UNIVERSITY OF GEORGIA
Center for Undergraduate Research Opportunities

2017

CURO Symposium

highlighting UGA's undergraduate research

April 3-4 • Classic Center • Athens, GA

Program & Book of Abstracts

UNIVERSITY OF
GEORGIA
Center for Undergraduate
Research Opportunities

2017 CURO Symposium

Program and Abstracts

CURO Office
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University of Georgia
Athens, GA 30602
706-542-5871

curo.uga.edu

Symposium chair:	Dr. Martin Rogers, Associate Director of CURO & Honors
Book of abstracts:	Jami Gilstrap, Program Coordinator, CURO Kerrie Bethel, Administrative Associate, CURO
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Special Assistance for 2017 CURO Symposium

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Ms. Karen Newcomb	IT Professional, Honors

Technology Equipment & Support for 2017 CURO Symposium

College of Engineering	Center for Teaching & Learning
Odum School of Ecology	Franklin College of Arts & Sciences
Honors Program	Terry College of Business

Reviewers for 2017 CURO Research Mentoring & Best Paper Awards

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Mr. Keenan Stone	Department of Physics & Astronomy

Schedule

Monday, April 3, 2017

Oral Session I **11:15 a.m.-12:05 p.m.**
Athena Breakout Rooms A, B, C, D, G, H, I, J

Oral Session II **12:20-1:10 p.m.**
Athena Breakout Rooms A, B, C, D, G, H, I, J

Oral Session III **1:25-2:15 p.m.**
Athena Breakout Rooms A, B, C, D, G, H, I, J

Oral Session IV **2:30-3:20 p.m.**
Athena Breakout Rooms A, B, C, D, G, H, I, J

Awards and Keynote Session **3:30-4:30 p.m.**
Athena Room E

Poster Session and Reception **4:30-6:30 p.m.**
Grand Hall South (downstairs – use escalator in lobby)

Tuesday, April 4, 2017

Oral Session V **9:30-10:45 a.m.**
Athena Breakout Rooms A, B, C, D, G, H

Oral Session VI **11:00 a.m.-12:15 p.m.**
Athena Breakout Rooms A, B, C, D, G

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Athena Breakout Rooms A, B, C, D, G, H, I, J

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Athena Breakout Rooms A, B, C, D, G

Oral Session IX **3:30-4:45 p.m.**
Athena Breakout Rooms A, B, C, D, G, H, I, J

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, JURO, theses, et al.) 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.

2017

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

Dr. Mable Fok, Assistant Professor, Electrical and Electronics Engineering, College of Engineering

Dr. Richard Lewis, R.D., Foods and Nutrition, UGA Foundation Professor in Family and Consumer Sciences

2015

Dr. Jeb Byers, Professor, Odum School of Ecology

Dr. Erik Hofmeister, DVM, DACVAA, DECVAA, MA (Anesthesia), Associate Professor of Anesthesiology, Chief of Small Animal Surgery and Anesthesia, College of Veterinary Medicine

2014

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 & International Affairs

2013

Master Level Faculty Award
Dr. Jennifer McDowell, Psychology, Franklin College of Arts & Sciences

Early Career Faculty Award
Dr. Katalin Medvedev, Textiles, Merchandising & Interiors, College of Family & Consumer Sciences

To view a complete list of recipients, visit: curo.uga.edu/faculty/research_mentoring_awards.html

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 Award and Keynote Session, and each award carries $100 in financial support. Winners for the 2017 CURO Symposium are listed below.

Arts, Humanities and Media:

Anna Jewell Davidson	Privileged Perception: An Examination of Supersensory Insight in Vladimir Nabokov's *The Gift*

Life Sciences:

Atul Lodh	Investigating the Role of Cyanogenic Glycosides as a Potential Defense for *Passiflora incarnata* against *Agraulis vanillae*

Public and International Affairs:

Hannah Catherine Turner	The Price We Pay: Analyzing the Over-Incarceration of Low-Level Juvenile Offenders in Georgia

Social Sciences:

Paul DuPont Oshinski	Women's Rights from 1985-2013: Using Gendered Theories to Explain Countries' Development

Technology, Engineering and Math:

Vineet Sundar Raman	Tablet-Based Data Collection for Leprosy Surveys

Program: Monday, April 3, 2017

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Athena Breakout Rooms A, B, C, D, G, H, I, J

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	Jonathan Zot Sr.	Olympic Performance and Propensity for Interstate Conflict
	Ali Elizabeth Anderson	Chemical Weapons and the Legacy of War
Room B	**Maggie Naughton**	Examining Stigma and Social Functioning in Young Adults with Autism
	Evan Simone Johnson	How Do Parental Practices Influence Adolescent Food Choices?
	Sara Carroll Johnson, Amber Madden	Mothers' Childhood Emotional Neglect as a Predictor of Child Behavior Problems
Room C	**Chelsea Thorpe**	*Charlie Hebdo*: Moral Injury and the Display of Religion in Satirical Press
	Mohammed Khalifa Kredan	Understanding American and Cuban Perceptions of Migration to America
	Izzy Ceron	"Immigrants, We Get the Job Done!": Depictions of the U.S. Immigrant Experience on Broadway
Room D	**Emily Elizabeth Gale**	White Matter Integrity Decreases Similarly with Age between People with Schizophrenia and Healthy Individuals with Low Cognitive Control
	Evan Knox	Mild Traumatic Brain Injury (mTBI) Moderates Protection of Cognitive Flexibility by Cognitive Reserve
	Haley Cohen	Risk Factors for Social Isolation in Elder Care Recipients
Room G	**Jianna Justice**	Examining the Entropic: Locating Modernity in the Writings of Jane Austen
	Sarah Jane Dillon	*Tolak Reklamasi*: Rejecting Tourist Developments in Bali
	Nina Goodall	Concrete Art and Fascism in Argentina in the 1940s

Room H	**Chip Chambers**	The Role of Non-Cas Proteins in the Adaptation Stage of CRISPR-Cas in *Pyrococcus furiosus*
	Aaron Martinez	Decoding Higher-Order Relations in Biological Data by Learning Markov Networks
	Tae-In Lee	Off-Target Effects of the Inhibitor MRS2578 on the Formation of Neutrophil Extracellular Traps
Room I	**Katie Howard**	Genetic Determinants of Intracellular Survival and Growth of *Bordetella pertussis*
	Santosh Nimkar	Facilitating the Continuous Expression and Secretion of the Influenza Surface Glycoprotein, Hemagglutinin, within Human Cells
	Hannah Kemelmakher	Functional Evaluation of Porcine Kidney: A Thorough PSF Organ Storage Study
Room J	**Emily Maloney**	Effect of Polarization on Hierarchies of Committee-Representative Networks: Social Network Analysis
	Stephen Benjamin Jordan	Mapping Near Misses in Athens-Clarke County
	Taylor Withrow	The Ugly Duckling Narrative: Identity Development in Multiracial Individuals

Oral Session II: 12:20-1:10 p.m.
Athena Breakout Rooms A, B, C, D, G, H, I, J

Room A	**Bryson Culver**	Judicial Politics in the Obama Era
	Emil Dmello	An Empirical Analysis of Economic Influence on Election Outcomes
	Brad Louis Williamson	The Effectiveness of US Congressional Committees
Room B	**Sydney-Alyce Bourget**	A Comparison of Functional and Fitness Traits of *Alliaria petiolata* along a Forest Gradient
	Mallory Jessica Harris	Vector-Borne Disease Forecasting

	Raheela Charania	Compiling Studies on Pedagogical Content Knowledge within Topics of Evolution
Room C	**Amanda Molly Joffe**	Bent and Broken: Debating China Beyond the Great Firewall
	Cameron Ward Henderson	Fifty Years In: Just Warming Up : How the Nuclear Nonproliferation Treaty Can Effectively Combat Global Warming
	Chelsea Thorpe	How Does Resource Availability Affect Non-State Armed Group Recruitment?
Room D	**Bryanna Moppins**	Development of a Novel Three-Dimensional Model to Study Breast Cancer Metastasis
	Miranda Moore	Effect of Heliox through Airflow and Aerosol Deposition in Oral Airway
	Carter Fitzgerald	Techno-Economic Assessment of Anaerobic Digestion Technology to Produce bioCNG
Room G	**Julia Marie Petros, Chantal Van Landeghem**	Parental Support for Autonomy as a Predictor of Anxious and Depressed Behaviors in Elementary School Children
	Joshua Reynolds	Neuroanatomical Correlates of Functional Decline during Normal Aging
	Zoe Schneider	Investigation of Visual Event Related Potentials in Schizophrenia, Schizoaffective, Psychotic and Non-Psychotic Bipolar Disorders
Room H	**Kathryn Marie Youngblood**	Pedagogical Methods for Developing Empathy in Engineering Students
	Briel Power	An Investigation into the Dynamics of Faculty Learning Communities
	Carter Patrick Maguire III	The Effect of ePortfolio Use on Real-World Application of Classroom Skills
Room I	**Katie Maddox**	Effect of Invasive Macroalgae *Gracilaria vermiculophylla* on Feeding Behavior of *Callinectes sapidus*
	Eric Dykes	Characterization of a V-H+-ATPase in *Toxoplasma gondii*

	Alexandria Lushaj	Forensically Influential Beetle Fauna in the Fall of 2016
Room J	**Nanma Okeani**	Justice for All: Addressing Codified Discrimination in the Georgia Justice System
	Sam Tingle, Stephen Jordan	Mapping Diverse Bicycling Experiences in Athens, GA
	Zac Commanday, Brian Northern	Resiliency and Sustainable Organizations: Leveraging Weather Management Systems

Oral Session III: 1:25-2:15 p.m.
Athena Breakout Rooms A, B, C, D, G, H, I, J

Room A	**Ellen Grace Krall**	Characterizing Ty1 Gag - CCT Complex Interactions in Budding Yeast Through Co-Immunoprecipitation and Mass Spectrometry
	Erin Hollander	Protospacer Structure and Cas Protein Function in Adaptation of the *Streptococcus Thermophilus* Type II-A CRISPR-Cas System
	Nikita Vantsev	Adapting a CRISPR-Cas System into a Novel Gene Knockdown Platform
Room B	**Adam Salway**	An African American Oral History: Historic and Contemporary Experiences of Gentrification in the Hancock Corridor
	Chloe Schrader	Intersectional Failure: The Effect of Zero-Tolerance Policy on Girls of Color
	Genesis Castro	Latino Resilience Among Undocumented Families
Room C	**Stephanie Ann Jaipaul**	The Prevalence of Science Misconceptions among the Human Body Systems: Understanding, Targeting, and Applying Misconception Findings to Effectively Teach Students about Diabetes
	Eli Chlan	Autonomy and Health Literacy Relationships as a Link to Patient and Provider Satisfaction
	Catriona Geddes	Determining Fidelity of the Physical Activity and Learning (PAL) Program

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Room D	**Jessica Ziling Ho**	Genotype-Phenotype Correlations for POMGNT1 and POMGNT2 in Dystroglycanopathies
	Catherine Waldron	Exploiting CRISPR/Cas Genome Editing System in Ciliogenesis
	Sunishka Thakur	Studying Gene Flow in *Boechera stricta* to Understand the Impacts of Climate Change
Room G	**Maria Granros**	Performance on a Measure of Multitasking is Related to Executive Function in Older Adults
	Jane Sutcliff	Cognitive Control Differences in Bipolar Disorder in the Presence or Absence of Psychosis
	Megan Murphy	The Effect of Aerobic Exercise on White Matter in Overweight Children: Studying the Effect of an 8-Month Exercise Program
Room H	**Rachel Collier**	Determining Water Usage of Lettuce under a Sodium Light Source for Indoor Agriculture
	Sokngim Kim	A Computer Program for Truss Design Optimization
	Adam King, Dustin Mizelle, Anurag Banerjee	Research and Development of Satellite Software and Electronics
Room I	**Jessica Lauren Reynolds**	Assessment of Spatial Distributions of Sea Turtle Nests In Relation to Artificial Lighting in St. Kitts, West Indies
	Jenna Kay Lea	Determining Reoccurring Tick and Tick-Borne Disease Associations with Mammal Hosts
	Lauren A Purvis	Effects of Form and Level of Vitamin E Supplementation on Kinematic and Physiological Measures of Muscle Damage Following Intense Exercise in Horses
Room J	**Anna Magdalena Goebel**	Goethe's Discovery of the Divine in Nature
	Lukas Woodyard	*Indecent*: The Show That Shut Down on Opening Night
	Abigail Elizabeth West	The Sapelo Island Coloring Book

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Oral Session IV: 2:30-3:20 p.m.
Athena Breakout Rooms A, B, C, D, G, H, I, J

Room A	**Nivedha Balaji**	Chondroitin Sulfate Glycosaminoglycan Matrices Promote Neuroprotection Sub-Acutely Post-Traumatic Brain Injury
	Kirsten Allen	Development of Polymer-Based Microspheres for Drug and Supplement Delivery
	Emily Nieves	Examining the Arrhythmogenicity of Dobutamine When Used in Conjunction with Isoflurane or Sevoflurane
Room B	**Jacob Beckham**	Two-Point Threshold as a Measure of Hyperacuity and Intraocular Scatter
	Sarah Caesar	The Relationship between Nutrition Status and IADLs in Community-Dwelling Older Adults
	Emily Stewart Moore	The Effect of Galanin on Stress Resilience in Rats and the Relationship between Stress and Inflammation
Room C	**Avni Ahuja**	Sex-Trafficking in Georgia: Equipping Our Hotel Workers with the Proper Resources
	Ashley Willard	Online Activism: The Movement to Combat Honor-Based Violence
	Eashaa Velamuri	Reducing and Preventing Sexual Assaults on Georgia College Campuses
Room D	**Shelbi Aldrich**	Textiles and Fibers Single Point of Contact (SPOC)
	Madeline Grace Harpham	Dior to Disco: Second Wave Feminism and Fashion
	Oloni Binns	Motown Styles and the 1960's American Dream
Room G	**Paul Lee**	The Effect of Lutein and Zeaxanthin Supplementation on Emotional Well-Being
	Shivani Singh	Fatigue, Executive Functioning, and Activities of Daily Living in Older Adults
	Emma Auger	The Effect of Age on Functional Connectivity of Cognitive Control Networks in People with Schizophrenia

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Room H	**Sonam Alka Brahmbhatt**	Exploring the Role of DNA Double-Strand Break Repair Proteins in CRISPR Adaptation
	Zack Flagel	Take Me Out to the Ballgame: A Legal Examination of Spectator Injury Risk at Major League Baseball Games
	Fatima Kamal	The Effects of Two Different High-Fat Diets on Appetite Hormone Levels
Room I	**Urmi Patel**	Substrate Specificity of the Lactoperoxidase/Thiocyanate/Hydrogen Peroxide Cell-Free System to Inactivate Influenza Virus
	Connor Matthew O'Neill	The Effect of Macrocyclic Lactones on the Canine Immune Response towards the Heartworm Parasite *Dirofilaria immitis*
	Jack Owen	Exploring Uncertainty in Models of Mosquito Vector-Borne Disease
Room J	**John Coffin**	Predicting Oyster Larval Recruitment and Growth Using Cheaply Obtained, Remotely Sensed Data
	Diamond Clarke	Cdal-1 Kinase of the Hippo Pathway in *Tetrahymena thermophila*
	Ian E. Van Giesen	Investigating the Grindability of Woodchips at Varying Torrefaction Temperatures

Awards and Keynote Session: 3:30-4:30 p.m.
Athena Room E

Welcome and Introductions	David S. Williams, Associate Provost and Director of Honors and CURO
Remarks	Jere W. Morehead, President
	Pamela Whitten, Senior Vice President for Academic Affairs and Provost
Introduction to Awards	Martin Rogers, Associate Director of CURO and Honors
CURO Research Mentoring Awards	David C. Lee, Vice President for Research
2017 Symposium Best Paper Awards	Rahul Shrivastav, Vice President for Instruction
UGA Libraries' Research Awards	Caroline Barratt, UGA Libraries

Poster Session and Reception: 4:30-6:30 p.m.
Sponsored by the Office of the President
Grand Hall South

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Poster # 2	**Madeleine Holden Snidow**	

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Poster # 13	**Breana Johnson, MacKenzie McGraw, Anna Marie Fink, Brianna Kelley, Lauren Langan, Meredith Anne Towey, Alexis Pope, Jennifer Smith, Sherry Sayavongsa, Aleah Norton**	Newborn Hearing Screening and Follow-up in the Northeast Health District
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Poster # 20	**Skyler Tuholski, Samrina Jamal, Katie Lee, Nidhi Thiruppathi, Abby Thomas**	Effects of Gender and Race on Speed and Accuracy of Facial Recognition
Poster # 21	**Samantha Delaney, Shruti Prathip**	Gender Differences in College Students with ADHD
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Poster # 26	**Aparna Kanjhlia**	Altered Neural Activity in the MCLS and NA linked to Alcohol Consumption
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Poster # 99	**Jeremy Miller**	Self-Assembled Chitosan Nanoparticles for Breast Cancer Therapy
Poster # 100	**Chase Tenewitz**	Ferrohydrodynamic Separation of Prostate Circulating Tumor Cells
Poster # 101	**Cole Burgess**	Nuclear or Solar, Why Does It Have to Be a Choice?
Poster # 102	**Jawad Iqbal**	Optimization of MATLAB Code for Faster and More Consistent Image Analysis
Poster # 103	**Melanie Kemp**	Electroformation of Giant Unilamellar Vesicles
Poster # 104	**Katherine MacManus**	Mechanical Characterization of Lipid Membranes Using Micropipette Aspiration
Poster # 105	**Katie Homeyer**	Nitric Oxide-Releasing Urinary Catheters as a Method to Prevent Urinary Tract Infections
Poster # 106	**Jennifer McCarty**	Improved Nitric Oxide-Releasing Polymer with Surface Exposed and Crosslinked Zwitterionic Polymer for Antimicrobial Applications
Poster # 107	**Sai Nagula**	Biocompatible, Biodegradable and Antimicrobial Skin Substitute with Nitric Oxide Release for Instant Burn Wound Treatments
Poster # 108	**Dieu Thao Nguyen**	Instant Clotting Patch to Prevent Excessive Bleeding during Emergency Injuries

Poster # 109	**Christina Workman**	Hydrophilic Top Coat on Nitric Oxide Releasing Surfaces for Enhanced Antibacterial and Antifouling Properties
Poster # 110	**Wilfred Oluwafemi Benard**	Design and Development of Bioengineered 3D Scaffold Using Novel Biomaterials for Tissue Regeneration Cell Culture
Poster # 111	**Dylan Munn**	Meat Consumption as an Indicator of the Near Term Stability of Each Country's Food Supply in the Global Marketplace
Poster # 112	**Ben Burgh**	Effects of Tracking Scale on User Performance in Virtual Reality Games
Poster # 113	**Ryan Snowden, Erica Anstey**	Automatic Recognition of Periocular Facial Alterations
Poster # 114	**Phiet T Do, Luis Perea**	Jamming Avoidance Response: An *Eigenmannia* Phenomenon
Poster # 115	**Kimberly Mercedes Shumaker**	Formation of Natural Product Glucosides by *Escherichia coli* in Controlled Conditions
Poster # 116	**Kevin Tuan Dong**	Development of Viscosity-Sensitive Fluorescent Molecular Rotors for Food Additives
Poster # 117	**Mary Catherine Lollis**	Evaluating Woody Tissue in Chicken Breast Samples with X-Ray, CT, and MR Imaging - A Pilot Study
Poster # 118	**Jonathan Chelena**	Effect of Ground Granulated Blast-Furnace Slag (GGBFS) on Heat of Hydration Concrete
Poster # 119	**Paul Coughlin**	Hurricane Risk Assessment of Georgia Coastal Bridges
Poster # 120	**Adara Dodson**	Beyond-Design Basis Evaluation of Georgia Coastal Bridges
Poster # 121	**Victor Lopez**	The Sustainability and Performance of Metakaolin and Blast Furnace Slag in Mass Concrete Production
Poster # 122	**Kevin Elliott Spicer**	Standards for Metakaolin Supplementation into Georgia DOT Concrete
Poster # 123	**Nicolas Rousseau Burgess**	Mechanical Ventilator Parameter Prediction

Poster # 124	**Laura Lanier**	The Development of a Pathogen-Specific Diagnostic Device for Pneumonia
Poster # 125	**Mayank Verma**	Visualization of Lung Inflammation
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Poster # 127	**Grace Hays Darling**	Recycled Crumb Rubber for Use in Concrete Barrier Walls and Other Applications
Poster # 128	**Jake Michael**	Evaluation of Residential Basement Wall Concrete Mixtures for Water-Tightness and Reduction in Traditional Reinforcing Steel
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Poster # 130	**Austin Etheridge**	Effects of Asphalt Mix Characteristics on Dynamic Modulus and Fatigue Performance
Poster # 131	**Jason Christopher Wright**	Investigation of the Effectiveness of Geosynthetics in North Georgia Soils
Poster # 132	**John Green II**	Design of Gallate-Based Persistent Phosphors in the Short-Wave Infrared Region
Poster # 133	**Amanda Pham, Darby Lyle Woodling, Marisa Stewart**	Mechanisms of Drug Resistance Based on Computational Studies of Taxol
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Poster # 135	**Julian Moore**	Development of an Indoor Guidance System for Unmanned Aerial Vehicles with Power Industry Applications
Poster # 136	**Sarah E Clement**	Effect of Prescribed Burning of Riparian Zones on Stream Hyphomycete Fungi Productivity
Poster # 137	**Desirae Ann Dickerson**	The Effect of Litter Leachate from Fresh Riparian Rhododendron Leaves on Microbial Respiration in Headwater Streams in the Southern Appalachians

Poster # 138	**Reed Peloquin**	Do Changes in the Quality and Quantity of Leaf Litter Inputs Affect Growth Rates and Emergence of Stream Macroinvertebrate Consumers Following Reach-Scale Removal of Rhododendron?
Poster # 139	**Hend Rasheed**	Incorporating Individual Consumer Physiology into Our Current Understanding of *Littoraria-Spartina* Interactions within Southeastern US Salt Marshes
Poster # 140	**Alyson Ming Wright**	Studying the Effects of Valsartan on *Daphnia Magna*
Poster # 141	**Siva Venkatachalam**	Influence of Air Pollution and Socioeconomic Factors on Chronic Obstructive Pulmonary Disease (COPD)
Poster # 142	**Joseph Walker**	Mapping and Modeling Hotspots of Schistosomiasis
Poster # 143	**Sumaya El-Khalidi**	Nitrogen Fixation of Biological Soil Crusts in Longleaf Pine Savannas Respond to Alterations in Precipitation Frequency
Poster # 144	**Kelsey Morton**	Discovery of Foliar Endophytic Nitrogen Fixation in *Pinus palustris*
Poster # 145	**Sunishka Thakur**	Effect of Various Threat Categories on the Spatial Clustering of Threatened Mammals
Poster # 146	**Soo Min Lee**	Effect of Reproductive State on Parasite Infection in Wild Rodents
Poster # 147	**Erin Malsbury**	Local Perceptions of Wildlife in Samburu, Kenya
Poster # 148	**Isabella Mateu**	Is Serum Bacteria-Killing Ability in the African Bush Rat Driven by Complement?
Poster # 149	**Nam Money**	Comparing Activity Budgets between Adult and Juvenile Asian Elephants
Poster # 150	**Mackenzie Rose Pryor, Nam Money, Jessica C Respress**	Persistence of Extractive Foraging in Humans and Wild Tufted Capuchins (*Sapajus libidinosus*) Abstract
Poster # 151	**Lily Victoria Lee Wang**	Comparison of Female and Male Lone Star Tick Microbiomes in Watkinsville, Georgia

Poster # 152	**Emily Measel**	Testicular Toxicity of Bisphenol AF: Induction of Multinucleation of Spermatogonia
Poster # 153	**Maggie Holland**	Exploring Linkages between Environmental Degradation and Human Rights
Poster # 154	**Narissa Turner**	Shedding Light: A Study of Light Pollution on the UGA Campus
Poster # 155	**Olivia Lauren Sieverts**	Plasma Purification Method for Agglutination Assays in White Ibis
Poster # 156	**Sarah Hensey**	Assessing Toxicity and Contamination in Lake Herrick
Poster # 157	**Stephanie Stromp**	Bacteria-Phytoplankton Interactions in Understanding the Marine Carbon Cycle
Poster # 158	**Jessica Mei Brown**	Analysis of Genetic Diversity in *Asimina triloba* to Infer Historical Processes Responsible for Range Expansion
Poster # 159	**Liana Mosley**	Comparing the Incomparable: A Methodological Investigation of Water Limitation Treatments
Poster # 160	**Brandon Davis**	An Investigation of Environmental Variable and Dispersal Patterns of North American *Photinus* Fireflies
Poster # 161	**Pearl Shah**	Characterizing the Species Distributions of North American Pyractomena Fireflies
Poster # 162	**Garrett Vollino**	A Phylogenetic Analysis of *Pyractomena* Fireflies
Poster # 163	**Grace Manning**	The Effects of Salinity on *Helianthus*
Poster # 164	**Alex Morgan Smith**	Phosphorous Efficiency in Cultivated Sunflower
Poster # 165	**Becca Sussman**	Nitrogen Use Efficiency across Soil Fertility Treatments in Cultivated Sunflower
Poster # 166	**Darien Power**	The Persistence of Small Pollen Grains in Populations of *Ipomoea purpurea*
Poster # 167	**Ariane Wong**	Effect of the Female Frequency on the Pollen Dispersal Distance in Natural Populations of the Wild Geranium, *Geranium maculatum*

Poster # 168	**Krishna Patel, Eva Rodriguez**	A Method for Enrichment of Maize Stem Cells and Leaf Primordia
Poster # 169	**Brendan Fatzinger**	Effects of Microbe Activators in an Organic Agricultural System
Poster # 170	**Usha M Kaila**	How Does FoodCorps Contribute to the Pursuit of Farm to School Success?
Poster # 171	**Praharshak Asireddy**	Insect Resistance Characterization of *IRP9* in Soybean
Poster # 172	**Bryan Kamalaker**	Are *Wolbachia* Co-Obligate Nutritional Symbionts in the Banana Aphid *Pentalonia*?
Poster # 173	**Jacki McCollum**	Insects as a Nutritional Source in Horse Feed
Poster # 174	**Linden Pederson**	Variation in Egg Development in Deceased *Extatosoma tiratum* Females
Poster # 175	**Elizabeth Umanah**	An Investigation of RIN4 Phosphorylation in Plant Immunity
Poster # 176	**Diane Park**	Effect of Different Concentrations of 25-Hydroxycholestrol on Osteogenic Differentiation of Mesenchymal Stem Cells (MSC) from Broiler Compact Bone
Poster # 177	**Neil Doshi**	A Comprehensive Assessment of Cognitive and Motor Functional Outcomes After Traumatic Brain Injury in a Porcine Model
Poster # 178	**Lily Francis**	A Novel Porcine Model of Vascular Cognitive Impairment Demonstrates Changes in Cerebral Blood Flow and White Matter Tracts
Poster # 179	**Richard Dunstan Murray**	Novel Object Recognition: A Promising Approach to the Comparative Study of Memory in Porcine Vascular Cognitive Impairment Studies
Poster # 180	**Kelly Marie Scheulin**	Nanoparticles Transport of FDA-Approved Drugs Across the Blood Brain Barrier in a Porcine Stroke Model
Poster # 181	**Naomi Afnan Siddiquee, Noah Goldstein**	An In Vitro Model Demonstrating the Direct Current Stimulation Mediated Recovery from Neuronal Injury

Poster # 182	**Adir Mohaban**	Small Molecule-Stimulated MSC Adhesion to Enhance Atopic Dermatitis Therapy in Companion Animals
Poster # 183	**Tarun Daniel, Aditya Sood**	Analyzing TGF-β Regulation of the Progenitor Motor Neuron/Motor Neuron Glial Fate Switch
Poster # 184	**Jacy Donaldson**	Relationships and Trade Offs between Food Insecurity and Healthcare
Poster # 185	**Alexandra Case**	Motivations and Barriers of Volunteering among College Freshmen
Poster # 186	**Mariam Ahmed**	Microglia Activation in Rostral Nucleus Tractus Solitaries After Roux-en-Y Gastric Bypass Surgery
Poster # 187	**John Zachary Benton**	Gold Nanoparticles, Cytotoxicity and Radiosensitization in a Feline Vaccine-Associated Sarcoma Cell Line, In Vitro
Poster # 188	**Adrea Mueller**	Adaptation of a DNA Purification Protocol for 3rd Generation Sequencing of *Eimeria* Species
Poster # 189	**Stephanie Alexandra Pierre**	Effect of Sample Collection at Various Collection Sites on the Detection of *Mycoplasma Synoviae* by Real-Time PCR
Poster # 190	**Ebun Dada**	Histological Comparison of Various Coccidial Control Programs Used in Commercial Poultry
Poster # 191	**Christina Valentini**	Understanding the Role of Social Determinants in Drug Overdose Deaths in Georgia
Poster # 192	**Aaron Adams**	Creation and Testing of Myogenic Promoter Reporter System in C2C12 Cells
Poster # 193	**Umar Muhammad Ghilzai**	Creation of Genetically Modified Pomgnt2-Knockout Neuro2A and C2C12 Mouse Cell Lines by CRISPR/Cas9 Gene Targeting to Further Understand Dystroglycanopathies
Poster # 194	**Morgan Gibbs**	Probing the Structural Basis of P-Glycoprotein Transport of μ-Opioid Receptor Agonists: Methadone and Loperamide
Poster # 195	**Baker Edrees**	Identification of Therapeutics that Target Zika Virus RNA Polymerase
Poster # 196	**Kyana Breche' Morris**	An Analytical Evaluation of the Compounding Skills of Pharmacy Students

Poster # 197	**Hiral Patel**	Cytotoxic Effects of Novel Compounds on Clinically Challenging Cancer Cell Lines
Poster # 198	**Michael Linzey**	Sensitive Liquid Chromatography/Tandem Mass Spectrometry Method for the Determination of a Novel Highly Lipophilic Anti-Cancer drug Candidate in Rat Plasma and Kidney Tissue
Poster # 199	**Aamanya Raval**	Biophysical Characterization of Human Transketolase (TKT) and Transketolase-Like Protein (TKTL-1) Interactions with the Thiamine Diphosphate Cofactor
Poster # 200	**Daiannette Lopez**	Tail Ischemia Associated with Arterial Catheters in the Coccygeal Artery: A Case Series
Poster # 201	**Dru Adams**	Comparison of Anabolic Growth Factor Elution from Thrombin/Calcium Chloride Activated Platelet-Rich Fibrin Gels and Platelet-Rich Chondroitin-Sulfate Glycosaminoglycan Gels
Poster # 202	**Maggie Pritchett**	In Vitro Activity of Gallium Maltolate against Drug-Resistant *Rhodococcus equi*
Poster # 203	**Susie Jones**	PCR Detection of the SRY Gene of Male Dog Mesenchymal Stem Cells in Female Dog Brains with Experimentally Induced Ischemic Stroke
Poster # 204	**Sierra Megan Smith**	Affect of Capsiate on Perirenal and Epididymal Fat in Rats Fed a High Fat Diet
Poster # 205	**Madeline Young**	The Role of Chondrogenic Growth Factors in the Pathogenesis of Equine DSLD
Poster # 206	**Mevelyn Kaalla**	Significance of MARCO in *Mycobacterium tuberculosis* Resistance
Poster # 207	**Isabelle Veigh Snider**	

Poster # 211	**Rahul Katkar**	Isolation of VAR2CSA DBL3x Binding Domains for Protein Expression
Poster # 212	**Trisha Dalapati**	Effects of *Plasmodium falciparum* Derived Hemozoin on Expression of Inflammatory and Coagulation Factors in BeWo Cells
Poster # 213	**Hayley Reynolds**	Lassa Virus GP1 Glycoprotein Receptor Binding Site Characterization
Poster # 214	**Nicholas Ciappa**	Examination of *Mycobacterium tuberculosis* Protein Expression in Infected Lung Tissue
Poster # 215	**Connor Grady**	Characterization of Antibody Response and Cell-Mediated Immune Response to Seasonal Influenza Vaccination
Poster # 216	**Matthew Prellberg**	Chikungunya Virus-Like Particles Vaccine Formulations that Elicit Balanced Th1/Th2 Response in Mice
Poster # 217	**Emma Harrison**	Understanding the Determinants of Seeking Medical Attention for Injury
Poster # 218	**Alyssa Varsalona**	Association Between Ankle Sprain History and Current Ankle Sprains in Collegiate Club Sports Players
Poster # 219	**Alexandra Bronwen Flemington**	Volumetric Muscle Injury on Mitochondrial Function
Poster # 220	**Anita Qualls**	Early Rehabilitation to Augment Skeletal Muscle Function Following Volumetric Muscle Loss Injury
Poster # 221	**Shaun Goh**	Limb Elevation as a Model for Peripheral Arterial Disease
Poster # 222	**Riley Jenkins**	Mitochondrial Capacity in Young, Well-Controlled People with Type 1 Diabetes
Poster # 223	**Bethany Toney, Riley Jenkins**	The Effects of Type 1 Diabetes on Skeletal Muscle Endurance
Poster # 224	**Rachel Aldridge, Nivita Sharma**	Comparing the AX3 and MetaSensor Accelerometers for Measuring Muscle Twitch
Poster # 225	**Nivita Sharma, Rachel Aldridge**	Using Electrical Stimulation to Lower Post-Prandial Blood Sugar in People with SCI

