and media affects and plays a role in the creative process of individual students in higher education. The quantitative data will be collected using an online survey developed by the student and mentor faculty member and subsequently completed by

undergraduate and graduate students within the College of Family and Consumer Sciences at the University of Georgia. The qualitative interview portion of the data collection will help strengthen the study's findings by providing a richer perspective of student's perceptions.

The Effects of Age on the Relation of beta-Carotene, Lutein, and Zeaxanthin on Cognitive Performance in Adults

Raman Shrestha, CURO Research Assistant

Dr. Steve Miller, Psychology, Franklin College of Arts and Sciences

Oxidative stress damages brain tissue, causing changes in neural structures and decline in cognition. Neural damage may be countered by the antioxidative carotenoids: beta-carotene (B-C), lutein, and zeaxanthin (L&Z). However, these protective effects may differ in younger and older adults. This study examined the moderating effect of age on the relationship between carotenoids (main predictor) and cognitive tasks (sustained attention and executive function (EF)). 50 older adults (M=71.8 years; SD=5.90 years) and 35 younger adults (M=20.6 years; SD=2.09 years) participated in this study. Carotenoid concentrations were assessed using blood serum. Attention and EF were assessed using the Continuous Performance Task (CPT) and Shifting Attention Task (SAT) from the cognitive battery CNS Vital Signs. Four hierarchical regressions assessed the age-moderated effect of carotenoid levels on cognitive scores by inputting the main predictor, then the moderating variable age, and then the interaction term. The main effect of age was significant ($p < 0.001$) in all the regressions, such that younger adults performed better than older adults on the CPT and SAT. There were no significant main effects for L&Z on either task controlling for age; however, beta-carotene significantly predicted SAT performance across age groups ($p = 0.014$). Additionally, there were no significant age-carotenoid interactions. As expected, our study found age-related differences in attention and EF. Although age was not a significant moderator, we demonstrated a novel finding that beta-carotene predicted EF in both younger and older adults. Our results suggest that beta-carotene may be important for executive functioning across the lifespan.

Physicians' and Pharmacists' Perceptions about Patient Education and the Use of Opioid Medications

Dhairya Shukla, CURO Research Assistant

Dr. Henry Nolan Young, Clinical and Administrative Pharmacy, College of Pharmacy

Abuse of prescription opioids is a severe problem that affects the health, social, and economic welfare of the United States and was declared as a national emergency by President Trump in 2017. Health care providers wrote 259 million prescriptions for painkillers in 2012, enough

for every American adult to have a bottle of pills. This issue is further complicated by the duty of a healthcare team to confront negative impacts of abuse while preserving the fundamental role played by prescription opioids in reducing human suffering. Prior studies have been conducted to address patient education; however, evidence suggests that patients are still not knowledgeable about the abusive potential of opioid, including sharing and disposal of opioids. Additionally, patients have no recall of receiving this information from their healthcare providers. This study aims to understand physician and pharmacist perceptions about educating patients on the safe and appropriate use of opioids. Focus group interviews will be conducted in communities across Georgia. Focus group transcripts will be analyzed using NVIVO analysis software to identify key themes. Four focus groups have been completed and preliminary data suggests that creation of a partnership between physicians and pharmacists with a shared standardized curriculum to provide and reinforce information to patients may bolster patient education about opioids. The translational goal of this study is to increase the efficacy of the healthcare team in conveying information to patients about opioid use and to reduce opioid abuse in the United States.

Evaluating the Effects of Neonicotinoid Pesticides on Male Reproduction by Using a Novel *in vitro* Stem Cell-Based Model of Human Spermatogenesis

Joshua Samuel Siar

Dr. Chas Easley, Environmental Health Science, College of Public Health

Sperm counts of men in North America, Australia, Europe, and New Zealand are plummeting. There has been a 52% decline in sperm concentration, and a 59% decline in total sperm count over a nearly 40-year period ending in the year 2011. This phenomenon is uniquely occurring in developed countries, and it is therefore important to investigate the ubiquitous environmental toxicants that may be contributing to decreased sperm counts in these men. Neonicotinoids, or neonics, are a relatively new class of synthetic insecticides that are chemically similar to nicotine. Two neonics, Imidacloprid and Thiamethoxam, are some of the most widely used insecticides in the developed world. Studies have shown that neonics can act as an inadvertent contraceptive for bees, cutting live sperm in male bees by almost 40%. In our project, we focus on determining the potential reproductive toxicity associated with exposure to the insecticides Imidacloprid and Thiamethoxam. This is accomplished by using a novel *in vitro* stem cell-based model of human spermatogenesis. By being able to mimic the process of spermatogenesis, we can investigate whether exposure to Imidacloprid and Thiamethoxam may be disrupting the process of male

gametogenesis. Our preliminary results show no significant impacts of Imidacloprid and Thiamethoxam on total germ cell viability; however, we do observe a potential loss of haploid spermatids in the presence Thiamethoxam. These findings indicate that more research needs to be accomplished in order to determine whether Thiamethoxam and Imidacloprid may be contributing to the rise of male-factor infertility in Western men.

Exploring the Development of Educational Modules in Virtual Reality through Participant Observation

Tala Sidawi

Brian West, Jacob Ursrey, Prasant Joshi

Dr. Siddharth Savadatti, Environmental, Civil, Agricultural, and Mechanical Engineering, College of Engineering

ENGR 2120 (Engineering Statics) is a vital sophomore level engineering course that introduces students to various concepts upper level engineering courses will build off of. Students tend to find this course particularly challenging. The purpose of this study is to identify the challenges faced by current statics students and develop, in collaboration with students in CSCI 4830 (Virtual Reality), educational modules in virtual reality that can be used as learning tools by future statics students. The difficulties faced by students in the current semester will be determined primarily through participant observation and thematic analysis. Throughout the semester, a group of four undergraduate students will participate in separate sections of statics as teaching assistants, make observations on problematic concepts for students, and periodically analyze them to find commonalities in the students' understandings and struggles with the material, especially those relating to visual-spatial skills. These findings will be used to develop educational modules in virtual reality that can be used by students to better learn statics. It is hoped that, in the future, instructors will incorporate these modules into their lectures or provide them as additional resources for students to succeed in statics.

Effects of Tetrabromobisphenol-A on Cell Viability in Normal Rat Kidney Cells after Acute Exposure

Naomi Siddiquee, CURO Research Assistant

Dr. Brian Cummings, Pharmaceutical and Biomedical Sciences, College of Pharmacy

Brominated flame retardants (BFRs) are a class of organohalogens commonly added to commercial products such as computers, electronics, textiles, and furniture to reduce their flammability. BFRs have significant environmental persistence and have been reported to be detected in human blood and breastmilk. Further, BFRs have been reported to have adverse effects on humans and wildlife. As such, the mechanisms of BFR-induced

toxicity are actively being explored under the United States Environmental Protection Agency's Toxic Substance Control Act. Tetrabromobisphenol A (TBBPA) has the highest global production volume of any BFR. Previous research has shown that TBBPA causes nephrotoxicity in newborn rats; however, the mechanisms mediating this nephrotoxicity are unknown. In the present study, we used the MTT assay to measure the effects of TBBPA on cell viability in normal rat kidney (NRK) cells after 48 hours of exposure to 0.3, 1, 3, 10, 30, 60, 100, and 300 μM concentrations. Analysis of these data demonstrated an IC_{50} of 73.3 μM . These data will be used in future studies to determine the molecular mechanisms of TBBPA-induced renal cell death after subchronic exposure to low, environmentally relevant doses.

Effects of Personality on Immune System Function in the Cotton Rat (*Sigmodon hispidus*)

Madeline Siegel

Dr. Vanessa Ezenwa, Ecology, Odum School of Ecology

There is an increasing amount of evidence that animal personality traits are heritable and can play a role in predicting ecological outcomes for individuals and populations. Recent studies on this concept suggest that personality traits can be linked to the strength of an individual's immune response. For example, more introverted behavior in humans is linked to lower levels of pro-inflammatory gene expression (an indicator of a relatively weak biological immune defense), whereas higher pro-inflammatory gene expression and stronger immune defenses were seen in extroverts. We are further exploring these ideas in a wild mammal, the cotton rat (*Sigmodon hispidus*), an established model for human infectious diseases. Specifically, we are testing the hypothesis that risk-avoidance behaviors trade-off with immunological responsiveness, such that bolder individuals have higher levels of immune defense than those exhibiting shyness. Cotton rats were sampled using a standard capture-recapture method at three study sites in Athens, Georgia. Tests were performed to quantify personality traits and blood samples were collected to assess immune responses.

Effectiveness of Need-Supportive Physical Activity Summer Camp in Girls

Marlyse Sifre, CURO Research Assistant

Dr. Sami Yli-Piipari, Kinesiology, College of Education

Habitual physical activity (PA) is linked to obesity risk. Research has shown PA interventions to be successful short-term, but is limited to sustained change. Self-determination theory (SDT) postulates that a psychological need-supportive environment (i.e., one that supports competence, autonomy, and social relatedness) is effective in maintaining volitional motivation leading to sustained

PA. Although research has supported these tenets, there is limited evidence examining whether a summer camp intervention can sustain improvements in PA motivation and behavior. This study examined the effectiveness of a 5-day need-supportive summer camp to enhance self-determined PA motivation and behavior. Adolescent girls [$N=42$; $n=18$ overweight or obese girls (OW/OB, >85th percentile); $\text{Mage}=11.7\pm 1.1$] attended a 5-days camp and a completed a 12-week post-camp follow-up. At baseline, compared to OW/OB, healthy weight girls (HW) were similar in PA motivation (18.66 ± 3.52 , 19.88 ± 3.59 ; $p>.05$) and engaged in greater moderate-to-vigorous intensity PA (MVPA) (291.7 ± 46.4 vs. 185.4 ± 90.8 , $p<.05$). In PA motivation, the repeated measures analysis of variance results showed a significant within-subjects effect ($F[1,38]=6.83$, $p=.019$, $\eta^2=.29$). The within-subjects contrast analyses examining the growth trajectories showed a linear and positive growth pattern for OW/OB but a quadratic inverted U-shape for HW. Similarly, the analysis of covariance determined that the camp had a significant between-group effect on MVPA ($F[1,19]=21.63$, $p>.001$, $\eta^2=.52$) with OW/OB increasing their PA whereas HW PA remained stable. This study suggests that the psychological need-supportive summer camp was effective in initiating sustainable PA motivation and behavior change among OW/OB but not among HW.

Environmental Disasters and Mental Health: Southeast Asian Immigrants in the United States

Stella Sim

Dr. Denise Clark Lewis, Human Development and Family Science, College of Family and Consumer Sciences

This poster describes an outreach project that addresses the preparedness for and recovery from environmental disasters and how these influence Southeast Asian (SEA) immigrants' mental health. SEA immigrants in the United States are often isolated in low socioeconomic areas and have little to no access to or knowledge of available emergency preparedness agencies or mental health services. Consequently, they are at higher risk for long-term mental health effects from environmental crises, in part because of a lack of preparedness and difficulty with recovery. A literature search was conducted to identify what SEA immigrants need in order to cope with emotional distress after major environmental disasters. We found that after a disaster, immigrant communities experience higher incidences of depression, anxiety, and post-traumatic stress disorder. Information from the literature search and collaboration with SEA community leaders in communities along coastal Alabama informed the development of a resource manual for use by these SEA immigrant communities. This outreach project is significant because it will create a culturally responsive resource manual that will help these communities foster positive mental health

through increasing knowledge of and accessibility and to disaster preparedness and recovery resources and mental health services.

Effect of Ocean Acidification on Carbonic Anhydrase Activity and Photosynthesis in Hard and Soft Corals

Jacob Thomas Simon, CURO Research Assistant
Dr. Brian Hopkinson, Marine Sciences, Franklin College of Arts and Sciences

Corals live in a delicate symbiotic relationship with photosynthetic organisms called dinoflagellates. In this relationship, corals supply photosynthate; the production of which requires uptake of inorganic carbon by using an external enzyme called carbonic anhydrase. In addition, carbonic anhydrase also provides carbon for use in calcification by the coral itself. The efficiency of carbonic anhydrase is of critical importance to the survival of corals. As the global climate changes, rising atmospheric carbon dioxide will result in higher levels of dissolved carbon dioxide in the world's oceans. This study will examine the impact of rising carbon dioxide levels on photosynthetic and carbonic anhydrase activity in hard and soft corals. Several species of hard and soft corals will be grown in water with elevated carbon dioxide levels, as well as control groups grown in standard oceanic conditions. Carbon dioxide levels will be manipulated to mimic the predicted levels of the world's oceans in the year 2100. The activity of carbonic anhydrase and photosynthetic levels will be measured using mass spectrometry techniques. It is anticipated that the alteration of the water's chemistry caused by the higher levels of carbon dioxide will alter the activity of carbonic anhydrase and may change photosynthetic rates as well. Gaining a better understanding of how corals cope with elevated levels of carbon dioxide may illuminate the ways that reef ecosystems will be affected in the future.

Interactions Between Delusory Parasitosis Sufferers and the Medical Community

Elizabeth Slater
Dr. Nancy C Hinkle, Entomology, College of Agricultural and Environmental Sciences

Delusory Parasitosis (DP) is a multifaceted delusional disorder in which an individual believes that they are victims of parasitic arthropods, which may include spiders, mites, or worms, among others. Sufferers of this condition often experience both visual and tactile hallucinations that result in self-mutilation of the affected areas, which can be difficult for doctors to diagnose due to a lack of entomological training and awareness of this condition. Furthermore, once a diagnosis is made, convincing a patient that the cause of the sensations is a delusion can be very difficult considering the stigma and misinformation

regarding mental illnesses. This project aimed to determine the relationship between reported symptoms and reported medical response, accomplished through phone interviews and testing of environmental samples provided by the individual. We predict that misdiagnosis and poor interactions between the medical community and DP patients has alienated these individuals and has resulted in off-label usage of insecticides and medications. By understanding the relationship between the patient's symptoms and the response in the medical community, strategies can be created to help medical professionals properly diagnose and treat DP patients.

Jewish Investment in Education: Do Jewish Populations Make Different Investment Choices in Education

Michael Sloman
Dr. Josh Kinsler, Economics, Terry College of Business

This paper analyzes in what ways religion effects educational outcomes. Examining Jewish educational outcomes specifically, I determine that religion itself has some causal effect on educational attainment. I then further look at religion's effect on childhood investment using a multivariate analysis to determine whether different religions invest in their children at different rates. These results help explain potential theories that all vie to explain why Jews attain higher levels of education than expected. I argue that Jewish populations do in fact invest more in their children than other groups, and that these results support the theory that Jews, over time, have invested more in human capital than other groups. I then look at how Jews invest in their daughters specifically, but reach inconclusive results.

Neuron Proliferation in the Site of Ischemic Damage in a Canine Model

Sierra Megan Smith
Alisha Muscatwala
Dr. Buffy Howerth, Pathology, College of Veterinary Medicine

Dogs can be used as a translational model for the treatment of stroke in humans. In this particular model, dogs are experimentally stroked by vascular occlusion and then receive mesenchymal stem cells. Mesenchymal stem cells elaborate beneficial cytokines that may reduce ischemic brain damage and hasten healing. One question in this model is whether re-establishment of neurons in the area of ischemic damage is enhanced by stem cell treatment. I hypothesize that treatment of stroked dogs with mesenchymal stem cells will increase numbers of new neurons at the site of ischemic damage and the increase will be dose dependent. Proliferation and migration of neuroblasts to the site of damage will be evaluated in stroked dogs that received or did not receive various

doses of stem cells using immunohistochemistry for Ki67 (proliferation of neuroblasts) and doublecortin (neuroblast enumeration and migration), and the number of new mature neurons will be evaluated by immunohistochemistry for NeuN.

Multi-Functional Micro-Facial Alteration Toolkit for Face Recognition

Ryan Snowden, CURO Research Assistant

Dr. Larry Hornak, Electrical and Computer Engineering, College of Engineering

The effects of facial alterations on face recognition systems has been studied in the past, but these studies focused primarily on globalized or large localized alterations (e.g. barrel distortion or simulated rhinoplasty). This work focuses on the development of a MATLAB toolkit to computationally alter subject images in order to quantitatively assess the effect of specific micro-facial alterations on the performance of facial recognition algorithms. This tool allows for automated alterations of any extent (region size, structure position, orientation, alteration distribution) on any biometric images. This tool will be beneficial to researchers, students of biometrics, and biometric practitioners alike. The altered images will be analyzed using various facial recognition algorithms and the results will be compared to recognition scores of probe images in order to assess the overall effect of the alterations. It is expected that the face alterations will negatively impact face recognition of subject images, but the extent of this effect is uncertain.