Poster # 226	**Nicole McGarrell**	Endurance Training in Patients with Friedrich's Ataxia
Poster # 227	**Diana Springer**	Limb Elevation as a Model of Peripheral Arterial Disease
Poster # 228	**Sydney Michelle Mohr**	The Difference Between Men and Women in the Effects of Exercise on Circulating Angiogenic Cells
Poster # 229	**Olivia Mendel**	Glycome Profiling of Medaka Exposed to Chronic, Low Level Ionization Radiation
Poster # 230	**Nitin Daniel**	Structural Analysis of a Predicted Skp1 GlycosyItransferase PuGT8A
Poster # 231	**Haley Folmar**	Biophysical Properties of Pectins Isolated from Seed Mucilage of *Arabidopsis thaliana* Wild-type and gaut11-2 Mutant Plants
Poster # 232	**Nikhil Reddy Gangasani**	Fighting a Pathogen with Its Own Medicine: Enzymatic Preparation of Carbohydrates for Effective Immune Response
Poster # 233	**Joseph Elengickal**	Regulation of Sialic Acid Polymerization
Poster # 234	**Manasa Kadiyala**	Identification of MAb109 Epitope in Pancreatic Cancer Cells
Poster # 235	**Stephan Nicholas George**	Characterization of Causative Mutations in OGT for XLID
Poster # 236	**Jessica Ziling Ho**	Development of a Droplet Digital PCR Assay for Pre-NGS Quality Assessment of DNA from FFPE Specimens
Poster # 237	**Patrick Thomas Seethaler**	Understanding Toxicity of *Botrytis cinerea* Mutant
Poster # 238	**Jesse Hu**	Characterization of Cas4 Activity in the CRISPR-Cas Systems of *Pyrococcus furiosus*
Poster # 239	**Leslie Adams**	Single Subunit Over Expression of NfnI in *Pyrococcus furiosus*
Poster # 240	**Alex Thomas Crowley**	Ethanol Production in *Pyrococcus furiosus* using High Temperature Alcohol Dehydrogenase AdhC

Poster # 241	**Christina Marie Najjar**	Investigation of NAP1 as Reporter for CaaX Protein Post-Translational Modification Shunt Pathway
Poster # 242	**Weston Ellis McDonald**	The Conservation of Allostery in *C. Elegans* UDP-Glucose Dehydrogenase
Poster # 243	**Caria Evans**	Development of Biodegradable and Biosourced Microcellular Polyurethane Foams for Foam-In-Bag Packaging
Poster # 244	**Jonathan Spagnoli**	ROS-Responsive and pH Inhibiting Polymer Nanoparticle Platform for Cancer Treatment
Poster # 245		

Poster # 256	**Stephanie Nguyen**	Using Serological Tools to Measure the Prevalence of Filarial Infection after Mass Drug Administration
Poster # 257	**Rajeev Subu**	In Vivo Assessment of Olfactory Receptor Neurons and Projection Neurons Using Appetitive Olfactory Inputs in *Drosophila* Larvae
Poster # 258	**Nidhi Aggarwal**	Attenuation of *Trypanosoma cruzi* by Fatty-Acid **β**-Oxidation Monotetraallelic Knockouts
Poster # 259	**Evelina Kravchuk**	Tagging Fatty Acid Metabolism Proteins in *Trypanosoma cruzi*
Poster # 260	**Tre Justin Landry**	Measuring the Expression Efficiency of Constructed Single Plasmid System in *Trypanosoma cruzi*
Poster # 261	**Lilith Renae South**	Investigating CRISPR/Cas9 as a System for Gene Editing in *Trypanosoma cruzi*
Poster # 262	**Adam Greg Aston**	Mechanistic Relationships Between Mga and Myc During Zebrafish Development
Poster # 263	**Shanlin Shoemaker**	Proteomics of CBL0137-Treated *Trypanosoma brucei*
Poster # 264	**Obi Okafor**	Characterization of Genes Predicted to Function in Signaling for Expression of RNA Repair Operon in *Salmonella enterica* serovar Typhimurium
Poster # 265	**Andrew Charles Wise**	Environmental Conditions That Activate the *E. coli* RNA Repair Operon
Poster # 266	**Annie Hass**	Investigation into Surface Glycan Variation in *Campylobacter fetus* Species
Poster # 267	**Sheena Vasquez**	Structural Insights into the Role of [2Fe-2S] Clusters in Bacterial Ferrochelatases
Poster # 268	**Akiel Gabriel Etienne**	In Vivo and In Vitro Activity Analysis of Acetylation on Fructose-1, 6-Bisphosphatase in *Salmonella enterica*
Poster # 269	**Rebecca Marie Gardner**	Overexpression and Characterization of Two Pectate Lyases from *Paenibacillus amylolyticus*
Poster # 270	**Jonathan David Hill**	Investigating the Role of HPG27_395 in *Helicobacter pylori*

Poster # 271	**Hirel B Patel, Ben Park, Kyler Herrington, Ghazal Motakef**	Building the Genetic Tools to Make *Methanococcus Maripaludis* the Next-Generation Model Chassis for Biochemical Production
Poster # 272	**Mallorie Lee Huff**	Development of an Inducible Histone Methyltransferase System to Analyze Establishment of Repressed Chromatin Domains in *Neurospora crassa*
Poster # 273	**Annika Carter**	The Insect Version of Oxytocin Influences Female Tolerance of Males in a Subsocial Beetle
Poster # 274	**Madeline Sparks**	Morphological Attributes Underlying Feeding Ability in Burying Beetles
Poster # 275	**Cord Helmken**	Developing a Protocol for Large-Scale Toxicity Assays Using Flow Cytometry
Poster # 276	**Lauren Dunavant**	Reprogramming Mouse Embryonic Fibroblasts via Induced Expression of *Foxn1* and *Foxg1* Transcription Factors to Generate Induced Thymic Epithelial Cells (iTECs)
Poster # 277	**Cherien Z Abou-Harb**	Life History Traits of *Boechera stricta*
Poster # 278	**Kathryn McKibben**	Climate Change and Gene Flow Rates in *Boechera stricta*
Poster # 279	**Katelyn Chandler**	Transcriptomic Investigation of Disease Tolerance in the Ochre Sea Star *Pisaster ochraceus*
Poster # 280	**Kaley Ann Desher**	Investigating Genes Implicated in Ciliogenesis Using CRISPR/Cas
Poster # 281	**Sophie Alexandra Barton**	Examination of Courtship Songs Across *Drosophila subquinaria* Populations
Poster # 282	**Amy Nguyen**	Evolution of Body Size in *Drosophila Subquinaria*
Poster # 283	**Zehra Rahman**	Investigations on the Distinct Isoforms of Duffy Antigen Receptor for Chemokines
Poster # 284	**Lauren Taylor Wassel**	The Expression of the Duffy Antigen Receptor for Chemokines in the Triple Negative Breast Cancer Cell Line, HHC1806

Poster # 285	**Brooke Aspinwall**	Multimerization of Long DNA Inserts via Bombardment
Poster # 286	**Brianna Renee English**	Genetic Mapping of the Chromosome Variant K10-L2 in Maize
Poster # 287	**Sehar Ali**	Investigating Performance of *Agraulis vanillae* on *Passiflora incarnata*: A Geographic Mosaic Approach
Poster # 288	**Atul Lodh**	Investigating the Role of Cyanogenic Glycosides as a Potential Defense for *Passiflora incarnata* against *Agraulis vanillae*
Poster # 289	**Chandler Elizabeth Johnson**	An Inquiry into the Role of SUT5 and SUT6 in the Release of Exudate at the Extrafloral Nectaries of *Populus tremula x alba*
Poster # 290	**Jacob Reeves**	Variant Identification Using RNA-Seq Data for Improvement of CRISPR gRNA Design in Hybrid *Populus*

Oral Session V: 9:30-10:45 a.m.
Athena Breakout Rooms A, B, C, D, G, H

Room A	**Kendall Lee**	A Preliminary Evaluation of Supplemental Vitamin E Form on Serum α-Tocopherol Levels and Oxidative Stress Parameters Measured in Response to a Novel Exercise Challenge
	Caroline McElhannon	Rapid Control of New Infections with *Trypanosoma cruzi* in Previously Infected Mice
	Sophie Alexandra Barton, Sreinick Keo, Rushi Ketan Patel	Unfamiliar Stone Hammer Use in Juvenile Bearded Capuchin Monkeys
	Isabel Ott	Investigating a Potentially Novel Cache Valley Virus Variant in a Clinical Case in Missouri
Room B	**Nadine Fares**	Green Greenhouses: An Application of Energy Informatics
	Miranda Russell	Books for Keeps' "Stop Summer Slide!" Program and its Impact on Literacy Levels in Clarke County Schools
	Ana Duron-Fleck	The Effectiveness of Financial Education Mandates in Georgia Public High Schools
	Kavi Pandian	South African Wineries and the US Wine Market
Room C	**Ryan Switzer**	Hunting for Homology: The Role of Working Class Pride in Modern Skinhead Subcultures
	Jessica Garcia	Fake News: The New Propaganda Machine
	Emma Katherine Protis	No Longer Used: Designing Non-Exploitative Communication for Organizations Seeking to End Human Trafficking
	Magali Lapu	Unlock the Vote: The Implications of Felon Disenfranchisement Laws on the Political Power of African Americans
Room D	**Jared Conner**	Mushroom Biochar: The Properties and Potential Applications of Novel Biochars Derived from Mushroom Fruiting Bodies

	Lexi Blue Ritter	The Role of Histone Modification in Splicing and the Tethering of ps-mRNA
	Evan Barnard	Organic Fertilizer Improves Revegetation of Roadside Soils
	Cecelia Giangacomo	Analysis of Discrimination Methods for Amplifying the Microbiome from Plants
Room G	**Anna Jewell Davidson**	Privileged Perception: An Examination of Supersensory Insight in Vladimir Nabokov's *The Gift*
	Kate Huller	Religion in Fantasy: Christian and Wiccan Protagonists as Vessels for Gendered Religious Ideals
	Sachi Shastri	Unalterable Roots
	Michael Sloman	The Chthonic Elements of Mithraic Worship
Room H	**Rebekah Trotti**	Emotional Modulation of the Late Positive Potential
	Sarah Robinson	Propagation of Errors in Single Cell Oscillatory Time Series to the Periodogram
	Sang M Lee	Current Investigations of Chromium Photocatalyzed [4+2] Cycloadditions
	Chandler Mulford	Application of Heel Lift during Squat Task Decreases Trunk Flexion Overcompensation

Oral Session VI: 11:00 a.m.-12:15 p.m.
Athena Breakout Rooms A, B, C, D, G

Room A	**Abraham Branch Johnson**	Pressuring Playwrights: New Play Development for Contemporary Stages
	Gabrielle Stecher	A Movie without a Hero: Casting Becky Sharp in Early Hollywood Cinema
	Shawn Christian Foster	Dialect Variation in the American South
	Audrey Miller	The Call of the Crypt Keeper: E.C. Influences in the Films of George A. Romero

Room B	**Emily Edwards**	Disordered Drinking in College Populations: An Identity Issue?
	Madison Lorene Brumbaugh, Jacob Scott Kepes	Georgia Monetary Sanctions
	Kavi Pandian	Reducing School Discipline Disparities and Excesses in K-12 Education in the State of Georgia
	Andrea L Morrison	

	Alexandra Carlton	Role of Bacterial Polysaccharides in Bacteriophage Invasion

Oral Session VII: 12:30-1:45 p.m.
Athena Breakout Rooms A, B, C, D, G, H, I, J

Room A	**Anita Qualls**	Time is Brain: Expanding Access to Stroke Care in Rural Georgia Communities
	Aaron Conley	The First Amendment Protections Afforded to Student Newspapers at Public Universities
	Jackson Hopper	Analogies between Numbers and Polynomials
	Caskey Dyer	Atlanta, Race, and Housing: Racial Segregation in the Context of the Great Recession
Room B	**Ammishaddai Sully Grand-Jean**	Reducing Homelessness in Atlanta
	Jennifer Ashtyn Hardister	Fund Balances in Georgia's Cities
	Andrew Michael Teal	Congressional Complexity: Modernizing Financial Legislation
	Nancy Saucedo	United States Corporate Tax Reform: Keeping Capital within US Borders
Room C	**Joshua A Kalter**	Characterizing the Ribonuclease Activity of *Staphylococcus epidermidis* Csm6
	Laurel Hiatt	Biochemical Investigations of Congenital Disorders of N-Linked Glycosylation
	Anne Kathryne Belocura	Optimized Enzyme-Linked Immunosorbent Assay to Assess Anti-Neuraminidase Response in Human Sera
	Christian Chandler Cullen	Neutrophil Extracellular Trap Induction Dependence on Flagellar Motility
Room D	**Samantha Askin**	Changes in Distribution of Black-Bellied Whistling Ducks (*Dendrocygna autumnalis*) in the Southern Atlantic Flyway
	Casey Lawrence	Blood Transfusion Related Zika Virus Transmission

	Logan Ruiz	Analysis of Different Methods for Quantitative Western Blot Analysis in the Avian Model System
	Roland Francis Seim	Saharan Dust Increases Amount of Vibrio Pathogens in the Florida Keys
Room G	**Nicholas D Weinand**	Derivation of Aerosol Optical Depth and Total Column Ozone via DOBSUN Instrument
	Aubrey Wheeler	Utilization of Organic Synthesis to Investigate Molecular Organic Frameworks
	Caleb Ashmore Adams	The Feasibility of Structure from Motion over Planetary Bodies with Small Satellite Systems
	Autumn Nobles	Archaeometry of Argentinean Rock Art
Room H	**Manisha Banga**	Revising the Classics: Modern and Contemporary Female Authorial Treatment of Unactualized Characters from Greek Myth
	Reilly Megee	Admit One: Analyzing the Myriad of Pathways into the Design Industry
	Catherine J Huff	Desires for Difference: Tastes and Collecting of Later Nineteenth-Century American Paintings
	Jesse Riley	Digital Timeline of Mina Loy's New York Years 1937-1953
Room I	**Morgan Green**	Influence of Corrective Exercise Compliance on Physical Activity Levels and Perceived Functional Abilities
	Jamie Pham	A Look into the Contents of Faculty Learning Community Meetings of STEM Professors
	Kalvis Golde	The Convergence of Quantum Physics and Religious Mysticism
	Amita Joshua	Depression and Risky Health Behaviors: The Moderating Effect of Coping Responses
Room J	**Hannah Turner**	The Price We Pay: Analyzing the Over-Incarceration of Low-Level Juvenile Offenders in Georgia
	Peyton Sammons	All-Source Fusion in Combatting The Global Terrorist Threat

	Emmanuel Elsar Jr.	Has Gentrification Led to Increased Police Brutality in the United States?
	Jessica Jin Suh	Open Versus Structured Rules: Examining the Policy Effects of Rule Choice in the House of Representatives, 2003-2016

Oral Session VIII: 2:00-3:15 p.m.
Athena Breakout Rooms A, B, C, D, G

Room A	**Vineet S Raman**	Healthcare for All: A Roadmap for a Healthier Georgia
	Hannah Bass	Obstructed Labor: Analyzing Realistic Implementations for Developing Countries to Decrease Maternal Morbidity
	Lauren Jayne Lauterbach	Socioculturally Attuned Family Therapy: Guidelines for Equitable Theory and Practice
	Maggie Spears	Homeschooling and Its Effect on the Parent-Child Relationship
Room B	**Ashley Elizabeth Lall**	The Chromatin Remodeling Protein, ATRX, Regulates the Formation of Non-Canonical DNA/RNA G-Quadruplex Structures in Mammalian Oocytes
	Ana Maslesa	Bone Characterization in the Treatment of Hypophosphatasia with Mesenchymal Stem Cells
	Sholeh Namdari	Glycosylation in Spores
	Catrina Kure	The Role of LNFPIII-Dex on Cholesterol Efflux in Raw 264.7 Cells
Room C	**Luke Gamblin**	Effects of Acid Rain on *Brassica rapa*
	Robert Erwin Hines	Shoring Up Dam Safety: Risk Assessment Via Simplified Inundation Mapping
	Grace Anne Ingham	Sensitivity of Heterotrophic Soil Respiration (HSR) to Temperature as Mediated by Mycorrhizal Fungi
	Harris Jamal	Depth Gradient Analysis of Potential *Vibrio* Pathogens in Subtropical Marine Water After the Arrival of Atmospheric Saharan Dust

Room D	**Caroline Shearer**	Parasite Infection, Group Size, and Feeding Behavior in Grant's Gazelle
	Marrissa Jean Blackwell	The Effect of Sericea lespedeza on Strongyle Fecal Egg Counts in Mature Horses
	Kayla Jordan Smith	Effects of Vegetation Structure on Nest Predation of Artificial Diamondback Terrapin Nests
	Cody Alan Swint	Effects of Condense Tannins from *Lespedeza cuneata* on Oxidative Stress in Horses
Room G	**Rara Reines**	African Agency in Policy and Project Autonomy: An Analysis of Investment Promotion Centres in Rwanda, Botswana, and Lesotho
	Adrien Sandercock	Legislative Complexity in an Increasingly Competitive Electoral Environment
	Tucker Boyce	The Role of Technology and Statements in the July 2016 Turkish Coup Attempt
	Bilind Amedi	Geography of Kurdistan

Oral Session IX: 3:30-4:45 p.m.
Athena Breakout Rooms A, B, C, D, G, H, I, J

Room A	**Vineet S Raman**	Tablet-Based Data Collection for Leprosy Field Surveys
	Trey Powell	Investigating the Use of mRNA Transfection to Treat Hypophosphatasia
	Dianna Wong	Developing a Sub-Viral Particle Dengue Vaccine Using Computationally Optimized Broadly Reactive Antigen (COBRA) Technology
	Sarah Elizabeth Brown	Biochemical and Structural Characterization of vOTUs from Ganjam and Hazara Nairoviruses
Room B	**Nicholas Twiner**	Applicatives in Southern English
	Anna Kay McKenzie	A Comparison of Muslim and Jewish Cultural Impacts on Spanish Society in Relation to Punishments for Practicing These Religions during the Spanish Inquisition

	Leighton Carlock	Women's Fate
	Aisling Mohini Manison	The Effectiveness of Music Therapy Techniques for Improving Second Language Acquisition in Adult ESL Students
Room C	**Bessie Lockwood**	Distribution of Ticks on Cervids and Prevalence of Selected Tick-Borne Pathogens in These Ticks from Kentucky
	Margaret Zacharias	Long-Term Population Dynamics Pre-Die Off of the Vermetid Gastropod, *Ceraesignum maximum*, in Mo'orea, French Polynesia
	Anh Hoang Thi Nguyen	Investigation of Antimicrobial Resistance in *Salmonella* and *Escherichia coli* isolated from the Upper Oconee Watershed
	Tyler Moore	Are Urban Birds in South Florida Reservoirs of Salmonella spp. for the American White Ibis (*Eudocimus albus*)?
Room D	**Ryan Freeman**	University of Georgia Amending and Roll Call Project
	Will Russell Vineyard	An Insight into Organizational Use of Business Process Management Tools and Technologies: An Exploratory Examination
	Trace Calloway	The Affordable Care Act's Effect on Perceived Mental Health Outcomes and Substance Abuse Treatment
	Elizabeth Alexandra Hardister	Religious Terrorism and Weapons of Mass Destruction
Room G	**Megan Le Corre, Graham Grable**	Structural Design and Optimization of the SPOC Cube Satellite
	Taylor Beth Timmons	Plasticization of Nanocellulose Gel
	Cathy Lee	From Trash to Fashion: Converm [(Sa)a Scscmene

	Fernando Arturo Cruz	An Exploratory Investigation: Examining the Current and Future Prospects of Organizational Use of Business Process Management Tools and Technology
	Matthew Wicker	Two Dimensional Visualization of Higher-Order Relations in Biological Graphs
	Lydia Liu	Consumers as Curators: Brand Use in Social Media
Room I	**Ginny Lee Olivier**	Examining Younger Age at Menarche in Mexican-American Girls
	Maddie McGarrah, Jacklyn J Byrd	Fluidity of Identity Among Older Gay Men
	Rhiannon Euhus	The Association between Body Image Dissatisfaction and Sports Participation in Mexican-American Youth
	James Conners	Effect of Mythic Primers on Psychological Well-Being
Room J	**Madison Demetry**	Testing Immune Function in Naked Mole Rats During Periods of Wound Healing
	Brooke Hull	Genomic Editing of *Neurospora crassa* as a Tool for Studying Circadian Cycle Synchronization
	Hannah Packiam	The Effects of Temperatures on the Stability and Infectivity of Arboviruses
	Maddie Gloeggler	Assessment of Oxidative Stress and Serum α-Tocopherol Levels in Exercising Horses in Response to Level and Form of Vitamin E Supplementation

Abstracts

Life History Traits of *Boechera stricta*

Cherien Z Abou-Harb, CURO Research Assistant
Dr. Jill Anderson, Genetics, Franklin College of Arts and Sciences

Life history trait correlations are used to determine the evolution of life history strategies aimed at optimizing an organism's survival and reproductive fitness. Life history traits are typically: responsive to resource availability, heritable, and under strong selection. Therefore, life history trait correlations indicating enhanced adaptation (positive trait correlation) or genetic constraint (negative trait correlation) to life history trait evolution can be mediated by resource availability. Current predictions associated with climate change suggest altered precipitation patterns will shift water and nutrient availability along an elevational gradient in montane systems. Here, we investigate the role of altered resources on life history trait correlations at family and population levels in an ecologically relevant model organism, *Boechera stricta*. In a greenhouse setting, we will cross three water treatments (wet, semi-drought, and drought) with three nutrient treatments. We will record life history traits including growth, timing of reproduction, and number/size of offspring. We predict family level trait correlations may indicate trade-offs while the overall population level response may suggest enhanced adaptation due to variation in family resource acquisition. Most life history traits correlations are taken on a population level. However, this study will show that trait correlations at the genotypic level may vary, and test whether environmental stress will drastically alter life history trade-offs.

The Impacts of Narcissism on Individual Status in Interdependent Teams

Joshua Acosta
Erica Medrano, Allie Martin
Dr. Dorothy Carter, Psychology, Franklin College of Arts and Sciences

An individual's status in an organization can determine his or her access to important material and social resources; however, there are many individual-level characteristics that may determine whether or not an individual achieves the status necessary to succeed in their organization. Specifically, an individual's level of narcissism may greatly impact whether they are viewed as high status or low status members of their organization. Thus, the purpose of this study is to evaluate whether narcissism is a beneficial characteristic for achieving status. We assert that higher levels of narcissism will positively predict incoming status nominations in interdependent organizational contexts. We test our hypotheses in a sample of 240 undergraduate participants assembled into 20 unique 12-member teams tasked with combining disciplinary knowledge in a complex problem-solving task. Participants responded to self-report sociometric measures of status perceptions in relation to their teammates. We will analyze data from these surveys using a class of inferential models of network emergence called exponential random graph models, which identify key predictors of networked relationships. Our findings suggest important implications for organizations, because if narcissists are more likely to achieve status in organizations, they may overwhelmingly control important resources. In fact, although narcissism is related to leadership emergence, the trait has conflicting results predicting leadership effectiveness; thus, biasing status toward those with narcissistic tendencies may impede overall effectiveness of organizations.

Creation and Testing of Myogenic Promoter Reporter System in C2C12 Cells

Aaron Adams, CURO Research Assistant
Dr. Aaron Beedle, Pharmaceutical and Biomedical Sciences, College of Pharmacy

Transcription factors are proteins that bind the promoter region of a gene and alter the expression of that gene by activating or suppressing the affinity for RNA polymerase. Transcription factors allow for coordination in the expression of genes used in complex biological pathways. Muscle regeneration, for example, is controlled by a family of transcription factors, called myogenic transcription factors, which include: Myog, Myod, Myf5, and Myf6. Through the use of cloning and transformation in *E.coli* bacteria, a plasmid containing the promotor sequence of these myogenic transcription factors upstream of a destabilized fluorescent protein was created. By transfecting C2C12 muscle cells with this plasmid, we hope to create a real-time method for

visualizing the expression of the four myogenic transcription factors.

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

Alison Kay Adams, CURO Summer Fellow
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 equilibrium was found, indicating that the parasitic wasp may be what permits the existence of the social polymorphism in the bee in nature.

The Feasibility of Structure from Motion over Planetary Bodies with Small Satellite Systems

Caleb Ashmore Adams, CURO Summer Fellow, CURO Research Assistant
Dr. Marguerite Madden, Geography, Franklin College of Arts and Sciences

The majority of works using point clouds employ 3D representations from terrestrial/aerial LiDAR, but progresses in computer vision have made available a series of algorithms that allow for the generation of point clouds and surfaces that do not need a point-based collection characteristic of LiDAR systems. One such algorithm, Structure from Motion (SfM), can extract 3D features and reconstructions of objects/structures based on multiple photographs or video frames. The Mapping and Ocean Color Imager (MOCI) Satellite we are designing and constructing in the UGA Small Satellite Research Lab will use these techniques on a space-based platform and run a series of machine vision algorithms to produce a topographical mesh from MOCI-acquired images. A Scale-Invariant Feature Transform (SIFT) is first performed on the image set. A sparse point cloud, consisting of points identified as similar between a series of images, can be computed from a combination of SIFT and the parallax of satellite with its target area. This sparse point cloud can then be used to compute a dense point cloud. A surface mesh is computed with Poisson surface reconstruction. Initial tests have been performed to determine the feasibility of SfM mapping in Low Earth Orbit (LEO). Tests consisted of scaled graphics models in Blender software. Automatic scripts and programs were used to simulate image acquisition, then SfM was performed on the image set. Initial tests have shown SfM to be feasible at a landscape scale. Planetary SfM was performed with data from the International Space Station (ISS); it was demonstrated that cloud lines could be distinguished. Surface maps of Pluto were also generated using SfM with available data from the New Horizons Pluto fly-by.

Comparison of Anabolic Growth Factor Elution from Thrombin/Calcium Chloride Activated Platelet-Rich Fibrin Gels and Platelet-Rich Chondroitin-Sulfate Glycosaminoglycan Gels

Dru Adams, CURO Research Assistant
Dr. Sam Franklin, Small Animal Medicine and Surgery, College of Veterinary Medicine

Platelet-rich plasma (PRP) is commonly used to deliver anabolic growth factors to tissues in order to encourage tissue regeneration. However, previous studies have shown that growth factors are eluted very rapidly from PRP, potentially limiting the effectiveness of this therapy. Ionic bonding between positively charged anabolic growth factors and a negatively charged delivery vehicle could potentially result in sustained release

of these growth factors. The purpose of this study was to determine whether use of a negatively charged hydrogel would result in a more delayed elution of transforming growth factor-β1 (TGF-β1) from PRP. PRP was prepared from the blood of 9 dogs and split into two aliquots. One aliquot was activated with thrombin and calcium chloride and the other was combined with a negatively charged chondroitin-sulfate glycosaminoglycan (CS-GAG) hydrogel. The resulting gels were maintained in petri dishes for 13 days with eluent collected every 2 days. The concentration of TGF-β1 was quantified in each eluent sample using an ELISA, and differences between the two groups were assessed using a repeated measures ANOVA. The vast majority of TGF-β1 was eluted by day 5 from the thrombin gels whereas TGF-β1 elution from the CS-GAG hydrogels was more delayed. Significantly more TGF-β1 was eluted from the CS-GAG gels than standard PRP preparation for each sampling point between days 3 and 13 ($p<0.001$). The CS-GAG hydrogel resulted in a more sustained release of TGF-β1 than standard PRP preparation and further investigation of this delivery vehicle for clinical application is warranted.

Single Subunit Overexpression of NfnI in *Pyrococcus furiosus*

Leslie Adams, CURO Research Assistant
Dr. Mike Adams, Biochemistry and Molecular Biology, Franklin College of Arts and Sciences

The hyperthermophilic archaeon *Pyrococcus furiosus* contains two copies of genes that encode for the NADH-dependent Ferredoxin: NADP oxidoreductase I and II, referred to as NfnI and NfnII. NfnI is a two subunit enzyme recently characterized to be a bifurcating enzyme through its catalysis of the coupling of the oxidation of Fd and NADH to the reduction of NADP. However, NfnII, a highly similar enzyme to NfnI in regards to structure and spectroscopic properties, does not catalyze this same coupled reaction. To test whether NfnI and NfnII can form a chimeric protein, to obtain more in depth information on activity and redox properties of each subunit of NfnI, and to study the stabilities of the single subunits of NfnI, *P. Furiosus* strains were engineered to overexpress single subunits. Two of these strains, NfnI overexpression strains, are grown on a mass scale and are now being studied to determine their chimeric properties through gel filtration. Once the structure of the overexpression strains is determined, activity studies and assays will be performed to further study the overexpressed strains to give insight as to the specific kinetic and spectroscopic properties of each single subunit. The stability and interactions with Ferredoxin will be included in these ongoing studies as well to completely understand the properties of the NfnI enzyme and give insight as to why NfnII will not catalyze the same reactions despite having such a similar genetic makeup.

Attenuation of *Trypanosoma cruzi* by Fatty-Acid ß-Oxidation Monotetraallelic Knockouts

Nidhi Aggarwal, CURO Research Assistant
Dr. Rick Tarleton, Cellular Biology, Franklin College of Arts and Sciences

The hemoflagellate protozoan parasite *Trypanosoma cruzi* causes vector-borne Chagas disease, which is endemic to Central and South America as well as the southern United States, infecting >10 million individuals. Though it remains the greatest infection-based cause of heart disease, methods for diagnosing, treating and preventing *T. cruzi* infection remain ineffective. Our efforts to develop attenuated parasite lines for use in vaccination have been thwarted by technical and time-challenges of genetic manipulation of *T. cruzi*. However, recently developed CRISPR/Cas9-based methods now enable rapid gene knockouts (KO), insertional tagging, and whole genome library screens. The genes involved in fatty acid β-oxidation (FAO) in *T. cruzi* are essential; KO of both alleles of any of these genes in this diploid organism is lethal. However individual single allele KO of FAO genes attenuates parasite growth but is not lethal. To assure safety and to guard against reversion (i.e. future duplication of the remaining single allele), we propose to make multiple (up to 4) single-allele KOs in FAO genes in a single parasite line, using SaCas9 protein and specific gRNA complexes along with both serial and composite transfection strategies. Parasites with multigene KOs will be identified by monitoring gene tags inserted in the truncated gene. In addition to potential uses of these attenuated knockout lines for vaccine development, this research project is a functional application of

genome-editing tools in a high impact parasite that is both poverty driven and poverty promoting in the Americas.

Cemetery Records and the Spanish Flu in Athens, GA

Adwoa Agyepong
Dr. Susan Tanner, Anthropology, Franklin College of Arts and Sciences

Cemetery records hold unique insights to the past. They tell us more than who died; cemetery records can tell us the dates of birth, dates of death, as well as the gender of the dead. These records can give us demographic information for the cemetery and the local community, and can show us who is uniquely affected by certain diseases. This project will use cemetery records to better understand Georgia at the beginning of the 20th Century. I will focus on cemetery records from 1910 to 1920 in Athens-Clarke County, Georgia, and utilize public records, such as newspaper and public health records, for historical context. My primary goal is to compare demographic information from an Athens cemetery to records from similar cemeteries throughout the Southeastern US to assess if mortality patterns, including age at death are similar throughout the region. This project will also test for possible signatures of Influenza in the cemetery records. Newspaper accounts confirm the 1918 Influenza strain, otherwise known as the "Spanish Flu", was present in Georgia after October 1918. Previous research on the 1918 Influenza epidemic has documented that young adults were most vulnerable, with a peak of 28 years of age of death. I hypothesize that if the Spanish Flu had an effect, a rise in deaths will occur after October 1918, likely affecting young adults. This research will demonstrate how we can utilize cemetery records to better understand local history, including the health and lifeways of the community.