Wireless Sensor Network for Real-Time Power Plant Conditions Monitoring

Daniel Snyder, CURO Research Assistant

Haram Lee

Dr. Leidong Mao, Biological and Agricultural Engineering, College of Agricultural and Environmental Sciences

One thing that has always plagued large factories is the inability to sufficiently and efficiently monitor and diagnose issues with large, multi-million-dollar pieces of equipment. Due to safety and financial concerns inside loud, intense factories, we have decided to implement a real-time wireless sensor monitoring network to provide up-time status and diagnose possible issues with the machinery inside a power plant. We will be using our knowledge of microcontrollers and sub-gigahertz bandwidth communication to create a mesh network of sensors that can monitor important data such as vibration, heat, and rotation. This wireless technology has benefits over hardwired technology because of its easy installation and reduced need for upkeep. The data will be displayed to the user through a graphical user interface (GUI). We can then create an application that sets calculated thresholds to let us know when machinery is

in danger of malfunctioning. We expect to see a positive change in the lifespan of heavy machinery when they are monitored by our mesh network. The reason for that is because our sensors will be able to notify the users when a certain threshold is reached, prompting a repair. We expect to improve the responsiveness and accuracy of required maintenance as well. This will not only benefit our users financially by reducing the need for newer equipment through maintenance, but this will also make extremely warm and loud power plants safer to occupy.

Phase-OTDR Distributed Fiber Sensor

Allen Victor Spain, CURO Research Assistant

Dr. Mable Fok, Electrical and Computer Engineering, College of Engineering

This paper presents a distributed sensor which utilizes phase-sensitive optical time domain reflectometry (-OTDR) in a method of monitoring variations in phase difference detected by a photodetector (PD). In -OTDR the coherence of the light source makes interference possible, and perturbations along the physical length of the fiber introduce a phase-difference between neighboring light beams traveling inside the fiber. Disturbances in the fiber can therefore be precisely measured in the temporal and spatial domain. This optical sensor utilizes a laser source that generates a narrow linewidth 1550 nm continuous waveform (CW), which passes into an electro-optic modulator transforming the CW into 10 ns square pulses. The resolution of the sensor is dependent upon the pulse width generated. A singular pulse will enter into a length of test fiber where the pulse will be scattered by external perturbations in addition to imperfections in the fiber's core. After various stages of signal filtration and amplification the signal can be converted into an electrical signal, by means of a PD, and sampled by a data acquisition instrument. Due to light's propagation speed, hundreds of traces can be acquired very quickly. The perturbed signal can then be compared to the unperturbed signal in order to determine the disturbance location. -OTDR sensors have a long sensing range and a higher resolution than conventional OTDR sensors. These sensors occupy a practical space in civil applications such as, railway health monitoring, pipeline leak detection, and intruder detection.

Inter-Religious Dialogue Between Orthodox Christians, Early Muslims, and Early Protestants

Jacob Sparks, CURO Research Assistant

Dr. Robert Foster, Religion, Franklin College of Arts and Sciences

This presentation seeks to rediscover a framework for modern inter-religious dialogue between Orthodox Christians, Muslims, and Protestants in the United States through examining the past religious dialogue between the

Orthodox and the Muslims of the Umayyad Caliphate as well as dialogue between the Orthodox and the early German Lutherans. This goal will be realized through historical and theological analysis of the writings of the Orthodox scholar John of Damascus (655-750 AD) on early Islam and analysis of the letters exchanged between the Orthodox Patriarch Jeremias II of Constantinople (1536-1595 AD) and the early Lutheran reformers regarding the theology of the Augsburg Confession. Through examining the explicit and implicit attitudes of these Orthodox authors towards Muslims and Protestants, it becomes possible to discover a positive way forward that allows for mutual understanding and love towards others of different beliefs as well real conversation and disagreement on important theological issues. It is hoped that this research will be able to rediscover practical methods for Orthodox Christians in the United States to understand their own faith and the faiths of Muslims and Protestants in order to recognize the humanity and worth of Muslims and Protestants as a result of them being made in the image of God.

Opportunity to Experience Pushes Many College-Aged Food Security Activists to Action

Sarah Elizabeth Spradlin

Dr. Maria Navarro, Agricultural Leadership, Education, and Communication, College of Agricultural and Environmental Sciences

Everyone has a passion—a motivation that keeps them from walking away from projects they love when things inevitably get hard. Everyone “cares” about starving children in Africa after watching a two-minute infomercial on television, but not everyone joins the field of fighting hunger. So what prompts an individual to action and determines the actions they take? What moments transform students interested in food security from bystanders to activists? This study first explored these questions through an in-depth literature review, investigating key issues within the developing social entrepreneurship world and what trends and attitudes have shaped those who work in it. It explored challenges faced by activists, particularly in the field of food security. A second part of the study involved qualitative research methods. Through open-ended interviews, the researcher explored the motivations behind UGA’s student activists finding that motivations are complicated, emerge early on, and are fueled by uniquely personal experiences facilitated by service, academia, and even political engagement. Using the results of this study, influencers such as advisors, peers, and university faculty can better facilitate growth by understanding individual student motivations for food security engagement as complex. They are combinations of opportunities such as on-campus organizations and relevant classroom conversation and build off experiences created in the pursuit of these opportunities. For the students

interviewed, environments that allow for and catalyze “aha” moments simply provide opportunities to explore their passions and build momentum until, as an interviewee aptly stated, “you just do it.”

Screening for Inhibitor Tolerance in *Saccharomyces cerevisiae* for Bioethanol Production

Vivek Reddy Sreepathi

Dr. Joy Doran Peterson, Microbiology, Franklin College of Arts and Sciences

Biofuels fuels, as an alternative renewable energy source, have become a method to reduce the demand for fossil fuels. *Saccharomyces cerevisiae* is used in the production of several industrial products including bioethanol because of its high fermentative abilities and ethanol tolerance. The strains used in this study were XR122N, an industrial corn conversion strain, and GHP1 and GHP4, two strains derived from XR122N. Second generation bioethanol production from lignocellulosic biomass requires a pretreatment step, allowing cellulose to become accessible for fermentation. By performing the pretreatment potentially inhibitory compounds are produced, resulting in reduced yeast growth and ethanol yield. To counter this, GHP1 and GHP4 were evolved to more effectively grow and ferment pretreated pine in the presence of inhibitory compounds. Previous analysis of the evolved strains has shown multiple genomic changes resulting in better tolerance to the inhibitor compounds, which will allow for increased ethanol production. The purpose of this experiment is to characterize and confirm the inhibitor tolerance of XR122N, GHP1, and GHP4. To accomplish this, the experiments will analyze the growth curve for GHP1, GHP4, and XR122N at various and standard inoculum sizes and at various inhibitor concentrations to test for the inhibitor threshold for each strain. The findings will show that both GHP1 and GHP4 grow faster and produce more ethanol than XR122N as the inhibitor concentration rises. By completing this experiment and comparing the different strains a further understanding of inhibitor tolerance by *Saccharomyces cerevisiae* will be gained that may allow for more efficient bioethanol production.

The Effects of Submaximal Exercise on Vascular Function when Challenged with a Psychosocial Stressor

Charity Starkes

Dr. Nathan T Jenkins, Kinesiology, College of Education

The aim of this research is to determine the effects of an acute bout of submaximal exercise on vascular function preceding a psychologically stressful activity. Healthy young adults both male and female will be asked to participate. During the initial visit, all volunteers will be asked to perform a baseline vascular assessment using Near Infrared

Spectroscopy (NIRS) technology and a maximal oxygen consumption exercise test to get a VO₂ max. Next, half the participants will be randomly assigned to do the stressor alone while the other half will be performing a bout of submaximal exercise (65%) prior to the stressor. A final vascular assessment will be performed on all participants. The stressor will consist of a Stroop test and a serial subtraction. Saliva samples will be taken throughout each visit to monitor cortisol levels. The anticipated results will be a statistically significant difference between the stressor only and exercise plus stressor groups. The stressor only group is expected to show a vast difference between their baseline assessment and their post-stressor vascular assessment. The NIRS results should show a slower recovery time of oxygen refill after the stressor. However, the exercise group should show a similar recovery time between their baseline values and post-stressor vascular assessment. The results are expected to display how submaximal exercise prior to a stressful event can blunt the negative effects that stress can have on the cardiovascular system.

Let's Make it a Popularity Contest: University Health Centers or Outside Health Services

Emily Starling

Dr. Juan Meng, Advertising and Public Relations, Grady College of Journalism and Mass Communication

University health centers are an important part of campus. At the University of Georgia (UGA), students pay a mandatory fee each semester to access the University Health Center (UHC), regardless of whether or not they use the services. Many students opt to seek medical care elsewhere. The hypothesis is that there's a common belief on UGA's campus that the UHC is not as effective as outside health services, and the research designed to figure out why. A survey and in-depth interviews were used for research. Since a person's health is a private topic, in-depth interviews were the best solution in order to uphold the privacy of the individual while also getting the most out of their participation. There were 167 survey responses and 6 in-depth interviews. After reviewing the responses, the survey found that this stigma was not fully held by students. 43% of students said it had a good reputation, which was the highest percentage of the study. The results of the surveys did not reinforce the hypothesis, but the in-depth interviews did. Based on conflicting results, more research should be conducted, students should also be informed better on the UHC fee, and physicians should have a better follow-up procedure in place. The UHC helps teaches about many ways to live a healthy life for students who might not have access to this at home. It's here to treat and teach, but it's often underutilized by students. If we can figure out why it's underutilized, we can gear it towards positive changes and increase interactivity.

Investigating Sphingolipid Manipulating Factors Impacts on Mesenchymal Stem Cell Morphology and Immunosuppressive Potency

Isaac Steinmetz

Dr. Luke Mortensen, Animal and Dairy Science, College of Agricultural and Environmental Sciences

Successful biomanufacturing of cell therapies requires an efficient, high yield production of homogeneously potent cells, but mesenchymal stem cells (MSCs) have been shown to have heterogeneous immunosuppressive potency within populations and between donors. The objectives of this project are to investigate the possibility of rescuing MSC potency by testing the immunosuppressive impact of several sphingolipid manipulating factors (SMFs) and use high content imaging to investigate morphological changes that may predict MSC potency. Cells were treated with the two SMFs amitriptyline and sphingosine-1-phosphate, and then high content imaging was used to determine the morphological impact. In the process cells were stained with one of three dyes: a nucleus dye (NucBlue), a cytoplasm dye (CellTrackerRed) and a lipid raft dye such as (Vybrant Alexa Fluor 488 Lipid Raft Labeling Kit). These results were analyzed using R studio to conduct principal component analysis and logistic regression to determine any morphological changes caused by the SMFs. Then, the treated MSCs were subjected to an Indoleamine 2,3-dioxygenase 1 (IDO) assay to determine the immunosuppressive impacts. Catabolism of L-tryptophan to kynurenine maintains an immunosuppressive microenvironment and IDO is a rate limiting enzyme making it a good indicator of immunosuppressive potential. This assay screens for the activity of exogenously expressed IDO. Finally, the results from the image analysis and the IDO assay were used to determine any correlation between morphological features, immunosuppressive potency, and treatment.

Clp Family Proteins and their Biological Significance in *Plasmodium falciparum*

Dylon Stephens, CURO Research Assistant

Dr. Vasant Muralidharan, Cellular Biology, Franklin College of Arts and Sciences

The causative agent of the disease malaria is a protistan parasite; *Plasmodium* spp. It is estimated to affect 3.2 billion people world-wide, causing around 400,000 deaths per year, primarily children in Sub-Saharan Africa. *Plasmodium falciparum* is studied to better understand the parasite, allowing for insight into the biology of the species and the eventual discovery of a cure. One family of proteins, the Clp family, are proteins of bacterial ancestry that aid in the folding and unfolding of proteins in the cell. One protein in particular, ClpP, is believed to form a complex with other

chaperones to aid in degradation of proteins. This complex is localized to the apicoplast, the center of metabolic processes in the parasite. Through genomic editing, we created a strain of mutant parasites containing a TetR-DOZI aptamer that allows for the control of the gene expression of ClpP. It was discovered that, after the removal of aTc in culture, the protein was sufficiently suppressed with the parasites displaying no death phenotype. Because of this, we believe that ClpP is nonessential to the parasite in asexual blood stage growth. A new clone of the 3D7 lab strain of *Plasmodium falciparum*, where the ClpP gene is knocked out of the genome using a Human DHFR cassette, will allow us to conclude if the protein is essential or non-essential to the parasite.

Paternal Sensitivity and Language Development: The Influence of Gender and Ethnicity

Adele Nicole Strother, CURO Research Assistant
Dr. Margaret Caughy, Human Development and Family Science, College of Family and Consumer Sciences

The purpose of this analysis is to examine the effects of paternal sensitivity on language development in low SES populations with a high proportion of English-language learners. Significant research supports the association of maternal sensitivity with positive language outcomes; however, the effects of paternal sensitivity have not been established in this population. In this analysis, paternal sensitivity is a composite variable of cognitive stimulation, parent's sensitivity, and positive regard rated from direct observations of a structured father-child interaction task. The composite also includes negative regard, detachment, and intrusiveness, which are inverted. This analysis seeks to determine if paternal sensitivity is associated with language development over and above maternal sensitivity. This study will also investigate if the relation between paternal sensitivity and language development is moderated by child gender and/or ethnicity. The data used in this analysis were collected as part of the Dallas Preschool Readiness Project (DPRP) that included African American and Latino children from low-income families. It is expected that paternal sensitivity will be less strongly correlated with language development than maternal sensitivity. Regarding gender, it is anticipated that, compared to girls, boy's language development will be more strongly affected by paternal sensitivity. Finally, it is predicted that, compared to Latino children, the language development of African American children will be more strongly affected by paternal sensitivity. This research is essential because low income and Hispanic populations both exhibit relatively low levels of language proficiency and academic success. This study aims to inform real-world solutions to this discrepancy.

Analysis of Oncogenic Properties and Peptide Inhibitors of NMT1

Essilvo Sulejmani, CURO Research Assistant
Dr. Houjian Cai, Pharmaceutical and Biomedical Sciences, College of Pharmacy

Protein myristoylation is a co- and post-translation modification process that is responsible for the co-valent attachment of a myristoyl group (14 carbon saturate fatty acid) from myristoyl-CoA to a variety of proteins within the cell. *N*-myristoyltransferase (NMT) catalyzes myristoylation of proteins including Src kinase, an important oncogenic protein that is aberrantly expressed in numerous cancers including advanced prostate cancer. Acyl-CoA Synthetase Long Chain Family member 1 (ACSL1) activates long-chain fatty acids to biosynthesize acyl-CoAs. Expression levels of NMT1, Src, ACSL1, and Gleason score data in human prostate tumor samples were extracted from the TCGA database and analyzed to infer any correlation between them and prostate cancer aggression. Data have shown a significant correlation between NMT1 and Src kinase levels. Additionally, expression levels of ACSL1 are positively associated with Gleason score, a metric for identifying the aggressiveness of a prostate cancer. Additionally, following the data analysis and extensive literature review three peptides were identified as inhibitors of NMT1. Protein myristoylation assay was conducted to measure the efficacy of these peptide inhibitors to NMT1. The results will allow for further analysis of their *in vitro* functions and animal studies *in vivo*. These inhibitors could also potentially suppress an affinity association of myristoylated proteins with exosomes. These results suggest a link between protein myristoylation, NMT1 activity, and prostate cancer cell proliferation, painting the enzyme as an attractive target for prostate cancer therapy.

Maronite Christian and Muslim Interactions during the Lebanese Civil War, 1972-2000

Christian Michael Sullivan, CURO Research Assistant
Dr. Robert Foster, Religion, Franklin College of Arts and Sciences

This presentation analyzes the level of inter-religious cooperation present in the various Lebanese sectarian communities during the Lebanese Civil War, a devastating conflict that destroyed Lebanon's national identity. The goal of this project is to display that despite the numerous brutalities conducted in the name of one religious affiliation or another, religion served to unify the Lebanese population across multiple demographic factors towards peacemaking efforts. The research was conducted through the close analysis of sociological and historical studies of Lebanese communities, communication between key religious figures in both Maronite Christian and Shi'a and Sunni Muslim communities, and Lebanese Civil War era literature, historical fiction that reflects reality. All of these sources were

primarily written by Lebanese observers and/or participants of the conflict. This research aims to determine strategies Lebanese multicultural society employed to minimize sectarian strife and promote interreligious dialogue during a tenuous conflict. These strategies will potentially prove crucial to resolving various demographic divisions within contemporary multicultural American society, especially with respect to promoting harmony between diverse religious groups as social occurrences such as Islamophobia remain prevalent in American society.

Structural Mechanics and Vibration Phenomena Demonstrated with 3D Printed Units

Sean Sullivan, CURO Research Assistant

Dr. Ben Davis, Environmental, Civil, Agricultural, and Mechanical Engineering, College of Engineering

This research involves the design and fabrication of 3D printed units to demonstrate different phenomena in structural mechanics and vibration. The 3D printed units will be used in teaching and research as visual representations of complex concepts. Examples of physical phenomena to be demonstrated include snap-through instability, sympathetic resonance, nonlinear vibration, and modal energy transfer. This project will show how 3D printed technology can be used to vividly demonstrate physical concepts and phenomena without the need for expensive or complicated equipment.

Adaptive Optics in Light Sheet Microscopy

Kaitlyn Summey

Dr. Peter Kner, Electrical and Computer Engineering, College of Engineering

In the field of biology, advances in microscopy play an important role in new discoveries by providing scientists with the ability to make more detailed observations. Light sheet fluorescence microscopy is a technique that allows scientists to image small organisms such as *C. elegans* roundworms and zebrafish with multi-view sample rotation, high imaging speeds, and minimal phototoxicity. However, when imaging a biological sample with a thickness of hundreds of microns, the scattering of light increases with the imaging depth into the sample due to the differing refractive indexes that make up the various types of tissues in biological organisms. Our goal is to correct for the aberrations as we image through the central nervous system of zebrafish larvae, which are 300-400 microns thick. This scattering of light results in an aberrated wave-front of light that negatively effects image quality, making it more difficult to discern the details of the zebrafish brain. Wave-front sensing and adaptive optics techniques can be used to correct these optical aberrations. We have implemented a scene-based Shack Hartman wave-front

sensor to obtain an accurate measurement of the distorted wave-front. Using this measurement, we can correct the wave-front by applying the inverse shape of the wave-front to a deformable mirror. Here we describe the design of the wave-front sensor and our progress in correcting the wave-front when imaging into the zebrafish larva central nervous system.

Evaluating a New Analysis Protocol for Measuring Muscle Mitochondrial Capacity

Max Sumner, CURO Research Assistant

Dr. Kevin McCully, Kinesiology, College of Education

Near infrared spectroscopy (NIRS) has been used to measure muscle mitochondrial capacity. The current method requires the use of ~22-ischemic cuffs per test. We aim to develop a new analysis protocol for data collection that decreases the number of ischemic cuffs required. Unidentified data sets ($n=35$) were collected with a NIRS device (Artinis, Ltd.) from the bicep flexors. The mitochondrial tests consisted of electrical stimulation followed by a series of 22 ischemic cuffs lasting from 5-10s, with a metabolic rate obtained with each cuff. Two analyses were performed on the data. One analysis using the standard 22 cuff exponential curve fit, while the other used the first four metabolic rates in its calculations. The bicep rate constants, when compared against each other, had an equation of $y=0.935x+0.008$, when controlled for good data ($n=22$, R^2 values > 0.99). The rate constant was not significantly different between the two analyses, $R^2=0.809$. The slope and intercept of the linear fit was not different from one and zero, respectively. The 4-cuff analysis program provides the same results as the longer 22 cuff analysis when the data is considered to be good. Further testing is required to evaluate data with reduced signal quality and to revise the 4 cuff analysis. The 4-cuff analysis has the potential to be faster and easier to tolerate for the test subjects.

Prevalence and Genetic Characterization of *Dirofilaria lutrae* from North American River Otters (*Lutra canadensis*) from the Southeastern United States

Liandrie Swanepoel

Dr. Michael Yabsley, Forestry, Warnell School of Forestry and Natural Resources

During the initial description from 1965, adult parasites were detected in otters from Louisiana and Florida. This species is unique among the subcutaneous-dwelling *Dirofilaria* spp. in that it lacks longitudinal cuticular ridges. *D. lutrae* is not known to cause disease, but it must be distinguished from *Dirofilaria immitis* (heartworm), which can be an important pathogen of otters. Our goal was to determine the prevalence of this parasite in otters from North and South Carolina, and to sequence a portion of

the cytochrome oxidase I (COI) gene to investigate the phylogenetic relationship of *D. lutrae* with other *Dirofilaria* spp. Subcutaneous worms were found in 12/31 (39%) otters trapped in North Carolina ($n=30$) and South Carolina ($n=1$). They were morphologically identified as *D. lutrae*. A portion of the COI gene was amplified and sequenced from 10 worms from an otter from South Carolina. The sequences (705bp) were identical and most similar (91.8%) to *Dirofilaria repens*, a parasite of carnivores and other hosts in Africa, Asia, and Europe. Our data contribute to the knowledge of this parasite by extending the confirmed range into North and South Carolina and provide the first sequences for this species. Although *Dirofilaria* is a specious genus and the COI gene is now commonly used in many phylogenetic studies of nematodes, there are only two other species with sequences in Genbank so additional sampling is needed to better understand the phylogenetics of filarial worms.

Experiences of Student Parents at the University of Georgia

Christina Brooke Swiney, CURO Research Assistant
Vivian Anderson, Katy Gothard
Dr. Michelle R vanDellen, Psychology, Franklin College of Arts and Sciences

The student organization Uplifting Parents (UP) at the University of Georgia (UGA) is a non-political, non-religious club that desires to ensure that student-parents are provided with all the resources they may need to be able to manage their coursework while parenting. UP and their coalition of faculty supporters, the UP Village, seek to discover through this survey what our student-parent population looks like as well as what their main problems are when it comes to their experiences as students at UGA. We plan to create an online survey using Qualtrics to be taken by as many undergraduate and graduate student-parents at UGA as possible. The survey will be advertised through flyers posted around UGA's campus with QR codes that, when scanned, lead participants to the survey as well as through links posted to UP's public social media pages. The data from this survey will hopefully be used to integrate UP into the fabric of the institution of The University in order to create an equitable learning environment that sustains the wellness and success of student-parents and their children. We expect that the population of student parents at UGA is larger than we know, and that there are significant issues that these students deal with that exist solely because they are student parents. This data will identify the next steps for the organization and university to take to improve quality of life for student-parents.

3D Printed Thermochromic Resin and Its Application

Harshitha Tadinada, CURO Research Assistant
Aaron Asael Smith
Dr. Zion Tse, Electrical and Computer Engineering, College of Engineering

The purpose of this research is to identify the properties of thermochromic powder mixed with resin and its application on food industries. Initially, experiments were conducted to determine the best ratio of powder to a resin to obtain the visible pink color after mixing. Now that the resin has thermochromic properties due to the powder, experiments on connecting the ambient temperature and product color are being conducted. Specifically, the product has been tested in a beaker with water on a hot plate to determine the activation temperature of the material. Currently, the material that we have has an activation temperature of 32° Celsius - meaning it will begin turning clear from its original pink pigment. In addition to this, an IOS camera app is programmed to analyze the average RGB value of the product and display its temperature based on the product's color. The color to temperature relationship was determined by constructing a color map. The app has additional features such as a map view, data sharing, and timestamp. The goal of this research is to apply this technology to the meat and dairy transport industry by inserting it in temperature controlled containers and as containers themselves. This will help the transporters to determine which food has been spoiled by using the product with the camera app to determine the temperature.

The Effects of HIV Viral Load in the Presence of Arboviral Coinfection

Shreya Dilip Tailor
Keshni Kokliakumar, Joseph Mcdaniels
Dr. José F Cordero, Epidemiology and Biostatistics, College of Public Health

Human immunodeficiency virus (HIV), a virus spread through bodily fluids that attacks CD4 cells in the immune system, affects over 36.7 million people globally. In the past 40 years, an increase in the number of well-known mosquito-borne disease has occurred, including but not limited to Chikungunya (CHIKV), Dengue virus (DENV), and Zika virus (ZIKV). HIV is prevalent in developing countries where mosquito-borne diseases are common; therefore, determining the relationship between HIV viral load and the presence of arboviral coinfection is vital. Conduct a systematic review regarding the relationship between CD4 count and arboviral infection among individuals diagnosed with HIV. The systematic review was conducted following PRIMSA guidelines, using the PubMed database. Eligible studies included information on HIV CD4 count and arboviral co-infection. Included articles reported the total

sample size, number of individuals with and without HIV, number of individuals with and without arboviral infections, mean HIV viral load, CD4 count, and what arbovirus studied. After reviewing 462 articles for specified criteria, 9 articles were included. Populations with CHIKV had lower CD4 cell counts, compared to DENV; however, CD4 counts increased when concurrent with HIV. Two studies provided anecdotal evidence that ZIKV increased CD4 counts, while Dengue decreased HIV viral load in infected individuals. Understanding the interaction between HIV patients and arboviral infection should be a priority in countries where HIV is prominent and arboviral infection is endemic. Based on preliminary results, there is evidence that HIV CD4 count is related to arbovirus infection.

The Spanish Dialect of Roswell, Georgia

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In Roswell, Georgia, there is an emergent and growing community of Spanish speakers who come from a variety of backgrounds. A point of inquiry in Spanish dialectology and linguistic studies are certain expressions of action; one commonly-studied feature is past reference in Spanish verb forms. Dialects tend to have stable patterns of selecting a certain percentage of present perfect and a certain percentage of past tense verb forms to refer to past actions. Generally, present perfect is used to talk about past events that have relevance within the immediate discourse, while past is used to talk about discrete past events. This distribution has been studied in Spanish-speaking countries and in Spanish-speaking minority communities, such as New York and the Southwest. However, there is a lacuna in the southeast for Spanish research because of historically lower populations of Spanish speakers. In studying past reference in Roswell, we aim to better understand this emergent dialect and its characteristics in comparison to monolingual Spanish dialects and other Spanish dialects in contact with English. After conducting qualitative interviews with residents about their lives and journeys, verb forms with past reference were extracted and compiled. Further analysis will code for factors that might influence the type of past reference selected. Preliminary analyses have confirmed the distribution of present perfect and past are similar to levels seen in Mexican dialects, and this is expected in further analyses. Understanding these usages aids in understanding more broadly how new varieties emerge, and this research provides that opportunity.

Evaluation of Tire Chips and Fiber Reinforcement for Use in Concrete Barrier Walls

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This project assesses the likely impact and full potential of concrete barrier wall designs utilizing recycled tire chips and fiber reinforcement in order to absorb impact. Further, this study will be used to validate a non-linear finite element model of barrier walls through the construction and drop-weight impact testing of several scaled concrete barrier walls incorporating recycled tire chips and fibers. Initially, this study will establish limits of inclusion for recycled tire chips and fibers. Concrete mixtures will be produced with recycled tire chips and fibers and tested for compressive strength, load-deflection, and drop hammer impact. The composition of the rubberized/fiber concrete mixtures will include varying amounts of recycled tire chips (up to 20% coarse aggregate replacement) and fibers (up to 1% by mixture volume). Select mixtures will then be used to fabricate scaled beams and subjected to static and dynamic loading. The large-scaled beams (approx. 6in x 8in x 120in) will be tested in a static condition. In addition, scaled specimens will be subjected and evaluated for their dynamic response by sending a 500lb weight with an accelerometer down a 20ft vertical sleeve for impact. The response will be digitally recorded using a high-speed motion capture system with multiple physical markers. Once completed, this information will inform the design and testing of full-scale concrete barrier walls incorporating recycled tire chips and fibers.

The Future of Investor-State Dispute Settlement

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The proliferation of investor-state dispute settlement (ISDS) since the late 1980s has been dramatic. Some 3,000 investment treaties currently allow investors to bring claims directly against sovereigns in arbitration. As tensions between investors' rights and sovereign power escalate, ISDS has been a focal point in contentious debates about the crossroads facing the international system for trade and investment. This project evaluates the winners and losers of the ISDS system in the context of these ongoing debates and controversies. Using the best available data, this project contributes a more detailed and refined assessment of winners (home states of claimants) and losers (respondent states) in the ISDS system. Specifically, is ISDS disproportionately hurting some countries more than others? Building on the results from this winner-loser analysis, this research considers future

implications in the context of the contested nature of the ISDS system. While data has been collected on ISDS for various research applications, this project seeks to quantify impacts of ISDS on home and respondent states. This is done through collection of claims, awards, and settlement values, to allow for quantitative analysis. Perceptions and realities surrounding the results of ISDS have influenced the international investment climate in meaningful ways. Sovereigns have reacted to ISDS risk exposures in a number of ways, from India's treaty strategy overhaul to outright International Centre for Settlement of Investment Disputes withdrawals in Latin America. Although data on ISDS face certain limitations, critical observations are available and contributions to the existing empirical literature on ISDS are within reach.

The Effects of Ischemic Stroke on Gait in the Porcine Model

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Stroke is the leading cause of disability in the United States. A majority of stroke victims experience an impaired ability to walk and more than 30% are limited to their homes due to mobility loss. Therefore, in this study, we seek to determine how induced stroke affects the gait of the porcine model. We will accomplish this by inducing ischemic stroke through permanent middle cerebral artery occlusion (MCAO). Prior to stroke, gait data will be collected using a quantitative computerized gait analysis software, GAIT4. Gait data will then be collected post-stroke in order to determine gait differences in gait symmetry including step height, stride length, and stride velocity pre- and post-stroke. We expect pre-stroke gait data to demonstrate a high level of symmetry in left and right limb movement in order to achieve consistent step height, stride length, and stride velocity. Post-stroke gait data will be expected to demonstrate significant changes in stride length, stride velocity, and step height, which is expected to correlate with the affected areas of the brain. Due to the similarities between pig and human brains, the results collected in this study are very translatable to clinical studies, giving the scientific community insight into how stroke may affect motor function in patients and which areas of the brain are affected.

Longleaf Pine Restoration in Coastal Georgia

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The longleaf pine forest is one of the most biologically diverse ecosystems in North America. Prized for their high quality lumber and protective sap, longleaf pines were

overharvested for generations and today only about two percent of the original community remains. This study seeks to understand post-harvest reestablishment techniques, specifically when converting from a mixed-pine hardwood forest to longleaf pine in Coastal Georgia, USA. This study tested seedling survivorship in two different ground preparation treatments and tracked mortality after the first prescribed burn. A strip-plot design assessed survivorship in cleared ground versus uncleared ground, where post-harvest residual has remained. Preliminary results suggest cleared sites may have higher survivability than those where the post-harvest residual material was left in place. Pines were planted in February 2016. Mortality percentages were as follows: in summer 2016 mortality was 0%, 0%, 26%, 9%, 3%, and 2% and in winter 2018 mortality was 9%, 7%, 55%, 15%, 9%, and 27%, respectively. The third plot (highest mortality) is located in an area with a higher water table, suggesting that longleaf pines are less able to withstand saturated conditions, but may persist. This finding is important given rising water levels are predicted to affect coastal environments. The first prescribed burn occurred in early 2018 and survivability will be assessed post-burn. Additionally, a pilot study tested establishment of grasses and forbs (seeded vs. plugged) and preliminary results will be presented. This research is ongoing and helps define longleaf pine forest and groundcover reestablishment in Coastal Georgia.

Examining the Context Dependency of Genetic Clines in *Boechea stricta*

Sunishka Thakur

Dr. Jill Anderson, Genetics, Franklin College of Arts and Sciences

Climate change is imposing novel patterns of selection on natural populations, influencing both the ecology and evolutionary dynamics of plants and animals. To investigate the effects of climate change on plants, we study *Boechea stricta* across an elevational gradient, where conditions range from hot and dry in low sites to cool and moist in higher sites. This plant is an exceptional model species because it has adapted to variation in climate that it experiences across broad elevational and latitudinal gradients in nature. This leads to the creation of genetic clines for a variety of traits in this species. Previous research has documented that genetic clines for certain traits are context-dependent, such that they changed in strength across growing seasons that varied in the depth of snowpack and timing of snowmelt. To test whether context dependency holds in a greenhouse setting, we exposed seeds from populations distributed across a wide elevational gradient to three soil moisture treatments: well-watered control, slightly water restricted, and drought stress. My work will test whether genetically-based clines in functional traits such as specific leaf area, leaf water content, water use

efficiency, and stomatal density indeed depend on the water treatment provided to these plants.

Monitoring for Rapid Shifts in Carbon Mineralization and Iron Availability during Soil Oxygen Changes

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Shifts in soil oxygen levels can strongly impact nutrient availability and microbial activity. Different sets of microorganisms thrive under anaerobic (no oxygen) and aerobic (oxygen rich) conditions. Some anaerobic microbes can use soil iron minerals (Fe(III) oxidation state) as an electron acceptor and dissolve them, releasing any bound nutrients, such as phosphorus. However, it is unclear how quickly microbial communities can shift between aerobic and anaerobic metabolisms in response to a change in oxygen concentration. The focus of this study is to quantify microbial activity during shifts in oxygen concentrations by measuring carbon dioxide (CO₂) release and to monitor for the use of iron minerals as an electron acceptor by measuring the production of reduced iron [e.g., Fe(II)]. To do this we filled test tubes with soil and incubated them under aerobic or anaerobic conditions for a week and then exposed the test tubes to the opposite conditions (e.g., switched aerobic to anaerobic and vice versa) and sampled them a 5 minute intervals for a total of 30 minutes for carbon dioxide and iron (II). The results show a steady increase of carbon dioxide during the incubation week and rapid flux of CO₂ during the switch in in conditions. Surprisingly, the flux of CO₂ during the week-long acclimation period was similar during anaerobic and aerobic conditions. We are current quantifying Fe(II) and CO₂ from the 5 minute interval sampling and this data will be presented and discussed.

Applying Phylogenetic Relatedness to Species Distribution Modelling: A Novel Approach

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Dr. John Maerz, Forestry, Warnell School of Forestry and Natural Resources

One significant challenge of applied conservation is figuring out the best ways to manage rare or enigmatic species based on limited data. By their very nature, species that are rare or hard to detect are often “data deficient.” Additionally, robust species distribution models that predict and analyze a species’ habitat can aid in conservation decision making. We determined that data from phylogenetically related species could potentially be used to improve the statistical power of these models. Using available Geographic Information Systems (GIS) data, we are modelling Inyo Mountain salamander habitat (*Batrachoseps campii*) using the data of two closely related species (Kern Plateau

Salamander, *Batrachoseps robustus*, and Oregon slender salamander, *Batrachoseps wrighti*) to test this hypothesis. We anticipate that that the niche conservatism observed in this clade of salamanders will allow for the surrogate data to boost the power of our species distribution models. By using this novel approach to modelling, we hope to demonstrate that no species is data deficient when you consider its ecological relatedness to sister taxa.