Microglia Activation in Rostral Nucleus Tractus Solitaries After Roux-en-Y Gastric Bypass Surgery

Mariam Ahmed, CURO Research Assistant
Dr. Krzysztof Czaja, Veterinary Biosciences and Diagnostic Imaging, College of Veterinary Medicine

One out of every 3 Americans suffers from obesity. According to the CDC, this number will only increase as the years progress, predicting that by the year 2030, 50% of Americans will be obese. An effective solution to attain long-term weight loss is Roux-en-Y gastric bypass (RYGB) surgery. During surgery, the vagus nerve is damaged, thus the brain communication with the gut is hindered. Previous research shows that innervation damage to the peripheral nervous system causes inflammation in the brain. The aim of this study was to understand these neuronal changes in the Nucleus tractus solitaries (NTS) 24-hours after RYGB surgery and 4 weeks after RYGB surgery. The experiment is conducted by collecting tissues from rats that have undergone RYGB surgery and those that had a sham surgery. The rats were perfused and their brains were dissected. The tissues were sectioned using a cryostat and stained using IBA1 antibody binding to activated microglia. Finally, microglia activation was analyzed in the stained tissues using the binary image analysis. The results of the study show that RYGB surgery is activating the microglia in the NTS both 24 hours and 4 weeks after surgery. In conclusion, RYGB surgery is altering gut-brain communication by inducing long-term inflammation in the NTS. This altered communication may be a key factor in the mechanism of reducing body weight post-surgery.

Sex-Trafficking in Georgia: Equipping Our Hotel Workers with the Proper Resources

Avni Ahuja, Foundation Fellow
Dr. Jody Clay-Warner, Sociology, Franklin College of Arts and Sciences

Human trafficking, referred to as "modern-day slavery," is a crime and a human rights violation. It is also the world's fastest growing criminal industry. The FBI ranks Atlanta as one of the top cities for child sex-trafficking, but this form of trafficking pervades almost every part of Georgia. Sex-trafficking, one of many forms of trafficking, is especially prevalent in hotels and motels. Traffickers and those purchasing sex capitalize on the privacy extended by lodging establishments and function with low risk of detection when staff and community members are unable to recognize signs of human trafficking. In this project, it is proposed that lodging establishments require their employees undergo training that teaches them to

recognize signs of sex-trafficking and report those signs to appropriate law enforcement agencies. Though the state of Georgia has taken many steps to counter sex-trafficking, many of these solutions are embedded within the justice system and seek to reform judicial process. While these solutions are important, more needs to be done on the forefront to identify victims and potential victims so that they can be removed from a dangerous situation and provided with restorative resources. Trafficking in lodging establishments presents a risk to the security of a hotel's business and its lawful hotel customers. Thus, the proposed policy benefits everyone in the state of Georgia. This project was completed by analyzing relevant research, legislation, and other government documents.

Studying Breast Cancer Metastasis to Bone Using Tissue Engineering

Jenna Evelynn Al-saleh, CURO Research Assistant
Dr. Cheryl Gomillion, Chemical, Materials, and Biomedical Engineering, College of Engineering

Breast cancer metastasis to bone can be detrimental for breast cancer patient outcomes. Currently, the mechanisms by which cancer is able to bypass bone tissue defenses, invade the tissue, and proliferate once settled in bone tissue sites are unknown. Many theories regarding chemical and signal cascades that allow for metastasis have surfaced; however, no clear cause has been identified. To develop more effective therapeutics, it is essential to understand this process. Tissue models of the microenvironments involved can help; several studies suggest that tissue stiffness has a direct correlation with breast cancer's ability to spread or metastasize. The objective of this work was to create an in vitro model of adipose tissue that mimics the breast tissue environment. Once a successful scaffold was created, we aimed to alter the stiffness of the scaffold to mimic native bone and study any resulting tumor cell changes. We prepared various percent solutions of low, medium and high molecular weight chitosan (1%-5% weight/volume), and hydrogel scaffolds were fabricated using chitosan cross-linked with sodium hydroxide. Scaffolds were characterized to evaluate the strength and storage modulus of the viscoelast/(v)2.6( )102aterial to determine wh( )102/(v)2h solut/on

The goal of my research was to build an online textile database, or a Single Point of Contact, to be referenced by consumers and UGA Extension agents in the new Textiles division. The main research questions that I had to solve were, "What data should be included in the Single Point of Contact," and "What is the best way to organize the content online for both the consumer and the agent?" In order to address these questions, I did extensive research on textiles, garment quality and selection, and textile care through textile-related Extension files made available to me. Additionally, I worked with an IT professional to learn the best methods to use to turn my findings into an online database. The most logical place to develop the Single Point of Contact was on the pre-existing FACS Outreach web page, adding my research findings in a separate textiles section. The results are a fully-functioning web page for consumers to visit in order to find information on textiles, with a separate password protected portal providing information exclusively to UGA Extension Agents.

Comparing the AX3 and MetaSensor Accelerometers for Measuring Muscle Twitch

Rachel Aldridge, CURO Research Assistant
Nivita Sharma
Dr. Kevin McCully, Kinesiology, College of Education

Fatigability is an important characteristic of skeletal muscle, particularly in clinical populations. A clinically relevant endurance test has been developed that uses accelerometers to measure chances in muscle movement in response to electrically induced muscle twitches. We aimed to determine if transverse or parallel placement of the accelerometer on the muscle altered signal/noise ratios (s/n) and to compare the s/n of two triaxial accelerometers, each manufactured by a different company (MetaSensor and AX3). Twitch acceleration measurements were performed on the left vastus lateralis muscle of two able-bodied females. Electrical stimulation was performed using a medical grade electrical stimulator (Theratouch 4.7, Rich-Mar). The s/n was quantified by measuring the ratio between the vector amplitude of the first vibration of the muscle twitch and the peak to peak noise between muscle twitches. Transverse orientation of the AX3 and MetaSensor accelerometers yielded a 15% higher s/n ratio than the parallel orientation (transverse = 50.3, parallel = 36.6). Consequently, transverse orientation was used to compare s/n ratios between the accelerometers. The MetaSensor accelerometer (60.5) had a 50% larger signal to noise ratio than the AX3 accelerometer (29.9). Transverse orientation seemed to provide higher s/n ratios, even if the accelerometers are triaxial. The less expensive MetaSensor ($45 versus $200) may have better s/n ratios than the AX3. However, both accelerometers had adequate s/n ratio to perform measurements of muscle fatigability.

Archetypal Features of the Graphical User Interfaces of Electronic Medical Records and Their Cognitive Burden on Users

Eliza Ali, CURO Research Assistant
Dr. Dale E Green, Health Policy and Management, College of Public Health

This research examines common and arguably necessary attributes of electronic medical record (EMR) systems and the impact of their organization on end users. Specifically, this research will examine how to make the workflow of an ambulatory outpatient facility more efficient while optimizing quality. The specific groups of the workflow that will be analyzed are front desk staff, clinical support, and practitioners. The first part of the research involves designing a standard archetype of a graphical user interface of an EMR for each part of the chosen workflow in the form of a series of screens. EMRs are pervasively used in the United States today, and ill-designed EMR systems can cause issues with liability, privacy, and patient safety. Each health information system vendor designs their own user interfaces, often with staff from a technology background with little experience with or understanding of the health care system. Therefore, the second phase of research involves designing and administering an evaluation that will measure the cognitive burden the archetype has on volunteers that have used an EMR before. The evaluation will be in the form of a test in which each question will have a time limit. During the evaluation, an eye tracking tool will be used to monitor and later evaluate what the users' eyes are drawn to. Determining ways to alleviate

the cognitive burden of EMR systems on end users can provide insight to the creators of these systems and may lead to the development of more intuitive, safe and streamlined software.

Investigating Performance of *Agraulis vanillae* on *Passiflora incarnata*: A Geographic Mosaic Approach

Sehar Ali, CURO Research Assistant
Dr. Rodney Mauricio, Genetics, Franklin College of Arts and Sciences

Plant populations in different geographic locations are subject to interactions with multiple different herbivore species. These interactions can result in defense traits evolving in plant populations that are specific to the local herbivore community, which may ultimately result in differences in defense traits between plant populations across a large geographic distribution. This pattern is formally known as the geographic mosaic of coevolution hypothesis. One test of this hypothesis is to measure how interactions between plants from different populations affect herbivore performance with the assumption that herbivore species will perform differently on plants they are accustomed to (local populations) and ones they are naïve to (foreign populations). We tested this prediction by conducting two feeding experiments with *Agraulis vanillae* on *Passiflora incarnata* plants from different regions of the United States. We measured performance traits in *A. vanillae* including survival, development time, and pupation weight. We found that development time of *A. vanillae* did vary depending on which plant populations they fed on. This study provided another example of the incredibly intricate dynamics of the geographic mosaic of coevolution between plants and insect herbivores.

Development of Polymer-Based Microspheres for Drug and Supplement Delivery

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

The development of polymer-based microspheres as a subset of novel drug delivery was investigated. These spherical beads have the potential to hold and release certain drugs such as various proteins and fatty acids. Within a specific environment in the body and at a set point in time, microspheres are degradable and will release their content. This allows for a controlled release of the drug at the target site of the body. To facilitate bead development, a sample drug, such as bovine serum albumin (BSA), or gelatin, can be encapsulated in microspheres composed of polylactide (PL) using poly-vinyl alcohol (PVA). Microspheres can be prepared using a single emulsion, solvent evaporation method. In this work, polymeric microspheres of varying BSA and gelatin concentrations were created to characterize their dimensions and thermal properties. The BSA and gelatin encapsulated microspheres were also quantified for their encapsulation efficiency using a BCA assay and a hydroxyproline assay respectively. Current work involves the encapsulation of fatty acids, like linoleic acid, within polylmeric microspheres to serve as a protective transport system in ruminant digestion. These lipid encapsulated microspheres will be characterized using microscopy, compression testing, differential scanning calorimetry, and biodegradability testing to measure encapsulation efficiency. The linoleic acid encapsulated micropsheres will be optimized to support ruminant nutrition and health.

Geography of Kurdistan

Bilind Amedi
Dr. Amy Ross, Geography, Franklin College of Arts and Sciences

In international affairs today, the region known as Kurdistan is vitally important. It is located in Syria, Turkey, Iran, and Iraq. The United States (US) is currently engaged in a battle with ISIS in the air while the Kurdish army has boots on the ground fighting. How important is the US relationship with the Kurdish people? Can the US ally with the Kurdish people, and if so, what might be the affects on the US relationships with Turkey, Syria, Iran and Iraq? The US has had a big impact on Kurdistan dating back to Saddam Hussein's regime and the Iraq wars. In addition, Kurdistan has its own issues, such as statelessness, corruption, and persistent persecution. In my research, I seek to learn from the history and geography of Kurdistan, in relation to the Middle East and the US. This preliminary study of the

geography and international relations of Kurdistan will help me develop my research objectives for a future field-based study in Kurdistan.

Chemical Weapons and the Legacy of War

Ali Elizabeth Anderson, CURO Honors Scholar, CURO Research Assistant
Dr. James W Porter, Ecology, Odum School of Ecology

Between 1940 and 1970, more than one million metric tons of chemical weapons were dumped into the world's oceans. As the official policy of disposal, this method has resulted in decades of environmental damage and put people at risk. Even three-quarters of a century after the end of WWII, coastal zone communities around the globe still encounter these toxic munitions. While scientists and policymakers have worked to quantify and address the hazards of chemical weapons in the Baltic Sea and several other European waterways, this study focuses on the location and quantity of chemical weapons dumped in the tropical Pacific, where these weapons were stockpiled as the United States advanced toward Japan in the closing years of the war. This study will assess the impact of chemical weapons on economic development on several islands, policies regarding chemical weapons, and examine the limitations of the Organization for the Prohibition of Chemical Weapons to address these problems. The study was conducted via the collection and analysis of primary and secondary documents from a variety of sources, including historical data, maps, government reports, and scientific articles. While the war is long over, the toxic legacy of these weapons lingers both in the ocean and on adjacent lands. The challenge to find, retrieve, and destroy them remains.

Controlled Linoleic Acid Release in a Hydrogel-Based Mammary Adipose Tissue Model

Kerri Andre, Foundation Fellow, CURO Research Assistant
Dr. Cheryl Gomillion, Chemical, Materials, and Biomedical Engineering, College of Engineering

The female breast is largely comprised of fat, or adipose tissue. There is evidence that adipose tissue-related factors, such as fatty acids, affect cancer cell growth and spreading to other tissues; however, these mechanisms are not clearly understood. We aim to develop a hydrogel-based in vitro model system, mimicking the mammary adipose tissue microenvironment, to study the effects of fatty acids, such as linoleic acid (LA), on breast tumor cell behavior. Chitosan is a favorable biopolymer choice for this model because of its many excellent properties, including being antimicrobial, biodegradable, and biocompatible, in addition to its crosslinking ability. Thus, chitosan microspheres (beads) were used to yield controlled, timed, and steady release of fatty acid to more closely mimic the in vivo environment found in breast tissue. A preliminary two-dimensional (2D) study of breast cancer cells treated with either high or low doses of LA showed that both doses resulted in a negative effect on cell metabolic activity over the course of seven days, suggesting that lower level, slower release would be more optimal for our model. In a follow-up study, the controlled release of LA from chitosan bead models was successfully documented over the course of ten days, suggesting that chitosan beads can be utilized to create a mammary adipose tissue model for studying breast cancer cell behavior. Interaction of breast cells with the fatty acid-loaded beads will be evaluated with future work to further demonstrate the feasibility of this model.

Family Functioning and Health-Related Quality of Life in Adolescent and Young Adult Transplant Recipients

Lauren Ellis Arnold
Dr. Ronald L Blount, Psychology, Franklin College of Arts and Sciences

This work aims to determine the impact of family functioning in relation to health related quality of life (HRQOL) for adolescent and young adult (AYA) solid organ transplant recipients. HRQOL in this population is significantly lower than that of the general population. The purpose of this project is to examine if family functioning within the AYA solid organ transplant recipient population impacts HRQOL. Participants include 64 liver, heart, or kidney recipients ages ranging from 12-21 years (Mage=16.91 years, SD=2.03) and their caregivers (N=64). Caregivers completed measures of family adaptability and cohesion, and AYA HRQOL. AYAs completed self-report

measures of HRQOL. AYA-self and caregiver-proxy-reports on HRQOL in relation to family function were related to one another ($r=.58, p<.01$). Caregiver-reported family cohesion and flexibility were positively associated with caregiver reported HRQOL (both $r=.35, p<.01$). Family flexibility was also correlated with AYA self-reported HRQOL ($r=.29, p<.023$). Family functioning is significantly related with AYA HRQOL. Better family functioning for these individuals is associated with HRQOL. Intervention efforts to improve family cohesion and flexibility may result in improved HRQOL for AYA solid organ transplant recipients.

The Effects of Phthalate Exposure in Female Germ Cells

Gazal Arora, CURO Research Assistant
Dr. Maria M Viveiros, Physiology and Pharmacology, College of Veterinary Medicine

Errors in meiotic division can lead to aneuploidy, which is a major cause of pregnancy loss and congenital disorders such as Down syndrome. Studies indicate that exposure to environmental toxins can disrupt reproductive function, including meiotic division in female germ cells (oocytes). An increasingly prevalent group of environmental toxicants includes phthalates, used to soften and increase the flexibility of plastics, which are considered endocrine disrupting chemicals. The objective of this study was to test the effects of di (2-ethylhexyl) phthalate (DEHP), a commonly used phthalate, on meiotic division in mouse oocytes. Cumulus-enclosed oocyte complexes (COCs) were collected from the ovaries of PMSG-treated female mice and cultured for 17 hours with increasing DEHP concentrations (0, 1, 10, 100 μg/ml). The oocytes were then fixed for immunofluorescence analysis. The spindle microtubules and the microtubule organizing centers (MTOCs) were labeled with anti-acetylated tubulin and pericentrin antibodies, respectively, and the chromosomes detected with DAPI. All oocytes were analyzed using an upright fluorescent microscope and imaging software. The rate of oocyte maturation to metaphase-II (MII) and incidence of chromosome misalignment did not differ significantly with increasing DEHP exposure. However, direct measurements revealed a disruption in meiotic spindle organization in response to DEHP, particularly in metaphase-II (MII) stage oocytes. The MII spindles were characterized by reduced spindle length and less focused (broader) spindle poles. These data indicate that DEHP can disrupt meiotic spindle organization, which is necessary for accurate chromosome segregation.

Insect Resistance Characterization of *IRP9* in Soybean

Praharshak Asireddy, CURO Research Assistant
Dr. Wayne Parrott, Crop and Soil Sciences, College of Agricultural and Environmental Sciences

Salicylic acid (SA) is an important signaling chemical in plants, most notably acting as a hormone for pathogen resistance. The *IRP9* gene is a SA synthase gene from the bacterium, *Yersinia enterocolitica*. When introduced into plants, *IRP9* increases SA production, leading to improved pathogen resistance. However, SA can have an antagonistic relationship with jasmonic acid (JA), which is vital to a plant's insect resistance. In particular, increasing SA levels in soybean, *Glycine max*, is of agronomic interest to obtain increased pathogen resistance, but due to the antagonistic nature of SA and JA synthesis, the plant's resistance to insects could possibly worsen as SA production increases. Therefore, four lines of soybean with the *IRP9* gene engineered into them will be tested for insect resistance. These lines show increased SA levels ranging from 2 to 14 times higher than normal, and will be tested for resistance to the soybean looper (*Chrysodeixis includens*), by determining if the plants can inhibit growth of caterpillars feeding on them for 14 days. The usefulness of this gene for agriculture will be determined by the extent to which it affects insect resistance.

Changes in Distribution of Black-Bellied Whistling Ducks (*Dendrocygna autumnalis*) in the Southern Atlantic Flyway

Samantha Askin, CURO Research Assistant
Dr. Michael Chamberlain, Forestry, Warnell School of Forestry and Natural Resources

Whistling ducks have been reported in Florida, South Carolina, and Georgia. To date, there have been no studies evaluating distribution of

whistling ducks throughout the southern Atlantic Flyway, or the potential for an expanded geographic range. My objectives were to describe and map changes in distribution of whistling ducks through the southern Atlantic Flyway, determine potential movement routes, and identify potential factors influencing expanded distribution. State agencies provided banding and recovery data sets from 2006 - 2016. Citizen scientist data from 2006 - 2016 from eBird.org and the Cornell Ornithological Laboratory was also used. I used ArcGIS v. 10.4 to create maps that represented location and potential movement routes, providing a unique way to visualize change in their distribution. I used these maps to identify potential movement routes and geographic distribution of whistling ducks. 109 counties had sightings of whistling ducks during 2006-2016; Florida had the most rapid expansion, followed by Georgia and South Carolina. The birds in the southern Atlantic flyway are migrating north to south, rather than east to west. Future work could expand this research to look at the genetics of birds in the southern Atlantic flyway to identify where they are originally from. My overall suggestion would be to use results collected from this research to propose new management strategies for Black-bellied whistling ducks in the southern Atlantic flyway.

Multimerization of Long DNA Inserts via Bombardment

Brooke Aspinwall, CURO Research Assistant
Dr. Kelly Dawe, Genetics, Franklin College of Arts and Sciences

To transform plants, transgenes are often introduced using *Agrobacterium* because of the stability of insertion. Gene inserts from *Agrobacterium* are limited to about 30kb in size. Transformation via particle bombardment, or biolistic transformation, can insert larger DNA constructs than *Agrobacterium*, but it is less stable and has lower gene expression than *Agrobacterium* transformation. DNA inserted with biolistic transformation is thought to have more rearrangement, but it has never been definitively proven. Bombardment is used to transform a wide variety of plants and can use DNA in a range of forms to insert genetic constructs. Still, there are many unanswered questions associated with biolistic transformation, such as how large of a construct can be inserted, if rearrangement occurs, and if DNA pieces could be inserted and assembled into a larger construct. To test these questions, rice and maize were biolistically transformed with lambda DNA, which has sticky ends that are capable of joining together. Whole-genome sequencing will be used to figure out where the DNA was inserted, if the DNA joined together, and if rearrangements occurred.

Mechanistic Relationships Between Mga and Myc During Zebrafish Development

Adam Greg Aston
Dr. Scott Dougan, Cellular Biology, Franklin College of Arts and Sciences

This study focuses on the normal interactions of MAX Gene Associated (MGA) transcription factor and Myc during zebrafish development as well as its possible role in tumorigenesis. The *mga* gene encodes a transcription factor with two DNA binding domains conserved in humans, mice, and zebrafish, and is involved in cell cycle regulation and differentiation. In vitro, Mga antagonizes Myc, an oncogene previously well-studied. There is no current evidence documenting the relationship between Mga and Myc in vivo. To study the transcriptional activity of Mga in zebrafish, the morpholino system is utilized to knock down Mga. A morpholino is an oligonucleotide that binds to specific mRNA sequences and blocks their translation or splicing resulting in reduction of expression of their protein products. Injection of *mga* morpholinos in embryos can yield phenotypes including a wide array of defects in neural crest development and organogenesis. Given that Mych, a c-Myc homolog in zebrafish, is reported to be involved in neural crest formation, we used a reporter construct to determine if the morphant phenotype is due to the antagonistic role of Mga. The reporter construct contains a luciferase gene under the control of a minimal promoter and four E-boxes. By analyzing the reporter gene expression, the results should allow for a better understanding of Mga and Myc interaction in vivo during embryonic development and in human cancer.

The Effect of Age on Functional Connectivity of Cognitive Control Networks in People with Schizophrenia

Emma Auger, CURO Research Assistant
Dr. Jennifer McDowell, Psychology, Franklin College of Arts and Sciences

The integrity of cognitive control (CC) is related to the functional connectivity of brain networks as assessed by resting-state functional magnetic resonance imaging (rsfMRI). Good CC is associated with strong within network connections, like those in the executive control network (ECN, composed of frontal-parietal regions and recruited during CC); and strong differentiation between networks, like between the ECN and the default mode network (DMN, composed of midline regions and suppressed during CC). Resting-state networks change over the lifespan in healthy individuals and reflect changes in CC. People with schizophrenia experience CC deficits and disrupted brain connectivity of both networks in early and mid-adulthood. While there is some evidence that schizophrenia may be a neurodegenerative disorder, it is uncertain if age-related connectivity changes are similar between schizophrenia and healthy comparisons, especially when healthy comparisons have similar cognitive deficits (low cognitive control, LCC). In this study, people with schizophrenia (n=28) and healthy comparisons with LCC (n=28) will complete a resting-state scan. Each group will be further subdivided by age: younger individuals (20-35 years) and older individuals (44-63 years). To quantify the effect of age on CC network connectivities and how they might be different across the two groups, we will perform a group by age ANOVA on functional connectivity of the DMN and ECN. We hypothesize that older individuals will have less network connectivity compared to younger individuals. Using the neurodegenerative theory of schizophrenia, we anticipate this difference to be larger in people with schizophrenia.

Punitive or Positive: How University Affirmative Consent Policies Can Be Framed for Maximum Effect

Prentiss Rachel Autry, CURO Research Assistant
Dr. Justine Tinkler, Sociology, Franklin College of Arts and Sciences

While many college campuses have recently changed their sexual misconduct policies, there has been little consistency in the framing of these statements. This study, conducted through the Laboratory for the Study of Social Interaction, seeks to determine how university policies can best be presented to affect the most social change. Participants in this study are undergraduate students, given one of four randomly assigned policy statements and then asked to answer questions assessing their memory and understanding. The study has been pilot tested and researchers are currently collecting data. The findings of this study could have direct impact on university policy framing and will shed light on how policies impact cultural beliefs and behavior.

Chondroitin Sulfate Glycosaminoglycan Matrices Promote Neuroprotection Sub-Acutely Post-Traumatic Brain Injury

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

A traumatic brain injury (TBI) is defined as a penetrating wound to one's head that affects brain function. In the United States, an estimate of 2.4 million illnesses and deaths each year can be traced back to TBIs. There are two distinct periods in TBI: primary and secondary. The primary injury results from the initial force, causing tissue shearing and compression. The secondary injury results as a consequence of the primary injury and causes further tissue loss. Currently there are no effective treatments for the secondary loss of tissue post-TBI. We hypothesized that chondroitin sulfate glycosaminoglycan (CS-GAG) matrices or CS-GAG matrices along with rat PKH26GL labeled allogeneic neural stem cells (NSCs) help facilitate tissue repair. The treatments were delivered intracortically 4 weeks post-TBI. A histological analysis was conducted to demonstrate differences between treated and control groups. Nissl staining showed CS-GAG treated animals demonstrated enhanced neuroprotection ($p<0.05$) when compared to controls and NSC-only treated animals. Sox-1 and Ki67 staining indicated enhanced proliferation and maintenance of undifferentiated ($p<0.05$) NSCs in the CS-GAG-NSC treated rats. There was high retention of FGF-2 ($p<0.05$) in CS-GAG and CS-GAG-NSC treated animals. There was enhanced presence of

CD68+ macrophages ($p<0.05$) in animals treated with NSC only and CS-GAG-NSC. All treatment and SHAM control groups illustrated weakened presence of GFAP+ reactive astrocyte ($p<0.05$) in the lesion site when compared to TBI controls. These observations provide further evidence for the potential application of CS-GAGs as neuroprotective agents post-TBI.

Revising the Classics: Modern and Contemporary Female Authorial Treatment of Unactualized Characters from Greek Myth

Manisha Banga
Dr. Benjamin M Wolkow, Classics, Franklin College of Arts and Sciences

This work analyzes contemporary female authors' use of ancient Greek and Roman myth in their writing. The research is in two parts, where Part I analyzes authorial reinterpretation of marginalized characters from ancient myth and Part II analyzes authorial reinterpretation of heroes from ancient myth. Where female authors generally attempt to provide newfound voice and sympathy for ancient characters, a more complex process occurs in reinterpretations of heroes. In one method, contemporary female authors villainize ancient heroes as a mode of catalyzing sympathy for marginalized characters who are abused by heroes. In the second method, authors feminize ancient Greek heroes. By feminizing traditionally hypermasculine heroes, female authors reverse traditional norms and thereby engage in feminist revisionism. I analyze works from a diverse array of contemporary female authors, including Margaret Atwood, Anne Carson, Sarah Ruhl, Madeline Miller, and H.D.

Depletion of a Key Maternal Protein Impairs Early Embryonic Development

Wendi Bao
Dr. Maria M Viveiros, Physiology and Pharmacology, College of Veterinary Medicine

Aneuploidy in embryos is a major cause of congenital disorders as well as pregnancy loss, and is attributed to error-prone meiotic division in oocytes. The accuracy of chromosome segregation is dependent on stable spindle formation, which is regulated by unique acentriolar microtubule organizing centers (aMTOCs) in oocytes. To test aMTOC function we developed a unique transgenic (Tg) mouse model in which a key protein, Pericentrin (Pcnt), was knocked down exclusively in oocytes. We previously demonstrated that oocyte-specific loss of Pcnt in Tg mice disrupts spindle organization, leading to highly error-prone meiotic division and significant female subfertility. The current study assessed the basis of embryonic loss in Tg mice lacking maternal Pcnt. Ovulated metaphase-II oocytes were collected from control (WT) and Tg females and in vitro fertilized with control sperm. Presumptive zygotes were fixed for immunofluorescence analysis at 24 hour intervals post-fertilization to evaluate the development of pre-implantation stage embryos. While loss of maternal Pcnt delayed the first mitotic division, there was no significant difference between the WT and Tg groups in the overall 2-cell cleavage rates by 24 hours post-fertilization. Similar rates of embryos also developed to the morula and blastocyst stages. However, blastocysts derived from Pcnt-depleted oocytes showed an increased incidence of mitotic errors, and contained significantly fewer total cell numbers, attributed to a pronounced decrease in trophectoderm lineage cells specifically. These data demonstrate that ablation of maternal Pcnt disrupts early embryonic quality, which likely contributes to lower fertility in Tg females.

Organic Fertilizer Improves Revegetation of Roadside Soils

Evan Barnard, Ramsey Scholar
Dr. Nina Wurzburger, Ecology, Odum School of Ecology

Urbanization and road construction affect the global carbon cycle by releasing carbon from soil and reducing carbon inputs into soil from plant productivity. Revegetation of areas disturbed by construction can replenish soil organic matter, thereby increasing plant productivity and soil carbon storage. Plant restoration of disturbed roadsides can be facilitated by the application of fertilizers. However, fertilizers (i.e., organic or inorganic) vary in their effectiveness and carbon footprint. We conducted a plant growth experiment using *Elymus virginicus* and soils sampled along roads in Atlanta, GA to investigate how fertilizer treatments affect plant growth. We

performed a two-way factorial experiment, with two factors (inorganic or organic fertilizers), each with two levels (with or without), crossed to create four experimental treatments. We hypothesized that both inorganic and organic fertilizers would increase plant growth, but that plants grown with organic fertilizer would produce more biomass compared to those receiving inorganic fertilizer. Following twelve weeks of growth, we quantified plant growth, root:shoot ratios, soil microbial biomass, and soil nutrient and pH pools. We found that both inorganic and organic fertilizers increased plant biomass and decreased the root:shoot ratio, and addition of organic fertilizer increased plant biomass more than the addition of inorganic fertilizer. Our findings suggest the addition of organic fertilizer as an effective management tool for revegetating disturbed roadsides, promoting greater carbon sequestration in urbanized areas and counteracting the rise in atmospheric greenhouse gases.

Nutrition of Women and Adolescent Girls in Conflict Zones

McKenna Barney, Foundation Fellow
Dr. Maria Navarro, Agricultural Leadership, Education, and Communication, College of Agricultural and Environmental Sciences

This study focuses on the effects of malnutrition on women and children in conflict zones in developing countries and the efforts taken by governmental and non-governmental organizations to improve the health of these vulnerable community members. I used a meta-analysis of case studies completed on malnutrition in conflict zones including Chiapas, Afghanistan, Syria, and others to look for common causes and complications that could provide insight into how to better fight malnutrition in these areas. I also explore successful and unsuccessful attempts to assuage malnutrition in conflict zones and the reasons behind their relative impacts. By analyzing programs implemented by both governments and non-governmental organizations, this research can help to identify recurring problems with planning and implementation of nutrition promotion in regions plagued by conflict. Based on an extensive literature review, this research found that conflict exacerbates the issue of malnutrition due to disruptions in the food supply, economic instability, poor sanitation, safety concerns, and inadequate government services. On an individual level, exposure to trauma can interfere with breastfeeding among mothers and proper caloric intake among children. This study demonstrates that malnutrition in conflict zones is not simply caused by lack of food availability or improper utilization, and highlights key challenges development organizations experience when working to ensure food security.

The Financial Obligations of Owning a Pet

Ellen Barrow, CURO Research Assistant
Dr. Brenda Cude, Housing and Consumer Economics, College of Family and Consumer Sciences

This study was undertaken to discover the average financial obligations of owning a pet, especially for students in college. Specifically, we hoped to discover what pet related expenses are most common outside of regular expenses such as food and basic care. I wanted to explore the topic of pet insurance and whether students may find this service useful, as well as what plans are offered. To get a sense of what information would be relevant in analyzing these problems, informational interviews were conducted with students and other pet owners. The results were used to help formulate the questions we wanted to ask in our survey. Currently, the survey is planned to ask students and pet owners about their average expenses, un-planned expenses, and the costs and benefits of owning a pet. I have reached out to local veterinarians' offices to get their help to gain survey participants. After the survey results are available, I will analyze the benefits that having pet insurance provides compared to the average costs that pet insurance would cover. I will then use the data to make recommendations to students on whether pet insurance would be a beneficial endeavor. Finally, I hope to provide an average cost and time commitment in relation to pets to help better prepare future pet owners for their responsibilities.

Examination of Courtship Songs across *Drosophila subquinaria* Populations

Sophie Alexandra Barton
Dr. Kelly Dyer, Genetics, Franklin College of Arts and Sciences

The *Drosophila* genus is famous for its elaborate courtship behaviors that vary between species, populations, and individuals. Male fruit flies use a multitude of sensory signals to court a female, including pheromones, tapping, licking, and wing vibrations. Wing vibrations, which produce songs, are of particular interest, as they have been found to be acted upon by sexual selection and vary greatly between species. There are two major categories of song types produced by *Drosophila* flies—the sine song and the pulse song. The sine song is a continuous "humming" song that often comes before or after the more prominent pulse song. As its name suggests, a pulse song consists of a string of pulse sounds called a "burst." Many studies focus on the interpulse interval (IPI) between bursts because they are unique to each species and contribute to species recognition. *D. subquinaria*, a species whose songs have not been studied extensively, has been found to produce only pulse songs, which vary greatly between populations. In populations that are sympatric with the recently diverged *D. recens*, *D. subquinaria* females discriminate against conspecifics from other populations. This discrimination is likely in part due to fundamental song difference between populations. The present study sought to determine what differences in the characteristic songs of sympatric *D. subquinaia* and two other allopatric *D. Subquinaria* populations might be used as cues for discrimination. We recorded courtship songs of the three populations for analysis. It is expected that IPI will differ greatly across populations.

Unfamiliar Stone Hammer Use in Juvenile Bearded Capuchin Monkeys

Sophie Alexandra Barton
Sreinick Keo, Rushi Ketan Patel
Dr. Dorothy Fragaszy, Psychology, Franklin College of Arts and Sciences

Wild bearded capuchin monkeys in Fazenda Boa Vista, Piauí, Brazil regularly use stone tools to crack open nuts. They place nuts in shallow pits on anvil surfaces, which they strike with a hammer stone. Adults must accumulate years of experience to become efficient nut crackers—it takes more than six years for juveniles to become proficient. The monkeys use exploratory actions prior to striking the nut, such as flipping the stone and knocking the nut. Capuchin monkeys show individual variability in hand positions on the stone during the lifting and striking with the stone. The present study seeks to determine how the exploratory actions, stone grips, and strike success of juvenile capuchin monkeys differ from those of adults. Videos of individual monkeys cracking nuts using an unfamiliar stone at the field site in Brazil were coded for the first 20 strikes. We expect that juvenile monkeys use a more diverse set of exploratory actions, use more variable and inefficient stone grips, and have less striking success than adults, due to their smaller size and inexperience. Preliminary data suggests that juveniles are less consistent in stone hand positioning, use exploratory stone flipping actions more often, and frequently try to crack two nuts at once, which leads to lesser striking success. These and subsequent findings will provide insight into the development of stone tool use behavior of these monkeys and other species, including extinct hominins.

Obstructed Labor: Analyzing Realistic Implementations for Developing Countries to Decrease Maternal Morbidity

Hannah Bass, CURO Research Assistant
Dr. Trina Salm Ward, Health Promotion and Behavior, College of Public Health

Obstructed labor is one of the leading causes of preventable maternal death in underdeveloped countries. This mechanical problem occurs when the head of the fetus cannot fit through the mother's pelvis during child birth, even when healthy contractions are present. Cases of obstructed labor can be easily overlooked, especially since there are not definitive indicators for mothers at risk. Timely diagnosis is crucial for the heath of both the mother and child; however, there are several delays specific to developing countries that hinder a mother from obtaining the proper treatment in time. Once the obstructed labor is recognized, the mother can undergo cesarean section, have an assisted vaginal delivery, or undergo a symphysiotomy. The goal of my research is to understand risk factors and prevention of obstructed labor, as well as the best practices and treatment that could be realistically implemented in developing countries. I searched peer-reviewed articles between the years 2000 and 2017 that describe solutions for decreasing the chance of maternal morbidity due to obstructed

labor. I compiled article information and will synthesize literature results. This research will lead into a plan for deciding on the most effective practices and treatments, as well as areas for future work and improvements with regard to the available resources in underdeveloped countries.

Psychosocial Functioning and Barriers to Medication Adherence in Adolescents Awaiting Solid Organ Transplants

Haley Bearden, CURO Research Assistant
Dr. Ronald L Blount, Psychology, Franklin College of Arts and Sciences

Medication adherence is a significant concern for solid organ transplant candidates, parents and healthcare providers. Barriers to medication adherence have been related to treatment barriers (e.g., hospitalization, rejection episodes, and death) and internalizing symptoms in children and adolescents who have received solid organ transplants. Little research has been done to explore the association between medication adherence and psychosocial functioning (e.g., anxiety, depression, and attention problems) among adolescent patients before they receive their transplant. The purpose of this study is to examine medication adherence and psychosocial functioning among pediatric candidates awaiting solid organ transplants in order to prevent treatment barriers. The population includes 35 adolescents ranging from ages 12-20 (M= 15.99, SD= 2.35) awaiting solid organ transplants (54.3% kidney, 22.9% liver, and 22.9% heart). Participants were recruited at the Transplant Services Clinic at Children's Healthcare of Atlanta. Participants completed self-report measures on psychosocial functioning and barriers to adherence using paper-and-pencil measures while at their pre-transplantation evaluation appointment. Total barriers to medical adherence were positively correlated with attention problems (r=.34, p=.05) and depression (r=.56, p<.001). Correlations between barriers and anxiety and hyperactivity were not significant. Significant between-organ group differences in barriers to a2.9(i)1.7(2.3(e)1(r< 3)id)]TJ0 -1

haemagglutinin (HA) and neuraminidase (NA), which play essential roles in the budding and spreading of the agent. Current seasonal vaccines must be updated annually and protect poorly against antigenic drift variants, driving the search for improvements on the vaccine to ensure a broader protection. Flu vaccines have been developed to work against only HA, but NA has never been standardized for a vaccine. The goal of this experiment is to assess whether the current vaccine elicits antibodies against neuraminidase in an enzyme-linked immunosorbent assay (ELISA). We used virus-like particles (VLP) as an alternative influenza NA. For this experiment, sera from human cohorts vaccinated with A/California/7/2009 (H1N1)pdm-09-like virus and A/Hong Kong/4801/2014 (H3N2)-like virus were obtained day of vaccination (d0) and 21 days post-vaccination (d21). Sera were then incubated against VLP to test whether or not elicited antibodies recognized the expressed antigen and to assess antibody titer between d0 and d21. ELISAs have been tested on A/Switzerland/9715293/2013 NA VLP, A/Wisconsin/67/2005 NA VLP, and A/Panama/2007/1999 NA VLP.

Design and Development of Bioengineered 3D Scaffold Using Novel Biomaterials for Tissue Regeneration Cell Culture

Wilfred Oluwafemi Benard, CURO Research Assistant
Dr. Jaya Sundaram, Chemical, Materials, and Biomedical Engineering, College of Engineering

Extensive research has been conducted to determine a suitable material to promote new bone formation in clinical orthopedics. The biomaterials must be biodegradable, biocompatible, and bio-tolerable. This research focuses on the advantages of nanocellulose, such as mechanical reinforcement, surface chemical reactivity, biocompatibility, lack of toxicity, and high specific surface area. The structural advantages of nanocellulose are suitable for the production of a 3D cellular tissue scaffold material for bone tissue regeneration. Hydroxyapatite (HA) is an osteo-conductive material that stimulates muscle on bone fixation and enhances material rigidity, these two biomaterials (nanocellulose and hydroxyapatite) were combined to produce a suitable scaffold. In addition to nanocellulose and HA, alginate, a hydrogel biomaterial was used to give structural stability to the scaffold during development. We varied the concentration of each biomaterial to come up with the best possible scaffold support structure for tissue regeneration. Developed scaffolds were tested to analyze morphological characteristics, biochemical characteristics, and mechanical strength by measuring compressibility, swelling ratio, in vitro degradation analysis, and in vitro cell culture analysis. The nanocellulose is expected to have better cell matrix adhesion, cell differentiation and guided tissue regeneration.

How Social Media Affects Higher Learning

Anna Bennett, CURO Research Assistant
Dr. Lilia R Gomez-Lanier, Textiles and Merchandising, College of Family and Consumer Sciences

Today's higher education classroom setting is unlike it was a decade ago. The availability of smartphones, laptops, and tablets has increased considerably, and with them the ease of access to social media and various other applications. Most research regarding the impact of technology on learning has been focused on K-12 classrooms while only a small percentage has been conducted within the higher education community. Specific studies on Facebook use in college classrooms have been done, but beyond that, a minimal amount has been discovered on which social media and/or applications are currently being used to enhance the learning experience in today's college classrooms. The goal of this research is to determine which social media sites and/or applications are being used for educational purposes in higher education. Quantitative data will be collected through the use of an online survey host and will be taken from undergraduate and graduate students within the College of Family and Consumer Sciences at the University of Georgia. The findings will assist in discerning which applications and social media are being used most for learning, inside and outside of the classroom. They will also show student's personal preferences, based on gender and academic level, in utilizing these programs, as well as their overall preferences for these learning outlets. This information will assist educators in the decision of

incorporating social media into the learning environment, and if so, in what capacity, to enhance student learning.

Gold Nanoparticles, Cytotoxicity and Radiosensitization in a Feline Vaccine-Associated Sarcoma Cell Line, In Vitro

John Zachary Benton
Dr. Robert M Gogal, Veterinary Biosciences and Diagnostic Imaging, College of Veterinary Medicine

Vaccine Associated Sarcomas (VAS) are highly invasive feline malignant tumors that are frequently associated with routine vaccination. Current treatment modalities include chemotherapy, radiation, and radical surgery. VAS have been shown to be one of the more resistant of feline cancers to conventional therapy, with high rates of recurrence. Previous studies have shown that gold and other high atomic number nanoparticles have the ability to increase the dose of radiation deposited into tissue by generating secondary electrons. The current study evaluated the effects of 15 nm gold nanoparticles (AuNP) on VAS cells alone and when combined with electron beam radiation. Cells from an established VAS cell line were co-cultured with AuNp at 0, 0.25, 0.5, 1.0, 2.0 and 4.0 mM. Cytotoxicity of AuNP was evaluated by assessing changes in cellularity, cell proliferation, cell cycle and viability/cell death with the radiosensitizing potential of AuNP on VAS cells assessed by the clonogenic assay. AuNP, regardless of concentration, had a negligible effect on cellular proliferation, cell viability, cell cycle, and cell death. AuNP alone decreased colony formation in a dose dependent manor; colony formation was further suppressed when combined with radiation. Preliminary results indicate that 15 nm AuNp at less than 4.0 mM does not appear to be cytotoxic, but upon uptake within the VAS cell and irradiated does significantly impair colony formation. This would suggest that pretreatment of VAS cells with AuNP can enhance the efficacy of radiation therapy and thus have some level of therapeutic application.

Motown Styles and the 1960's American Dream

Oloni Binns, CURO Research Assistant
Dr. Monica Sklar, Textiles and Merchandising, College of Family and Consumer Sciences

The visual styles of iconic Detroit record label Motown held significance both during its prime in the 1960's and beyond. This research aims to evaluate two aspects of the costume history of Motown. Much of the design history is lost to the known record, and this project seeks to uncover the designers, labels, sourcing, and design development process as to how the performance clothing was selected, produced, and where it is archived. Through the examination of the garments and the development of the aesthetics, stories are revealed about the impact of Motown's dress choices on the wearer, the viewer, and in society in general regarding authenticity and identity. The label's aesthetic had relationships to the Vietnam War, the Civil Rights movement, and the overall culture of that era. This study conducts primary research by examining historic collections and exhibitions of the Motown museum, the Grammy Museum, and the National Museum of African American History and Culture, and speaking with historians, Motown artists, and their associates. Literature pertaining to the history of Motown also reveals information about the dress history embedded within greater narratives. This research deciphers interconnections and disconnections between the Motown artists' image, including on- and off-camera fashions, and the era of their greatest success.

The Effect of Sericea Lespedeza on Strongyle Fecal Egg Counts in Mature Horses

Marrissa Jean Blackwell
Dr. Kylee Duberstein, Animal and Dairy Science, College of Agricultural and Environmental Sciences

Equine parasite control is primarily accomplished through deworming programs that utilize anthelmintics to target small strongyles, and due to their widespread use, resistance is now a major issue. Studies in small ruminants have shown that condensed tannins found in sericea lespedeza (SL) play a role in reducing parasite load. The objective of this study was to analyze the effects of sericea lespedeza hay as compared to Russell bermudagrass (RB) on parasite load in horses.

Sixteen horses were divided into two treatment groups, each receiving 1.5% of body weight daily over four weeks. Fecal egg counts (FEC) were conducted at days 0, 14, 28, and 42 (two weeks after removing from treatments). Horses were randomly divided and housed in two adjacent pastures, and were brought into stalls for 6 hours/day to consume treatment diets. Average initial (day 0) FEC for horses on both treatment groups was high and not statistically different (SL=447, RB=451, P=0.98). All horses showed significant increases in FEC by day 42 (P<0.001). At day 28 and day 42, there were numerical differences between treatment groups with SL having lower FEC compared to RB (SL=317, RB=505; SL=1008, RB=1220 at day 28 and day 42 respectively), but high individual variation rendered this data not statistically significant (P=0.24, P=0.18 at day 28 and day 42 respectively). It was noted that in horses with FEC<50 epg (N=5), there was a statistical difference (P=0.0082) in FEC response between treatment groups, with SL horses showing no FEC increase, while RB horses showed an increase of approximately 100 epg by day 42.

MRI Compatible Response Keypad for Communication with Nonverbal Subjects

Brian Lawrence Boland, CURO Research Assistant
Dr. Zion Tse, Electrical and Computer Engineering, College of Engineering

The study aims to evaluate a new MRI compatible human response keypad designed for nonverbal subjects which is inexpensive and easily manufactured. The device is 3D printed in PLA plastic. Once assembled, the system alerts the operator when it senses interruption to the path of light across fiber optic cables caused by button presses. A combination of nonverbal and verbal subjects is split randomly into two groups. Group 1 subjects spend 15 minutes without the device in an MRI simulator. Subjects rate their mood on a predetermined numerical scale. Group 2 uses the device for the 15 minute period, and they also rate their mood. Subsequently, all subjects will use the device to perform several set tasks so that the ease of use and reliability of the device may be evaluated. It is anticipated that using the device will help alleviate feelings of anxiety to some degree. We expect that nonverbal subjects will feel less isolated when able to communicate. Reducing stress inside the MRI can help prevent panic, especially for people with communication disorders, by providing a simple option for an otherwise isolated person to connect with another human being. Tools like this have the potential to make MRI procedures more agreeable to a community of people with similar disabilities. Having increased communication could easily reduce the occurrence of image-blurring disturbances and the need for repeating scans. These benefits are shared by everyone involved in the form of saved time and money.

A Comparison of Functional and Fitness Traits of *Alliaria petiolata* along a Forest Gradient

Sydney-Alyce Bourget, CURO Honors Scholar, CURO Research Assistant
Dr. James E Byers, Ecology, Odum School of Ecology

Alliaria petiolata, commonly known as garlic mustard, is an invasive herb that has been spreading throughout the United States for over 150 years. In recent decades, garlic mustard has begun to invade the intact forest understory communities of eastern North America. The expansion of garlic mustard's invasive range into these habitats is a great concern, as garlic mustard exudes a chemical compound that inhibits the growth of essential soil fungi. The objective of this study was to determine whether garlic mustard populations located along a forest gradient exhibited different functional and fitness traits. We also sought to determine average height and fruit body yield between these populations over time. To conduct this study, an observational field experiment was set up in which the traits of garlic mustard populations located within the edge of a forest, intermediate forest, and forest understory were measured. These traits include height, number of leaf nodes, and reproductive siliques. Based upon data analyses, garlic mustard populations found within the edge habitats exhibited, on average, greater heights, leaf nodes, and reproductive siliques than any of the other microhabitats observed. Garlic mustard populations in intermediate sites exhibited the next greatest heights, leaf nodes, and reproductive siliques, while the forest population produced the shortest plants with the fewest siliques on average.

This data, along with previous data collected, would suggest that a source-sink dynamic is occurring in which edge populations are sourcing propagules into the forest understory.

The Role of Technology and Statements in the July 2016 Turkish Coup Attempt

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

The events that occurred the night and early morning of July 15th and 16th, 2016, shocked citizens of Turkey and the world. The attempt produced scenes of protest and violence in major urban centers and destabilized an already-precarious Turkish political environment. Unlike previous coups in Turkey and elsewhere, this short-lived attempt was broadcast live on social media around the world. What was the role of technology and government rhetoric in the Turkey's July 2016 coup attempt, and how does this attempt compare to previous coups in Turkey? This research analyzes and synthesizes a more accurate timeline of the attempt using numerous Turkish and English journalism reports, social media from that night, and an academic background on the role of coups and the military in Turkey. The timeline of events is used as a foundation for further analysis of key statements from government officials and pro-coup forces. The synthesis of these statements provides a more complete and nuanced picture of the role of rhetoric and technology during the coup. The attempt's ultimate failure was due to a variety of reasons, but pro-government mobilization via social media and government statements were particularly key in stopping a military takeover of the government. In addition, a historical overview of previous successful and unsuccessful coup attempts provides points of contrast to the July 2016 attempt.

Exploring the Role of DNA Double-Strand Break Repair Proteins in CRISPR Adaptation

Sonam Alka Brahmbhatt, CURO Research Assistant
Dr. Michael Terns, Biochemistry and Molecular Biology, Franklin College of Arts and Sciences

In many prokaryotic organisms, Clustered Regularly Interspaced Short Palindromic Repeats (CRISPR) and CRISPR-associated (Cas) proteins form a system (CRISPR-Cas) that provides adaptive immunity against foreign invaders such as viruses. The CRISPR-Cas system has three general stages: adaptation, crRNA biogenesis, and interference. While the mechanisms of the latter stages of the CRISPR-Cas system are well studied, many details concerning adaptation –the integration of foreign DNA into the CRISPR locus - remain obscure. Studies suggest that DNA double stranded break repair proteins, such as RecBCD in *E. coli*, may play a role in adaptation. The overall goal is to investigate the role of *S. thermophilus* DNA double-strand break repair proteins, RexA and RexB during the adaptation stage of the CRISPR process. RexA and RexB form a helicase–exonuclease complex and we hypothesize that the complex is important in generating short viral DNA fragments that are used by Cas proteins for integration into host cell CRISPR genomic locus. My project focuses on the expression and purification of these proteins for experiments to study and characterize their activity in an in vitro setting, with the expectation that the complex will generate short DNA fragments with properties similar to those observed to be integrated in CRISPR loci in vivo. This study is important to better understand the adaptation stage of CRISPR immunity. Developments in this field will reveal the exact mechanism of how foreign DNA is processed and incorporated into CRISPR loci.

Analysis of Genetic Diversity in *Asimina triloba* to Infer Historical Processes Responsible for Range Expansion

Jessica Mei Brown, CURO Research Assistant
Dr. Dorset Trapnell, Plant Biology, Franklin College of Arts and Sciences

The importance of natural versus pre-Colombian anthropogenic dispersal in post-glacial range expansion of the North American tree species *Asimina triloba* is being investigated. The large sweet fruit were highly prized by indigenous peoples and we hypothesize that humans were responsible for the dispersal of this species to the Northern US and parts of lower Canada, explaining 'Reid's Paradox' whereby plant species with limited dispersal ability migrated considerable

distances subsequent to glacial retreat. *Asimina triloba* samples collected throughout much of the species' range are being genotyped with nine nuclear microsatellite markers. Because neutral genetic diversity in contemporary populations contains the footprints of historical processes, we are able to discern natural versus anthropogenic origin of populations. Examination of four putative anthropogenic and four wild populations that are geographically paired revealed that wild populations had higher genetic diversity: a mean number of genotypes of 27.3 versus 1.3 per population, 89% versus 54% percent polymorphic loci, 4.5 versus 1.5 alleles per locus and expected heterozygosity of 0.562 versus 0.281. Ultimately, through the application of network analysis we will examine nodes of connectivity and infer patterns of movement and dispersal. This information can inform inference of the relative importance of natural versus anthropogenic dispersal, and provide a more complete understanding of how this species dispersed, colonized new habitats, and expanded its geographic range subsequent to glacial retreat.

Biochemical and Structural Characterization of vOTUs from Ganjam and Hazara Nairoviruses

Sarah Elizabeth Brown, CURO Research Assistant
Dr. Scott Pegan, Pharmaceutical and Biomedical Sciences, College of Pharmacy

Crimean-Congo hemorrhagic fever (CCHF), Ganjam, and Hazara are closely related nairoviruses. *Nairovirus* is a genus of RNA viruses including CCHFV. CCHF virus produces fever, prostration, and severe hemorrhages in humans. CCHF often has fatal effects in humans, while Ganjam and Hazara have only mild effects. However, Ganjam is often fatal in sheep. Hazara can be used as a model system for nairovirus infections. Within CCHFV is a viral homologue of the ovarian tumor protease (vOTU). Due to the close relationship between Hazara and CCHF, we can explore the differences between how the CCHF and Hazara vOTUs bind ubiquitin. Because Hazara is not our health concern, we can create and study structures of ubiquitin with Hazara and CCHF and ISG15 with Ganjam. As we study vOTUs, we can gauge between different viral proteases and their potential role in disrupting signaling pathways of the host cells that are dependent on ubiquitin or ISG15, such as the interferon type I response(IFN-I). These protein complexes must be purified and crystallized to create these structures which we will study. We anticipate creating Hazara with ubiquitin and Ganjam with sheep ISG15 structures to compare with existing structures of CCHF. Thus far we have preliminary data with some protein crystals that have some x-ray diffraction. These structures allow for a greater understanding of vOTUs as a class of proteases, so that we can address CCHFV in humans. By studying Hazara, we can create a model like CCHF to be able to discuss treatment and future therapeutic solutions.

Using Chlamydomonas as a Model for Oral-Facial-Digital Syndrome

Gehrig Broxton, CURO Research Assistant
Dr. Karl F Lechtreck, Cellular Biology, Franklin College of Arts and Sciences

Mutations in the *OFD1* gene are the cause of oral-facial-digital syndrome, a disease that results in severe malformations of the mouth, face, hands, and skeletal system. However, the cellular basis of this disease is not fully understood. The *OFD1* gene encodes for a protein localized to the base of the primary cilia, thin cell extensions with sensory and signaling functions also referred to as flagella. Here, we describe an *ofd1* mutant in *Chlamydomonas reinhardtii,* a widely used unicellular model for ciliary disease. Using polymerase chain reaction and gel electrophoresis, we confirmed an insertion of the paromomycin resistance cassette into the *OFD1* gene; we refer to this mutant strain as *ofd1-1*. The mutant strain was backcrossed to a wild-type strain to outcross potential second site mutations. We are now analyzing the phenotype of *ofd1-1*. Mutant cells possess flagella and are motile indicating that *OFD1* is not essential for the assembly of cilia in *Chlamydomonas*. I will now determine whether *ofd1-1* has a subtler phenotype such as changes in flagellar length or swimming behavior. *Chlamydomonas* facilitates the isolation of flagella allowing for a comparison of the biochemical composition of wild-type and *ofd1-1* flagella. Based on the severe phenotype of *Ofd1* mutations in mammals, we hypothesize that the mutation will have a noticeable effect on flagellar composition and function. Once the phenotype is characterized, the mutant strains will be rescued

by insertion of the wild-type gene, which should restore wild-type *OFD1* function.

Georgia Monetary Sanctions

Madison Lorene Brumbaugh, CURO Research Assistant
Jacob Scott Kepes
Dr. Sarah Shannon, Sociology, Franklin College of Arts and Sciences

This research project analyzes the application of fines, fees, and probation for misdemeanor criminal offenses throughout the state of Georgia. We collected three types of data to explore these processes. First, we collected quantitative data regarding fines and fees levied by each county from the years 2005 - 2015, including the total amount of money collected by each county per year, as well as the total amount of money collected for specific funds, per county, per year. Second, we systematically observed ~30 hours of court sessions in a large municipal court order to assess the application of these misdemeanor sanctions in a real courtroom. Third, we reviewed local governments' use of private probation companies to supervise people for misdemeanor offenses. We will present the current status of our research project and our exploratory findings to-date. Our analysis thus far shows that counties and municipalities in Georgia are collecting significant amounts of money, often at the expense of their own citizens, who are unable to pay.

Assessing the Removal of Lead from Water Using Commercially Available Filters

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

Water sanitation, especially contamination with heavy metals, has attracted greater attention in recent years. The neurotoxic effects of chronic low-level lead exposure make its removal a concern for home water treatment systems. Commercially available faucet-mounted water filters are officially tested under controlled conditions that may not reflect in-home operation. In this study, commercially available faucet-mounted water filters were evaluated to determine whether lead-removal performance would be impacted by abnormally high concentrations of lead or varying degrees of water hardness. The goal of this study was to evaluate how varying conditions affect lead adsorptivity onto filter cartridges and the ability to remove lead from water samples. Two variables, lead concentration and water hardness, were evaluated for their impact on filter performance. Inductively Coupled Plasma Mass Spectrometry (ICP-MS) was used to determine lead concentration in the filtered test samples and unfiltered control samples. Filters were tested with 150 ppb and 300 ppb lead solutions. Preliminary data suggests that filters are capable of removing lead at concentrations two-fold greater than certification testing.

Nuclear or Solar, Why Does It Have to Be a Choice?

Cole Burgess, CURO Research Assistant
Dr. David Gattie, Environmental, Civil, Agricultural, and Mechanical Engineering, College of Engineering

When it comes to carbon free energy, we have limited options for generation sources. In the US, nuclear, wind, and solar are the three predominant carbon-free energy generation sources. This research investigates the advantages of nuclear and solar energy in Georgia in an effort to recommend which if any energy source should be further developed to meet future demands. In Georgia, solar is an attractive source for energy generation because out of the fifty states, the state receives the 10th greatest concentration of incident solar energy. This concentration of energy combined with falling costs of solar panels has helped foster one of the top growing solar markets in the US. The growth of the solar industry is complimented with a growth in the nuclear energy sector of Georgia as well. Plant Vogtle is currently constructing the first new nuclear reactors in the US in over 30 years. This addition of 2,234 MW of electricity will help establish the base load power required to have a functioning electrical grid. Though both sources of energy are carbon-free, there are vast differences in their respective advantages and disadvantages. In an effort to transcend public perception for both energy sources, a comparative economic analysis referenced to identical generation (MWh) has been conducted for each. While both energy sources

have their limitations, Georgia should maintain its diverse energy portfolio and continue with future development of both carbon free energy resources.

Mechanical Ventilator Parameter Prediction

Nicolas Rousseau Burgess
Dr. Ramana Pidaparti, Environmental, Civil, Agricultural, and Mechanical Engineering, College of Engineering

Parameter estimations for mechanical ventilator settings are essential in giving optimal treatment for patients suffering from compromised lungs. Establishing a relationship between these parameters and the patient outcomes while using a decision-making model can support clinicians by improving accuracy and minimizing error during treatment. We developed an artificial neural network model in conjunction with inverse mapping for this parameter estimation. We applied a novel graded particle swarm optimization for inverse mapping, where the designed variant of particle swarm optimization involves gradation in the swarm and a hierarchical strategy. This model was tested on data collected from the ongoing study at the Small Animal Teaching Hospital (SATH) at the University of Georgia (UGA) for canines and felines and we were successful in achieving high percentages of accuracies in parameter prediction. Further, we plan to develop an application platform, allowing multiple users to connect to a server running this learning model. The final application aims to assist doctors in setting mechanical ventilator parameters; we will first deploy the application for the doctors at the SATH at UGA.

Effects of Tracking Scale on User Performance in Virtual Reality Games

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

We explore how scaling a user's tracking data may impact performance in an immersive virtual reality game, which may have implications for fairness and accessibility for many applications. In our study, which used an HTC Vive room-scale VR system, users play as a factory worker who must remove deformed bread from a production line. Users were scaled to a reference height, such that taller than average users were rendered shorter and had shorter reach and shorter than average users were rendered taller and had longer reach than normal. Users also performed with unscaled tracking data. Our analysis indicates that there was no systematic advantage of being taller or shorter than normal, and scaling users may have had a detrimental effect. Moreover, scale changes were noticed by many users who had conflicting preferences for various application-specific reasons, indicating that application strategy can be affected by scale. Results suggest that while virtual reality tracking data may be scaled to compensate for user differences in physical height or reach, care must be taken to ensure performance will benefit.

Characterizing the Role of Inhibitory Neurons in Regulating Seizure Activity in Embryonic Zebrafish

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

More than 50 million people worldwide suffer from epilepsy. Unfortunately, cellular and network level mechanisms behind this condition remain poorly understood, and skull thickness and large brain size inhibit observing cellular and network activity simultaneously in mammals. As an adjunct model system for studying seizure generation and propagation, the small, transparent embryonic zebrafish allows for observation of entire neural networks with cellular resolution. Seizure-like activity can be induced in zebrafish through manipulating the signaling of the inhibitory neurotransmitter GABA. We have genetically engineered a line of zebrafish in which we can visualize both whole brain activity (GCaMP5G) and the location of GABAnergic, inhibitory neurons (gad1b:RFP). By using light sheet microscopy for high-resolution calcium imaging in vivo, we can image seizure activity in real time and eliminate noise from tissue in other planes of focus. Using RFP tagging of GABA expression, we compare the propagation of seizure activity to the location of inhibitory neurons. Reducing GABA levels in inhibitory neurons by inducing CRISPR-Cas9 mutations in gad1b, we can alter the efficacy of the subset of GABAnergic, gad1-

expressing neurons. By examining the effect of this mutation on the propagation of seizure activity, this study aims to characterize the role of inhibitory neurons in regulating seizure activity in the embryonic zebrafish.

The Relationship between Nutrition

leftover? Why are these women not allowed to be and do what they want to do? I knew there must be more to this, and I was right. Shengnu is a new term, originating in the last decade. However, my research project argues that the concept is influenced by Confucianism, the oldest reigning philosophy, ideology, and belief system in China. Confucian ideals are in many ways the underlying thread of many aspects of present-day Chinese culture: politics, art, literature, humor, and film. The rhetoric regarding leftover women structures a society that puts women at fault. Their happiness is put on the back burner in the name of ancient Confucian "harmony" and the "stability" of the People's Republic of China.

Role of Bacterial Polysaccharides in Bacteriophage Invasion

Alexandra Carlton, CURO Research Assistant
Dr. Maor Bar-Peled, Biochemistry and Molecular Biology, Franklin College of Arts and Sciences

Bacteriophages are viruses that specifically infect bacteria, relying on the host bacterial cell to reproduce and propagate. In order to use the replication mechanisms within the bacteria, the phage must first enter the cell by means of recognition factors. Glycans, sugars that can be linked to a variety of different molecules, play a significant role in cell-to-cell communication and recognition of outside material. The components of this specific phage-bacteria recognition remain unknown. The aim of this study is to identify the role of bacterial polysaccharides in phage invasion or avoidance. Multiple glycolytically-mutated strains of *Bacillus cereus* will be tested for susceptibility to bacteriophage infection in vitro in order to monitor differences in biofilm formation, flagella glycosylation, and other key processes. We expect to find that some mutants will alter successful bacteriophage invasion. Previous studies of glycoproteins have aided our understanding of the mechanism of infection by particular phage strains. We hope that by identifying the polysaccharides affected by the mutant strains, we will further our understanding of specific bacteriophage recognition.

Child Disability and Maltreatment: Caregiver Support as a Protective Factor

Savannah Carroll, CURO Research Assistant
Dr. Assaf Oshri, Child and Family Development, College of Family and Consumer Sciences

Studies show that children with disabilities are at greater risk for maltreatment by their caregivers compared to children without disabilities. Therefore, it is essential to uncover risk and protective factors for maltreatment among children with disabilities in at-risk families. Evidence indicates that the level of social support caregivers receive can buffer against risk for child maltreatment. Despite the importance of caregiver social support, no research has empirically examined it as a buffer between child disability and maltreatment, measured by Child Protective Services (CPS) reports. Presently, we hypothesize that disability will be a predictor of four types of maltreatment (physical abuse, sexual abuse, emotional abuse, and neglect) and that social support will serve as a protective factor. To examine this hypothesis, we will conduct a secondary data analysis using a longitudinal sample from the LONGSCAN dataset (N = 1,354). A multiple regression will be used to examine how disability at age 4 influences the number of CPS reports between ages 4 to 8. Perceived social support will be examined as a protective factor. Preliminary results demonstrate that when there is low social support, child disability predicts higher rates of physical abuse, sexual abuse, and neglect compared to children without disabilities. Thus, higher levels of social support were found to buffer the link between disability and maltreatment. This research will inform policymakers, the medical community, and educators on the increased risk of children with disabilities to be victims of maltreatment and the importance of identification and prevention of child abuse and neglect.