Child Maltreatment and Substance Use: A Systematic Review and Meta-Analysis

Jessica Thompson, CURO Honors Scholar
Dr. Assaf Oshri, Human Development and Family Science, College of Family and Consumer Sciences

Adverse upbringing experiences have long lasting emotional and psychological effect on youth, which has been consistently linked to development of youth adjustment problems. For example, youth who are maltreated are more likely to engage in substance abuse behaviors during adolescence. However, research on the association between child maltreatment and youth substance use is showing inconsistent findings. Although some studies suggest a direct link, other studies suggest that this association is attenuated by the presence of other contextual risk and protective factors. Thus, the goal of this research project is to conduct a meta-analysis in order to (a) ascertain the strength of the association between child maltreatment and substance abuse (e.g., alcohol, cigarette, and marijuana abuse) during adolescence, (b) test the effect of moderators on this association. Methodologically, there are four phases to completing a meta-analysis: article retrieving, article selection, coding, and analysis. Currently, we are beginning the third stage of the meta-analysis. We hypothesize that there will be a significant relation between childhood maltreatment and substance abuse in adolescence, and that this will be moderated by several variables including characteristics of the maltreatment exposure, study characteristics, and demographic characteristics. It is important to better understand the ways that maltreatment can affect children’s risk-taking outcomes in order to improve mental health and prevent substance abuse among vulnerable youth.

The Architect’s True Purpose in Johann Wolfgang von Goethe’s *Elective Affinities*

Julia Thompson
Dr. Martin Kagel, Germanic and Slavic Studies, Franklin College of Arts and Sciences

The Architect in Johann Wolfgang von Goethe’s 1809 novel *Elective Affinities* has a vital role. Similarly to characters like Gardener, he is always addressed with the title of his profession, and his name holds great significance in this

regard; however, the Architect's role in the novel reaches far beyond simply an architect of the chapel built for the main characters. I assert that the Architect's true purpose in the text is to shape the reader's perception of Otilie as a saintly figure, even though this contrasts with the fact that she allows herself to be involved with an older, married man. He acts as a disciple who wordlessly "builds" her portrayal for the reader. Otilie's character is difficult for the reader to pin down because of her reserved nature and a purposeful lack of internal dialogue on Goethe's part during the first portion of the novel. However, through the Architect's perception, Otilie is seen in her truest form. In his redesign of the chapel, he demonstrates this concept through the unconscious illustration of her image on the walls. Then, in an incredibly symbolic scene, he places her directly within a tableau in the role of the Virgin Mary. Finally, the attitude of the public after Otilie's death qualifies these previous observations as being evident to those outside of the Architect's sphere of influence. The literary purpose of the duty-based characters in *Elective Affinities* is to highlight the functions of the main characters, as the Architect does with Otilie.

Effect of Parasite Load and Predation on Body Condition of *Sigmodon hispidus*

Kate Thompson

Dr. Vanessa Ezenwa, Ecology, Odum School of Ecology

Parasites influence host populations through both direct and indirect effects. Recent studies suggest that predators indirectly play a critical role in influencing the parasite dynamics of host populations. If a host population is infected with parasites that are virulent, then predators may selectively prey upon individuals weakened by a greater parasite burden. As heavily infected individuals are removed from a population, parasite transmission decreases. This study aims to investigate whether parasite load affects body condition in hispid cotton rats and whether this effect is partially due to selective predation on infected individuals. Three pairs of rodent trapping grids were established in agricultural fields in Athens, Georgia. Cotton rats were subjected to two different treatment types, a predator exclusion and a control. Each location contained one control grid and one experimental grid that had an enclosure net to exclude birds of prey. We quantified the gastrointestinal parasites of the cotton rats to determine whether cotton rats with greater parasite burdens had lower body conditions and whether this relationship differed between the treatment types. We hypothesized that populations with reduced predation pressure should exhibit a stronger negative relationship between parasite load and body condition than populations without reduced predation pressure. Analyses are still ongoing; however, preliminary results show a significant main effect of parasite load on

body condition, but no significant interaction between predator treatment and parasite load on body condition. This study reveals the need to further investigate the indirect effects of the interaction between parasites and predators on host populations.

Role of Single Stranded DNA Binding Protein in the Regeneration of Planarian Nervous Systems

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Dr. Rachel Roberts-Galbraith, Cellular Biology, Franklin College of Arts and Sciences

How well an organism responds to injury is crucial for its survival. Unlike many organisms, freshwater flatworms called planarians can completely regenerate their nervous system after injury. The gene that codes for Single Stranded DNA Binding Protein (*ssdp2*) affects neural regeneration in planarians. Without *ssdp2*, the planarian's brain and head regenerate in an odd shape, and the worms develop cyclopia, where they have one eye instead of two. The goal of our research is to discover more about why the unusual phenotype develops in planarians with decreased *ssdp2* mRNA. Since *ssdp2* has been identified as transcriptional regulator in other species, we searched for potential target genes for which mRNA is significantly greater or lesser after planarian *ssdp2* was knocked down. We will use *in situ* hybridization for each candidate target, so that we can discover where and in what kind of cells the target mRNAs are found. To further investigate the role of potential target genes in planarian regeneration, we will use RNA interference to reduce the levels of each mRNA.

Investigation of the Excited-State Dynamics of Photo-ODIBO Using Transient Absorption Spectroscopy

Will Thompson

Dr. Susanne Ullrich, Physics and Astronomy, Franklin College of Arts and Sciences

Photo-click chemistry utilizes photoreactive molecules, inert molecules in which reactivity can be induced by specific wavelengths of light. Photo-ODIBO contains a cyclopropanone functional group that undergoes photodecarbonylation upon irradiation of 350 nm light. The resulting cyclooctyne is highly reactive and subsequent cycloaddition of an azide provides for ample applications such as labeling of biomolecules for imaging. The details of the photodecarbonylation mechanism are not yet understood and are the subject of the present study. As the dynamics of photoactivation take place on a femtosecond time scale, ultrafast transient absorption spectroscopy is ideally suited to investigate the underlying photochemical processes. Transient absorption spectroscopy is based on a pump-probe technique that employs an ultrashort

pump pulse for photoexcitation of the sample and a time-delayed white-light probe pulse to monitor the excited state dynamics in real time. A transient absorption spectrum is acquired by scanning an optical delay between the pump and probe beams and measuring the transmitted spectrum of the white-light probe in a fiber-optic spectrometer. An optical chopper blocks alternate pump pulses to differentiate between ground and excited state absorption and a liquid flow cell ensures that each pump pulse photoexcites unreacted photo-ODIBO. The transient absorption spectra are analyzed to extract timescales and spectral signatures, which provide insight into the underlying photochemistry. The absorbance decay is of multi-exponential nature suggesting a stepwise procession of the photo-ODIBO relaxation and dissociation dynamics. To help distinguish spectral signatures associated with these two processes additional transient absorption measurements are performed directly on the photoproduct ODIBO.

A Major Decision: The Decision-Making Process of Choosing an Undergraduate Major

Caroline Knox Tompkins

Dr. Juan Meng, Advertising and Public Relations, Grady College of Journalism and Mass Communication

The purpose of this research is to better understand how undergraduate students are selecting their major and the decision-making process that goes into both selecting and changing major coursework. To study this, a qualitative survey of 102 respondents on Qualtrics was used, and three different focus groups were run to capture respondents own experiences. Research indicated the majority of UGA students have changed their major. Research also found that the majority of UGA students have not used the career center. From the students who have used their services, most students mainly use resume critique, but not many other services. Results from the research suggest that UGA Career Center has a general advising appointment during orientation. This would allow students to take core classes before focusing in on a specific area of study. Additionally, the Career Center should take advantage of students who come in for resume critiques, and provide them with material about the other resources that the center offers. This study provides insights into how specific colleges can affect student's satisfaction within their individual majors. It is no longer simply the major coursework or future jobs that students either enjoy or not, now- the services that individual colleges and the university career center offer make the difference as well.

We Can't Get No Satisfaction From Instagram... Or Can We?

Olivia Tompkins

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To identify the extent to which Instagram accounts impact user satisfaction levels. More specifically, the research aims at solving whether gratification levels change after Instagram use. The study will also attempt to answer: What about the specific content viewed makes people feel a certain way? Why do people use Instagram as much or little as they do? What words explain how people feel regarding their experience? The researcher used two research methods in this study: an online survey of 230 respondents, and one focus group of 6 participants, both of which contained millennials. The research was tailored around the assessment of four wide-ranging feelings: happiness, anxiousness, motivation, and insecurity. Questions were designed to focus on three types of Instagram content: entertainment, health and wellness, and peer-based content. Results suggest that millennial users are neutral, while leaning towards the satisfied margin, after Instagram use. Therefore, there is a higher chance users will be more satisfied if using Instagram. Practical implications include the importance of users tailoring their Instagram experience to meet their needs of satisfaction. The study provides insights into the ability of popular social media to impact human emotion and gratification. It is important to understand user gratification in developing effective public relations strategies.

Dual Oxidase (DUOX) Expression in a Murine Lung Infection Model of Influenza Virus A

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Dual oxidase (DUOX) and Lactoperoxidase (LPO) are two enzymes that play an important role in innate immune defense against influenza *in vitro*. The objective of this study is to evaluate expression of these enzymes in mouse lung and trachea *in vivo* and correlate expression levels with viral load and disease outcome. To achieve this goal, *Duox1* null-mutant and wild-type mice were infected with a sub-lethal dose of influenza. Lung tissues were inflated and sectioned for histology sections along with the trachea on days 3 and 7 post-infection. Unstained lung and tracheal sections were then subjected to immunohistochemistry using anti-DUOX1/2 and anti-LPO antibodies separately. In addition, immunofluorescence was used to assess co-localization of enzymes with endogenous tubulin as well as viral protein expression in tissues. Finally, comparative analysis of scoring and quantification of fluorescence intensity with the Confocal Nikon Imaging Systems software will be

performed to identify significance in protein expression and correlation with disease outcome. So far, our data indicate that DUOX1/2 is present in lung epithelial cells inside the bronchioles, while LPO, which catalyzes the oxidation of thiocyanate, is only observed in the submucosal gland of both wild-type and *Duox1* null-mutant mice, irrespective to infection status. Expression of DUOX1/2 is higher in infected wild-type mice than in infected *Duox1* null-mutant mice. These data indicate that DUOX1/2 and LPO are present in the lung and trachea of influenza-infected mice and can contribute to the innate immune defense against influenza *in vivo*.

Determination of Large Protein NMR Assignments by Sparse ^{13}C Labeling of Valine Methyl Groups

Jenny Tran

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In this investigation, the value of valine ^{13}C -methyl isotopic labeling was evaluated for use in nuclear magnetic resonance (NMR) experiments. My goal throughout this paper is to first assess the variability of valine rotamers in solution, then to evaluate how valuable NMR information (such as NOEs and RDCs) are in NMR assignments, and finally to investigate the use of molecular dynamics (MD) simulations to compensate for valine structure variability that may occur. In response to the issue of complicated spectra from larger proteins during uniform labeling, sparse isotopic labeling was developed to simplify spectra, but only a few amino acids are financially viable for this method. Valine is a good candidate because of its two methyl groups that can result in spectra that are simplified but have signals that are amplified more than amino acids with fewer methyl groups; compared to other amino acids that also have two methyl groups, valine has fewer rotamers, of which are in a distribution that is skewed toward one conformation. By combining sparse-labeling with molecular dynamics simulations and genetic algorithms, chemical shift assignments can be accurately made that will provide information about the structure of larger, glycosylated proteins without the concern of overcomplicated spectra.

Characterization of an Electrospun Nitric Oxide Donor Linked Wound Dressing

Martin Thach Tran, CURO Research Assistant

Dr. Hitesh Handa, Chemical, Materials, and Biomedical Engineering, College of Engineering

A rapid increase in medical expenses associated with wound injuries demands for a more efficient treatment strategy. Patients with chronic wounds are some of the most physically and financially burdened. This study focuses on the biochemical properties of the wound healing

process to fabricate a wound dressing that addresses some of the impediments of healing in chronic wounds in order to shorten the duration of hospitalization, and subsequently lessen the financial burden of medical expenses. The proposed wound dressing will be composed of arabinoxylan, a nitric oxide donor, and poly(vinyl alcohol) (PVA). Arabinoxylan will be incorporated into the dressing for its high absorbability, hydrophilicity, and porosity. Furthermore, arabinoxylan exhibits antimicrobial effects. A nitric oxide donor will then be linked to the arabinoxylan to prevent infection as well as promote angiogenesis at the wound site. Nitric oxide also has anti-inflammatory effects, which is crucial in chronic wounds due to their heightened and prolonged inflammation characteristic that leads to degradation of the extracellular matrix. Lastly, the nitric oxide donor linked arabinoxylan will be mixed with PVA and the polymer will be fabricated into mesh fibers by electrospinning. Electrospun mesh fibers, unlike other bandages, promote homeostasis at the wound site and has high absorbability, permeability, conformability, and scar preventability. Following the fabrication of the dressing, physical and biological characterizations will be carried out to examine its functionality *in vitro* and *in vivo*.

Comparison of Blood Lipid Responses from Muffins with and without Pecans

Laura Triana, CURO Research Assistant

Dr. Jamie A Cooper, Foods and Nutrition, College of Family and Consumer Sciences

Breakfast meals are often high in calories, sugar, and saturated fat, which can lead to increased post-meal blood sugar and fats. Incorporating pecans at breakfast may offset these increases due to its higher fiber and protein content. To compare a traditional high-fat, breakfast muffin against a pecan-containing muffin to determine if pecans will mitigate the post-meal increases in triglycerides and improve cholesterol levels. 22 healthy adults, ages 18-45yrs, were recruited for the double-blind, crossover study consisting of two testing visits. Each testing visit, separated by 72h, involved a different treatment: consumption of a muffin containing pecans or a standard breakfast muffin. The muffins were matched for total calories. A catheter was placed in the arm at the beginning of the testing visit and a fasting blood sample was taken. Blood draws also occurred at 30 min., 1h, 2h, and 3h postprandially. As expected, fasting blood lipid levels did not differ between muffins. The triglycerides increased from $82.7 \pm 64.9 \text{ mg/dL}$ at fasting to $132.3 \pm 85.6 \text{ mg/dL}$ at 120min postprandially for muffin A ($p=0.04$). Conversely, muffin B did not increase significantly from fasting to 120min postprandially ($97.2 \pm 61.9 \text{ mg/dL}$ to $120.9 \pm 58.9 \text{ mg/dL}$, respectively ($p=0.21$)). There was also a trend for a difference in the change in HDL (high density lipoprotein) between muffins ($-0.5 \pm 0.6 \text{ mg/dL}$ vs. $-2.1 \pm 0.5 \text{ mg/}$

dL for muffin B vs. A, respectively ($p=0.07$). There are some differences in the postprandial response between muffins with muffin B mitigating the postprandial increase in blood lipids. Treatments remain blinded until data analysis is complete.

Computation as Creative Interface: The Hidden Artistic Potential of Code

Connor Trotter, CURO Summer Fellow, CURO Research Assistant

Mark Callahan, Ideas for Creative Exploration, Lamar Dodd School of Art, Franklin College of Arts and Sciences

Despite common goals in pursuit of expression as well as representation, the disciplines of art and computation have been divorced under the assumption that they have very little to do with each other. Collaboration between visual artists and computer scientists in particular is rare, even though both identities require types of creative thought that are at times very similar. The rapid proliferation of computational procedures into the world of media is beginning to reveal how outdated this division is. Interdisciplinary limitations placed on computation and art act as blinders for people of either skill set, while the real boundaries between artistic practice and computational investigation are much more diffuse than people realize. My Summer Fellowship attempted to bridge this disciplinary gap by producing a small number of interactive studies that visualized computational concepts and enumerated artistic data. These studies exist on the web as interactive tools, where users can playfully investigate concepts like pixel sorting and polymorphism. Each study expresses a different manner in which computation can offer fresh perspectives on artistic practice and vice versa. The central objective of my inquiry isn't just limited to my own evaluation of how these two fields intersect – the most important motivation is to engage the broader community and encourage a more energized conversation. I'm continuing my research into spring of this year with support from Ideas for Creative Exploration, where I'm developing and hosting workshops that encourage interdisciplinary work from artists and scientists in general.

Mapping Lunatic, Manic, and Radical Fringe Modifications on Delta-Like Ligands

Emma Tucker, Foundation Fellow

Dr. Robert S Haltiwanger, Biochemistry and Molecular Biology, Franklin College of Arts and Sciences

The Notch signaling pathway is essential for cell differentiation in mammals, especially during embryo development. Notch receptors are transmembrane proteins that are activated or inhibited by direct contact with Notch ligands: Jagged1, 2 and Delta-like (DLL) 1, 3, and

4. Notch is subject to *O*-glycosylation on many of its 36 Epidermal Growth Factor-like (EGF) repeats, which can affect its ligand binding affinity and signaling activity. Protein *O*-fucosyltransferase 1 (POFUT1) is known to add an *O*-fucose to the Thr/Ser in consensus sequence $C^2XXXX(S/T)C^3$ on EGF repeats. These *O*-fucose residues can be elongated with an *N*-acetylglucosamine by Fringe, a β -1,3-*N*-acetylglucosaminyltransferase. Manic, Radical, and Lunatic are the three types of Fringe glycosyltransferases in mammals, and each modifies *O*-fucose residues on Notch EGF repeats with a different level of specificity. DLL1, 3, and 4 also contain EGF repeats, several of which are glycosylated by POFUT1 and Fringe, although it is unknown which EGF repeats Fringe modifies. Using mass spectroscopy, we will determine which EGF repeats of DLL 1, 3 and 4 are modified by each type of Fringe. In DLL, we expect to find *O*-fucosylation on each EGF repeat containing an *O*-fucose consensus sequence and Fringe elongation on a subset of these EGF repeats. We also expect to see that Radical, Manic, and Lunatic Fringe modify different subsets of *O*-fucose residues in order to adjust Notch signaling. This mapping of DLL glycan modifications enables further study into how the glycosylation of Notch ligands affects Notch activity during mammalian development.

Expression of *Callicellulosiruptor bescii* Pectin Degrading Genes in *Thermoanaerobacter ethanolicus*: Implications for Microbial Conversion of Plant Biomass to Ethanol

Nolan Tucker, CURO Research Assistant

Dr. Janet Westpheling, Genetics, Franklin College of Arts and Sciences

Biofuels produced from biomass is an appealing option as a carbon neutral and renewable source of energy. The pretreatment of biomass is a significant portion of the cost of producing biofuels. We aim to use genetic tools to create a strain of bacteria with the ability to break down the plant cell walls of untreated biomass and metabolize the products into ethanol efficiently. To do so we have targeted plant pectin in this study. While pectin exists in low abundance in most plant cell walls, it is critical to the structural integrity of plants. Cellulolytic bacteria such as *C. bescii* encode pectin degrading enzymes to weaken the architecture of plant cell walls and gain access to other substrates. By expressing pectin degrading genes, present in a single cluster in *C. bescii*, in *T. ethanolicus* we hypothesized that we would observe an increase in its cellulolytic capabilities. *T. ethanolicus* naturally produces ethanol in high yields and increasing its cellulolytic capabilities would likely have promising implications for ethanol production from biomass. We constructed a strain of *T. ethanolicus* containing three pectinase genes. Growth of the resulting strain was greatly reduced in its ability to grow on certain sources of biomass, particularly those with plant cell walls composed

of a large amount of pectin, relative to the wildtype strain. Based on this result we speculate that the growth of *T. ethanolicus* is inhibited by the release of certain plant cell wall components, specifically furans and lignins generated by activity of the pectinases.

Neuroanatomical Changes Observed in Nodose Ganglia and Hindbrain 24 Hours after Vagotomy Surgery in Rats

Anna Turlej

Nousheen Khetani

Dr. Krzysztof Czaja, Veterinary Biosciences and Diagnostic Imaging, College of Veterinary Medicine

Bariatric surgeries, which are the most effective treatments for obesity, result in weight loss and decreased preference for high-fat or sugary foods. The mechanism for these changes is unknown, but likely involves the damage of visceral vagal afferent fibers, which relay information about food intake and satiety to the nucleus tractus solitarius (NTS) of the hindbrain, where it may be integrated with gustatory information. Better understanding of the mechanism could lead to non-surgical obesity treatments. The goal of the present study is to investigate if severing of vagal fibers (gastric vagotomy), independent of bariatric surgery, induces inflammation and fiber reorganization in NTS. Rats ($n=7$) were separated into one vagotomy group ($n=3$) and one sham group ($n=4$). Twenty-four hours after surgery, rats were sacrificed and perfused. Their nodose ganglia (NG) and hindbrains were collected, cryosectioned, stained, and analyzed with immunofluorescence microscopy. The nervous tissues were stained with antibody against isolectin B4 (IB4), ionized calcium binding adaptor molecule (Iba1), and neurofilament M. A TUNEL assay was used to observe neuronal damage. As expected, Iba1 staining and analysis showed increased microglial activation in the NTS and NG after vagotomy, meaning vagal afferent cell bodies and terminals were in the degradation/regeneration process within 24 hours. Likewise, IB4 staining of the hindbrain showed decreased density of vagal afferents in the NTS of the vagotomy group. Finally, TUNEL assay confirmed higher neuronal damage in the NG post-vagotomy. Overall, the hypothesis that vagotomy would induce inflammation and fiber reorganization in the NTS was supported by results.

The Price of Freedom: An Analysis of Monetary Sanctions in the United States

Hannah Turner, CURO Research Assistant

Dr. Sarah Shannon, Sociology, Franklin College of Arts and Sciences

Across the country, millions of Americans are affected by legal debt. A person who is accused or convicted of a crime may be expected to pay momentous financial penalties as part of their sentence, a plea deal, or for simply

partaking in the court process. The debt accumulated from a single conviction can take years to resolve, resulting in unnecessarily prolonged contact with the criminal justice system. While the use of monetary sanctions has expanded in recent decades, this process has been significantly under researched. This presentation will explain the philosophical justification behind different financial penalties, examine broad trends across the country, and then focus specifically on the use of monetary sanctions in Georgia. The findings are based on numerical data provided by the courts for virtually all of Georgia's 150 counties and over 500 municipalities. These quantitative findings will be further supported by ethnographic observations from county-level courts in one large metropolitan jurisdiction. While the data shows significant variation depending on place, it reveals that a number of localities are dangerously dependent on the revenue associated with monetary sanctions to finance their courts. Particularly in places with high proportions of low-income and minority residents, such dependence can reflect discriminatory and predatory practices. Scholarly inquiry into the assessment of monetary penalties in the courtroom and the effect those penalties have on communities at large is key to ensuring that the criminal justice system is operating fairly and efficiently.

Fatigue Performance Characterization of Asphalt Concrete Mixture

Usenmfon Immanuel Udo, CURO Research Assistant

Dr. S Sonny Kim, Environmental, Civil, Agricultural, and Mechanical Engineering, College of Engineering

Approximately 95% of highway pavement is surfaced with Hot Mix Asphalt (HMA). As traffic loading increases, asphalt surface mixtures experience cracking, which mandates periodical maintenances and/or rehabilitation. This research provides knowledge on the characteristics of asphalt mixtures and in its susceptibility to fatigue and reflective cracking using overlay test method. The overlay test simulates the opening and closing of joints under tension loads. During the test, crack propagations on HMA mixture specimens are measured along the number of cycles to failure. In this study, the results from various asphalt mixtures are compared to identify the mixture that performs better with less cracking under traffic loading condition. In conclusion, the objective of this study will include analyzing the local asphalt mixture for susceptibility to cracking. The test results will be used to develop a cracking prediction model and correlate the asphalt characteristics such as binder type and nominal aggregate size with crack-resistance performance.

Standardized Tail Construction of Allelic Replacement Vectors (ST-CARV)

Elizabeth Enyanga Umanah, CURO Research Assistant
Dr. Brian Kvitko, Plant Pathology, College of Agricultural and Environmental Sciences

The bacterial plant pathogen *Pseudomonas syringae* is a powerful model organism used to study host/microbe interactions. Due to its high genetic tractability, the *P. syringae* genome can be precisely modified down to the individual base pair using a genetic technique termed allelic replacement. However, the creation of allelic replacement vectors is typically cumbersome, labor intensive, and requires specialized design for each vector making it the rate-limiting step in *P. syringae* genetic manipulation. Currently, our lab has designed a straightforward approach to generate allelic replacement vectors. This is based on standardized oligonucleotide tails (standardized tail construction of allelic replacement vectors) to facilitate the rapid and efficient assembly of multiple DNA fragments. The goal of this research is to optimize this approach for speed and efficiency of use by deploying ST-CARV to rapidly generate gene knockouts and identify *P. syringae* virulence genes. The results from this research will allow for the effective development of allelic replacement vectors and characterization of virulence genes.

Education Moderating the Relationship Between Personality and Impulsivity in Adults

Chiamaka Ujuaku Uzuegbunam
Dr. Steve Miller, Psychology, Franklin College of Arts and Sciences

Personality has been linked to many cognitive functions in the literature. The purpose of this study was to determine the relationship between personality factors and impulsivity in adults, and evaluate the moderating effect of education. We hypothesized positive relationships between openness, extraversion, and neuroticism and impulsivity, and negative relationships between conscientiousness and agreeableness and impulsivity. Education was hypothesized to moderate by weakening these relationships. A sample of 89 adults were used in this study (ages 36-85, $M= 62.53$, $SD= 13.61$). Each participant completed a NEO Five Factor Inventory (NEO-FFI), a comprehensive measure of personality traits. They were also given the UPPS Impulsive Behavior Scale, which is designed to measure impulsivity across four aspects of personality. Participants also reported their level of education in years. All five factors of personality were assessed. Participant's T-scores from our regression analysis for each factor and the UPPS total z-scores were used in our model. There was a significant main effect of agreeableness ($R^2= .155$, $F_{change}(1,85)= 15.585$, $p < .00$), conscientiousness ($R^2= .238$, $F_{change}(1,85)= 26.544$, $p < .00$), and neuroticism

($R^2= .163$, $F_{change}(1,85)= 16.895$, $p < .00$) on impulsivity. There was also a significant main effect of extraversion on impulsivity, and only this relationship was moderated by education, $R^2= .177$, $F_{change}(1,84)= 7.680$, $p < .01$. These results suggest that there are significant relationships between certain personality factors and impulsivity in our sample and that the more education an individual has, the more likely the relationship between extraversion and impulsivity will not be significant.

Sulfur Isotope Ratios of Terrestrial and Coastal Fauna on the Georgia Coast: A Step Toward Resolving Equifinality in Human Paleodiet Reconstruction

Logan Van Hagen, CURO Research Assistant
Dr. Doug Dvoracek, Center for Applied Isotope Studies, Office of Research

Sulfur isotope ratios in human bone collagen are used in paleodiet reconstructions to distinguish between marine- and terrestrial-based diets, because sulfur isotope ratios in marine organisms are typically higher. However, natural phenomena such as sea spray, rain, and flooding can deposit sea water sulfates on land that are bioavailable to plants and terrestrial animals. Comparing sulfur from archaeological deer and fish-eating raccoons from sites both in close proximity to the coast and further inland, this study examines whether sulfur isotope ratios have the potential to discern between marine and terrestrial foods in past human diets on the Georgia coast.

Adapting a CRISPR-Cas System into a Novel Gene Knockdown Platform

Nikita A Vantsev, CURO Honors Scholar, CURO Summer Fellow, CURO Research Assistant
Dr. Michael Terns, Biochemistry and Molecular Biology, Franklin College of Arts and Sciences

CRISPR-Cas adaptive immune systems of prokaryotes consist of a CRISPR locus containing an array of invader-derived sequences called spacers, separated by repeat sequences, and CRISPR-associated proteins. These systems function in three mechanistically distinct stages. First, there is integration of spacers into the CRISPR array of the host genome. Second, the CRISPR array is transcribed and processed into several guiding CRISPR RNAs (crRNAs) that each match a different invader sequence. Finally, the crRNAs are incorporated into a complex with Cas proteins and guide this crRNA-Cas protein complex in silencing invaders via cleavage and destruction of the foreign complementary nucleic acid. My research project focused on harnessing the RNA-targeting capability of the invader silencing complex, called Csm, of the Type III-A CRISPR-Cas system of *Lactococcus lactis*, to develop an efficient gene suppression tool for *E. coli* proteins. The protein complex of the Type III-A system was

expressed in *E. coli*. To guide the Csm complex, the CRISPR array was programmed with spacers that generated crRNAs complementary to different regions of various target *E. coli* mRNAs. The effect on specific mRNA degradation was assayed by Northern blot analysis. Additionally, the effects of targeting the lacZ mRNAs was further evaluated by quantifying the ONPG cleavage activity produced by the encoded beta-galactosidase. The results showed that Csm CRISPR-Cas systems can be engineered to efficiently and selectively inhibit gene expression in a predictable manner.

Vancomycin with Iron Conjugate for Treating Drug Resistant *Pseudomonas aeruginosa*

Nimisha Vasandani, CURO Research Assistant
Dr. May Xiong, *Pharmaceutical and Biomedical Sciences, College of Pharmacy*

This study focuses on combatting antibiotic resistance in the Gram-negative bacteria *Pseudomonas aeruginosa*. The broad spectrum of intrinsic antibiotic resistance imparted by its impermeable outer membrane prevents the uptake of high molecular weight antibiotics, thus limiting treatment options to only a few anti-pseudomonal drugs. To address this issue, an innovative approach is taken to overcome the outer membrane permeability barrier. By forming an antibiotic conjugate that can effectively cross the outer membrane, the antibiotic sensitivity of the organism is increased. Desferrioxamine B (DFO), a siderophore readily recognized by *P. aeruginosa*, is complexed to a trivalent metal cation, and is then internalized by the organism, making it an effective carrier molecule. By targeting the unique iron acquisition system found in this organism, toxicity to the host cells can be minimized, while affinity for active transport of the antibiotic conjugate is enhanced. Vancomycin (VAN) is a potent antibiotic against Gram-positive bacteria, but has little effect on Gram-negative bacteria due to difficulty crossing the outer membrane. Conjugation of the free carboxylic acid group on VAN to the free amine of DFO results in a VAN-DFO antibiotic-siderophore conjugate. The antibiotic activity of VAN-DFO complexed with either Fe or Ga will be evaluated relative to VAN alone using the broth microdilution method. The minimum inhibitory concentration of VAN-DFO is expected to be considerably lower than VAN, and could represent a new therapeutic strategy for treating drug resistant *P. aeruginosa* infections.

Structural-Thermal Optical Performance Analysis of Small Satellite Payloads

Casper Versteeg, CURO Research Assistant
Matthew Phillip Hevert
Dr. David L Cotten, *Geography, Franklin College of Arts and Sciences*

Thermal expansion governs the optical performance of

the Spectral Ocean Color satellite's (SPOC's) adjustable multispectral payload. Due to the dynamic thermal environment of low earth orbit (LEO), rapid temperature fluctuations will induce deformation in the structure. Additionally, the refractive properties of the optical lenses require them to be placed in very specific and precise positions. As the structure deforms due to thermal expansion, these positions will change in orbit, causing image quality to fluctuate as well. While this is an unavoidable effect, it can be calibrated for by using predictions from simulation, and careful selection of material coefficients of thermal expansion. Thermal, structural, and optical analysis is used to determine calibration parameters, and guide engineering design of the payload.

Climate Fiction as a Response to Climate Change: A Genre Analysis

Teddy Vincent, Ramsey Scholar, CURO Research Assistant
Dr. James Hamilton, *New Media Institute, Grady College of Journalism and Mass Communication*

This study explores the film genre of climate-fiction, an innovative way of addressing important scientific issues that affect populations worldwide. While movies are well-documented in their ability to capture attention and inspire, films confronting climate change have until recently misfired. They often take the form of documentaries, which rarely engage and rouse their audiences due to their generic footage of the environments, statistics, and muted emotions. However, a new genre of feature film termed climate-fiction, or cli-fi (as a play on the science-fiction genre), depicts the disastrous effects this phenomenon could have on society, or the dystopian futures that could come as a result through expertly crafted, fantasy narratives. This study conducts a modified genre analysis of the quintessential climate change documentary and a popular cli-fi movie. The films to be analyzed are 2006's *An Inconvenient Truth* and 2015's *Mad Max: Fury Road*, both being box-office and critically-acclaimed successes. By comparing and contrasting the narrative roles of climate change in each, the study speculates on the possible value of fictional treatments of significant real-world affairs. Through this comparison, I hope to uncover the extent to which climate-fiction might make this notoriously amorphous and ungraspable concept more tangible, and thus more receptive to sincere global response.

Is China's Economy Headed for a Crash?

Ashe Viswanathan
Dr. Zhongjin Lu, *Banking and Finance, Terry College of Business*

Over the past few years, the Chinese Stock market has experienced troubling levels of turbulence. Their government's efforts to reduce this turbulence has been

successful, however future performance levels remain uncertain. The aftermath of the 2008 Financial Crisis has brought increased attention to the mitigating of such crises. Although its scope was at a level unseen since the Great Depression, history argues that these busts are not as rare as they appear. The repetitive nature of the business cycle implies that economic booms will follow with inevitable busts. Understanding this trend, is it possible to characterize the nature of similar, if not all, financial crises? This paper proposes the following: 1) An analysis of financial crises across many regions over a period of centuries, and 2) a characterization of China's current economy that predicts where their markets are headed. The availability of historical data allows for a more holistic analysis on economic boom and bust periods. Detecting common characteristics and trends across these episodes, I focus on a potential modern-day episode: Is China's economy headed for a crash? By understanding the methods in which we categorize financial crises, we can place China's current economy into such a category. Readers will realize useful insights that will allow them to understand the necessary conditions surrounding these events, which will further provide them with the knowledge to detect future crises, and incentivize action to reduce potential losses.