The Insect Version of Oxytocin Influences Female Tolerance of Males in a Subsocial Beetle

Annika Carter, CURO Research Assistant
Dr. Allen J Moore, Genetics, Franklin College of Arts and Sciences

The ability to express the correct behavior is essential for the survival of most organisms. One such important behavior is sociality — the motivation to be around or tolerance of conspecifics. The insect ortholog of mammalian

oxytocin/vasopressin, inotocin, is known to be present in the subsocial beetle *Nicrophorus vespilloides*. During mating, female *N. vespilloides* beetles may be more or less accepting towards a male's mating attempts. Given the association between oxytocin/vasopressin and changes in sociality during mating in mammals, we hypothesized that the *inotocin* (*it*) and *inotocin receptor* (*itr*) genes would be differentially expressed across the female beetle's mating cycle and would be differentially expressed between females that are highly accepting or rejecting of a male during mating trials. To test this in *N. vespilloides*, we compared relative gene expression across stages of a breeding cycle: virgin females, mated females, mated females preparing a resource required for reproduction, directly and indirectly caring females and post-caring females. We also compared relative gene expression from virgin females who readily accepted males in mating trials to females who rejected males in mating trials from two different groups — one collected immediately after mating and one collected following 24 hours in an enclosed container. Expression varied for both *it* and *itr* across the five breeding stages. The expression of *it* and *itr* was significantly lower in post caring females and the expression of *itr* was significantly lower in resource preparation females. Expression of *it* and *itr* varied between the accepting and rejecting females and between the immediate and 24 hour time period. Both *it* and *itr* expression was significantly higher in accepting females. *it* expression was significantly reduced at the 24 hour time period. *itr* expression was significantly greater at the 24 hour time period. We suggest that *it* and *itr* are associated with the changing general sociality of *N. vespilloides* that occurs during mating, but not necessarily with parental care specifically.

Motivations and Barriers of Volunteering among College Freshmen

Alexandra Case, CURO Research Assistant
Dr. Jessica Holt, Agricultural Leadership, Education, and Communication, College of Agricultural and Environmental Sciences

The purpose of this study was to understand motivations and barriers behind volunteering practices of college freshmen at the University of Georgia (UGA). The demographics of gender, race, religion, income, and political ideology were included in this study to determine if those were related to students' volunteering behaviors. This study is timely due to a recent rise in college student volunteering and the implementation of the new experiential learning requirement for all UGA students. UGA freshmen were surveyed using an online survey (n = 348) disseminated through email. The survey was divided into three parts: motivations, barriers, and demographics. Preliminary analysis of the results has revealed that the top motivators for all demographics were related to personal beliefs and extra time, while the top barriers for all demographics pertained to a lack of time and a need to focus on oneself. It was also discovered that beliefs about volunteering were significantly more positive across all respondents and those who choose to volunteer felt supported and fulfilled. This study will give the Center for Leadership and Service a more comprehensive understanding of why or why not freshmen choose to engage in volunteering behaviors, as well as provide recommendations to engage those students not currently engaging in volunteering behaviors.

Latino Resilience among Undocumented Families

Genesis Castro, CURO Research Assistant
Dr. J. Maria Bermudez, Child and Family Development, College of Family and Consumer Sciences

The aim of this study is to examine effects of detention and deportation practices on mixed-status Latino families in the South. There is an urgent need and a significant lack of empirical data to help scholars and practitioners better understand the extent to which children and families are affected by current immigration policies and practices. We use a culturally responsive, community-based, participatory action mixed-method design. We assert that the untold disruption and immigration trauma among these individuals, families, and communities will help us formulate a framework for understanding Latino family risk and resilience and inform current immigration policies. Our goal is to be able to share what factors contribute to positive youth development among undocumented or Deferred Action for Childhood Arrivals students with the public, with the hope that schools, families, and

community members apply our findings to their interactions with students.

"Immigrants, We Get the Job Done!": Depictions of the U.S. Immigrant Experience on Broadway

Izzy Ceron, CURO Honors Scholar, CURO Research Assistant, Foundation Fellow
Dr. Edward A Delgado-Romero, Counseling and Human Development Services, College of Education

A recent crop of Broadway musicals, plays, and revivals delve heavily into the nuances of the immigrant experience in the United States. Given the current anti-immigrant and xenophobic political climate, what do popular Broadway productions tell us about the current perception of what it means to be an American? Broadway has played a crucial role in the American psyche since its inception, both reflecting and shaping perceptions of important social issues. From the revival of *West Side Story* to the runaway success of *Hamilton: An American Musical*, the immigrant experience has been at the forefront of theatrical content in the last decade. This study examines eight popular theatrical works performed on Broadway throughout the past decade and analyzes the depictions of various immigrant communities and experiences in the US. This study is still in the formative stage and summarizes preliminary conclusions from an extensive literature review. The study will be a qualitative analysis of each work's script, focusing on themes of immigration and the US immigrant experience. Ultimately, this study aims to gain insight about the broader implications of prototypes and stereotypes depicted on stage and the way these depictions may both reflect and shape public perception of immigrants in the US.

The Role of Non-Cas Proteins in the Adaptation Stage of CRISPR-Cas in *Pyrococcus furiosus*

Chip Chambers, CURO Honors Scholar, CURO Research Assistant, Foundation Fellow
Dr. Michael Terns, Biochemistry and Molecular Biology, Franklin College of Arts and Sciences

CRISPR is a powerful biological tool that has taken the scientific community by storm due to its powerful genetic engineering capabilities. Many of its basic biochemical mechanisms, however, have yet to be uncovered. CRISPR contains three stages: the adaptation stage, in which a prokaryote acquires DNA from an invader and integrates it into a CRISPR locus, the expression stage, where the CRISPR array is transcribed and processed to form crRNAs, and the interference stage, during which an effector complex uses the crRNA guides to target and silence invaders. My work investigates the potential roles of non CRISPR-associated (Cas) proteins in the initial adaptation stage of the CRISPR-Cas system. These include Argonaute (a DNA-guided nuclease), HerA (a helicase of Archaea), NurA (a nuclease of Archaea), and Hef (which repairs stalled replication forks). We are interested in the Argonaute protein because it serves as an innate defense system and plays a role in RNA/DNA-silencing. HerA, NurA, and Hef on the other hand, are all involved in DNA repair, but might also play a role in adaptation. We are specifically looking at the roles of these proteins in vivo within the host organism *Pyrococcus furiosus*, a hyperthermophilic archaeon used in various industrial processes. Utilizing knockout strains and polyhistidine tagged proteins, we performed assays to determine whether these proteins influence the frequency of adaptation and/or introduce a bias for the location or size of spacers. Ultimately, these findings may contribute to the body of general knowledge of this revolutionary technology.

Transcriptomic Investigation of Disease Tolerance in the Ochre Sea Star *Pisaster ochraceus*

Katelyn Chandler
Dr. John Wares, Genetics, Franklin College of Arts and Sciences

Sea Star Wasting Disease (SSWD) causes the tissues of echinoderms to decay rapidly and is responsible for a current mass mortality event among *Pisaster ochraceus*. Sick *P. ochraceus* were found to be approximately 20% less likely to be heterozygous for an insertion mutation at the elongation factor 1-alpha (EF1a) locus. This insertion at EF1a is known to be lethal when two copies are present; it appears to be maintained by heterozygote advantage in fitness. A statistically significant difference in gene expression between

the *P. ochraceus* genotypes might explain the possible advantage of heterozygotes in relation to SSWD. RNA was isolated from tissue samples collected from *P. ochraceus* individuals found in Friday Harbor, Washington. RNA-seq was then used to measure the differentiation in gene expression between individuals found to be the homozygous wild-type and heterozygous for the insertion at EF1a. Observations of differentiation in gene expression between the two genotypes found to be statistically significant were studied to interpret possible biological significance. Of particular interest were observations with high fold differences, expression present in one genotype but not the other, and doubled expression in the homozygotes versus the heterozygotes. The difference in propensity to be affected by SSWD based on genotype suggests that somewhere among these observations of interest a phenotypic difference is caused between the two genotypes, rendering SSWD inefficient or ineffective at infecting heterozygotes compared to homozygotes at EF1a. The mechanism of this phenotypic difference could be invaluable in understanding how SSWD works.

Compiling Studies on Pedagogical Content Knowledge within Topics of Evolution

Raheela Charania
Dr. Tessa Andrews, Genetics, Franklin College of Arts and Sciences

Understanding a topic in class is critical to learning the topic. The learning opportunities provided by the instructor are strongly associated with whether students learn (Smith et al. 2016). Pedagogical content knowledge (PCK) is one type of knowledge that helps instructors teach to facilitate student learning. PCK includes knowledge of misconceptions commonly held by students and addresses the misconceptions that can be critical to promote learning. In this project, we are identifying PCK currently available in the literature within the topic of evolution. To find relevant abstracts, we use a combination of search terms that allow us to locate articles that describe evolution PCK in various education levels and topic areas. This research will allow us to identify trends in the field of evolution education research and determine what has and has not been investigated previously. This will allow us to make recommendations for the progression of the field based on where there is a surplus and where there is a need. We will also be able to summarize PCK in evolution education for practical use in an undergraduate classroom.

The Personal Touch of Discovering Money Solutions

Marcus Chatman, CURO Research Assistant
Dr. Matt J Goren, Housing and Consumer Economics, College of Family and Consumer Sciences

The financial education curriculum, presented as PowerPoint presentations and hands on activities, of the Discovery Money Solution program is part of the Healthy Marriages and Relationship Education Program, and is purposed to aid families in bettering their economic stability. The 6-hour curriculum, which is separated into three 2-hour classes, is facilitated by two coaches. It addresses attitudes toward money and presents specific tools and solutions for participants. By collecting feedback from participants after each class, researchers will have a greater understanding of the subjective benefit of the various aspects of the class and curriculum. The assumption may be that the well-developed presentation and handout materials will be the most valuable aspect of the class for participants. Though the content will evolve based upon feedback over time, the presence of professionals may be of greater significance. If the interaction of coaches and participants supplies great value to the learning experience, as teachers do with students, then the opportunity to consult and collaborate with financial professionals creates the greatest impact upon the learning experience. The curriculum will always be predominantly consistent, but the presence of interactions between coaches and participants unique to each class will significantly influence the participant satisfaction with the overall course and resulting impact upon financial well-being. As displayed by the publicized dissatisfaction of automated customer service in telecommunications and web services, human interaction in cognitive learning and problem solving is critical.

Effect of Ground Granulated Blast-Furnace Slag (GGBFS) on Heat of Hydration Concrete

Jonathan Chelena, CURO Research Assistant
Dr. Mi Chorzepa, Environmental, Civil, Agricultural, and Mechanical Engineering, College of Engineering

Cement hydration produces a rise in internal temperature, and the outer concrete surface cools faster than the core of the section. By thermal expansion/contraction, the temperature differential induces thermal stresses at the surface. Once the maximum temperature in the interior exceeded the accepted threshold value, DEF (delayed ettringite formation) can occur in mass concrete elements. Therefore, DEF can be prevented by limiting the internal concrete temperature during its very early life. The maximum temperature suggested by prior research efforts to prevent DEF in concrete elements is 160°F. This reduced temperature can be achieved by direct specification of temperature allowable, by limiting the cement content, or by specifying the use of low heat supplementary cement materials. This study includes the design, batching, and testing of concrete mixtures with cement replacements of slag while keeping the total amount of cementitious material constant. Mechanical properties and heat of hydration are being measured for each mix design. An isothermal calorimeter is being used to measure the heat generated from the early hydration of cementitious materials. It is concluded that relatively low heat of hydration is observed in the slag mixture compared with the fly ash mixture.

Autonomy and Health Literacy Relationships as a Link to Patient and Provider Satisfaction

Eli Chlan, CURO Research Assistant
Dr. Lisa Renzi Hammond, Psychology, Franklin College of Arts and Sciences

Health literacy in the United States varies widely by gender, age, ethnicity, income level, and education status. It has been speculated that health literacy, in turn, limits patient autonomy. Despite this fact, patient autonomy has not been characterized in the majority of populations that frequently consume healthcare. The purpose of this proposal is to characterize autonomy, health literacy, and their relationship within two different populations. For the first part of this study, UGA undergraduates will be recruited to complete a survey assessing feelings of autonomy in recent health care visits. It is hypothesized that young, high literacy patients are also likely to be high in perceived autonomy. The second part of the study will involve undergraduates coming to the UGA Health Center (UHC) for medical visits and being randomly asked to fill out either a pre-visit survey on health literacy, or a pre-visit survey on autonomy. Following their visit, all participants will receive a follow up survey, and HCPs at the UHC will also receive a survey about their patient encounter but are masked to the intervention. It is hypothesized that patients primed with the autonomy survey will ask more questions about their diagnosis, will expect their HCP to be a partner in the decision making process, and will have higher adherence to prescribed treatments. The third part of the study will replicate this test scenario in a local free clinic that serves a largely impoverished population with low health literacy and low health access.

Development of Cellulose NanoFibrils (CNFs) Composites for Packaging Applications

Crystal Chu, CURO Research Assistant
Dr. Sudhagar Mani, Chemical, Materials, and Biomedical Engineering, College of Engineering

As consumers become increasingly eco-conscious, research into biomass derived polymers from replacing traditional petroleum plastics rises in importance and attention. These studies were conducted to determine water and chemical resistance of nanocellulose and alginate composite films for potential use in packaging. Five different film compositions were created with glycerol as the plasticizer for this research: a control of alginate, a control of nanocellulose, and three different ratios of alginate to nanocellulose composites. Three replicates per composition were used to support the accuracy of our results through a study of the standard deviations calculated. Water uptake testing was conducted by laying known weights of dried film samples in a desiccator with deionized water and measuring the water mass gained by the films over time. Water and chemical resistance studies were conducted by submerging known weights of dry film samples in either deionized water or a known solution, measuring the change in sample mass over time.

The percentage of water uptake by the films indicate that the nanocellulose control is highly hydrophilic while the composite films are more resistant to water penetration, both while submerged in water and while exposed to 100% humidity. Similar results as above, from water uptake and water resistance testing, are expected from the chemical resistance studies. The mechanical strength and biodegradability of developed films were also measured and compared to standards of current packaging products available as a benchmark for our development of cellulose nanofibrils composite films.

Examination of *Mycobacterium tuberculosis* Protein Expression in Infected Lung Tissue

Nicholas Ciappa, CURO Research Assistant
Dr. Russell Karls, Infectious Diseases, College of Veterinary Medicine

Tuberculosis (TB), caused by *Mycobacterium tuberculosis* (*Mtb*) is the leading cause of death by a single infectious agent in humans. In host tissues, *Mtb* can be identified through immunohistochemistry (IHC), a method that utilizes antibodies to detect specific proteins or other biomolecules. The focus of the current project is to determine where *Mtb* bacteria are located within the lungs of infected guinea pigs, a model system for human disease, and which *Mtb* proteins are expressed in this environment. Immunohistochemistry staining revealed Rv0097c-specific staining in the periphery of lung granulomas, but not within the necrotic granuloma centers. A granuloma consists of immune cells that surround an infectious center to contain the infection. The presence of Rv0097c in granulomas suggests that this protein is important for *Mtb* survival in this hostile environment. We are in the process of examining whether Rv0097c-specific staining is similar to immunohistochemical staining of *Mtb* secreted or bacterial surface-localized proteins. Such studies will aid in evaluating whether these proteins have potential as vaccine targets.

CdaI-1 Kinase of the Hippo Pathway in *Tetrahymena thermophila*

Diamond Clarke, CURO Research Assistant
Dr. Jacek Gaertig, Cellular Biology, Franklin College of Arts and Sciences

The ciliate, *Tetrahymena thermophila*, is a eukaryote that has a complex cortical pattern. These ciliates contain organelles such as an oral apparatus, contractile vacuole pores, and ciliary rows that are present at predictable positions on the surface of the cell. *Tetrahymena thermophila* undergoes equatorial cell division. CdaI is a Hippo/Mst kinase of the conserved Hippo pathway. In animals, this pathway controls organ size by regulating cell divisions and polarity. In the temperature-sensitive *cdaI-1* mutant of *Tetrahymena*, there is an improper anterior shift of the division plane that results in unequal cell division. This research focuses on the exact molecular role of CdaI in the equatorial cell division. A GFP-encoding sequence was added to the 3' end of the *CDAI* gene. We used immunofluorescence with anti-GFP antibodies to view the localization of CdaI. CdaI was not detected in interphase cells. Initially, CdaI-GFP localized to the anterior half of the dividing cell and later marked the newly-forming posterior end of the anterior daughter subcell. After analyzing the *cdaI-1* mutants, we also found that CdaI is not required for the formation of the new cortical organelles at the posterior end. CdaI's sole function appears to be the maintenance of the equatorial division plane. The Hippo pathway is highly conserved and present in all eukaryotic cells including mammals. Findings from this research could be applied to understanding of how other eukaryotic cells control their division plane.

Effect of Prescribed Burning of Riparian Zones on Stream Hyphomycete Fungi Productivity

Sarah E Clement, CURO Summer Fellow
Dr. Catherine Pringle, Ecology, Odum School of Ecology

Fires are an important structuring element of forest ecosystems – those naturally occurring and those used for forest management, and can vary in their severity and impact. Nutrient release in the form of nitrogen is one of the known short-term effects of forest fires in aquatic ecosystems, and this can potentially affect stream fungi. While nutrient enrichment has been shown to increase

aquatic fungal abundance, species richness and reproductive output (in the form of conidia production), there are very few studies on the effects of fire on stream fungi. This study aims to test if nutrient release from fires causes a similar effect on stream fungi as artificial nutrient enrichment using two different leaf types: one recalcitrant (Rhododendron) and one highly labile (Red Mable). This study is part of a USDA Forest Service Project that involved prescribed burning of Rhododendron-dominated riparian vegetation along a 300m stream reach in the Nantahala National Forest, North Carolina. To examine fungal response to the burn, leaves were incubated in the stream reach both pre- and post- burn. Fungal biomass was analyzed over time both pre- and post-burn by extracting ergosterol from incubated leaves. We predict that: increased nutrients post-burn will cause an increase in fungal biomass on both leaf types; leaf decomposition rates will increase as fungal biomass increases; and increases in fungal biomass will be greater for Red Maple than for Rhododendron.

Predicting Oyster Larval Recruitment and Growth Using Cheaply Obtained, Remotely Sensed Data

John Coffin, CURO Summer Fellow
Dr. James E Byers, Ecology, Odum School of Ecology

The Eastern Oyster, *Crassostrea virginica*, is an important ecosystem engineer in estuarine systems that physically alters and provides habitat for other species and stabilizes banks. 88% of reefs worldwide have been reduced by overharvesting and habitat degradation. Resource managers need better data to improve management practices. Larval recruitment and growth are key parameters governing the population dynamics of oysters, and are thought to be influenced by current velocity and wave energy. This study consisted of 60 sites surrounding St. Catherines Island, Georgia. Oyster reef sites were divided into three habitats—creeks, rivers, and sounds—based on different current and wave regimes, and sites were randomly selected from each habitat. Non-reef sites were also selected, as a control. Recruitment was estimated monthly by counting settled larvae on collection sticks, and average biomass and shell length over the four month study period provided growth information. Analysis by habitat revealed biomass did not vary between habitats, though average shell diameter was higher in sites containing a pre-existing reef than in bare sites, perhaps due to size-related selective pressures. Over the entire study, recruitment was lower in creeks than in rivers and sounds, suggesting water body width may impact recruitment, as larvae must travel greater distances to reach creeks, diminishing larval supply. Future work will utilize remote sensing to analyze how current velocity and wave energy drive larval recruitment and subsequent growth. A positive relationship is expected between current velocity and recruitment, while a negative relationship is expected between wave energy and growth.

Risk Factors for Social Isolation in Elder Care Recipients

Haley Cohen, CURO Research Assistant
Dr. Steve Miller, Psychology, Franklin College of Arts and Sciences

Physical and mental health and cognition are important variables for predicting older adults' social isolation. However, these relationships have not been addressed within the context of caregiver and care-recipient relationships. As relationships with caregivers may be important for older adults' well-being, this study examined how caregiver variables of physical health, mental health, and cognition relate to care-recipient social isolation in a sample of 450 caregiver/care-recipient dyads. We also examined the relation of care-recipient physical health, cognition, and functional independence (FI) to care-recipient social isolation. All care-recipients were cognitively or physically impaired older adults aged 60+ years. Physical health, mental health, and FI were assessed via scales adapted from Schultz et al., 1997, Katz et al., 1996, and Katz et al., 1963 and Lawton & Brody, 1969, respectively. Cognition was measured using the Repeatable Battery for the Assessment of Neuropsychological Status (RBANS). Hierarchical regression models were used to assess the unique variance contributed by each caregiver and care-recipient variable-of-interest on care-recipient social isolation, controlling for care-recipient dementia diagnosis and all other variables-of-interest. Contrary to expectations, none of the caregiver variables-of-interest significantly predicted social isolation above and beyond controlled variables. However,

as expected, care-recipient physical health (ΔR2 =.022, p=.033), FI (ΔR2 =.038, p=.001, and RBANS score (ΔR2 =.013, p=.045) each uniquely and significantly predicted social isolation, with declines in FI being the strongest predictor. Our findings have implications for patient care and highlight the importance of social interactions for elderly care-recipients, even in the context of declining physical and cognitive health.

Determining Water Usage of Lettuce

u9(n8(n)-2 t1( )4(h2114.6(e)4w)52o.9(r)-2(mpl)18(nd)a7(e)42(o)3.6(e.11(s)-3.7-7.6(e)4k7(v72.4(i)1ng

One of the most foundational ideas in the legal code of America comes in the form of the First Amendment of the United States Constitution. This amendment has served as the basis for many judicial decisions that have shaped the legal development of the US. In terms of the media, one of the most significant of those developments is the establishment of shield laws, which protect reporters from being forced to reveal the identity of confidential sources of information. Shield laws exist only at the level of state statutes, however, so a high degree of variance exists in how these protections are afforded to journalists. One area where this variance can be seen most plainly is in the protection that is afforded to those seen as professionals as opposed to amateurs. This is especially troubling for journalists at the collegiate level. This research examines this question surrounding this extension of protection, or lack thereof, by analyzing the variations in state shield statutes. This research also analyzes the recent events at the University of Kentucky, where the university has sued its own student newspaper in an attempt to force the paper to release documents that contain information that reporters are endeavoring to keep confidential.

Mushroom Biochar: The Properties and Potential Applications of Novel Biochars Derived from Mushroom Fruiting Bodies

Jared Conner, CURO Research Assistant
Dr. Valentine A Nzengung, Geology, Franklin College of Arts and Sciences

This research investigates the properties and applications of biochars derived from mushroom fruiting body feedstocks. We observed the unique hyphal structure of mushrooms, and hypothesized that these would produce a biochar with a unique structure that significantly enhances biochar applications that depend on surface area and morphology. The four species of mushrooms examined in this research were pyrolyzed at two temperatures. The biochar physical and chemical properties were analyzed, and then the biochar was evaluated for application potential in removal of multiple contaminants from agricultural and industrial wastewaters. This involved physical and chemical testing, as well as SEM imaging. Here, preliminary results are presented, along with pyrolysis data, pH data, and sorption test results for these biochars. Ongoing efforts to enhance the remediation capabilities of these biochars via iron impregnation are discussed. Sorption experiments for remediation of wastewaters showed that mushroom biochars can remove contaminants that conventional biochars cannot, and can remove ammonia more effectively than other biochars. pH testing showed that the three fast-growing, soft-tissue mushroom species had biochars with a high pH, while the slow growing, woody bracket species had a biochar with a lower pH. The results of this research indicate that mushroom biochars could be used as effective remediators of wastewaters, and therefore could decrease the impact of agricultural and industrial wastewaters on soil and water quality. SEM images revealed an open-celled morphology, which could indicate that these biochars have applications in industry that other biochars are ineffective at due to their porous, closed structures.

Effect of Mythic Primers on Psychological Well-Being

James Conners
Dr. Leonard L Martin, Psychology, Franklin College of Arts and Sciences

According to scholar Joseph Campbell, mythologies can provide for the "rapture of being alive," among other benefits (*The Hero with a Thousand Faces*, 1949). The present study examines whether certain mythic elements can serve to improve psychological well-being. We exposed n participants to "hero's journey" motifs found in popular films; specifically, in *Star Wars: A New Hope* (1977) and *Finding Nemo* (2003). A control group of n participants was exposed to an assortment of comparatively neutral tropes. For one week, both groups were instructed to observe their lives for occurrences of these respective motifs, and received daily reminders in the form of a mobile questionnaire (P.I.E.L. survey app, IOS) requesting that participants denote occurrences as they arose. At the end of the trial period, participants were self-assessed in regard to their perceived meaning in life, gratitude, awe, and capability for entering the state known as "flow" (Csikszentmihalyi 2008). We predict that exposure to "hero's journey" motifs will be associated with an increase in awe, gratitude, and flow.

Exposure to Synthetic Estrogens Disrupts Meiotic Division in Germ Cells

Madison Cook, CURO Research Assistant
Dr. Maria M Viveiros, Physiology and Pharmacology, College of Veterinary Medicine

Synthetic estrogens, such as Bisphenol-A (BPA) that are prevalent in plastics are recognized as endocrine disruptors that can adversely affect reproductive function, including meiotic division in germ cells. Errors in meiosis can lead to aneuploidy (an abnormal number of chromosomes), which is a leading cause of birth defects such as Down's syndrome. Previous studies showed that relevant concentrations of BPA promote meiotic errors. Bisphenol-F (BPF) is a commonly used substitute for BPA. While the effects of BPF on meiosis are less clear, it is structurally similar to BPA. This experiment tested the effects of varying levels of estrogens, both natural and synthetic, on meiotic division of female mouse germ cells (oocytes). Increasing concentrations of Estradiol-17β (0, 5, 15, 30μM) were compared to a high dose (50μM) of BPA and BPF during a 17 hour culture. The oocytes were fixed for immunofluorescence analysis to assess chromosome and meiotic spindle configurations. Spindle microtubules and MTOCs (Microtubule Organizing Centers) were labeled with anti-acetylated tubulin and pericentrin, respectively, and the chromosomes with DAPI. Oocytes were analyzed using an upright fluorescent microscope. Oocytes exposed to BPA and BPF showed lower maturation rates and increased chromosome disruptions compared to controls. Chromosomal errors were highest in the BPA group, and correlated with abnormal spindle organization. Oocytes exposed to high levels of Estradiol also showed chromosomal abnormalities. These data suggest that high estrogen levels including those from estrogen mimicking compounds, such as BPA and BPF, can disrupt oocyte quality.

Comparing Metallicity Measurements from Optical Spectra of Solar-Type Stars

Paige Copenhaver, CURO Research Assistant
Dr. Inseok Song, Physics and Astronomy, Franklin College of Arts and Sciences

Metallicity (where [Fe/H] is used as a proxy) is a stellar parameter that contributes to physical characteristics of a star, and it can reveal valuable information about the star. However, historically this quantity is difficult to measure, and there are several methods to derive it that show significant discrepancies in their results. We aim to quantify the discrepancies in the metallicity measurements between iSpec values, a Python-powered automated analysis tool, and known literature values. We want to determine the reliability of iSpec in obtaining metallicity of solar-type stars. To gather the sample of stars, we selected several G-type stars for which we have known [Fe/H], temperature, and surface gravity values. We used both the iSpec synthetic spectrum method and the equivalent width method in order to determine [Fe/H] from the absorption spectra. We then compared the results with the literature values. We show that iSpec parameters agree well with previously determined values. The known values of metallicity are generally well-accepted, but it is unclear at this time which method of obtaining the parameters is the most reliable. This study finds that the iSpec tool is a potentially reliable method for determining metallicity of solar-type stars. Having more reliable metallicity measurements can tell us more about the environment in which planets form. Only stars with high metallicities are good candidates for having planetary systems, since the cores of planets are formed from metals such as iron.

Hurricane Risk Assessment of Georgia Coastal Bridges

Paul Coughlin, CURO Research Assistant
Dr. Mi Chorzepa, Environmental, Civil, Agricultural, and Mechanical Engineering, College of Engineering

The necessity of proper disaster preparedness has rarely been exemplified so well as in 2005, when Hurricane Katrina crippled the Gulf Coast and wrought over $100 billion in damage to property and infrastructure. Georgia's coastline is fortunate to have been spared the devastation of bearing the brunt of a major hurricane in recent history, but history suggests that we should be wary of developing a false sense of security. Our research intends to meticulously catalog and assess the vulnerabilities of Georgia's 560+ coastal bridges in accordance with AASHTO code, in order to more precisely inform the state where to allocate its resources in the event of a major hurricane. By

compiling both public and independently surveyed data for each bridge into a self-contained, comprehensive database, we look to determine the most critical parameters to a bridge's structural integrity in the event of a major hurricane. Once we have identified the bridges most susceptible to failure, we will run a more granular analysis to determine the most likely failure modes of each bridge and whether multiple at-risk bridges exhibit similar vulnerabilities. By diagnosing the sub- and super-structure bridge components most prone to be compromised under the forces exerted by a major hurricane, we can provide GDOT with the necessary information to mitigate risks in the short term and better prepare for disaster management in the long term.

Ethanol Production in *Pyrococcus furiosus* using High Temperature Alcohol Dehydrogenase AdhC

Alex Thomas Crowley, CURO Summer Fellow, CURO Research Assistant
Dr. Mike Adams, Biochemistry and Molecular Biology, Franklin College of Arts and Sciences

Even with energy prices lower than in the previous decade, independence on fossil fuels for energy has raised concerns over continued costs, the environmental impact of carbon emissions, and a reliance on a resource that is nonrenewable. The creation of viable renewable resources as fuel has been a continually growing field of research, and to find a cheap, efficient production method for biofuels such as ethanol has been a major goal of this research for decades. The production of significant amounts of ethanol at 95°C has never before occurred. Through the overexpression of a native alcohol dehydrogenase in the hyperthermophilic archaeon, *Pyrococcus furiosus*, ethanol was produced in significant amounts at 95°C in comparison to the control strain, which did not contain the overexpressed gene. The pathway involved in the production of ethanol in *P. furiosus* saw a sharp jump in ethanol production during the last 3 hours of a 12-hour growth experiment after low and stagnant levels of ethanol production during the first 9 hours. This jump could be a coping mechanism meant to save the cell from extreme pH levels formed by the byproducts of its normal metabolic processes. The characterization of different ferredoxin oxidoreductases and their activity in conjunction with a native alcohol dehydrogenase show new relationships in this process that differ greatly at different temperatures, and the addition of a carbon monoxide dehydrogenase enzyme improves the yield of ethanol at 90°C in this system.

An Exploratory Investigation: Examining the Current and Future Prospects of Organizational Use of Business Process Management Tools and Technology

Fernando Arturo Cruz
Dr. Dave Chatterjee, Management Information Systems, Terry College of Business

This exploratory paper covers the current iteration and future prospects of Business Process Modeling Notation (BPMN) through analyzing a shift in its fundamentals and an aggregation of functions. First, Value-Driven BPM (VBPM) builds upon the previous BPMN practices by focusing on giving priority to processes that generate the greatest utility. VBPM includes three sets of tradeoffs: Efficiency or Quality, Agility or Compliance, and Integration or Networking. Although professionals continue to use BPMN for its routinization, the continued sacrifice of quality and agility reduces firm differentiation. Furthermore, businesses have been embedding Knowledge Management (KM) into BPMN fundamentals to maintain their competitive advantage. This theoretical combination creates a knowledge-intensive process that converts unstructured data to organizational wisdom. A diverse array of platforms using this methodology have expanded their functions from simple process modeling to complete implementation of automated systems. BPMN operates in two major domains, modeling and execution, while tools vary in interface and capabilities. A BPMN tool requires competency in four areas: BPMN compliance, syntax inspection, interoperability, and process executions. A brief qualitative investigation in this paper reveals a wide range of programs offering competency in all areas but with unique user focus and interface. In conclusion, BPMN supports interdisciplinary collaboration for business and technical professionals by offering a set of agile design principles coupled with a robust marketplace of modeling software.

Neutrophil Extracellular Trap Induction Dependence on Flagellar Motility

Christian Chandler Cullen
Dr. Balazs Rada, Infectious Diseases, College of Veterinary Medicine

Cystic fibrosis (CF) is a disease caused by a mutation in the cystic fibrosis transmembrane conductance regulator (CFTR) anion channel, resulting in severely impaired mucociliary clearance in the airways leading to chronic bacterial infections. *P. aeruginosa* exhibits a unique resistance to airway mucus and has become a common pathogen within airways. Despite the large-scale neutrophil recruitment in the airways, neutrophils fail to clear *P. aeruginosa* in CF. Instead, neutrophils release extracellular traps (NETs) composed of granule cargo and DNA into the airway lumen causing tissue damage. *P. aeruginosa*-induced NET formation occurs in CF airways and offers a likely mechanism for neutrophil-mediated lung damage. Previously, we have shown that bacterial flagellum is essential for planktonic *P. aeruginosa* to induce maximal NET release. Recently, we found that bacteria with motile flagellum trigger significantly more NET release than *P. aeruginosa* with immotile flagella. To gauge the role of flagellar structures, we tested 22 mutant strains of *P. aeruginosa* deficient in several of the motor genes moving the flagellum (motAB, motCD). Our results showed that deletion of both motility islands is needed to entirely eliminate flagellar motility-induced NET release in *P. aeruginosa*. However, partial deletion mutants revealed that the motAB island is more potent. From our work, we propose that bacterial motility is the primary virulence determinant responsible for triggering NET formation by enabling *P. aeruginosa* and neutrophil encounters. Our work adds to current literature by distinguishing bacterial motility machinery and proposes to target proteins driving flagellar motility as CF therapeutics.