Sexual Violence Prevention Method Effectiveness on College Campuses

Allison Michelle Vita, CURO Research Assistant
Dr. Deanna Lynn Walters, Health Promotion and Behavior, College of Public Health

Sexual violence is a major issue on college campuses. Among college students, 1 in 5 women, 1 in 4 members of the LGBTQ community, and 1 in 50 men are victims of sexual violence. Over 90% of cases go without being reported to police. Sexual violence in the general population has a higher report rate (16%-32%) but is still vastly underreported. One barrier survivors face in reporting sexual violence is the stigma that leads to shame, guilt, embarrassment, or fear of not being believed. This research examines the effectiveness of current sexual violence prevention methods on college campuses. Through a literature review of peer-reviewed scientific articles researching college sexual violence, common themes were determined regarding the effectiveness of college sexual violence interventions. Previous research indicates that mandatory online educational programs, bystander intervention programs and performance-based programs are the most popular strategies in preventing sexual violence on campuses. Research-informed implications for preventing and addressing sexual violence on college campuses are discussed. This research also investigates current programs implemented on the University of Georgia's campus. Lastly, data collected from university students on perceptions of campus sexual

violence, prevention efforts, consent definitions, and perceptions of how the university addresses sexual violence will be explored. With this data, the researcher will provide implications to improve the current efforts the University of Georgia has in place to prevent sexual violence.

Two-Dimensional Self-Assembly Experiments with Vibration Stimuli

Truc Vu, CURO Research Assistant
Dr. Ramana Pidaparti, Environmental, Civil, Agricultural, and Mechanical Engineering, College of Engineering

Self-assembly is defined as the spontaneous organization of molecules, typically repeated protein subunits, under thermodynamic equilibrium conditions into structurally well-defined and rather stable 2D and 3D arrangements. Typically, biological self-assembly systems include actin and tubulin filaments, which form a network of protein filaments called the cytoskeleton. Research on self-assembly has expanded in the past few decades as scientists continue testing different methods to model protein organization and to study the patterns that emerge. Studying protein self-assembly has many future applications within fields such as material science, nanotechnology, and tissue engineering. Our goal in our experiment is to model the natural process of protein self-organization using models for the protein units, a source of attraction and repulsion, a source of energy, and an experimental environment. We performed our experiment by 3D printing dodecahedron shapes with magnetic spheres inserted within and placing them atop a Dual-Purpose Shaker to vary energy frequencies. We then run controlled trials to see how the units are affected by factors such as size, shape, energy, and magnetic strengths. Data analysis of the 2D shape formations will allow us to study the patterns and rules in which these units assemble and disassemble. This presentation includes the results obtained from experimentation and their characteristics from which definitive rules of self-assembly can be formulated for further research to obtain 3D structures.

Identifying the General Principles of Neural Circuit Assembly

Shannon Walker, CURO Research Assistant
Ave Maria Fouriezios
Dr. Daichi Kamiyama, Cellular Biology, Franklin College of Arts and Sciences

The brain is composed of billions of neurons organized into circuits that are characterized by synaptic connections. Neural circuit generation depends upon developing neurons accurately extending their projections to their proper target regions. Neuron adhesion molecules play important roles in the placement of these morphological features. The Kamiyama laboratory seeks to create a library of *Drosophila* GFP-11 tagged neuron adhesion molecules to

understand neural circuit morphogenesis in a developing nervous system. The engineered mutator, MiMIC, can be used to tag genes and track their protein products. MiMIC uses transposons to insert transgenes randomly into the genome of *Drosophila*. In order to find the locations of the inserts, inverse PCR will be performed. The first step in inverse PCR is to perform a fly genomic DNA preparation utilizing PureLink Genomic DNA kit. After extracting the fly DNA, the genomic DNA is digested by a restriction enzyme. Self-ligation is then induced to produce a circular DNA product. PCR is lastly performed. When the MiMIC insertion sequences are found, this will allow for the creation of a *Drosophila* library of fluorescent tagged neuron adhesion molecules with GFP-11. The knowledge of how neural circuits form is crucial to our understanding of the nervous system and how neurodevelopment disorders develop.

The American Opioid Epidemic

Taylor Walker, CURO Research Assistant
Dr. Thomas L McNulty, Sociology, Franklin College of Arts and Sciences

This study examines the medical, legal, and socioeconomic problems underlying the ongoing opioid epidemic in America with emphasis on finding effective policy solutions. In the medical system, a lack of oversight of pharmaceutical companies, a massive increase in opioid production and sales, and the industrialization and automation of the medical profession are all major factors that contribute to the epidemic. The legal system contributes to the epidemic through its punitive stance towards drug use/abuse that has persisted since the 1970s, and the lack of access to rehabilitation and treatment programs in prisons. Socioeconomic problems relate to the lack of community-based programs for those at highest risk of addiction, and those programs have been underfunded and understaffed for decades. Potential solutions to the opioid epidemic are suggested by other nations that have faced similar epidemics, such as Switzerland in the 1980s and the Four Pillars Strategy that Canada enacted in Vancouver in the early 2000s. Adopting a less punitive stance towards the epidemic and instead addressing it as a public health problem would help curtail the ever-increasing death toll and bring an end to the epidemic.

Using Incremental Stable Nitrogen Isotope Analysis to Evaluate the Effects of Weaning on Infectious Disease Mortality in 19th Century Italy

Trey Walker, Ramsey Scholar, CURO Research Assistant
Dr. Laurie Reitsema, Anthropology, Franklin College of Arts and Sciences

The Developmental Origins of Adult Health and Disease Hypothesis (DOHaD) posits that early childhood stress plays

a vital role mortality from metabolic disorders. However, the relationship between early childhood stress and mortality from infectious disease has yet to be thoroughly explored. The goal of this study is to determine the role of age-at-weaning in mortality from infectious disease. Differences in weaning patterns correspond to changes in the nutritional or cultural environment of a population. Inadequate or extended weaning periods can be detrimental to the health of those being weaned. In this study, we compare age-at-weaning of 19th century cholera victims from Benabbio, Italy to a contemporaneous general population from Pieve dei Monti di Villa. We use incremental stable nitrogen isotope analysis to reconstruct age-at-weaning. Stable nitrogen isotope ratios of the infant are elevated above the stable nitrogen isotope ratios of the mother during breastfeeding. After breastfeeding cessation, these levels should return to levels similar to that of the mother, thus providing an indicator as to when an individual was weaned. By analyzing incremental nitrogen isotope ratios from canines, we can estimate the age-at-weaning for adults in these populations. We expect to find that cholera victims exhibit either a significantly earlier or later age-at-weaning compared to the general population. Earlier age-at-weaning indicates that children were weaned too early, which is detrimental to their brain development. Late weaning indicates that weanling food was not readily available, and extended weaning may have hindered brain development due to inadequate nutrition.

The Effects of Prenatal Exposure to Endocrine Disrupting Chemicals on the Onset of Hypertension

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The prevalence of hypertension in adolescents is on the rise in many parts of the world. Although this may be attributed to the prevalence of obesity in this population, we suspected that prenatal exposures to endocrine disrupting chemicals could be a major contributing factor. This is because endocrine disruptors such as bisphenol-A (BPA) are used in the production of plastics and a variety of personal care products on a large scale and exposure to these chemicals is ubiquitous. Currently, BPA is being replaced with analogs such as BPF. When pregnant women are exposed to these EDCs, it places their offspring at high risk for "programming effects" that can lead to disorders such as hypertension in later life. We have previously found that exposing female rats to low doses of estradiol that mimics oral contraceptive use can cause modest hypertension. We hypothesized that prenatal exposure to BPF will exacerbate hypertension when prenatally programmed offspring are exposed to low levels of estradiol in adulthood. To test this, pregnant rats were orally dosed with saline, or 1µg/kg BW of BPF from

day 6-21 of gestation. Two female offspring from each dam were implanted with telemeters at 2.5 months and were either sham-implanted or implanted with estradiol pellets at 3 months of age. Blood pressure readings were obtained at weekly intervals for the duration of the estradiol release (90 days). BPF exposure produced a modest increase in diastolic blood pressure, but there was a significant increase in systolic blood pressure in the BPF group implanted with estradiol. Moreover, mean arterial pressure was elevated in both BPF treated groups. These results indicate that prenatal exposure to BPF can predispose offspring to hypertension and exposing female offspring to an additional estrogen can increase the risk of hypertension even further.

Characterizing Root Architecture and Anatomy in African Savanna Trees and Grasses

Isabel Wargowsky, CURO Research Assistant
Dr. Ricardo Holdo, Ecology, Odum School of Ecology

We still have a limited understanding of how root morphology influences water uptake and transport ability of savanna tree and grass species. Such knowledge is important because plant water uptake potential can inform how tree-grass savanna systems respond to future drought or changes in climate. We investigated water uptake capability of ten tree and three grass species found in African savannas by characterizing their individual root architecture and anatomy. We determined root architecture by analyzing photographs of intact root systems to track branching patterns and classify roots by order, and root histology by utilizing microscopy to characterize vessel number and diameter in root cross-sections. We hypothesized that trees will have deeper roots and larger vessel diameters compared to grasses, therefore enabling each functional type to utilize water in the soil profile at different depths and various climatic scenarios. Under drought conditions we would expect trees to outperform grasses based on their potential to access deeper underground water sources, while grasses would outperform trees in seasons of unpredictable rainfall based on their ability to capitalize on more shallow water resources. We will present final results upon completion of the analysis.

Prevalence of Student Mental Health Issues: Implementing Awareness Training

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Among students facing the demands of higher education, mental health issues are the leading cause of students falling behind in school and often contribute to students stopping their education altogether. Universities and

colleges, although required to provide counseling and support resources, often fail to take enough steps to ensure students eventually reach the provided resources. Faculty are the most direct and important link for students to be successful in college, but there are no effective or standardized programs to instruct faculty to help students with mental health issues. We developed a comprehensive policy solution in which faculty and staff will be given necessary training to identify affected students as well as work with and refer those students to useful resources that can lead them towards good health. In developing a flexible and targeted policy, studies were consulted that report the perspectives and wishes of university students—those afflicted and un-afflicted by mental health issues—in addition to the positions and experiences of educators. Further consulted were the specific institutions currently implementing awareness and student-aid programs on campuses. The finalized policy can be implemented on a statewide basis for universities and colleges participating in the state systems across the nation to aid in the fight against mental health issues.

The Effectiveness of “Instructional Conversation” Pedagogy in Education for Multilingual Students

Lauryn Waters, CURO Honors Scholar
Dr. Paula J Mellom, Language and Literacy Education, College of Education

In the United States, students who are non-native speakers of English often do not have equal academic success as native English speakers. This trend is oftentimes a direct result of traditional classroom pedagogy and its reliance primarily on lecturing. Instructional Conversation (IC) is a teaching method that emphasizes hands-on connections with content. Rather than relying heavily on teacher lectures, this pedagogy allows children to learn how to effectively discuss classroom and social topics with their peers, make real-world connections, and gain a deeper understanding of classroom material, allowing multilingual students to better understand lessons and grow in their English-language skills simultaneously. However, engaging in collaborative conversations relies upon clear instruction and tools to promote student autonomy. This study investigates the role of clear, standardized lesson instruction in the form of “task cards” in promoting student autonomy and encouraging students’ content-specific language use. Over the course of many months, as part of a larger research study, the researchers have been collecting IC task cards and videos of students engaged in the accompanying lessons from classrooms in districts across Georgia. This study will rate the clarity of language in task cards, then, using Atlas T.I., a qualitative analysis tool, evaluate videos of students engaged in lessons utilizing the three top and three bottom-rated task cards. The results of this study will offer evidence

of whether this revolutionary form of teaching can be used to provide a method of education that is effective for all students.

A Study of the Consequences of Social Media on the Mental Health of College-Aged Millennials

Hannah Weeg

Dr. Juan Meng, Advertising and Public Relations, Grady College of Journalism and Mass Communication

The purpose of this research is to identify and analyze the positive or negative effects social media has on the mental health and overall happiness of college-aged millennials. An online survey and an in-person focus group were used to gain a better understanding of how college students feel about the effects social media has on their mental health. Research results showed that 92% of the people actively use Facebook, 88.5% use Instagram, and 87.5% are using Snapchat. Most respondents said they check these platforms more than three to five times a day. The focus group was most helpful in dissecting millennials' opinions, and why each social media platform is used. Overall, the most common reason that the students had for using social media was to keep up with the news and to socialize and keep up with friends. Focus group participants admitted that they often felt pressure to appear a certain way on social media, while more survey respondents noted that social media has the potential for positive effects. The results recommend that if students are feeling particularly stressed, anxious, or depressed in their lives, they need to take a break from using social media excessively. The study provides insights into the prevalence of social media and its effects on college aged millennials. It is important that students are aware of the consequences of social media.

How Trees in the North Campus of the University of Georgia Are Being Managed

Sarah Welch

Dr. Puneet Dwivedi, Forestry, Warnell School of Forestry and Natural Resources

Trees in urban areas provide necessary ecosystem services. Such trees however, are not beyond natural cycles and must be continuously maintained to ensure the continuance of the critical ecosystem services they provide the community. It is important to characterize both purposeful and unintentional changes in our urban tree management practices so remedial steps can be taken in a timely manner to avoid any future issues. The purpose of this study is to assess changes in tree composition and canopy cover on the University of Georgia's North Campus compared to a previous inventory performed in 2009. In this study, we surveyed every tree on North Campus, a 39-acre area between Broad Street, Lumpkin Street, Jackson Street, and

Baldwin Street. We recorded species and measured the diameter at breast height and the total height for each tree present. Almost 56% trees removed since 2009 were part of the forest's overstory. In the same time, only 45% of new trees planted were species capable of growing tall enough to become part of the overstory. Additionally, 33% of new trees established between 2009 and 2017 were non-native, bringing the total amount of non-native trees to 20%. While we understand there are many issues the University must consider when reforesting campus, to ensure our urban forest on North Campus remains healthy and capable of providing the critical ecosystem services the community requires, we must be willing to extend our management horizon and include species composition and canopy structure considerations into our efforts.

How Beta Angle Determines CubeSat Mission Development

Sydney Meredith Whilden, CURO Research Assistant

Dr. David L Cotten, Geography, Franklin College of Arts and Sciences

The University of Georgia's Small Satellite Research Laboratory is developing the Spectral Ocean Color satellite (SPOC) and Multiview Onboard Computational Imager (MOCI) missions to provide image data directly to UGA's Center for Geospatial Research. SPOC and MOCI are CubeSats – that is, nanosatellites adhering to a particular design specification composed of connected cube-like structures. A key factor in the success of low Earth orbit operations is a satellite's beta angle, which measures the percentage of time an orbiting satellite spends exposed to sunlight. Sunlight exposure determines when the satellite may generate power, adjust its attitude, image ground targets, or communicate with a ground station or neighboring craft. Thus, the beta angle is crucial to scheduling on-orbit operations of the SPOC and MOCI missions. Using Systems Tool Kit 11, simulations were conducted examining ground target feasibility, fine sun sensor access to the vector of direct sunlight, solar panel power generation, and downlink opportunities for telemetry and data. Using beta angle as a user-selected criterion, these simulations provided filtered results that are being used to plan satellite operations. It was found that beta angle would indeed strongly influence mission scheduling and assurance, and new concerns were identified, such as periods of overexposure to sunlight. Understanding such orbital parameters and conditions permits the progression of both CubeSat missions, which are hoped not only to successfully transmit image data, but also to explore new avenues of nanosatellite functionality for climate and terrain research.

Addressing Supply Chain Logistics and Resilience Challenges for the Sustainable Commercialization of Carinata Jet Biofuel and Bioproducts

Haley Audrey White, CURO Research Assistant
Dr. Puneet Dwivedi, Forestry, Warnell School of Forestry and Natural Resources

Carinata, an oilseed brassica plant, represents a new opportunity for biofuel in the Southeastern United States, as it offers a twofold solution to the pressing issue of carbon emissions: oil extracted from carinata seed can be used to produce bio jet fuel, diesel, and other renewable products while the leftover meal serves as a high protein feed for livestock. Carinata could be grown as a cool season cover crop in the Southeastern United States to meet the demand for biofuel. However, before the industry can be established, infrastructure must be in place. We will locate the facilities necessary to establish and maintain a successful industry for carinata and obtain statistical and logistical information about such facilities. We will contact Georgia Farm Bureau, Georgia Development Authority, the Georgia Feed and Grain Association, and the Georgia Fats, Oils, and Grease Alliance to locate grain elevators, greasing facilities, and crushing facilities throughout Georgia. We will individually contact owners and managers of each facility. Capacity data will be recorded in an excel spreadsheet, and a map of facilities will be created. Then, we will identify those infrastructure facilities that can be utilized for maintaining year around supply of carinata to a processing mill located in Panama City, Florida by doing a suitable GIS-based analysis. Information gathered during this project will ultimately contribute to establishing a sustainable industry for carinata in Georgia.

Preparing for Productive Post-Retirement Life: LifeQuest

Morgan White, CURO Research Assistant
Dr. Heidi H Ewen, Gerontology, College of Public Health

The time after retirement, the third age, is characterized as a time of life during which active, healthy people find renewed sense of purpose. Volunteerism, encore careers, travel, and enriched learning are common among couples. Older men, however, often find themselves feeling disconnected and isolated. This project aims to assist two retired professionals in planning for a non-profit organization in Athens. This study evaluates six post-retirement programs designed to maximize retirees' talents and interests for betterment of the community. First, qualitative methods will be used to critically analyze the programs' missions, purpose and programming, products and outcomes. Secondly, a survey of community service organizations will aid in determining what resources are available presently and estimate scope. Next, we will conduct a focus group with retired men in Athens Clarke County to determine interest, skills, and

potential avenues for developing a volunteer organization. Lastly, we will work with our community partners to identify and assess ways to implement a volunteer-based service organization in the Athens area.

Feature-Guided Safety Testing of Neural Networks

Matthew Wicker, CURO Research Assistant
Dr. Liming Cai, Computer Science, Franklin College of Arts and Sciences

As machine learning algorithms find increasing relevance in modern applications it is clear that their impact on the future of computer science and technology will continue to be significant and substantial. These complex algorithms present an exciting future for the field and pose consequential issues. Namely, the safety and security of these algorithms is sparsely understood. Initial efforts in understanding the safety of neural networks, perhaps the most popular machine learning algorithm, have been focused on crafting adversarial examples. In short, an adversarial example is an input to a learning algorithm that, though initially classified correctly, is misclassified due to an often-imperceptible alteration. Such examples expose the fascinating and concerning duality between the generalization abilities of state-of-the-art algorithms and their robustness to inputs with diverse structural and compositional elements. Initial studies of adversarial examples require an understanding of the specifics of a network under investigation (e.g. topology and hyper parameters). In our work, we abandon this notion as it quickly imposes impractical scalability constraints. Using no knowledge of the network topology or hyper parameters, we establish a novel method for exploring the input space of a network. With a formalized perspective of our method posed as a two-player turn-based game, we employ Monte-Carlo Tree Search method that makes asymptotic guarantees about the quality and existence of adversarial examples. Further, testing of state-of-the-art networks for computer vision, including networks for autonomous driving, reveals adversarial examples to be ubiquitous.

Comparison of Iodide and Thiocyanate Substrates in the Lactoperoxidase-Halide Antimicrobial System

Lauren Christine Widman, CURO Research Assistant
Dr. Balazs Rada, Infectious Diseases, College of Veterinary Medicine

Influenza virus has increasingly become more prevalent and difficult to contain. Influenza initially contacts and infects airway cells. To combat this the body utilizes an innate immune defense mechanism which creates the antimicrobial anion, hypothiocyanite (OSCN⁻). The lactoperoxidase (LPO)-halide system uses hydrogen peroxide (H₂O₂) and thiocyanate (SCN⁻) to produce hypothiocyanite. In the

respiratory epithelium Duox 1 is responsible for producing H_2O_2 that is used in this system. The LPO-halide system can also utilize other halides such as iodide (I^-) as a substrate. First, we examined the susceptibility of different influenza subtypes to each LPO substrate. To do this we utilized a cell-free method that generates hypiodous acid (HIO) and hypothiocyanite in an *in vitro* system. We discovered that different influenza subtypes had different levels of susceptibility to each substrate. We hope to confirm this data from the cell-free systems by utilizing normal human bronchial epithelial cells (NHBE). NHBE cells mimic the body's bronchial epithelium providing H_2O_2 via Duox 1. The H_2O_2 /LPO/ I^- system demonstrates a stronger inactivation for influenza A virus strain (IAV) and the H_2O_2 /LPO/SCN $^-$ system demonstrates more robust inactivation of influenza B virus (IBV) strain in comparison. These findings allow for further understanding of the molecular mechanism of OSCN $^-$ and HIO inactivation of influenza virus and the susceptibility of differing subtypes.

Measurements of Pre-Heater Temperature-Dependence on Flow Rates for Combustion Experiments

Caleb Wiff, CURO Research Assistant

Dr. Brandon Rotavera, Environmental, Civil, Agricultural, and Mechanical Engineering, College of Engineering

The project goal is to conduct calibration measurements of a pre-heating system used to minimize the temperature gradient between mixing, combustible gases inside a turbulent, spherical reactor. The measurements consist of recording and graphically interpreting temperature and volumetric gas flow data to develop a reference table for use in the Combustion and Atmospheric Reaction Mechanisms Laboratory (CARMel) at UGA. Inside the spherical reactor, fuel is mixed with an inert gas and injected into a reactor coaxially with O_2 . Heating the gas before injection decreases the temperature gradient between the inert gas, O_2 , and the fuel, and ensures mixture homogeneity, resulting in accuracy in reported temperatures and reliable extraction of gas samples from the reactor for offline analysis using GC/MS/VUV-absorption. The data collection for this project consists of measuring initial and final temperature of N_2 flowing through a resistance heater, volumetric gas flow, and voltage applied to the heater to determine how these variables affect the outlet temperature of the gas. Flow rates from 500-5000 sccm, and voltages from 30-115 VAC will be tested. Gas temperatures will be measured using K-type thermocouples affixed to the gas inlet and outlet lines, and a K-type probe inside the heater will monitor the heater temperature to ensure the heater temperature rating of 400°C is not exceeded. It is expected that using the heater will result in a gas temperature increase of 150-200°C. The data will be used to construct a reference sheet to be used in CARMel at UGA. The reference sheet will

enable quick adjustment of equipment settings between experiments, without the need to derive new data for each new experiment.

Simulating Turbulence in the Magellanic Stream

Elliott Williams, CURO Research Assistant

Dr. Robin Shelton, Physics and Astronomy, Franklin College of Arts and Sciences

Our Solar System lies in a galaxy, the Milky Way (MW), that is surrounded by neighboring galaxies. Two of these neighboring galaxies, named the Large and Small Magellanic Clouds (LMC and SMC, respectively), have been caught in our gravitational field and are currently orbiting around the MW. As the LMC and SMC travel around the MW, gas is stripped from them, leaving a trail that extends more than halfway around the MW. This structure, the Magellanic Stream (MS), is mostly neutral and ionized hydrogen gas that was pulled from the LMC and SMC. Gas from the MS cools and falls into the MW, where it can be used to fuel star formation. Its important role in the evolution of the MW has prompted study and interest from astronomers. Astronomers have observed clouds in the MS that seem to have random trajectories rather than being aligned with the Stream, possibly indicating turbulence. In this study we run simulations of two clouds, one downstream from the other, to attempt to recreate these conditions. We have developed code to study velocity dispersion, an indicator of turbulence, in the simulations. Velocity dispersion is measurable in observations as well, so this project will not only further insights about simulated turbulence but will also provide a method to quantitatively compare observations to simulations. If we are unable to reproduce the amount of velocity dispersion seen in observation, this could lead to future work, possibly suggesting that turbulence exists on larger scales in the MS.

Differential *Fusarium verticillioides* Gene Expression in Response to *Streptomyces* Bacteria Exposure

Felicia Williams, CURO Research Assistant

Dr. Scott Gold, Plant Pathology, College of Agricultural and Environmental Sciences

Fusarium verticillioides (*Fv*), a mycotoxigenic fungus, is a soil-borne pathogen of corn (*Zea mays*). The toxic compounds produced by this species have been shown to cause birth defects in mice and are associated with a higher incidence of birth defects for humans in areas of high corn consumption. In the soil, *Fv* is in contact with a myriad of competitor microbes that have evolved weapons and defenses to better exist in this competitive environment. Soil-borne fungal pathogens tend to have more lactamase encoding genes, which we speculate counter antibiotic compounds released by their soil-dwelling microbial competitors. However, the

function in biosynthesis vs degradation for all but one lactamase remains unconfirmed. Lactamase encoding gene (FVEG_08291) is required for degradation of a corn plant produced antibiotic called BOA. Importantly, FVEG_08291 is also induced by BOA. Based on this paradigm, the central hypothesis for my work is that lactamase encoding *Fv* genes induced by specific antibiotics will confer degradative resistance to those antibiotics. *Streptomyces* bacteria are common competitors of *Fusarium* species in agricultural and undisturbed ecosystems. Through dual-culture experiments, I identified four *Streptomyces* strains that together show a wide range of *Fv* inhibition, from dramatic to subtle. *Fv* mycelial samples were collected for RNA extraction on a time course of exposure to these strains. RNAseq libraries have been generated for the two-hour time point, and differential expression data will be presented as available. *Fv* mutants in induced lactamase genes will be tested for increased inhibition by the inducing *Streptomyces* strains.

The Effects of Galanin in the Mesolimbic System

Kevin Charles Williams III, CURO Honors Scholar
Dr. Philip Holmes, Psychology, Franklin College of Arts and Sciences

There is high comorbidity between conditions of chronic inflammatory pain and depression; however, the neural underpinnings of this link are not well understood. Dysfunction of the mesolimbic dopamine system may contribute to this comorbidity. Furthermore, the neuropeptide galanin is upregulated in response to pain and inflammation and has been shown to modulate dopamine release, therefore it may also play a role. We investigated the effects of acute galanin administration on dopamine levels in the mesolimbic system to determine if acute effects of galanin on the dopamine system could be measured in tissue samples using High Performance Liquid Chromatography (HPLC). Galanin ($n = 4$; $10\mu\text{g}/10\mu\text{l}$) or artificial cerebrospinal fluid (aCSF; $n = 4$; $10\mu\text{l}$) was administered into the lateral ventricle of male Sprague-Dawley rats through a cannula (AP: -0.5 mm , ML: $+1.5\text{ mm}$, DV: -3.0 mm relative to Bregma). Rats were euthanized and brains extracted within fifteen minutes. The monoamine neurotransmitters and their metabolites were measured in the nucleus accumbens (NAc), locus coeruleus (LC), and ventral tegmental area (VTA) by HPLC. We hypothesized that galanin administration would decrease dopamine in the VTA, but this was not supported. We did show non-significant trends towards decreased 5HIAA in the VTA and NAc, and, norepinephrine and serotonin in the LC, after galanin administration. Our results indicate that measuring tissue content may not be sufficient to identify the effects of galanin on this pathway and therefore a technique to measure extracellular content, such as microdialysis, may be required for further investigation of this topic.

Diagnosis and Treatment of Asthma by Airflow Dynamics and Particle Deposition Using Heliox

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Dr. JongWon Kim, Environmental, Civil, Agricultural, and Mechanical Engineering, College of Engineering

Would heliox be superior to air when delivering medicine? It is feasible in principle to diagnose lung diseases using exhaled aerosols. The exhaled aerosol profile is telltale of the airway they traveled through, or are traceable. The level of traceability depends on the flow regimes. Information dispersion (signal loss) will be significant in turbulent flows and will be smaller in laminar flows. Heliox (20% Oxygen, 80% Helium) has approximately five times lower kinematic viscosity for a given inhalation velocity. In this study, the feasibility of breath test with aerosol biomarkers has been assessed to diagnose obstructive lung diseases. The hypothesis is that exhaled aerosol distributions are 'fingerprints' of the respiratory airway structure, which varies whenever there is a change to the airway geometry. The objective of this study is to investigate the effect of heliox flow with the sensitivity of exhaled aerosol particles to geometrical variations in two mouth-lung models with computational modeling. Specifically, one normal condition and one asthma case were considered. We will be using six different models to demonstrate how heliox compares to air when it comes to the deposition of medicine particles. First, there will be two inhalation models. One model using air and one using heliox. Next, there will be two exhalation normal lung models using air and heliox. Finally, there will be two exhalation models with an asthmatic lung, using air and heliox.

The First CRISPR/Cas9-base Reverse Genetic Screen in *Trypanosoma cruzi*

Georgia McClure Wilson
Dr. Rick Tarleton, Cellular Biology, Franklin College of Arts and Sciences

Trypanosoma cruzi is the etiologic parasitic antecedent of Chagas Disease. Few effective drugs and no vaccines exist for this parasite, and the functions of many proteins encoded by the *T. cruzi* genome are not well understood. One effective method to globally assess gene function is to conduct a reverse genetic screen by creating a population of organisms, each individual with a mutation in a single gene, and evaluating the result of those mutations on some characteristic of the organisms (e.g. survival, growth, replication, etc.). This study attempts to test the feasibility of a reverse genetic screen in *T. cruzi* using CRISPR/Cas9 gene editing to target a subset of genes with predicted or known functionality. For this purpose, I first designed a gRNA-encoding DNA oligonucleotide library for the gene subset and used CRISPR/Cas9 to integrate the DNA

oligonucleotides into a unique expression site in the *T. cruzi* genome. This produced a population of parasites in which each cell contained a knockout of one of the targeted genes. The essentiality of each gene for parasite growth was characterized by the representation change of parasites over time. Over a two-week sampling period, 73% of the genes either increased or decreased in representation. These results confirm the CRISPR/Cas9-based reverse genetic approach for the 104 subset in *T. cruzi* and lay the groundwork for developing a whole-genome library screen in *T. cruzi*, which could provide valuable information regarding the essentiality of each gene in the *T. cruzi* genome.

Evaluating the use of Metakaolin in Mass Concrete Specimens

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The Georgia Department of Transportation (GDOT) is currently funding a research that evaluates the use of metakaolin, a locally available material, as a partial cement replacement in concrete. The goal of this research is to determine whether the heat liberated through the exothermic reaction of cement hydration will be reduced as a result of metakaolin inclusion. Heat reduction is an important material property for mass concrete structures due the potential for extensive cracking resulting from elevated internal temperatures produced through the heat of hydration process. To date, the use of metakaolin as cement replacement for mass concrete mixtures has not been evaluated by GDOT. Phase I of this research is to determine the effects of metakaolin inclusion on the reduction of the heat of hydration and time to peak temperature. In order to complete this evaluation, concrete mixtures with varying amounts of metakaolin are produced and specimens tested for compressive strength, air content, workability, and heat of hydration. The internal concrete temperature is taken at three different locations within a large concrete block specimen: bottom, center, and side. Wireless thermocouples record the temperature at 30 minute intervals throughout the evaluation period (14 days). The specimen is cast in an insulated box with insulation R-value of 40 to prevent heat loss as cement hydration occurs. After 14 days of age, the specimen is removed from the mold and the data is analyzed and compared to other mixtures to determine whether it satisfies GDOT's Mass Concrete Specification.

Identity Development in Multiracial Individuals: Living Between the Racial Divide

Taylor Withrow, CURO Honors Scholar

Dr. Valerie Babb, African American Studies, Emory University (formerly: English, Franklin College of Arts and Sciences)

Race has been a central factor in the development of society for hundreds of years, principally in the creation of a social structure defined by a person's race or ethnicity. The power of race lies in its ability to segregate and isolate groups of differing races. However, racial mixing and the presence of multiracial individuals weaken this power because they prove racial barriers can be broken. As we rapidly move towards a more mixed world, it is becoming more important to understand these individuals who live on the border between races. The intriguing aspect of multiracial individuals is how the external environment, specifically society's objection towards racial mixing, can significantly impact the identity growth of multiracial peoples. Accordingly, this research focuses on how multiracial people develop identity in a society built upon racial segregation. To answer this question, past theories on multiracial identity growth and the depiction of multiracial characters in literature were examined to isolate patterns of identity development. Recently, there has been a shift towards the idea that race cannot be used as a legitimate tool for classification or categorization and at the forefront of this shift is the multiracial individual. Within our society, however, certain institutions and policies exist that rely on the use of racial categorization; therefore, understanding multiracial identity struggle and growth is key to understanding the both constructive and destructive effects of racial labeling and categorizations in society today.

Transition Readiness and Health-Related Quality of Life in College Students

Daniel Woodhead, CURO Research Assistant

Dr. Ronald L Blount, Psychology, Franklin College of Arts and Sciences

Poor readiness to transition from pediatric to adult healthcare can lead to negative health implications including low medication adherence, more missed appointments, and general deficits in health-related quality of life (HRQL; perceived physical and mental health)". This study aimed to examine HRQL, perceived transition readiness, and their relation in a sample of healthy college students and those with a chronic illness. Participants included 232 college students aged 18-28 years old ($M=19.36$, $SD=1.49$), with half endorsing a chronic illness ($n=116$) and half reporting no medical condition ($n=116$). Participants completed self-report measures of HRQL and transition readiness. Results indicated that students with a chronic illness had lower overall HRQL ($M=55.00$, $SD=21.87$)

and higher ability to track health issues ($M=4.10$, $SD=0.72$) compared to the healthy group (HRQL $M=71.03$, $SD=16.48$; $t(230)=6.31$, $p<.001$, $d= .83$; tracking ability $M=3.86$, $SD=.90$; $t(230)=-2.19$, $p=.03$, $d=.29$). Within the healthy group, the ability to manage daily activities was significantly related to emotional ($r=.18$, $p<.05$) and social domains of HRQL ($r=.25$, $p<.001$). For students with chronic illnesses, overall transition readiness was significantly correlated with pain ($r=-.22$, $p=.02$). It is likely that the physical and mental health of healthy participants was influenced by their ability to manage daily activities. Also, it is likely that participants with chronic illnesses had higher transition readiness scores due to their experiences in attending many appointments and managing medications. These correlations between transition readiness and HRQL highlight the importance of ensuring a smooth transition from pediatric to adult healthcare.