Judicial Politics in the Obama Era

Bryson Culver, CURO Honors Scholar, CURO Research Assistant, CURO Summer Fellow
Dr. Susan Haire, Political Science, School of Public and International Affairs

The Federal Judiciary acts as an independent and apolitical body; however, in an era of growing partisanship, it is not immune from political influence. Looking at the Federal Appellate Courts, this project has 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 2009-2012 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. Over time, the judges have become more moderate as cohorts of older presidents (Carter, GHW Bush, Clinton) are more polarized in comparison to the more recent presidents (GW Bush, Obama). The project also looks at change in circuit composition under Obama. In 2008, only one Circuit had a majority of democrat appointed judges. By 2016, eight of the twelve Circuits became majority democratic appointees. Additionally, every single Circuit gained a larger proportion of minority and female judges. The researchers found the composition to be important as judges' voting behavior was directly affected by the composition of the panel they sat on. The presence of a conservative judge on a panel increased the likelihood of liberal judges to vote conservatively. Additionally, in cases involving gender or racial issues, the presence of a minority or woman on the panel affected the outcome of the decision.

Design of a High Speed Water Tunnel and Associated Instrumentation

Haynes Curtis, CURO Research Assistant
Dr. Ben Davis, Environmental, Civil, Agricultural, and Mechanical Engineering, College of Engineering

High-speed water tunnels are used to visualize the fluid flow around submerged bodies as well as study the corresponding hydrodynamic forces. Due to the extreme costs involved with purchasing a water tunnel from a commercial manufacturer, it was decided that a water tunnel would be designed and built in-house with the assistance of the UGA Instrument Shop. The goal of this study was to research the critical design aspects of water tunnels and their instrumentation

through literature review and site visits to existing tunnels. Additionally, one of the most fundamental pieces of tunnel instrumentation, a force balance, was designed for in-house fabrication alongside the water tunnel. The force balance will be used to measure lift and drag forces imposed on object tested in the water tunnel. It is expected that the high-speed water tunnel will be installed in the Dynamic Devices and Solutions Lab in the College of Engineering during the spring 2017 semester.

Histological Comparison of Various Coccidial Control Programs Used in Commercial Poultry

Ebun Dada
Dr. Susan M Williams, Population Health, College of Veterinary Medicine

Coccidiosis has been deemed the biggest parasitic threat to commercial poultry throughout the world and is caused by the protozoan *Eimeria*. To control the internal spread of the bacteria in chickens, traditio0 Tw 125(a)2.8t3.6(pVe)1(t Td[(.)]TJ0 8.9(m)-.9(hir)-5(a1.9(0 Tw.7(t.6(T)-u.6(pVe)e.1(i)9(n)-)-3(ol)i)9(n)-u-1.12
c1.7(u)Td[(u)10o po8()5(mo9(ti-3.5c)5(o)11(n(a)4.8n7(s)-s1.73.7(po) c)5(o)11(d3.9(c(ol)125(r))(by)4)4.8(u),)25(d10.9(thta)4.8

of gene expression of these targets will provide insight into inflammatory and coagulation responses during PM.

Structural Analysis of a Predicted Skp1 Glycosyltransferase PuGT8A

Nitin Daniel, CURO Research Assistant
Dr. Christopher M West, Biochemistry and Molecular Biology, Franklin College of Arts and Sciences

Toxoplasma gondii (*Tg*) is an obligate apicomplexan parasite that can infect most warm-blooded animals. It uses a pathway that includes the glycosylation of the Skp1 Cullin-1 Fbox E3 ubiquitin ligase complex resulting in a pentasaccharide that is thought to aid the parasite in cell cycle regulation. The Skp1 complex in the model organism *Dictyostelium discoideum* is hydroxylated by PhyA and modified by glucosyltransferases GnT1, PgtA and AgtA. The Tg Skp1 hydroxyproline is modified by a similar mechanism and addition of the sugars is carried out by homologs of GnT1 and PgtA, but the last two sugars are added by GT32A and GT8A. This was unexpected because GT8A was previously predicted to encode a glycosyltransferase (glycogenin) critical for initiation of glycogen synthesis. To understand the relationship between GT8A and glycogenin, a structural study was initiated. After crystallization efforts of TgGT8A were unsuccessful due to poor diffraction, a homolog from the plant pathogen *Pythium ultimum* was chosen as an alternative candidate based on its sequence similarity to TgGT8A. Here we express the PuGT8A plasmid in *E. coli*, purify it using an IMAC column, and show its predicted activity as an alpha-galactosyltransferase through a radioactive assay. PuGT8A crystals were diffracted in an in-house X-ray generator and a diffraction pattern was obtained. Studies are ongoing to solve its 3-D structure. Structural studies on the glycosyltransferases that modify Skp1 are expected to help us understand the mechanism of their regulation, which in turn might lead to new opportunities for parasite control.

Analyzing TGF- ß Regulation of the Progenitor Motor Neuron/Motor Neuron Glial Fate Switch

Tarun Daniel, Foundation Fellow
Aditya Sood
Dr. Steven Stice, Animal and Dairy Science, College of Agricultural and Environmental Sciences

In the developing primitive spinal cord, termed the neural tube, motor neuron progenitor cells (pMN) undergo a temporal change in potency, first generating motor neurons (MN) and later, oligodendrocyte precursor cells (OPC). Oligodendrocyte transcription factor 2 (Olig2) is a critical fate determinant central to this fate switch. In vivo, Olig2 promotes self-renewal, and primes cells for neurogenesis, ultimately resulting in the generation of MN while maintaining a subset of undifferentiated pMN. pMN then co-express the transcription factor homeobox protein Nkx2.2 alongside Olig2, which together drive much of the genetic glial machinery, marking the initiation of oligodendrogenesis. The underlying mechanism(s) involved in this fate switch, namely the transcription and expression of Nkx2.2 in pMN, are poorly understood. Previous studies suggest that a soluble, secreted transforming growth factor beta (TGF-β) family protein can regulate similar neural progenitor fate switches. Sonic hedgehog (Shh), a morphogenic inducer of both Olig2 and Nkx2.2 transcriptions, is also an important component in driving this initiation event, though alone it is insufficient in triggering glial initiation. Using an in vitro, pluripotent stem cell (PSC)-based model of neural tube development, we hypothesize that TGF-β primes pMN for the glial fate switch by altering the post-transcriptional state of Olig2. Further, we expect Shh to drive Nkx2.2 transcription. Ultimately, our studies will aid in developmental and disease modeling, stem cell manufacturing, drug and toxicity testing and regenerative medicine.

Recycled Crumb Rubber for Use in Concrete Barrier Walls and Other Applications

Grace Hays Darling, CURO Research Assistant
Dr. Stephan A Durham, Environmental, Civil, Agricultural, and Mechanical Engineering, College of Engineering

As the availability and storage area of landfills diminish, there is an increasing demand for finding new methods to incorporate recycled

materials into construction applications. The recycled material of interest for this study is rubber tires. Concrete safety barriers are one of the widely used impact reducers that are intended to either decelerate vehicles to a safe stop or redirect them away from a fixed object. Concrete barriers constructed by GDOT consist of a Class A concrete mixture design (3000 psi). A benefit for using recycled rubber in concrete barrier applications would be the possible reduction in materials cost. GDOT has not conducted any studies about the use of rubber tires in concrete barrier walls or any other application. This research project will involve extensive review of literature related to the use of recycled rubber tires, predominantly crumb rubber, in transportation applications. Crumb rubber is shredded recycled tire scraps consisting of only rubber that becomes granular in size. In this study, the fine aggregate component of concrete will be substituted with incremental proportions of crumb rubber. The intention of this study is to determine a concrete mixture with crumb rubber inclusion that is feasible without any significant disadvantageous effects on the concrete's structural performance. The compressive strength of the crumb rubber concrete mixtures will be tested at 1, 7, and 28 days of age to measure their mechanical performance as the crumb rubber substance increases. Ultimately, the data gathered from this study will be utilized in further phases of a larger-scale research analysis.

Privileged Perception: An Examination of Supersensory Insight in Vladimir Nabokov's *The Gift*

Anna Jewell Davidson
Dr. Charles Byrd, Germanic and Slavic Studies, Franklin College of Arts and Sciences

As one of the greatest achievements of Vladimir Nabokov's career, *The Gift* reveals the possibility of connecting with a world otherwise unseen and undetected. Such supersensory insight is the defining gift of the novel's hero, Fyodor Godunov-Cherdyntsev, in his attempts to achieve recognition as a writer despite continuous criticism by the outside world. As a result, Fyodor reveals his supersensory insight to no one except in covert statements that largely go unrecognized. This presentation examines Fyodor Godunov-Cherdyntsev's supersensory insight and the factors contributing to its presence in *The Gift*. We will first draw upon the ideas of the French philosopher and Nabokov's invented man of wisdom, Pierre Delalande, for greater understanding of supersensory insight followed by evidence of its existence in Fyodor. We will then explore evidence of supersensory insight in one of Fyodor's few literary supporters, Aleksander Yakovlevich Chernyshevski (the namesake of the renowned author and philosopher). We will later analyze the Kirghiz story told to Fyodor by his late father in which supersensory insight is a supreme influence. The final subject of analysis will be the novel's concluding paragraph and its relation to Aleksandr Pushkin's *Eugene Onegin*. Through Fyodor's experience, Nabokov teaches us to not only seek awareness of things beyond our own human comprehension but also to be slow to rebuke those who claim to understand things we do not. We are compelled to ask ourselves how often we value objects with mere temporary worth while rejecting those that are much more significant and invaluable.

An Investigation of Environmental Variable and Dispersal Patterns of North American *Photinus* Fireflies

Brandon Davis
Dr. Kathrin F Stanger-Hall, Plant Biology, Franklin College of Arts and Sciences

Among the genera of North American fireflies, the genus *Photinus* is the most diverse, with over 40 different species. The distribution of *Photinus* species across North America varies greatly, and little is currently known that can explain these observed distributions. This research study utilized state and county records for 36 North American *Photinus* species, which were collected over the last 50 years. All county coordinates (longitude and latitude) with observed *Photinus* species were entered into ArcGIS, a sophisticated geographic mapping program, and were used to test hypotheses on the influence of different environmental variables (average annual precipitation, soil composition, elevation, and average annual temperature) on species distribution. Insights from this study will be important in identifying key characteristics of *Photinus* habitats. Furthermore, this investigation may identify important habitats for conservation of *Photinus* fireflies across North America.

Abstracts

Gender Differences in College Students with ADHD

Samantha Delaney, CURO Research Assistant
Shruti Prathip
Dr. Jason Nelson, Psychology, Franklin College of Arts and Sciences

Limited empirical research investigating the subject of gender differences in attention-deficit/ hyperactivity disorder (ADHD) provides evidence for under-identification of ADHD in females. This poses a significant concern, as women with ADHD demonstrate significantly higher levels of other mental health comorbidities when compared to non-ADHD females. This study sought to contribute to the available research by examining potential gender differences in first-time ADHD diagnosis in college, ADHD subtypes, hyperactive-impulsive symptoms across the lifespan, and treatment-seeking behavior. Participants included 589 students pursuing postsecondary education who were diagnosed with ADHD using multi-method, multi-informant evaluations. The gender distribution was 51.4% male (n=303) and 48.6% female (n=286). Archival data from evaluations leading to the ADHD diagnoses were used for the analyses. Self-report and parent-report ratings were used to measure ADHD symptoms. Females were more likely than males to be initially diagnosed with ADHD in college. Females were not more likely to be diagnosed with inattentive type ADHD, though self-reported inattentive symptoms were significantly higher in females in adulthood. Females were more likely to present with comorbid anxiety and mood disorders. While females were also more likely to have attended therapy in the past, differences in stimulant usage between males and females were insignificant. Findings provide evidence that ADHD in females is more likely to be under-identified in childhood. Given empirical findings that males and females are both likely to experience significant impairment associated with ADHD, there may be reason to modify the approach in which practitioners identify the disorder.

Testing Immune Function in Naked Mole Rats During Periods of Wound Healing

Madison Demetry
Dr. Vanessa Ezenwa, Ecology, Odum School of Ecology

Typically, when an animal is wounded, the skin regenerated is characterized by abnormal collagen patterns and lack of hair follicles. Some species, such as *Acomys kempi*, can regenerate skin characterized by normal collagen patterns, both skin layers, and the presence of hair follicles. In animals where skin-regeneration is possible, it has been proposed that a biological trade off exists between immune system function and complete regeneration. I investigated by testing the innate bacterial killing capacity of non-regenerative animals and comparing it to data previously collected on the killing capacity of regenerative species living in the same habitat. By comparing the killing capacity of pre-wounded Naked Mole Rats (*Heterocephalus glaber*) to the killing capacity of four other species, I found that *H. glaber* had a killing capacity that fell between that of regenerative species (*A. kempi*, *A. percivali*) and non-regenerative species (*Myomyscus brockmani*, *Mus musculus*). Additionally, I found that the killing capacity of *H. glaber* significantly decreased 24 hours after wounding. Because *H. glaber* does not possess regenerative properties, it was expected that the killing capacity of this species would have been relatively close to that of other non-regenerative species. Interestingly, results instead indicated that the killing capacity of *H. glaber* (12%) was closest to one of the regenerative species, *A. percivali* (17%). This result could be contributed to many different factors, such as hyaluronic acid levels or fibroblast properties specific to Naked Mole Rats.

Investigating Genes Implicated in Ciliogenesis Using CRISPR/Cas

Kaley Ann Desher, CURO Research Assistant
Dr. Jonathan Eggenschwiler, Genetics, Franklin College of Arts and Sciences

Cilia, the hairlike organelles that project from the surface of eukaryotic cells, play several critical roles such as sensing the extracellular environment, cell signaling, and embryonic development. Disruption of these processes can lead to ciliopathies that compromise human health. Alpha-TAT1, Bbs8, Ick/MRK, Ift122, and Kif7 are all ciliary proteins implicated in

ciliogenesis that have undetermined functions. We generated reversible mutations in each of these genes using the CRISPR/Cas9 genome editing system and a Cre-LoxStopLox (LSL) transcriptional cassette containing the puromycin resistance gene. We also cloned a LSL/RFP/homology sequence cassette for each gene that will be utilized to generate double
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Influence on Election Outcomes
Emil Dmello,/CUROResearch Assistant

The United States has undergone a divisive election that has answered several questions, but has left more unanswered. One of these questions that political scientists and historians have continuously debated is the significance of economic variables on general election results. Historians postulate that economic conditions outweigh the quality of candidates, while political scientists stipulate the opposite. This debate can be distilled down to whether political fortunes are determined by great people or involve great circumstances. My research examines this dichotomy by assessing the significance of economic influences on the political fortunes of the two major parties in the US. I will collect economic data and perform Poisson regressions to assess whether economic variables influenced changes in representation within the House of Representatives and the Senate. As my response variables on Congressional representation are discretely valued, Poisson regressions are employed for continuous-discrete pairing analysis. Since Poisson regression assumes there is mean-variance equivalence within the response data, its assumptions must be validated prior to analysis. While traditional evaluations of this question may involve the least-squares model, I believe the Poisson regression can help us understand the driving forces in a discrete fashion. My research aims to determine if macro-level economic indicators such as unemployment and inflation, as well as subjective economic indicators including measures of economic anxiety, the Gini-coefficient, and measures of social mobility, influence election outcomes. Based on my research, I hope to highlight the role of personal charisma versus economic circumstance in defining the priorities of voters.

Jamming Avoidance Response: An *Eigenmannia* Phenomenon

Phiet T Do
Luis Perea
Dr. Mable Fok, Electrical and Computer Engineering, College of Engineering

The *Eigenmannia* is a species of South American fish that features the ability to perform a Jamming Avoidance Response - JAR. This electric fish uses electrical discharge pulses to sense its environment through electroreception. When the fish comes into contact with another gymnotiform electric fish producing an electrical discharge at a similar frequency, it results in destructive interference of the two discharges causing the electroreception to be distorted. Evolutionary modifications have occurred so that the two fishes employ a neural circuit behavior to avoid each other's specific frequency, restoring their respective electroreception. The objective of this research is to understand how the electrosensory lateral line lobe and the neural pathways interact to perform this neural behavior. There have been different, competing theories to explain the jamming avoidance response; for example, one theory emphasizes asymmetric amplitude, while another emphasizes on phase differences of the signals. In an attempt to simulate the *Eigenmannia* phenomenon, our biological model will consist of pass band filters, logic gates, a switch module, and a feedback control system. Applying this knowledge will help us begin prototyping a photonic and electrical circuit to replicate the jamming avoidance response, as we believe it has the potential to revolutionize radio communication.

Beyond-Design Basis Evaluation of Georgia Coastal Bridges

Adara Dodson, CURO Research Assistant
Dr. Mi Chorzepa, Environmental, Civil, Agricultural, and Mechanical Engineering, College of Engineering

The evaluation of existing bridge drawings to determine critical bridge parameters necessary for hurricane vulnerability evaluation and the development of a load-capacity assessment procedure are the objectives leading the "Vulnerability Evaluation of Georgia Coastal Bridges" research project. To gather necessary criteria, two procedures must be completed. Initially, critical bridge components and bridge drawings are assessed as part of a Georgia Department of Transportation project. This assessment includes identifying significant bridge details and gathering them in a logical format for future uses. Subsequently, the research data gathered is used to develop a load-capacity assessment procedure for beyond-design basis hurricane categories (e.g., Category 4 or 5). During my semester of contribution, as well as the previous years' work on the project, the necessary bridge drawings were reviewed and the first phase

was considered complete. Currently, the vulnerability assessment of coastal bridges is underway in order to evaluate reliability of Georgia coastal bridges under, beyond-design basis, hurricane loads.

Relationships and Trade Offs between Food Insecurity and Healthcare

Jacy Donaldson, CURO Research Assistant
Dr. Abigail Borron, Agricultural Leadership, Education, and Communication, College of Agricultural and Environmental Sciences

Every day, there are people who struggle due to instability in their life. Survival often requires tough choices regarding food, health, shelter, education, and other daily needs. When focusing on one area, such as food insecurity, making ends meet through to the end of the month can be identified through varying resources for assistance. However, when food insecurity intersects with health-based concerns, an increasingly complex set of issues arise. This research project focuses on the tradeoffs and unique characteristics between food insecurity and health care. The majority of literature focuses on how food insecurity increases the need for health care due to health issues related to poor nutrition. While this is important, there is also an opportunity to consider how food insecure families perceive and deal with weighing the options between food and health care needs. The target population for this study is individuals utilizing food pantries in and around Atlanta, Georgia. Using qualitative research methods such as focus groups, in-depth interviews, and photovoice, we will gather information about people's choices regarding food insecurity and health from their own perspective. Couched in a larger multi-disciplinary project, this research will focus specifically on the intersection of food and health when analyzing the data. The findings will contribute to developing a more comprehensive understanding of this complex intersection, which is intended to inform the Atlanta Community Food Bank, as staff consider potential interventions for assistance at the agency level.

Development of Viscosity-Sensitive Fluorescent Molecular Rotors for Food Additives

Kevin Tuan Dong, CURO Research Assistant
Dr. Mark A Haidekker, Electrical and Computer Engineering, College of Engineering

Fluorescent molecular rotors are being utilized more for their probing properties; they are reporters of fluid viscosity with the major advantage of ultrafast measurement in extremely low fluid volumes compared to conventional mechanical rheology. Among many applications, some being the examination of microviscosity in the cell membrane of blood plasma and macromolecule suspensions, the rotors can be applied to food additives. In these applications, however, a substance's autofluorescence critically interferes with the fluorescent emission of the molecular rotor. Our investigation aimed at determining a method to separate this spectral emission interference, in our case, with wort solutions. Preliminary experiments with stained (with rotors) and unstained fluid samples showed that it was impossible to separate this autofluorescent interference. It was hypothesized that additional factors such as poor solubility of the rotor, viscosity sensitivity, or even temperature could also play a role. We proceeded by synthesizing a series of molecular rotor derivatives, containing a naphthalene core, as derived from the benzylidenemolonitrile motif. These rotors exhibited a strong bathochromic shift with an emission peak at 660nm (red). At this wavelength range, the contribution from the autofluorescent emission should be negligible. With this shift, however, viscosity sensitivity was reduced. Further experimentation and development is needed to improve the rotational freedom of the rotor to increase the dye's sensitivity.

The Ratio of Gas to Dust at High Galactic Latitudes

Jessica E Doppel, CURO Research Assistant
Dr. Loris Magnani, Physics and Astronomy, Franklin College of Arts and Sciences

The ratio of the column density of atomic Hydrogen (N(HI)) and the color excess (E(B-V)) varies over the different studies that have examined the ratio. Using the data from the Leiden/Argentine/Bonn (LAB) survey and the Schlafly et. al. color excess survey, the values of the column density and the color excess are

plotted against each other for specific points in the sky to determine the N(HI)/E(B-V) ratio. From these data sets, the value of the ratio has been determined to be $N(HI)/E(B-V) = 3.2 \times 10^{21}$ mag^{-1} cm^{-2}. It is anticipated that the N(HI)/E(B-V) ratio will be dependent on distance, region of the galaxy, and the technique through which the quantities are determined. This study sets out to both understand the differences in this value between this research and previous work and to tighten the understanding of the ratio of gas to dust in various regions of the galaxy, particularly at high latitudes ($|b|<20°$) using these newer, higher resolution data sets. The determination of a reliable relation between the gas and dust would allow for identifying and mapping molecular and atomic clouds in regions of the sky that have not yet been surveyed.

A Comprehensive Assessment of Cognitive and Motor Functional Outcomes After Traumatic Brain Injury in a Porcine Model

Neil Doshi
Dr. Franklin Delano West, Animal and Dairy Science, College of Agricultural and Environmental Sciences

Traumatic brain injury (TBI) is a leading cause of death and permanent disability in the United States. Children between the ages of 0-4 years are at the highest risk of sustaining a TBI and are also the most likely to suffer cognitive and motor function deficits as a result of their premature neurological development. Currently, there is no effective treatment for TBI. Due to their similarities in neuroanatomy and physiology to humans, pigs may serve as a successful animal model for treatment development. The present study assesses changes in cognition and motor function in a piglet traumatic brain injury model. We hypothesize that TBI in a piglet model will elicit measurable deficits at the functional level, evident through changes in cognition and motor function. A spatial T-maze test was utilized to assess the spatial memory aspect of the piglets' cognition. Additionally, gait analysis was conducted to observe changes in the piglets' spatial-temporal gait biomechanics. The TBI piglets navigated the spatial T-maze slower than their sham counterparts ($p<0.05$) and made more ($p<0.05$) mistakes during the acquisition phase of testing. Interestingly, injured piglets saw a significant recovery in many gait parameters by the end of this longitudinal study. Key insights into TBI deficits garnered from this study will form the necessitous basis of all future treatment development studies for monitoring improvements in cognition and biomechanics.

A Comparison of the 2014 Scottish Referendum and 2016 European Union Membership Referendum Campaigns

Samuel Driggers, CURO Honors Scholar, CURO Research Assistant
Dr. Cas Mudde, International Affairs, School of Public and International Affairs

In the developed world, the United Kingdom has perhaps received the most attention for its nationalist, autonomist, and secessionist movements. Several UK political parties seek greater regional autonomy, and some advocate disunion from the European Union or UK based on: 1) frustration with political, cultural, and economic marginalization, 2) the strengthening of national identity, and 3) rights of self-determination. Composed of four distinct nations, and as member of an economically and politically powerful international organization, the UK is plagued by questions concerning its concentration and divisions of political sovereignty. In attempt to preserve political rights and to appease vocal segments of its populace, the UK Parliament continually allows constituents to vote in referendums which direct how the UK's sovereignty is divided and concentrated. The most recent referendums, the 2014 Scottish Referendum and 2016 EU Membership Referendum, had focal campaigns resulting in high voter turnouts and close percentage splits. By comparing the traditional nationalist movement in Scotland to the unconventional nationalist movement surrounding the EU Referendum, this project attempts to draw parallels between sovereignty-seeking movements within states and international organizations. Additionally, this comparison attempts to support the idea that movements need not seek traditional ideas of independence to be categorized as nationalist. Furthermore, comparison of each referendum's campaigns will further the understanding of nationalist movements, questions of political

sovereignty, and simultaneous trends of political integration and disunion. This project began with a review of literature on nationalist, autonomist, and secessionist movements before proceeding to comparison of campaign materials, speeches, and actions.

Reprogramming Mouse Embryonic Fibroblasts via Induced Expression of *Foxn1* and *Foxg1* Transcription Factors to Generate Induced Thymic Epithelial Cells (iTECs)

Lauren Dunavant
Dr. Brian Condie, Genetics, Franklin College of Arts and Sciences

The CRISPR/Cas9 system has revolutionized the field of genetics by allowing direct modification and regulation of genomic regions of interest. In this study, re-engineered versions of this system (subsequently referred to as CRISPR/dCas9), which are gRNA-directed but have nullified nuclease domains, were used to activate endogenous genes in mouse embryonic fibroblasts (MEFs). The goal was to generate induced thymic epithelial cells (iTECs) to mimic the function of TECs that naturally form a thymic microenvironment essential for T cell maturation. The *Foxn1* and *Foxg1* genes (of the Forkhead box protein family) are critical in early thymic development and were activated via transfection of MEFs with CRISPR/dCas9 systems and site-specific gRNA sequences. Multiple CRISPR/dCas9 systems were used, including a p300-dCas9 plasmid, a SP-dCas9-VPR plasmid, a TetO-FUW-VdC9BV plasmid, and a humanized VP64 dCas9-GFP plasmid. Various gRNAs were also tested to optimize activation, and resulting gene expression profiles were compared to those of iTECs generated from cre-activated transgenic mice. Current data shows that the p300-dCas9 plasmid-treated cells showed an approximate 10-fold increase in *Foxg1* expression (compared to an internal control), although further optimization may be required. Screening of the SP-dCas9-VPR, TetO-FUW-VdC9BV, and VP64 dCas9-GFP plasmids also gave strong evidence that the SP-dCas9-VPR plasmid may effectively activate both *Foxn1* and *Foxg1*. Research is ongoing, but if activation of these FOX proteins results in repeatable reprogramming of MEFs to iTECs, these results may have serious implications for the future of regenerative medicine, including treatment options for chemotherapy-related immune deficiency, autoimmune disorders, and age-related thymic involution.

The Effectiveness of Financial Education Mandates in Georgia Public High Schools

Ana Duron-Fleck, CURO Honors Scholar, CURO Research Assistant
Dr. Brenda Cude, Housing and Consumer Economics, College of Family and Consumer Sciences

In the state of Georgia, public high school students are required to take an economics course with a personal finance section in it in order to graduate from high school. Students are tested on their knowledge and take an exam worth 20% of their final grade. Last year's focus of this study was on the effects of this class on the students' financial behaviors. However, this year we are focusing on the class's overall effectiveness and its impact on students' financial literacy skills by asking students basic questions constructed to gauge their knowledge of personal finance. We distributed a 31 question survey via email to all freshmen in attendance at the University of Georgia. The questions ranged from the student's gender and major to questions about their savings accounts and knowledge of interest rates. Using the responses from students who graduated from Georgia public high schools, we limited our analysis to only those students that recall taking the course and identified the proportion that answered the financial literacy questions correctly. Through the use of different combinations of questions and answers we were able to determine if the style and medium of class affects what the student learned and if it changed how the student answered the financial literacy questions. We hope to find that students who took a standalone course covered more content than those who took a course only in part about personal finance/money management.

Atlanta, Race, and Housing: Racial Segregation in the Context of the Great Recession

Caskey Dyer

Dr. Steven Holloway, Geography, Franklin College of Arts and Sciences

The subprime mortgage crisis of 2007-2008 resulted in foreclosures, major losses of capital for financial institutions, and losses of equity for hundreds of thousands of homeowners. These effects were not evenly distributed. In the years leading up to the crisis, the subprime loans which so toxified lender's asset sheets were disproportionately given to lower-income, minority households. The causes for this are multifold - explicit mandates given by the federal government, implicit practices normalized by government-sponsored enterprises, and pre-existing practices of racial and class discrimination on the part of lenders combined to produce an environment in which discriminatory lending became institutionalized in the name of profit and growth. This paper will examine the degree to which these practices re-constituted historical socio-spatial racial and class divisions by focusing on the Atlanta metropolitan area, where historical racial segregation has been produced and re-produced across the decades, through similar governmental and financial lending practices. I will give a history of socio-spatial racial segregation in Atlanta and its suburban counties, focusing on how state and private actors managed to produce these conditions, before using data on housing and lending practices across the region to analyze if, and how, these divisions became re-created on a larger scale. I will end with a critical analysis of how the reality of these divisions contrasts with dominant narratives of growth in the context of a supposedly post-racial state and a globalized economy, before discussing the potential dangers of the post-Recession lending environment.

Characterization of a V-H+-ATPase in *Toxoplasma gondii*

Eric Dykes, CURO Research Assistant
Dr. Silvia N J Moreno, Cellular Biology, Franklin College of Arts and Sciences

Toxoplasma gondii is an apicomplexan parasite that causes chronic infection in humans through inadvertent consumption or contact with infected cat feces or undercooked meats. As many as 2 billion people are infected with this parasite worldwide, most of them unaware of their chronic infection. The available drugs used to treat the infection are only effective against the fast growing tachyzoite. We believe that it is critically important to understand better the physiology of *Toxoplasma* to discover better ways to block its lytic cycle, which is linked to pathogenesis. We are interested in proton transport and homeostasis and we are characterizing a vacuolar ATPase that localizes to both the plant-like vacuole (PLV) and plasma membrane of *T. gondii*. Vacuolar ATPases create proton gradients by coupling the hydrolysis of ATP with the pumping of protons across the membranes of vacuoles in cells. These pumps create a proton gradient, which can be used to exchange for ions or to maintain the membrane potential. We believe that *T. gondii* relies on proton gradients to help regulate such cellular functions as ion homeostasis, pH homeostasis, and membrane potential. Using conditional knockdowns, we are studying the physiological functions of this vacuolar ATPase; we will measure intracellular pH, proton extrusion, and the membrane potential of the vacuolar ATPase knockdowns. We believe our investigation into this important physiological pump will lead to increased understanding of parasite physiology and potentially identify an important gene(s) for a future drug target(s).

Predicting Horse Racing Outcomes Using Multinomial Logit and Probit Modeling Techniques

Jordan Eckert, CURO Research Assistant
Dr. Lynne Seymour, Statistics, Franklin College of Arts and Sciences

Can statistics beat random guessing in figuring out if a horse will win, place, or show for a race? The aim is to compare multinomial logit and probit models against random guessing, and themselves, to see if they are more accurate in predicting a horse's finish. The first step is to create the data set that will be tested by logistic regression. After research, the task begins of writing R-code to run the analysis. Ultimately, the goal is to create R-Code that could be used subsequently with other horse racing data from other years, a kind of plug and chug code. After both modeling codes have produced their outputs, a comparison of both against random guessing will be performed to see how accurate they are at producing the winning

horse. These methods will then be compared against themselves, and the most accurate model will be assessed. This accuracy will be gauged using each model's RSME. The anticipation here is that probit modeling will be better than logit regression modeling in predicting horse racing outcomes, but that both will be better than random guessing. Predicting horse racing has several other world applications. Horse racing markets follow a similar trend to time series markets such as the stock market, and are often theorized to move in similar manners. If these modeling methods prove efficient and effective in horse racing, then further research into other time series fields that fit a similar profile could be done using these modeling techniques.

Identification of Therapeutics that Target Zika Virus RNA Polymerase

Baker Edrees
Dr. Cory Momany, Pharmaceutical and Biomedical Sciences, College of Pharmacy

One aim of this experiment is to clone and purify the RNA Polymerase from the Zika virus. A second aim is to create an in situ method of making nucleoside triphosphates using human nucleotide metabolizing enzymes, like adenosine and uridine nucleoside kinases, for use in assays. The amino acid sequences of the proteins will be codon optimized to clone and purify the proteins in *E. coli*. The process of cloning involves using type IIS restriction enzymes simultaneously with ligation which allows for rapid cloning. The protein purification process entails using metal chelate chromatography. The goal of this project is to identify small molecules that inhibit the Zika virus RNA polymerase. This information will help with the fight against the Zika virus.

Disordered Drinking in College Populations: An Identity Issue?

Emily Edwards, CURO Research Assistant
Dr. Dawn T Robinson, Sociology, Franklin College of Arts and Sciences

It has been known for quite some time that Greek lettered membership is associated with greater alcohol usage in contrast to unaffiliated students. Traditional theoretical arguments emphasize peer affiliation and social learning to explain the differences in alcohol usage between affiliated and unaffiliated populations; however, comparable disordered drinking occurs beyond Greek populations. This project investigates whether the same processes explain problem drinking among fraternities and sorority members and non-members. We propose that a partier identity rather than fraternity or sorority involvement alone motivates disordered drinking. Affiliates and non-affiliates could share symbolic identity meanings associated with "partier"—one who participates in party culture. Both student populations, affiliated and unaffiliated, receive environmental signals to drink as encouraged from party symbols, such as drunken behaviors, friends drinking, underage drinking, etc., that cause an individual to enact the "partier" identity. This potentially dangerous identity manifestation is incorporated into the student's network; therefore, the individual prioritizes partying behaviors in order to maintain his social relationships or risk the loss of his network. We hypothesize that having more numerous and stronger social ties connected to the partier identity and consistent identification with meanings associated with the partier identity (e.g. self-descriptions of "fun", "social", "outgoing", and "irresponsible") will increase the level of disordered drinking, regardless of affiliation. To test this hypothesis, we surveyed a sample of 200, which consisted of affiliated and unaffiliated, male and female college students locally. After controlling for gender and race (male and white), students who participate in a fraternity have higher levels of disordered drinking as previous literature would predict.

Nitrogen Fixation of Biological Soil Crusts in Longleaf Pine Savannas Respond to Alterations in Precipitation Frequency

Sumaya El-Khalidi, CURO Research Assistant
Dr. Nina Wurzburger, Ecology, Odum School of Ecology

Biological soil crusts (BSCs) fix atmospheric nitrogen (N_2) into biologically available forms, and may be important to ecosystem recovery in longleaf pine savannas. BSCs must be exposed to moisture to be metabolically active, so the frequency of precipitation may affect their ability to fix N_2. Future climate scenarios for the southeastern United States predict a change in precipitation variability and little is known how

BSCs will respond to this shift. For this research, we investigated how variable moisture frequencies could impact N fixation in the BSC communities common in longleaf pine ecosystems. We performed a laboratory experiment in which we treated field-collected BSCs with low, moderate, and high precipitation frequency over an eight-week period. Nitrogenase activity was tested before treatment, at four weeks, and at the end of the experiment. A Repeated-Measures ANOVA was used to test whether N-fixation differed among treatments. We found that when exposed to high moisture frequencies, nitrogenase activity was undetectable, indicating that BSCs had difficulty in performing N-fixation. However, when exposed to the lowest moisture frequency, BSCs fixed a substantial amount of atmospheric N_2. BSCs observed response to variable treatment frequency simulates the likely response BSCs will reflect when exposed to climatic shifts. Since N is necessary for ecosystem recovery, determining BSCs' response may be important in understanding the resiliency of longleaf pine savannas to climate change, and how conservation efforts can be modeled to manage these rare environments.

Regulation of Sialic Acid Polymerization

Joseph Elengickal, CURO Research Assistant
Dr. Hawkeye Pierce, Biochemistry and Molecular Biology, Franklin College of Arts and Sciences

Glycans are sugar molecules that are on the surface of cells. They are vital to cell functions such as cell signaling, immune responses, and protein folding. They have also been found to play a role in illnesses such as cancer, and biomarkers for cancer cells have originated from the study of these glycans. Nevertheless, unlike other vital biological molecules like DNA and protein, not much is known about how these glycans are produced or how they function. The purpose of this research project is to investigate a specific glycan, sialic acid. This sugar molecule is found in high concentrations in the brain and plays an important role in neural transmission. On cell surfaces, sialic acid monomers link together to form polymers, long chains of these sugar molecules. The process by which these chains are elongated is not well known and is the subject of this research. This project investigates how sialic acid's polymerization is regulated by glycosyltransferases by using high performance liquid chromatography. This process works by separating sialic acid and then detecting the sialic acid with a small molecule called DMB. The project also investigates how specific proteins influence the polymerization by setting up a tet inducible system, thus furthering the understanding of sialic acid regulation. This research could lead to a better understanding of glycan regulation during oncogenesis and may even lead to future treatments for cancer.

Has Gentrification Led to Increased Police Brutality in the United States?

Emmanuel Elsar Jr.
Dr. Jennifer Joelle White, International Affairs, School of Public and International Affairs

With the increased coverage of relations between the police and minorities in the United States, one key factor has been continuously ignored. With rent prices and cost of living in major metropolitan cities rising, citizens who before were able to afford living in their homes are now being forced to relocate to cheaper areas. This process of removing and renovating a neighborhood so that eventually more middle class individuals move there is known as gentrification; however, the social and political implications usually involve wealthier, whiter people moving into low-income, minority heavy areas. One notable aspect of the combination of rising rent and a changing demographic is the increase of calls to police departments. One may come to the conclusion that this is the result of new people in the neighborhood and their preconceived notions of longtime residents in the area; others may argue it is a result of different viewpoints on how to conduct oneself in your neighborhood. Nevertheless, there is a different dynamic of how the police interact with their respective communities and in some cases it has led to the deaths of primarily black and latino men. In order to fully answer my proposed question, I plan to collect data from calls sent to police departments in the 10 largest metropolitan areas in the United States listing disturbances in the area and cross reference them to instances of police altercations with individuals in those cities.

Genetic Mapping of the Chromosome Variant K10-L2 in Maize

Brianna Renee English, Foundation Fellow, CURO Research Assistant
Dr. Kelly Dawe, Genetics, Franklin College of Arts and Sciences

Meiosis is a process in which a diploid cell divides into four haploid daughter cells, capable of becoming the organism's next generation. During the stage of anaphase, sister chromatids are pulled apart towards opposite spindle poles through microtubule attachment to the centromeres of the chromosomes. In maize, there are two forms of chromosome ten: a common normal version and a rare abnormal version which contains repetitive sequences called knobs. Knobs are normally inactive regions of the genome, but in the presence of the abnormal chromosome K10L2 they can act as neocentromeres. When active, these neocentromeres move towards the spindle poles ahead of the centromere during anaphase. This study is focused on constructing a genetic map of K10L2 and developing a better understanding of how neocentromeres function. Using fluorescent in situ hybridization to observe knobs, PCR to amplify candidate genes, and the observation of phenotypes unique to chromosome ten, we analyzed the combinations of markers from each test to generate a genetic map. This study will ultimately provide more information about the origins of K10L2 and will help in finding the location of the candidate gene.

Effects of Asphalt Mix Characteristics on Dynamic Modulus and Fatigue Performance

Austin Etheridge, CURO Research Assistant
Dr. S. Sonny Kim, Environmental, Civil, Agricultural, and Mechanical Engineering, College of Engineering

Developed under NCHRP 1-37A, the Mechanistic-Empirical Pavement Design Guide (MEPDG) provides three hierarchical levels of design inputs (i.e., levels 1, 2, and 3). This allows the designer to select the level of details of design inputs according to the level of importance of the project. The dynamic modulus |E*| is considered one of the fundamental asphalt mix properties and is obtained from a series of complex modulus tests at different temperature and loading frequency conditions. Several State Highway Agencies (SHAs) have already created or are in the process of creating an |E*| database for the calibration and implementation of MEPDG. Georgia Department of Transportation (GDOT) has made a continued commitment to the performance enhancement of pavement and proactively calibrated and implemented the MEPDG methodology for the design of flexible pavement structures. However, the GDOT material input library includes |E*| based on only two sources of aggregate. Further, an |E*| library for Polymer Modified Asphalt (PMA) and Ground Tire Rubber (GTR) Asphalt mixtures has not been developed yet although the PMA mixtures are being used for high volume traffic roads in Georgia. The study will supplement the current |E*| database by extending the aggregate sources for different Superpave mixes and binder types. Secondly, three different laboratory fatigue tests will be performed on selected mixtures. Based on different fatigue test approaches, a local fatigue prediction model will be recommended for Georgia pavement. Finally, the effects on dynamic modulus and fatigue due to different asphalt mixtures will be determined.

In Vivo and In Vitro Activity Analysis of Acetylation on Fructose-1, 6-Bisphosphatase in *Salmonella enterica*

Akiel Gabriel Etienne, CURO Research Assistant
Dr. Jorge Escalante-Semerena, Microbiology, Franklin College of Arts and Sciences

Glucose is an important building block for cells of all domains of life. Not surprisingly, cells have evolved elaborate systems to acquire glucose from their environments. Because of the relevance of glucose to cell function, cells can also make glucose endogenously. The pathway dedicated to this purpose is known as gluconeogenesis (GNG). The enzyme fructose-1, 6-bisphosphatase (Fbp) plays a key role in GNG because Fbp generates glucose 1,6-biphosphate. Fbp function is regulated at many levels. Recently, we discovered that Fbp function may also be regulated by post-translational modifications. Reverse Lysine Acetylation (RLA) is a post-translational modification that is conserved across all domains of life, and is used to modulate protein function. Recently, we showed that STM1857 acetylates

Fbp. It is not known how many times STM1857 acetylates Fbp, or how Fbp function is affected by acetylation. We hypothesize that acetylation may lower the activity of the enzyme relative to the non-acetylated version of it. To test this possibility, Fbp activity will be assessed in vitro as a function of its acetylation state. To do this we will use a continuous assay that monitors the oxidation of NADH at 340 nm. We will also use high-resolution mass spectrometry to determine which lysyl residues of Fbp are acetylated by STM1857. Acetylation sites identified by mass spectrometry will be validated by site-directed mutagenesis. Finally, the effect of acetylation on Fbp activity will also be assessed in vivo under conditions that require the cell to use GNG to make glucose.

The Association between Body Image Dissatisfaction and Sports Participation in Mexican-American Youth

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

Youth sports participation has well-known physical health benefits. However, its mental health effects are less known, particularly for Mexican-American youth. The purpose of this research was to analyze sports participation and body image dissatisfaction (BID) among Mexican-American adolescents to: (1) determine sources of pressure that contribute to BID in sports participation (2) compare the prevalence of BID in students involved in non-aesthetic, aesthetic and no sports, (3) determine if general physical activity has the same effect on BID as organized sports involvement, and (4) determine the association between sports-related BID and unhealthy eating behaviors. The sample (n=826) is from a 2010-2011 survey of Mexican-American students in south Texas. Eighty percent of the students reported participating in organized sports. Twenty-one percent of the athletes felt pressure to "look a certain way", with 57% saying the pressure came from friends. Compared with those who did not play sports, non-aesthetic sport athletes were the only group that had a significant difference in BID, with those athletes thinking they were smaller than their ideal body image ($p=0.0117$). BMI percentile, sports participation, physical activity, and sex were significant predictors of BID ($p<0.05$ for all associations). Physical activity behavior was found to have similar effects on BID as organized sports involvement. BID was not associated with unhealthy eating behaviors. These findings provide a better understanding of BID among Mexican-American youth; the results may inform parents and coaches how to identify youth who are most at risk, and aid in the creation of programs that mitigate BID.

Development of Biodegradable and Biosourced Microcellular Polyurethane Foams for Foam-In-Bag Packaging

Caria Evans, CURO Research Assistant
Dr. Jason Locklin, Chemistry, Franklin College of Arts and Sciences

High volume packaging applications for high value products often use polyurethane foam-in-bag systems to save packaging time, labor costs, and packaging facility footprint space. Despite ubiquitous 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 formulation and a polyol precursor formulation which polymerize into closed- or open-cell foams upon mixing via step growth polymerization and CO_2 bubble formation. The project will focus on the development and characterization of the isocyanate and polyol precursors, surfactants, additives, and rheological modifiers from renewable sources that meet the appropriate reaction conditions to generate stable closed-cell and open-cell polyurethane foams. Developing recipes that have high biosourced material content, high impact resistance, proper viscoelastic properties, and fully compostable chemistries is principally important. Free standing monoliths of polyurethane foams will be prepared using a counter rotating mixer. The degree of functionality of the polyol and isocyanates, catalyst loading and type, viscosity modifiers, surfactants, and fillers of the formulations will be systematically varied to determine optimal cream and rise times and thermomechanical properties. Dynamic mechanical analysis and rheological measurements will be used to probe foam kinetics and tune material moduli (1 kPa – 1 MPa) over shipping temperature ranges, approximately -30

°C – 70 °C. Foam uniformity will be assessed by optical and electron microscopy.

Green Greenhouses: An Application of Energy Informatics

Nadine Fares, CURO Research Assistant
Dr. Richard Thomas Watson, Management Information Systems, Terry College of Business

In order to feed a growing and wealthier population within the next 30 years, food production must increase by an estimated 70 percent. Controlled-environment agriculture (CEA), such as indoor farms and greenhouses, is a key path to increasing food production; however, the industry's current practices can require considerable energy to power artificial lighting to maintain plant growth on overcast days to meet production schedules. This system is inefficient, resulting in energy waste and higher operational costs. Phytosynthetix has developed controllable LED lighting, in conjunction with the University of Georgia's Horticultural Physiology Laboratory, which uses a built-in light intensity sensor to set the level of artificial light to maintain plant growth when natural lighting falls below a plant's threshold needs. We are working with Phytosynthetix to build a discrete event simulator to understand how to create an effective information system to minimize the cost of electricity for a CEA while meeting plant production schedules. Sensitivity analysis of this simulation model will help us to identify horticultural studies to gain a greater understanding of the critical determinants of plant growth. We also intend to use the model to refine methods for descriptive analytics (plant database), predictive analytics (energy price and solar radiation forecasting), and prescriptive analytics (portfolio management). By running simulations using R, we have estimated over 90% decrease in electricity costs by using the smarter model instead of traditional lighting. If implemented, this project could contribute monumentally to food security and sustainability, which are necessary for our developing world.

Effects of Microbe Activators in an Organic Agricultural System

Brendan Fatzinger, CURO Research Assistant
Dr. Elizabeth Little, Plant Pathology, College of Agricultural and Environmental Sciences

In organic agriculture, maintaining plant health depends on soil microbial biodiversity. Soil microbes are important for nutrient cycling, pathogen suppression, and soil quality. The primary means of maintaining soil microbial populations is the periodic application of composted plant and animal wastes. In addition, commercial preparations are available which claim to enhance the activity of beneficial microbes. This study will assess the effectiveness of specific homeopathic preparations on soil microbiological activity and plant health. The project will be conducted at the UGArden on the UGA campus. The experiment consists of two different rotations, either cool season vegetables with a summer cover crop or warm season vegetables with a winter cover crop. All crops will be grown using organic methods either with or without the additional preparations. Basal soil respiration CO2 output from each experimental replication will be measured using alkali traps and titration. Populations of free-living and parasitic nematodes will be counted and specific microbial communities will be identified using gene amplification. Plant health will be quantified based on the severity of selected diseases and on growth parameters such as harvest weight and quality. Base line measures of soil microbial activity will be determined at the beginning of the experiment and repeated at the end of each cropping season. The long term goal is to identify practices that increase productivity and sustainability in organic agriculture.

Techno-Economic Assessment of Anaerobic Digestion Technology to Produce bioCNG

Carter Fitzgerald, CURO Research Assistant
Dr. Sudhagar Mani, Chemical, Materials, and Biomedical Engineering, College of Engineering

Animal manures, food waste and lignocellulosic biomass can be anaerobically digested into biogas, a mixture of carbon dioxide and methane. Anaerobic digestion is the series of biological processes where organic material is broken down by microorganisms, particularly methanogenic bacteria, in the absence of oxygen. The biogas can

be cleaned and compressed to produce compressed natural gas (CNG), or compressed even further to form liquid natural gas or burned to produce heat and power. The digested organic material can be used as compost or as fertilizer. The main objectives of this study were to develop a process simulation model to convert organic materials into bioCNG via anaerobic digestion technology and to evaluate the economic feasibility of producing bioCNG. An anaerobic digester plant capacity of 100 tons/day was simulated to produce biogas using a Superpro designer software platform. The biogas was cleaned and compressed to produce bioCNG. A detailed mass and energy balance was conducted and used for estimating the economic analysis. Finally, the capital expenditure, operating cost and the minimum selling price of bioCNG were calculated and compared with market price. A detailed sensitivity analysis was conducted to evaluate the impacts of process and plant parameters to minimize the energy cost of CNG. The developed model can be used for conducting the economic feasibility of small to medium scale biogas plants in the US.

Take Me Out to the Ballgame: A Legal Examination of Spectator Injury Risk at Major League Baseball Games

Zack Flagel, CURO Research Assistant
Prof. Nathaniel Grow, Insurance, Legal Studies, and Real Estate, Terry College of Business

Each year, over 1,750 fans attending Major League Baseball (MLB) games are severely injured by foul balls, a worrisome statistic that has increased each year. Despite this alarming trend, MLB does not currently have a standardized policy that requires ballparks to have nets protecting fans from foul balls flying into the stands. As such, fans sitting in the Danger Zone, areas of the ballpark that have increased in danger over time, often do not have such protection and are at risk to injury. Legally, however, MLB has no motivation to make any change due to a protection in the American legal system known as the "Baseball Rule," which essentially assigns full liability of any injury to the spectator (and zero responsibility of liability to MLB) due to the inherent risk of attending a game. The only exception to this rule is if the injury occurs in the "most dangerous part of the ballpark," historically considered only to be the area behind home plate, which already has protective netting in every MLB ballpark. Presenting original research on several quantitative factors that have increased the degree of spectator risk in the Danger Zone over time, this paper argues that the "most dangerous part of the ballpark" has expanded, and consequently should be reflected in decisions by American courts. However, until courts change their position on the "Baseball Rule," MLB is unlikely to change their policy on protective netting anytime soon, and the risk of injury by a foul ball will remain.

Volumetric Muscle Injury on Mitochondrial Function

Alexandra Bronwen Flemington, CURO Research Assistant
Dr. Jarrod A Call, Kinesiology, College of Education

Volumetric muscle injuries sustained during combat cost the Department of Defense a total of $42.4 billion a year. Currently, the specific pathophysiology of such an injury is unknown. This lack of knowledge leads to inadequate rehabilitation and recovery for patients. The primary objective of this study is to determine how the mitochondria of these injured cells are affected. We hypothesize that by determining the mitochondrial enzyme activity, specifically citrate synthase, in the muscle during the first couple of weeks post-injury, we will gain a better understanding of what occurs physiologically following such an injury. To determine mitochondrial enzyme function, we will perform a citrate synthase assay on the muscle samples. We first homogenize each sample in phosphate buffer and then freeze-thaw each one three times. We then dilute each sample and add an oxaloacetate solution in order to start the enzymatic reaction. We will then put the sample along with the oxaloacetate solution in a spectrophotometer while the reaction is occurring. The spectrophotometer will take readings at 412 nm every 15 seconds for 3 minutes. These readings are then used to determine the activity of the citrate synthase enzyme in the mitochondria of the injured muscle. Overall, we hope to clarify how the injury affects mitochondrial function, thus indirectly studying the effect on the rate of muscle recovery. We hope to apply this new knowledge to the creation of innovative and effective

rehabilitation programs for victims of volumetric muscle injuries.

Biophysical Properties of Pectins Isolated from Seed Mucilage of *Arabidopsis thaliana* Wild-type and gaut11-2 Mutant Plants

Haley Folmar, CURO Research Assistant
Dr. Debra Mohnen, Biochemistry and Molecular Biology, Franklin College of Arts and Sciences

Pectin is a complex polysaccharide used extensively in the food and nutraceutical industries. Analysis of the biophysical properties of pectin from wild type and mutant plants will provide information on molecular targets in pectin structure that can be modified to enhance its properties for industrial materials applications such as food packaging. To test this, we are studying *Arabidopsis* seed mucilage, a source of pectin-rich fibers. Our earlier studies showed that mucilage from the *Arabidopsis* Galacturonosyltransferase (GAUT) 11 mutant (gaut11) is more easily released from seeds compared to mucilage from wild type (WT) seeds. We hypothesize that the lack of a functional GAUT11 pectin biosynthetic protein in the gaut11 mucilage leads to structural changes in pectin that result in changes in mucilage release compared to WT. To study the relationship between the physical properties and structure of pectin in wild type versus gaut11 mucilage, we isolated pectin from mucilage of both types of seeds. We fractionated the isolated mucilage over a diethylaminoethyl (DEAE) cellulose column with the goal of comparing the physical and structural properties of the different pectic components in the WT and mutant mucilage. Both types of fractionated mucilage will be analyzed for adhesion, thin film generation, and nanofiber formation properties in collaboration with Dr. Sergiy Minko's laboratory. We hypothesize that pectin from gaut11 may not exhibit the same adhesive properties as pectin from the WT. The significance of the results in regards to functional properties of pectin that may have applications in the materials area will be discussed.

Dialect Variation in the American South

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

There is not just one Southern accent. People from different states, social classes, and centuries may all sound Southern despite their speech having few features in common. Understanding the differences between the many accents of the South is a vital step towards understanding the peoples of the region. This project uses data from the Digital Atlas of Southern Speech to investigate how vowel pronunciation varies among populations of the American South. The vowel features to be examined will include the "Southern Shift," whose features are often perceived as the "Southern Drawl," and the pin-pen merger, a sound change in which the distinction between words like pin and pen, and tin and ten is lost. Phonetic analysis will be carried out on over 16,000 acoustic measurements. Then, tests will be run to compare measurements across demographic lines. Significant differences are expected to be found in participation in both of these sound shifts based on the race, gender, and age of the speaker. It may be possible to determine the chronological or social origins of these changes by examining differences in pronunciation across groups in the sample. Examination of how these sound changes spread throughout the region may reflect how the different speech communities of the South interact with and influence each other. The ultimate goal of this investigation is to determine which dialect features, if any, are common throughout the South, and which features serve to differentiate linguistic communities within the region.

A Novel Porcine Model of Vascular Cognitive Impairment Demonstrates Changes in Cerebral Blood Flow and White Matter Tracts

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

Recent studies anticipate the prevalence of dementia will increase by three hundred percent in the next three decades. Almost all aging adults develop cerebral white matter damage that is

linked to poor blood supply, which progresses and leads to symptoms ranging from mild cognitive dysfunction to severe vascular dementia. Although there is no preventative treatment for dementia, preliminary results of remote ischemic conditioning (RIC) show promise of decreasing white matter damage by increasing cerebral blood flow. Most animal models of dementia use rodents, which are inadequate due to the extreme cerebral differences between humans and rodent species. For this reason, it is necessary a model more similar to the human brain is developed to test RIC treatment for vascular cognitive impairment (VCI). The aim of this study was to develop a chronic hypoperfusion porcine model to more adequately mimic dementia in humans. In order to decrease cerebral blood flow and induce corresponding white matter lesions, bilateral vascular constrictors were placed on the common carotid arteries (CCA). The efficacy of these constrictors and the resulting hypoperfusion model were studied using magnetic resonance imaging (MRI), diffusion tensor imaging (DTI), magnetic resonance angiogram (MRA), and arterial spin labeling (ASL) sequences pre-VCI induction and 4 weeks post-VCI induction. These sequences revealed thar gradual bilateral constriction of the CCAs resulted in a global decrease in cerebral blood flow and compromised white matter integrity. These findings suggest that bilateral vascular constriction of the CCAs produce a reproducible potential porcine model of VCI.

University of Georgia Amending and Roll Call Project

Ryan Freeman, CURO Summer Fellow
Dr. Michael S Lynch, Political Science, School of Public and International Affairs

As measured by roll call voting behavior, congressional polarization is up to the highest levels since the Civil War. As a result, congressional approval ratings are extremely low. While interest groups on both sides of the aisle have begun to research methods to fix the problem, there is comparably little scholarly research into Congressional institutions in recent decades. Moreover, the little work that exists focuses on existing data from roll call voting patterns of members. Oftentimes, these votes are taken out of context and no additional details regarding lawmaking are provided. My research proposal seeks to fill in some of these gaps. I have been working with the University of Georgia Amending and Roll Call project. This is the first systematic effort to model the roll call generating process. Professors Madonna and Lynch have headed the project to code data on all amendments to landmark enactments. It has shown a sharp increase in votes on "messaging" amendments. These are amendments offered solely for the purpose of putting partisan opponents on record, with little policy success. This may serve to artificially increase polarization. The information being looked at comes from *The Congressional Record*. We record data on the type of amendment, the party of the politician offering the amendment, the type of vote that was taken, the number of yeas and nays (if applicable), and whether or not the amendment passed or failed among other things.

White Matter Integrity Decreases Similarly with Age between People with Schizophrenia and Healthy Individuals with Low Cognitive Control

Emily Elizabeth Gale, CURO Research Assistant
Dr. Jennifer McDowell, Psychology, Franklin College of Arts and Sciences

Schizophrenia is a complex psychiatric disorder that may be indicated by positive symptoms, including delusions, disordered speech, and impaired cognitive control. Recent studies suggest that these cognitive deficits may be related to alterations of neural white matter. In the superior longitudinal fasciculus (SLF), a white matter tract that has been linked with cognitive control, white matter integrity (WMI) is decreased for people with schizophrenia relative to healthy people with high cognitive ability. Both WMI and cognitive control are known to decrease with age in healthy people, but little is known about how aging changes these in people with schizophrenia. This study sought to identify whether neural WMI is affected similarly by age in individuals with schizophrenia and healthy people with comparable cognitive function. Diffusion-weighted imaging was used to assess WMI in 26 participants with schizophrenia and 26 healthy participants with low cognitive control, who were further subdivided into younger (19 to 35) and older (44 to 63)

groups. Regions of interest were drawn on individual brain images to isolate left and right SLF. Measurements of fractional anisotropy (FA, an index of WMI) were then obtained and compared between groups. This analysis demonstrated no significant interaction between diagnosis and age. These results suggest that regardless of diagnosis, decreases occur in older individuals, and regardless of age, decreases occur in individuals with schizophrenia. Both diagnostic groups seem to age similarly, which suggests that decreases in schizophrenia are likely disease-specific rather than related to cognitive control ability.

Effects of Acid Rain on *Brassica rapa*

Luke Gamblin, CURO Research Assistant
Dr. Ford Ballantyne, Ecology, Odum School of Ecology

Acid rain is characterized as precipitation which has pH values that are lower than those of normal rain (<5.5). This increased hydrogen ion concentration is typically caused from the diffusion of industrial waste into the atmosphere. This research project is aimed at further understanding the effects of acid rain on plant life history through the manipulation of *Brassica rapa* (mustard plant) by using varying acidities of "rain" water. The experiment will consist of 4 experimental groups of *Brassica* which will each be watered solely with its corresponding "acid rain" solution. The solutions have pH values of 2.5, 3.5, 4.5, and 5.5, with the 5.5 solution being the control for naturally occurring rain. Every plant in the experiment will be watered with the same amount of corresponding solution (as needed), and each plant will be measured every other day for 45 days. Measurements will include stem height, leaf count and length (from stem), flowering time (# of days to first flower appearance), and number of seeds produced. Additionally, a general assessment of each plant's health will be made throughout the experiment. In general, it is expected that those plants which are watered with low pH "acid rain" will grow slower, be less healthy, and produce fewer seeds. These findings will be important because they will provide data for the probable detrimental effects of acid rain on plant life history, which could be broadly extrapolated to agricultural practices in those areas which are subject to acid rain.

Fighting a Pathogen with Its Own Medicine: Enzymatic Preparation of Carbohydrates for Effective Immune Response

Nikhil Reddy Gangasani, CURO Honors Scholar, CURO Research Assistantship
Dr. Fikri Avci, Biochemistry and Molecular Biology, Franklin College of Arts and Sciences

Pneumococcal diseases like pneumonia are currently a major global health issue. Caused by *Streptococcus pneumoniae* bacteria, these diseases are responsible for up to 1.6 million annual deaths globally, according to a World Health Organization estimate. In particular, *S. pneumoniae* serotype III (*Pn3*) has increasingly victimized children under the age of five, who represent about half of global victims. The worldwide proliferation of microbial resistance to antibiotics accentuates the need for more effective pneumococcal vaccines. Glycoconjugate vaccines, composed of carbohydrates linked to carrier proteins, alleviate this issue. The *Pn3* bacterium expresses a carbohydrate coating on its microbial surface called a capsular polysaccharide (CPS). Breaking down this long, complex *Pn3* CPS into smaller fragments of suitable size and composition provides an appropriate carbohydrate source for studying how glycoconjugate vaccines activate a protective immune response against *Pn3* CPS. In 1931, a bacterium called *Bacillus circulans* was observed to generate an enzyme which degrades *Pn3* CPS into smaller fragments. Through experimentation, we purified the *B. circulans* enzyme and determined its size, studied the interactions between the enzyme and *Pn3* CPS, and determined the means of CPS degradation. Furthermore, we established ideal conditions for the enzymatic degradation of *Pn3* CPS, and confirmed the sizes of the main degradation products. Utilizing what is now known about *Pn3* CPS and the *B. circulans* enzyme that degrades it, future research efforts will work towards creating a means of effective protection from the harmful *Pn3* bacterial pathogen.

Fake News: The New Propaganda Machine

Jessica Garcia, CURO Research Assistant
Dr. Audrey Haynes, Political Science, School of Public and International Affairs

Throughout history, those fighting in the political trenches have found methods to manipulate the public to behave in ways to benefit the propagandist rather than the public. Often this manipulation has been through the use of campaign ads, jingles, and whisper campaigns. In 2016, the emergence of the widespread use of "fake news" created concern among those who study American politics. While "fake news" is not new, the significant increase and the political nature of this recent manifestation is concerning. There has been little systematic analysis of the "fake news" that has made its way into the political dialogue. While we know the dispersion of "fake news" surpassed mainstream, vetted news on social media platforms such as Facebook and Twitter, we have little understanding of what "fake news" usage really looked like. What were the sources, targets, and messages conveyed by this "fake news?" By exploring this data systematically, we can make better assessments and projections about the likely impact of this "fake news." We conduct this exploration by analyzing politically-related fake news stories generated during the 2016 campaigns and during the two months after the presidential inauguration. We have gathered information on "fake news" from this period through archived "fake news" on the Snopes.com website, and we have supplemented this data with additions gathered through our own searches. We use this data to explore patterns found throughout the "fake news" universe and discuss the implications of these patterns on the future of American political campaigns and policy-making.

Overexpression and Characterization of Two Pectate Lyases from *Paenibacillus amylolyticus*

Rebecca Marie Gardner, CURO Research Assistant
Dr. Joy Doran Peterson, Microbiology, Franklin College of Arts and Sciences

Cellulosic ethanol is an alternative fuel which has the potential to be cheaper than corn-based ethanol and cleaner than petroleum. However, further improvement in ethanol yields and reduction in cost is necessary for cellulosic ethanol to become a renewable fuel on a global scale. Many agricultural wastes used in cellulosic ethanol like citrus peels and sugar beet pulp are rich in pectin, a plant polysaccharide in the cell wall that provides structure. Pectinases such as pectate lyases degrade pectin and are conducive to higher ethanol yields for these pectin-rich biomasses. Besides cellulosic ethanol, pectinases are useful for other industries like textile manufacturing and food processing. Despite this, pectinases lack the research that other enzymes have received. *Tipula abdominalis* larvae can degrade cellulosic biomass due to bacteria in its hindgut. One bacterium which does this is *P. amylolyticus*. Two pectinases found in *P. amylolyticus*, PelA and PelB have previously been characterized and demonstrate activity on a broad range of pectin, singlehandedly doing the work of multiple pectinases. In fact, PelB has been used successfully to ferment cull peaches. An analysis of the genomic sequence of *P. amylolyticus* identified two additional pectate lyases. These two lyases, pamy_1763 and pamy_4669, will first be heterologously expressed in *Escherichia coli* KRX. Pectate lyase assays will then be used to identify optimum temperature, pH, etc. It is likely that the lyases will require calcium ions, prefer an alkaline pH, and have a broad substrate range similar to the two previously characterized pectate lyases in this system.