“Indecent” Immigration: Including “the Other” in Theatre

Lukas T Woodyard, CURO Research Assistant
Prof. George Contini, Theatre and Film Studies, Franklin College of Arts and Sciences; Dr. Frances N Teague, Theatre and Film Studies, Franklin College of Arts and Sciences

This research project follows the history of Sholom Asch's drama *God of Vengeance* and its subsequent role in Paula Vogel's play, *Indecent*. Specifically, the project questions how Vogel's play addresses current issues of immigration and diasporic identities in the United States through its representation of “the other.” In 1923, Asch's play was shut down on opening night due to charges of indecency as the American public viewed the first lesbian kiss on stage. The cast and crew were arrested and put on trial. Though they were charged with an act of indecency, scholars point to an undercurrent of anti-Semitism that figured prominently in the play's hostile reception. Vogel's *Indecent* follows the journey of *God of Vengeance*, from Asch's creation of the script in Europe to the controversy over the American production to the reverberation felt during and after WWII. Using Brechtian dramatic techniques and Victor Scholzkzy's idea of defamiliarization, Vogel presents an experience that seems contemporary to modern-day immigrants and their descendants. Vogel's play uses the marginalization of a queer, Jewish experience, to comment upon the broader experience of being the “other” in America. Vogel's dramatic skills and Rebecca Taichman's direction familiarize the struggles of being a foreigner in the United States. This project further validates that Vogel's play is not just a play about the Jewish community, but a play about all those seeking a life in America whether they be Asian American, Chicanx American, Latinx American, Middle Eastern American, etc.

The Relationship Between Creativity and the Music Emotional Effect on Creativity Based Courses

Devin Blake Worthy, CURO Research Assistant
Dr. Lilia R Gomez-Lanier, Textiles and Merchandising, College of Family and Consumer Sciences

This research study will explore the effect that emotions produced by music have on the creative process and leaning of individual students in higher education. The study will focus on undergraduate students enrolled in four creativity based studio classes. Two of the classes will act as a control group, while the other two act as the experimental group. The study will be composed of two creativity and learning phases assessments. The first phases will have students in all four classes listen to a lecture on creativity with the addition of classical music in the background. Afterwards, all students will complete a multiple-choice questionnaire to assess their learning during the lecture. In the second phase, the student control groups will solve a design problem while listening to music of their choice with earphones. After both groups have completed their design projects, they will complete the same questionnaire provided earlier in phase one. This study will add to both the knowledge of the relationship between creativity and the music emotional effect. The questions we will focus on will be how music influences the creative process of students in design studios and does music have a greater influence on the creative process of students in the beginning of their design school experience versus later in the educational process? The prediction for results is that music will affect the creative process in some way.

The Long-Term Effects of Corticosterone Exposure on Sex Ratios in Laying Hens

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In the egg industry, male chicks are killed shortly after birth since they cannot lay eggs and this breed of chicken is not used for meat production. Many female bird species can modify the phenotype of their offspring prior to hatching. Studying the mechanism underlying sex ratio manipulation and the deposition of yolk hormones by the female birds can help the industry reduce the amount of male chicks that have to die. It has been seen in other bird species, such as peafowls, that females who produced more female embryos had higher yolk corticosterone levels. Therefore, it is important to study the effects of long-term corticosterone exposure on laying hens to gain an understanding of sex ratios. In this study, hens were provided an implant containing corticosterone under the skin of its neck and artificially inseminated twice per week. The fertile eggs were then collected and the resulting embryos sexed to see

whether the implant influenced sex ratios of the offspring. It is expected to find more female than male embryos when hens are exposed to corticosterone.

The Role of Chondroitin Sulfate Glycosaminoglycans (CS-GAGs) in Glioma Invasion

Kallie Elise Wynens

Dr. Lohitash Karumbaiah, Animal and Dairy Science, College of Agricultural and Environmental Sciences

Glioblastoma multiforme (GBM) is the most aggressive form of astrocytoma and accounts for the majority of primary malignant brain tumors among adults in the United States. The current standard of care has no effect on patient survival because no therapies directly target glioma cell invasion, which is necessary to inhibit cells that migrate away from the main tumor mass. The brain extracellular matrix (ECM) plays a role in healthy neuronal homeostasis, and aberrant ECM alterations can directly promote tumor invasion. Evidence shows that sulfated chondroitin sulfate glycosaminoglycans (CS-GAGs) in the brain ECM may play a role in facilitating tumor invasion, but the mechanisms are unknown. To evaluate the role of sulfated CS-GAGs in this process, a small molecule GAG-antagonist, surfen, will be used to block CS-GAG signaling and curtail glioma invasion and spread. *In vivo* frontal lobe tumor inductions mimicking human GBM will be performed in a rat model. One cohort of animals will be inoculated with 50×10^5 rat allogeneic F98 cells in media only, and another cohort will contain 50×10^5 cells in media containing 20 μ M surfen. MR imaging will be performed post-inoculation at day 7, 14, and 21 to track progress of tumor growth as well as quantify tumor volume and angiogenesis. By blocking the tumor cells' ability to interact with extracellular CS-GAGs, we expect to see a reduction in normal tumor formation and growth compared to animals inoculated in control media only, which should develop larger, more invasive tumors with undefined boundaries.

Identification of Polycomb Repressive Complex-2-Interacting Proteins by Biotin Proximity Ligation in *Neurospora crassa*

Tiffany Yee

Dr. Zachary A Lewis, Microbiology, Franklin College of Arts and Sciences

The Polycomb Repressive Complex-2 (PRC2) is a chromatin modifying enzyme that is important for development and cell differentiation. PRC2 can act as a gene silencer through the methylation of histone H3 and has been implicated in some diseases, such as cancer. The mechanisms that control PRC2 localization and enzyme activity are poorly understood. We are using *Neurospora crassa* as a model to understand regulation of PRC2 and its role in epigenetic gene silencing. To identify novel proteins that interact

PRC2, we will be using proximity ligation via a biotin protein ligase fused to a PRC2 component in *Neurospora*. We hypothesize that PRC2-interacting proteins may regulate this conserved enzyme complex. This work will help further our understanding of the control and function of PRC2. I will summarize the ongoing progress of this research in my presentation.

Dermatan Sulfate Epimerase Expression in Equine DSLD Tissues

Madeline Young, CURO Research Assistant

Dr. Jaroslava Halper, Pathology, College of Veterinary Medicine

Equine Degenerative Suspensory Ligament Desmitis (DSLD) occurs in many horse breeds and often results in pain and lameness. Our lab has shown that the key histopathological sign of DSLD is a buildup of an abnormal form of decorin, a tendon proteoglycan, within connective tissue throughout the body. Decorin in DSLD horses has a chondroitin sulfate in place of a dermatan sulfate on its GAG chain. Additionally, we have found that DSLD tissues have increased levels of the chondrogenic growth factor BMP-2. Finding increased levels of BMP-2 was interesting because it stimulates the growth of cartilage and could therefore be involved in the lesions seen in DSLD horses. These data indicate that the BMP-2 could be the cause of the excess of decorin and other proteoglycan in DSLD. Therefore, it is imperative to understand the mechanism behind the synthesis of the deviant decorin. We have turned our attention to dermatan sulfate epimerase, an enzyme responsible for the proper glycosylation of decorin. The level of epimerase expression in connective tissue was determined utilizing immunohistochemistry in control and DSLD horse tissues. Dermatan sulfate epimerase levels were found to be relatively equal between DSLD and control horses. This finding indicates that another enzyme may play a greater role in the pathogenesis of DSLD or that the epimerase expressed in DSLD horses is abnormal. Both of these possibilities will be explored in future studies through gene expression analysis and PCR.

Investigating the *in vitro* Dose Response Characteristics of Macrocytic Lactone-Resistant and Susceptible Strains of *Dirofilaria immitis*

Tiffany Yue, CURO Research Assistant

Dr. Ray M Kaplan, Infectious Diseases, College of Veterinary Medicine

Heartworm disease, caused by the filarial nematode *Dirofilaria immitis* (Di), is the most important canine parasite in North America. Macrocytic lactone (ML) anthelmintics are the only preventive drugs available, and are 100% effective. However, drug-resistant strains of heartworm are being increasingly diagnosed, which is a major concern for canine

health. ML anthelmintics are known to cause paralysis in gastrointestinal nematodes; however, the mechanism of action against Di remains unclear. To investigate this issue, we tested the *in vitro* dose response of L3 and L4 stages of an ML-susceptible (Missouri-MO) and ML-resistant (Metairie-Me) strain using ivermectin and eprinomectin. Drug concentrations tested ranged from 0.625 μ M-20 μ M. Parasite motility was measured every 24hrs for 96hrs using the Worminator system, and dose-response was analyzed using a nonlinear regression model fit to motility data. For ivermectin-L3 assays, mean IC₅₀ values were 3.34 and 22.56 μ M for MO and Me strains, respectively and for eprinomectin were 83.48, 15.98 μ M. For ivermectin-L4 assays, an IC₅₀ value could not be determined for MO, and was 9.18 μ M for Me. For eprinomectin-L4 assays, IC₅₀ values were 8.01, 9.79, respectively, for MO and Me. No consistent differences were seen between ML-susceptible and ML-resistant strains or between larval stages. Additionally, concentrations used failed to achieve 100% motility inhibition despite being >5000x higher than *in vivo* concentrations that achieve 100% efficacy. These data demonstrate that MLs lack appreciable paralytic activity against larval stages of Di *in vitro*, suggesting that *in vivo* mechanisms of action are not attributable to paralysis or to direct effects on worms.

Population Dynamics and Mass Mortality of the Vermetid Gastropod, *Cerastium maximum*

Margaret Zacharias, CURO Research Assistant
Dr. Craig W Osenberg, Ecology, Odum School of Ecology

Coral reefs form the world's most productive ecosystems, but corals are currently threatened by physical and biological stressors. One of these stressors, the vermetid gastropod, *Cerastium maximum*, decreases coral survival, growth, and photosynthetic yield. Little is known about the ecology of these snails, and this lack of data limits our ability to understand the temporal and spatial extent of the deleterious effects of snails on corals. In July 2015, vermetid populations experienced a massive die-off throughout French Polynesia. To better understand population dynamics, and to determine if there were early signals for the die-off, we analyzed an 11-year photographic time series (2006-2016) from Mo'orea, French Polynesia to quantify snail density and live coral cover. The vermetid population grew logistically, increasing from its lowest density in 2006 (3.12 vermetids/m²) to an apparent equilibrium (4.79 vermetids/m²) that persisted from 2009-2015. Sites (and years) with higher vermetid densities had lower coral cover. Five months after the 2015 survey, the population declined abruptly to 0 on Mo'orea and on many other islands in French Polynesia. There were no indicators of a crash prior to the die-off. Given the deleterious effects of vermetids on corals, we predict that the population crash will lead to increases in

live coral. Future work will examine if different coral species declined differentially as vermetid densities increased. We will also quantify how size structure of the vermetid population changed over the 11 years. These data may help us to better understand dynamics of populations before massive die-off events.

Basis and Metric Variations of the Fractal Image Compression Presented by Yuval Fisher

Meekail Zain
Dr. Malcolm R Adams, Mathematics, Franklin College of Arts and Sciences

How do variations in basis and metric choices affect the compression quality, time efficiency and the generality of the fractal image compression techniques presented by Yuval Fisher? The methods developed and presented by Yuval Fisher are specifically designed for images, exploiting the spatial structure evident in most images leading to high compression while maintaining quality, but also limit the process to two-dimensional images. Basis generalizations refer to changes in the supported vector types of data. Such variations may make it so that the general techniques can be applied to compress different types of data, from one-dimensional time series data (e.g. stock prices by time) to higher dimensional data (e.g. data tables commonly used in machine learning tasks). Metric generalizations refer to changing the value that is being minimized. Traditional methods minimize the root-mean-square value of domain-range block pairs, corresponding to the L2 metric. Various choices in metric may lead to faster computation, greater compression, and higher quality compression. The research will also be done on the possible co-dependence of basis and metric choices, and the performance of various combinations of choices. The performance will be measured by computation time, image quality (PSNR), compression ratio and supported data structures. Advancements in the choices of basis and metric may lead to significantly greater applicability of fractal image compression techniques by generalizing the techniques to new types of data structures and increasing quality to a competitive level.

State Capacity and Contagion of Ethnic Conflict: Case Study of UK and China

Heng Zang, CURO Research Assistant
Dr. Jennifer Joelle White, International Affairs, School of Public and International Affairs

Extant literature reveals that the majority of ethnic conflicts are capable of spreading across borders uncontrollably and exerting international implications. As a result, policy makers often overwhelmingly concentrate on the importance of state capacity (the ability of state to constrain the contagion of ethnic conflicts), and claim that conducting a large-

scale national intervention is the most effective way to prevent domestic ethnic conflicts from creating severe security consequences on both intra- and interstate levels. However, I argue that conventionally defined conception of state capacity lacks sufficient precision, which can lead to inaccurate conclusions in the analysis of instances of ethnic conflict contagion. Considering state capacity a relatively independent indicator, this article mainly focuses on exploring how state capacity affects the contagion of ethnic conflict through interaction with other possible factors - including geographic proximity (geographically clustered groups are expected to have a higher likelihood of conflict), access to information about ethnic conflicts, kinship connection between transnational ethnic groups and the presence of primary commodity - that exert influences on the spillover of ethnic conflict. This article intends to investigate and compare interaction effects between two types of state capacity and the contagion of ethnic conflicts from a perspective synthesized on the scholarly literature and empirical evidence to support the arguments. Using *income per capita* and *tax ratio* as measurements of state capacity, I explicitly focus on cases of ethnic conflicts in United Kingdom (UK) and China to testify whether civil-wealthy states or state-wealthy states are more capable of constraining contagious ethnic conflicts. My findings have implications for the better understanding of the contagion effect of ethnic conflict and the need to consider multiple factors that contribute to this outcome.

Effects of Thiamine Deficiency on Magnetic Resonance Images of Mice Brains

Louise Leyi Zhuang

Dr. Qun Zhao, Physics and Astronomy, Franklin College of Arts and Sciences

Thiamine is an essential nutrient whose deficiency, present in the malnourished population and chronic alcoholics, can cause damage to the human nervous system. Thiamine deficiency (TD) also causes similar neural damage in mice. Common diagnostic methods for TD include blood tests and lumbar puncture, which are invasive, and analysis of physical symptoms, which is non-specific; however, MRI could potentially detect this condition noninvasively and accurately. In this study, the effects of TD on T_2 , T_2 -weighted, T_2^* , and T_2^* -weighted magnetic resonance (MR) relaxation parameters were investigated by comparing parameter values between TD and control mice in the thalamus and lateral ventricle brain areas. Mice were fed a controlled diet, with treatment mice given pyrithiamine injections to induce TD and control mice given thiamine injections. MRI scans were taken cross-sectionally using multi-echo multi-slice spin and gradient echo sequences for control and treatment mice at 3, 6, and 10 days after starting treatment. Relaxation times were then calculated and analyzed in

MATLAB using manually-drawn regions of interest in the thalamus and ventricles. Significant hyperintensities in thalamic T_2 , T_2 -weighted, and T_2^* -weighted values and significant differences in ventricular T_2 , T_2^* , and T_2^* -weighted values were apparent in TD mice compared to control mice as treatment days increased. The results indicate that neural damage caused by TD in mice is evident in significant MR parameter differences, with thalamic T_2 and T_2 -weighted values being especially indicative of TD. These effects demonstrate that MRI has potential to noninvasively and specifically diagnose thiamine deficiency in mice and possibly humans.

Natural Indigo-Nanocellulose Based Dyeing for Cotton Fabrics

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Conventional dyeing methods in the textile industry typically use high amounts of water and chemicals. Moreover, with high levels of water pollution caused by these processes, the treatment of effluent is a costly process. In this study, nanocellulose (NC) gel based dyeing provides a sustainable, eco-friendly and cost-effective method of dyeing cotton textiles with natural indigo in comparison to dyeing with synthetic indigo dye. In this research, the concentrations of natural indigo and the mordant (fixing agent) in the NC gel were varied. Cotton fabric samples were prepared by applying the natural indigo dyed NC gel through a screen-printing technique. For comparison, samples of the same varying concentrations were prepared through the conventional vat-dyeing process, using the same material - liquor ratio as for dyeing NC gel. Visually, color brightness increased with an increase in dye concentration, with or without the presence of a fixing agent. Use of the mordant alum provided the best results for color strength, light fastness, and wash fastness, but samples without mordant exhibited the best results for both wet and dry crocking tests. Use of the NC gel based dyeing process vastly reduced the amount of water and reducing agent, thiourea dioxide, when compared to the conventional process. While further research must be done to optimize the performance of indigo-based NC gel-dyeing processes, the potential for environmental impact can already be seen.

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