Determining Fidelity of the Physical Activity and Learning (PAL) Program

Catriona Geddes, CURO Honors Scholar, CURO Research Assistant
Dr. Jennifer L Gay, Health Promotion and Behavior, College of Public Health

Evidence suggests that being physically active can increase academic achievement, and that encourage giving children access to environments that allow them to play, run around, and interact socially with their peers. The Physical Activity & Learning (PAL) Program looks directly at the effect that physical activity can have on mathematic and reading skills in elementary school students. Each year, sixty 2nd-5th grade students from two elementary schools participate in PAL. Students are selected based on academic, behavioral, and social characteristics. One area that can impact PAL effectiveness is implementation, or how closely teachers follow the lesson plans, student engagement, attendance, and participant satisfaction with PAL. Preliminary analyses were conducted to examine fidelity in PAL. Choral reading is the most frequently used

teaching strategy, followed by partner reading. Addition was the most covered skill in math. Separate one-way ANOVA models tested differences in fidelity for teaching, student learning, and engagement by subject matter. Fidelity scores for teaching, student learning, and engagement were high relative to the maximum possible score. There were no significant differences in fidelity across PAG, reading, and math ($p>0.05$). This means that teachers follow the objectives of the program similarly across subjects. Future analysis will include the full implementation score, incorporating attendance and participant satisfaction. Associations between implementation and achievement in math and reading will be examined. Programs like PAL have the potential to improve academic achievement for children. Tracking program implementation is important to understand the relationship between PAL and academic learning.

Characterization of Causative Mutations in OGT for XLID

Stephan Nicholas George, CURO Honors Scholar, CURO Research Assistant
Dr. Lance Wells, Biochemistry and Molecular Biology, Franklin College of Arts and Sciences

Approximately 1% of the global population is affected with intellectual deficiency, with males affected more than females. Approximately 5-10% of male non-syndromic cases have been attributed to abnormalities in the X chromosome. Recently, 7 missense mutations (L254F, A259T, R284P, A319T, E339G, T570A, Y835C) in the X-linked O-GlcNAc transferase (OGT) gene have been designated causative for the disorder. OGT catalyzes the reversible transfer of the glycan N-acetylglucosamine (GlcNAc) from UDP-GlcNAc to serine and threonine residues on its nuclearcytoplasmic and mitochondrial substrates, while the enzyme O-GlcNAcase (OGA) reverses this process. UDP-GlcNAc is a byproduct of the hexosamine biosynthesis pathway, of which approximately 5% of cellular glucose levels is directed. Thus, O-GlcNAc cycling by OGT and OGA affects cellular functions such as transcription, translation, cell cycle regulation, and proteostasis in a nutrient dependent manner. Consequently, abnormalities in O-GlcNAc cycling have been linked to diabetes, XLID, cancer, and Alzheimer's disease. The goal of this project is to determine how each OGT mutation impacts cellular function to arise in the disorder's phenotype. To accomplish this, the OGT variants will be biochemically examined with respect to stability/activity/kinetics by defining the altered interactome of the OGT mutants using common quantitative glycoproteomic approaches. Preliminary data suggests that altered cleavage of host cell factor C-1, a cell cycle regulator in neurons, is caused by OGT mutation. Additionally, a UDP-Glo assay found that other mutants displayed reduced glycosylation of CK2 peptide. Combined, the initial data suggest these mutations may cause XLID by impairing the catalytic and proteolytic activity of OGT.

Creation of Genetically Modified Pomgnt2-Knockout Neuro2A and C2C12 Mouse Cell Lines by CRISPR/Cas9 Gene Targeting to Further Understand Dystroglycanopathies

Umar Muhammad Ghilzai
Dr. Aaron Beedle, Pharmaceutical and Biomedical Sciences, College of Pharmacy

Pomgnt2 is a protein that plays a vital role in the glycosylation of α-DG, which is a protein found on the cellular membrane of many cells as a component of the dystrophin glycoprotein complex (DGC). α-DG has the important role (among others) of cell to matrix signaling through the binding of extracellular proteins. A specific type of secondary dystroglycanopathy can arise due to mutations within the Pomgnt2 gene that results in the hypoglycosylation and reduced binding capabilities of α-DG. To expand research into the study of secondary dystroglycanopathies, we developed Pomgnt2-knockout neuroblastoma and myoblast mouse cell lines that will allow us to extrapolate information about the inner workings of muscular dystrophy through laboratory testing. To minimize the possibility of off-target modification of the cell lines, we have used the "nickase" Cas9 strategy with specific gRNAs. We expanded many single clonal lines for both cell types and identified Pomngt2-knockouts by Western blot analysis of α-DG glycosylation. These new Pomgnt2-knockout cell lines can now be used to understand the role of Pomgnt2-deficiency in α-DG glycosylation and functional roles for α-DG in cellular biology.

Abstracts

Analysis of Discrimination Methods for Amplifying the Microbiome from Plants

Cecelia Giangacomo, CURO Research Assistant
Dr. Jason Wallace, Crop and Soil Sciences, College of Agricultural and Environmental Sciences

In order to analyze the DNA of the microbiome from plant samples, it first must be amplified through PCR. Conserved priming sequences and small starting percentages of microbial DNA create a situation in which it is difficult to exclude plastid DNA without 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. We compared the ability of anti-chloroplast primers, blocking primers and PNA clamps to discriminate against host DNA through amplification in PCR. Each discrimination method was tested on DNA samples from leaves, soil, and a known bacterial community under standardized conditions with appropriate positive and negative controls. The resulting libraries were sequenced, and the methods compared for their ability to accurately amplify target DNA while excluding host DNA.

Probing the Structural Basis of P-Glycoprotein Transport of μ-Opioid Receptor Agonists: Methadone and Loperamide

Morgan Gibbs, CURO Research Assistant
Dr. Arthur Roberts, Pharmaceutical and Biomedical Sciences, College of Pharmacy

P-glycoprotein (Pgp) protects the brain from toxins by acting as a gatekeeper at the blood-brain barrier. Pgp also limits penetration of therapeutics including μ-opioid receptor agonists into the brain for treatment of central nervous system (CNS) diseases. Although they are structurally similar, the μ-opioid receptor agonist loperamide is effluxed out of the CNS by Pgp at four times the rate of methadone. Because of these differences, methadone and loperamide were used to probe the mechanism of Pgp-mediated efflux. We hypothesize that higher Pgp-mediated efflux rates of loperamide are the result of m.7(t)10.9h .609 0(obe)4.9( )]Tw T(t)10.op theraoid theidhn.7(g)3 to Pgk Cobef m.7(.8(nd).9(t

across the longitudinally critical weaning period, and one sample that is from the youngest individual who has the highest carbon-nitrogen ratio of all. I hope to see how exactly how fecal composition correlates to the diet. The diet of the geladas is known and there is currently isotopic carbon-nitrogen ratio data from mass spectrometry to compare the data to.

Assessment of Oxidative Stress and Serum α-Tocopherol Levels in Exercising Horses in Response to Level and Form of Vitamin E Supplementation

Maddie Gloeggler
Dr. Kylee Duberstein, Animal and Dairy Science, College of Agricultural and Environmental Sciences

Vitamin E is an essential antioxidant found primarily in fresh forages and commercial equine feed rations as synthetic all-rac-α-Tocopherol acetate. This study aimed to compare natural to synthetic forms of vitamin E, and determine if supplementing above NRC recommendations is beneficial to exercising horses. Following a 14 day washout period, 18 horses were divided into three treatment groups and fed the control diet plus (1) synthetic low (SYN-L), 1000 IU synthetic α-Tocopherol acetate/d, or (2) synthetic high (SYN-H), 4000 IU/d synthetic α-Tocopherol acetate, or (3) natural (NAT), 4000 IU/d micellized RRR-α-Tocopherol. After a 7 day acclimation period, horses began a 6 week exercise protocol, with standard exercise tests (SET) performed prior to and at the conclusion of the 6 week exercise protocol. Resting, pre-feeding blood samples were collected at days 14, 21, 42 and 63, as well as 2 hour pre- and post-SETs. Initially and at pre-SET1, no differences in serum α-Tocopherol were seen across treatment groups. At all other time points, NAT horses had higher serum α-Tocopherol compared to SYN-H and SYN-L ($P<0.05$). No differences were noted between SYN-H and SYN-L. Pre SET1, NAT had lower protein carbonylation compared to SYN-L ($P=0.048$). Only NAT horses showed a significant increase in protein carbonylation post exercise for both SET1 and SET2 ($P=0.0004$). SYN-L and SYN-H horses showed a tendency ($P=0.066$) to increased protein carbonylation post SET2 only. Results indicate that natural vitamin E is superior to synthetic in maintaining serum α-Tocopherol levels in response to exercise and resulted in increased protein oxidation post exercise.

Goethe's Discovery of the Divine in Nature

Anna Magdalena Goebel
Dr. Martin Kagel, Germanic and Slavic Studies, Franklin College of Arts and Sciences

Johann Wolfgang von Goethe (1749-1832), a German writer and a natural philosopher, spent much of his life studying nature and attempting to understand the emotions it evoked in him by focusing on the human perception of nature. Through his literary works he strived to understand and explain the divine that was hidden in the complexity and depth of the natural world around him. Examining Goethe's novel, *Elective Affinities*, autobiography, *From my Life: Poetry and Truth*, and poem, "On the Divine," my paper argues that Goethe found the divine in the orderliness that nature possesses. He is able to make sense of the world around him using a God manifested in nature's structure rather than the traditional Christian God image. In the poem "On the Divine," nature isn't able to distinguish between the good and the evil, treating everything as equal. This impartial characteristic makes it predictable, running its natural course, unable to be stopped by anyone. In Goethe's novel *Elective Affinities*, nature's order is continually established through the application of natural sciences, equating human relationships with simple chemical reactions. In his autobiography *From my Life: Poetry and Truth*, Goethe allows us to trace his discovery of the "Erhabenen" (the sublime); the connection he makes between the divine and nature's impact on him. By offering his readers insight into the orderliness of nature, Goethe shows us that God is embodied in nature and that the divine is actually all around us. This belief ultimately let him make sense of the complex idea of God.

Limb Elevation as a Model for Peripheral Arterial Disease

Shaun Goh, CURO Research Assistant
Dr. Kevin McCully, Kinesiology, College of Education

Prior studies have shown that limb elevation can decrease blood flow to the elevated muscle, similar to reductions seen in peripheral arterial disease (PAD) patients. The purpose of this study was to test if limb elevation can be used as a model for PAD and to look at the effects of oxygen saturation on the endurance test developed by the lab. Experiments consisted of an endurance test with oxygen saturation monitoring, followed by reperfusion and mitochondrial capacity tests. The endurance index (EI) was measured using accelerometry and electrical twitch stimulation. Blood flow and mitochondria capacity were measured using the rate of recovery of oxygen consumption through near infrared spectroscopy (NIRS). The mean EI after 6 Hz between 2 cm and 60 cm was 79.5 $\pm$ 8.6% and 74.4 $\pm$ 18.3% (p=0.09). The end of exercise oxygen saturation showed no significant differences with levels of 52.9 $\pm$ 12.4% and 49.7 $\pm$ 42.7% for 2 cm and 60 cm (p=0.42). Oxygen delivery was slower during the elevated condition (p=0.04) with time to half magnitudes of 11.3 $\pm$ 3.3 seconds versus 23.4 $\pm$ 16.2 seconds for 2 cm and 60 cm. Mitochondria capacity across both elevations were similar with rate constants of 2.8 $\pm$ .4 at 2 cm and 2.9 $\pm$ .4 at 60 cm (p=0.38). Conclusively, limb elevation is a limited model for PAD from a functional standpoint, but is reflective of previous blood flow and mitochondria capacity measurements. It may also provide validation for the accelerometer endurance test based on its relationship to oxygen levels.

The Convergence of Quantum Physics and Religious Mysticism

Kalvis Golde, Foundation Fellow
Dr. David Williams, Religion, Franklin College of Arts and Sciences

Science and religion engage in vigorous debate over truth about the universe. Today, however, there is evidence that religion and science are converging to a similar truth, while claiming to progress in opposite directions. Quantum physicists and religious mystics both agree that interconnectedness is a basic truth of our universe; each also believes that the other's methods should fail to produce valid understanding of any sort. This research investigated questions addressed by both quantum physics and religion, including Hinduism, Buddhism, Judaism, and Islam, especially forms of mysticism. It determined that the convergence of these intellectual traditions is real and significant, not a superficial phenomenon. The research then compared fundamental assumptions of both groups to discern why their divergent methods have arrived at a similar picture of reality, in particular the idea of an interconnected universe. Two possible conclusions were drawn. The convergence of physics and religious mysticism may foreshadow a new understanding of the universe based firmly on interconnectedness. Alternatively, the assumptions of both physicists and mystics are so rife with implication for their respective searches for truth that this agreement may push one branch into a crisis and spark a revolution in thinking among its members.

Concrete Art and Fascism in Argentina in the 1940s

Nina Goodall
Dr. Nell Andrew, Art, Lamar Dodd School of Art, Franklin College of Arts and Sciences

In the summer of 1944, a magazine called *Arturo: Revista de Artes Abstractas* ran for a single issue in Buenos Aires, Argentina. Although short-lived, this magazine signaled the formation of a group of artists intent on exploring invention and abstraction in art and denouncing the traditional picture frame. The group was interested in the European style of abstraction that offered a new language through the abandonment of representation. After an exhibition in 1945 at the Galería Comte in Buenos Aires, the Asociación Arte Concreto Invención (AACI) was created. Using their art to showcase their political aspirations in regard to the newly formed regime of Juan Perón, the group believed abstract art could unite and be understood by all people, and therefore, be used to better the world. They looked to the European tradition of abstraction, but this political purpose for abstraction was a uniquely Argentine invention. This paper will explore how and why the group used the artistic technique of geometric abstraction to display their Communist values. It will also examine not only how the AACI and the future of Argentine abstraction were affected by the government censorship of Perón but how the group was successful in their resistance to the fascist dictator.

Characterization of Antibody Response and Cell-Mediated Immune Response to Seasonal Influenza Vaccination

Connor Grady, CURO Research Assistant
Dr. Ted M Ross, Infectious Diseases, College of Veterinary Medicine

Influenza virus infection is a disease of global concern, causing significant morbidity and mortality in many individuals. Annual seasonal influenza vaccination is the most effective way to reduce the risk of acquiring infection and is recommended for all individuals 6 months and older. A robust cell-mediated immune response to influenza infection is necessary for viral clearance and recovery. The purpose of this study is to quantify the frequency of CD154/$CD4^+$ and $CD8^+$ T cells, CD27 memory B cells, CD138 plasma cells, CD107a Natural Killer cells, $CD11b^+$ myeloid-lineage cells, and immunoglobulin lymphocytes derived from human peripheral blood mononuclear cells before and after influenza vaccination of a split inactivated tri/quadrivalent intramuscular vaccine. By using flow cytometry, cell populations can be analyzed by comparing cell frequencies before vaccination and 21 days post-vaccination. These cell populations can then be compared to antibody titers, determined by hemagglutination inhibition assay, against the strains included in the vaccine along with historical influenza strains to determine if there is a correlation between humoral and cellular immune response. Based on prior studies, it is expected that the frequency of all cells assessed will increase in response to influenza vaccination and that HAI titers will positively correlate with immune cell populations.

Reducing Homelessness in Atlanta

Ammishaddai Sully Grand-Jean
Dr. Christopher Cornwell, Economics, Terry College of Business

There are over 6,000 homeless people who reside in the City of Atlanta. Each homeless person costs tax payers about $40,000 a year, which includes emergency visits, prison, and police activities. Since homeless people do not own homes, it is difficult for them to obtain jobs and, as a result, they are trapped in the cycle of poverty. Homelessness doesn't only negatively affect the homeless, but also businesses and the local economy. Atlanta already has transitional housing programs that put homeless people in shelters that give them skills to prepare them to go back in the workforce and become home owners. Still, there are not enough resources available to reach the total homeless population. There are three policies that can positively aid in the reduction and prevention of homeless people in Atlanta: tax breaks offered by the state & local government for businesses who hire homeless people for at least 6 months; increased taxes on citizens and businesses that make $1 million or more a year and use the revenue to increase the reach of the current initiatives to reduce homelessness; and housing homeless people in the 46,000 vacant homes in Atlanta. Housing homeless people will prove to be best in reaching the total homeless population and is the most cost-effective and efficient out of the three policies. Atlanta should move to use its vacant homes to house homeless people and thus reduce the many costs that homeless people bring on the city.

Performance on a Measure of Multitasking is Related to Executive Function in Older Adults

Maria Granros, CURO Research Assistant
Dr. Steve Miller, Psychology, Franklin College of Arts and Sciences

Current research suggests that cognitive training may retard decline in attention, memory, and executive functions in older adults. Age related decline is normal for both mildly cognitively impaired and healthy older adults. Executive functions are the skills necessary for organization, execution of goals, and inhibition of compulsory actions. Specifically, executive dysfunction demonstrates difficulty in multitasking activities of everyday life. To examine the relationship between executive functions and performance on a task representative of multitasking abilities, a sample of older adults (n=20) played *Neuroracer*, a video game customized to train, challenge and measure multitasking ability over 12 visits, completing 20 trials each visit. The game required participants to drive a vehicle on a road while periodically and simultaneously responding to interjected symbols on the driving screen field. The difficulty level of each trial run changed specific to each participant using an algorithm that considered performance

on previous runs. The executive performance status of the participants was assessed using validated measures including DKEFS subtests Verbal Fluency, Color Word, and Trails DKEFS as measures of executive function. Correlation revealed that average latency did not correlate with the DKEFS measures (n(18)=-.300, p= .106). However, DKEFS scores were significantly related to average driving accuracy (n(18)=.594, p=.004) and final difficulty level (n (18)= .507, p= .011). Findings suggest that successful multitasking may be dependent on executive functioning. Findings thus support the testing of multitasking interventions as tools for cognitive enhancement in older adults.

Design of Gallate-Based Persistent Phosphors in the Short-Wave Infrared Region

John Green II, CURO Research Assistant
Dr. Zhengwei Pan, Environmental, Civil, Agricultural, and Mechanical Engineering, College of Engineering

Persistent luminescence is the ability of a material to continuously emit light after the excitation is ceased. This capability has had many breakthroughs in recent years, specifically with the persistent luminescence in the near-infrared (NIR; ~700–900 nm) and short-wave infrared (SWIR; ~900–1700 nm) spectral regions. Both NIR light and SWIR light are not visible to naked eye. Although significant progress has been made in NIR persistent luminescence, the research in SWIR persistent luminescence is particularly lacking and is where my research takes place. SWIR persistent luminescence can be applied in the field of biomedical imaging, photovoltaics, and night-vision. Rare-earth metals are the main emitters used in SWIR persistent phosphors because of their unique energy-level structures suitable for emitting SWIR light. This research lab particularly deals with gallate-based phosphors (gallium oxide compounds) that have appropriate electron traps to store excitation energy and subsequently release the energy to emitter. The goal of this research is to develop optimal SWIR persistent phosphors with the ability to give long and strong SWIR persistent luminescence emission.

Influence of Corrective Exercise Compliance on Physical Activity Levels and Perceived Functional Abilities

Morgan Green, CURO Honors Scholar, CURO Research Assistant
Dr. Cathleen Brown Crowell, Kinesiology, College of Education

One potential cause of physical inactivity, a leading risk behavior for many chronic diseases, is a history of athletic injury. Little research exists on how physical activity levels and perceived functional abilities change after injury. This study aims to determine if a corrective exercise program intervention, provided with minimal supervision, alters perception of function and sport participation after injury. By monitoring changes in physical activity level, compliance with a corrective exercise program and perception of function, we aim to gather information to further understand how injured athletes self-select to complete rehabilitation or not, and participate in activity or not, following injury. We hypothesize injured participants will report decreased levels of physical activity and an associated decline in perceived functional movement ability due to pain or injury. Following baseline movement screens, college-aged club sport athletes will complete weekly surveys detailing their participation in physical activity. Upon a lower extremity injury, participants will receive corrective exercises to complete as well as an additional weekly survey to assess compliance to the intervention and overall perception of lower extremity function. Chi-square or *t*-tests will be used to compare perception of function and level of activity between those injured participants who self-select to complete the corrective exercises and those who don't, controlling for injury severity. We anticipate the compliant injured individuals will see a quicker return to normal physical activity level. Therefore, the importance of aggressive treatment using corrective exercises should be heavily stressed as a primary prevention for long-term health issues.

Regional Brain Morphometry and Associated Cognitive Functions in Older Adults with Cardiovascular Disease

Luvika Gupta

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

Cardiovascular disease (CVD) describes a range of conditions that affect the ability of the heart and vascular system to supply sufficient blood flow throughout the body. Although research studies of older adults with CVD have consistently demonstrated increased risk of neurodegenerative disease, patterns of cognitive decline, associated structural brain changes, and the relationships between them remain under investigation. The aim of this study is to examine the relationship between cognitive decline and regional brain morphometry among older adults with CVD. As part of a larger study, 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 (ROI) in the dorsolateral prefrontal cortex (DLPFC), inferior parietal cortex (IPC), and posterior parietal cortex (PPC) that have been previously implicated in morphometry studies of CVD. Group differences will be tested using an Analysis of Variance (ANOVA). Relative to controls, it is hypothesized that a) the CVD group will demonstrate lower performance on the RBANS attention and visuoconstruction composite index scores, b) the attention index will significantly correlate positively with DLPFC and IPC regional thickness, and c) the visuoconstruction index will significantly correlate positively with DLPFC and PPC regional thickness. The results are expected to increase understanding of cognitive and neural changes associated with CVD.

Effects of Lutein on Vision and Cognition in Children

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

Lutein (L) is a carotenoid found predominantly in green, leafy vegetables and brightly colored fruits. Although humans cannot synthesize their own L, consumption of L-rich foods causes L to be deposited in a variety of body tissues, such as the neural retina and the frontal and occipital cortices of the brain. In neural tissue such as retina and brain, L is thought to perform a few important functions, one of which is to directly influence neural signaling. Past research suggests that increasing dietary L levels, either by consumption of L-rich foods or via supplementation, can cause increases in neural L levels as measured in the neural retina (as macular pigment, MP). As MP optical density increases, cognitive performance also increases, across the adult lifespan. Whether or not L status relates to cognitive function in younger participants undergoing rapid neurological development is not yet known. The purpose of this study was to test this hypothesis. School aged children (7-12 years) were recruited from the Athens-Clarke and surrounding county areas. Food diaries were used to determine L-rich food intakes, and the Woodcock Johnson test battery (III) was used to measure cognitive function. Visual processing speed and reaction time were measured psychophysically, and MP optical density was also measured. Analyses are ongoing, and results will be presented at the symposium. It is hypothesized that children with higher dietary intakes of L and higher MP optical density will have improved cognitive function, reaction times and processing speeds compared with children with low dietary intakes.

Southern Gothic Feminism: The Women of Flannery O'Connor's *Wise Blood* and the Women of the Bible

Halle Brooke Hammond, CURO Research Assistant
Dr. Hugh Ruppersburg, English, Franklin College of Arts and Sciences

Flannery O'Connor's 1952 novel *Wise Blood* features three predominant female characters, Sabbath Lily Hawks, Leora Watts, and Mrs. Flood. It uses attributes of the Southern Gothic genre in addition to biblical parallels in order to outline the demise of Hazel Motes and his Church Without Christ. The objective of this research project is to analyze the three female characters of *Wise Blood* in their relationships with the men of the novel (Hazel Motes, Asa Hawks, and Enoch Emery), and in their own parallels and contrasts to various women of the Bible, but including the Old and New Testaments, Virgin Mary, and Mary Magdalene from the life of Jesus Christ. Using

several texts, including *Collected Works* edition of Flannery O'Connor's work, which includes *Wise Blood* and her letters and essays, and the Bible, this project seeks to analyze the novel's Southern Gothic attributes from a Gothic feminist perspective. The women of the Bible and specifically their sins directly parallel the women of *Wise Blood* and their contributions to the demise of Hazel Motes, including his blindness and eventual death. The use of femininity in the novel contributes to its status as a Southern Gothic work. The South and its complicated relationship with feminism relies heavily on its connection to Christian religion and culture. Flannery O'Connor's work as a Southern Gothic writer provides an opportunity to analyze the impact of this culture on the South and its women.

Religious Terrorism and Weapons of Mass Destruction

Elizabeth Alexandra Hardister, CURO Honors Scholar, CURO Research Assistant
Dr. Seema Gahlaut, Center for International Trade and Security, School of Public and International Affairs

Proponents of the theory of "new terrorism" conflate the lethality of contemporary religious terrorist organizations to a heightened motivation and capacity to create mass fatalities, and thus, greater motivation and capability to acquire weapons of mass destruction. This theory cites the cosmic worldview of religious ideology as a significant condition that legitimizes the mass casualties and destruction potentially caused by these weapons. However, literature on conventional terrorism does not uniformly support the key assumption that religiously-affiliated terrorist organizations that hold purely religious goals produce greater numbers of fatalities than those with limited, strategic goals. The functional traits of religion that increase terrorist organizations' capacity to carry out violence and could potentially facilitate the acquisition and use of WMD were identified. Additionally, in light of the view that nuclear devices present the greatest potential for the advancement of the capacity to commit violence, information on a number of attempted acquisitions of nuclear material and weapons by terrorist organizations were compiled for analysis.

Fund Balances in Georgia's Cities

Jennifer Ashtyn Hardister, CURO Honors Scholar, CURO Research Assistant
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. In this study, the various policies regarding fund balances in cities in Georgia and their compliance with these policies will be examined.

Dior to Disco: Second Wave Feminism and Fashion

Madeline Grace Harpham, CURO Research Assistant
Dr. Monica Sklar, Textiles and Merchandising, College of Family and Consumer Sciences

This research aims to establish a connection between the literature of second wave feminism, and the changes mainstream women's silhouettes undertook from the 1950s-1970s. During this time period, clothing changed dramatically; shifting from the rigid shape of the 1950s that exaggerated the female form, to the A-line, shorter mini-dress of the 60s, to the free-flowing silhouette of the hippie movement, to the streamlined androgyny of the 1970s. This study utilizes pertinent feminist literature from impactful writers such as Gloria Steinem, Betty Friedan, and Simone de Beauvoir, as well as a critical analysis of those writings, and *Vogue* magazines from the era to develop a literature review of fashion and feminism. Articles of clothing from the University of Georgia's Historic Clothing and Textiles Collection and the University of Minnesota's Goldstein Museum of Design establish the links between the messages of the media with the fashions of the time. Material culture and content analysis methods

highlight the relationship between the changing silhouettes of women's fashion in the 1950s-1970s, and the feminist movement. The transition of the fashionable silhouette for women from the feminine 'New Look' of the 1950s to the sexually ambiguous styles of the 1970s has linkages to the second wave feminist movement through literature, the fashion cycle, and cultural changes.

Do Transparent Whiteboards Promote Learning from Online Lectures in STEM?

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

The current study tested the effectiveness of the Learning Glass technology, which allows instructors to write a lecture while maintaining face-to-face contact with students using a transparent whiteboard. How do instructional methods using transparent whiteboards affect student learning in STEM subjects? To help address this question, 80 college students were asked to view a 10-minute video lecture about the human respiratory system. Participants were randomly assigned to one of two groups. Students in the conventional whiteboard group viewed the instructor draw diagrams on a conventional whiteboard, which requires the instructor to frequently turn his/her back to the camera throughout the lesson. Students in the transparent whiteboard group viewed the instructor draw the diagrams on a transparent whiteboard, which allows him/her to face the camera throughout the lesson. Participants were assessed on their understanding of the lesson both immediately and after a one-week delay. We also assessed their feelings of motivation and social engagement with the instructor. We predicted that the transparent whiteboard group would outperform the conventional whiteboard group on immediate and delayed tests of understanding. We also expected the transparent whiteboard group to report higher levels of motivation and social engagement. There is growing research that supports the idea that a direct view of the instructor may offer benefits for learning in STEM by establishing a stronger sense of social partnership with the instructor and providing better access to the instructor's eye gaze. This project will increase our understanding of how students learn from social cues in multimedia lessons.

Vector-Borne Disease Forecasting

Mallory Jessica Harris, Foundation Fellow
Dr. John M Drake, Ecology, Odum School of Ecology

Especially in resource-depleted areas, costly control efforts are often abandoned when case abatement is mistaken for true elimination. Resurgent epidemics can reverse decades of progress in disease elimination. Resurgence may be defined as a shift between two stable states: elimination and epidemic. We propose a non-parametric disease forecasting software that would detect a threat prior to the first resurgent outbreak and mobilize preemptive responses. These methods draw from the theory of critical slowing down, which states that as a system approaches the tipping point of disease resurgence, its ability to recover from slight perturbations decreases. This behavior results in characteristic changes in statistical indicators, including lag-1 autocorrelation, variance, and the first difference of variance, which can be detected as early warning signals of an approach to criticality. We apply the proposed techniques to several vector-borne disease systems. First, we develop a theoretical framework using stochastic modeling to predict the trajectory of each indicator. We quantify each test's sensitivity as the area under the receiver operating characteristic curve. Then, we validate our predictions by testing a monthly malaria data set for early warning signals of a 1993 resurgence event in Kericho, Kenya. We find that variance and the first difference of variance are promising indicators of critical transitions in vector-borne disease systems. Finally, we generate a simulation of the campaign to eliminate malaria from Haiti by the year 2020 and demonstrate how spatial early warning signal testing could facilitate more targeted, efficient interventions.

Understanding the Determinants of Seeking Medical Attention for Injury

Emma Harrison
Dr. Cathleen Brown Crowell, Kinesiology, College of Education

Multiple determinants may influence athletes to seek medical attention. However, it is unknown if athletes seek medical attention based on previous injuries. Our objective was to determine if there is

a significant relationship between frequency and severity of previous injuries with seeking medical attention for in-season injuries. Our participants were collegiate club rugby and ultimate frisbee athletes (n=39; 20 male, 19 female; age=20.8 ±1.6years, height=172.48±8.6cm, weight=74.1±15.6kg). Athletes underwent injury history screening prior to competitive seasons. Throughout the season, athletes reported injuries and specifics (e.g., date, anatomical location, type, time lost, and medical attention sought). Previous injury was defined as any self-reported, medically diagnosed injury or discomfort affecting sport participation. A point biserial correlation was used to determine association between previous injury frequency and seeking medical attention for in-season injury. A chi-square test was used to determine association between previous injury severity (>3 weeks lost) and seeking medical attention for in-season injury. There was significant correlation between previous injury frequency and seeking medical attention for an in-season injury (rpb=0.37; p=.02), as well as significant association between previous injury severity and seeking medical attention for an in-season injury (phi=0.365; p=.02). Statistically significant weak-to-moderate correlation exists between previous injury frequency and severity and obtaining medical attention for an in-season injury. Athletes who seek medical attention for in-season injuries are likely to have a previous history of athletic injuries and/or to have lost at least 3 weeks of athletic participation due to an injury.

Investigation into Surface Glycan Variation in *Campylobacter fetus* Species

Annie Hass, CURO Research Assistant
Dr. Christine Szymanski, Microbiology, Franklin College of Arts and Sciences

The *Campylobacter* genus consists of species causing periodontitis, spontaneous abortions, and diarrhea. This research focuses on *Campylobacter fetus* species known to cause spontaneous abortions in livestock and recently associated with diarrheal disease and rare cases of human fatality. The N-linked protein glycosylation (Pgl) pathway is conserved among all campylobacters and influences a wide range of cellular functions. In *C. fetus*, the biosynthetic enzymes in this pathway create one major N-glycan structure, while the enzymes from a bacteriophage operon known as gtr create a second antigenic variant of the N-glycan. Normally the gtr operon is involved in O-antigen serotype conversion of lipopolysaccharide and prevention of superinfection. In *C. fetus*, the operon appears to be mobile in the genome resulting in mixed populations of gtr positive and negative cells. We hypothesize that the mobility of the operon may be dependent on stressors such as antibiotics and that the mixed antigenic population may be beneficial for pathogenesis. We will be testing different environmental conditions, such as antibiotic stress, to see what induces mobility of the gtr operon. In parallel we will be performing mutagenesis on putative mobility factors and pgl/gtr genes to assess pathogenesis in a wax moth larvae model.

Developing a Protocol for Large-Scale Toxicity Assays Using Flow Cytometry

Cord Helmken, CURO Research Assistant
Dr. Art Edison, Genetics, Franklin College of Arts and Sciences

Caenorhabditis elegans are nematodes that have the ability detoxify the environments in which they thrive through the employment of various mechanisms. In this study, I seek to develop a protocol for large-scale toxicity assays using the Union Biometrica BioSorter and to use this protocol to assay for the detoxification ability of *C. elegans* glycosyltransferase mutant strains in response to the toxin 1-hydroxyphenazine (1-HP). Because *C. elegans* utilize glycosylation in order to neutralize 1-HP, we hypothesize that some GT mutant strains will exhibit increased susceptibility to the toxin compared to the wild type N2 strain. In this study, wild type N2 and GT mutant strain *C. elegans* were exposed to a gradient of 1-HP concentrations then treated with a fluorescent nucleotide stain and analyzed using the Union Biometrica BioSorter, a large-particle flow cytometry device. Results from this experiment will be used to assess and improve current protocols and direct future experiments focused on the glycosylation ability of *C. elegans*.

Fifty Years In: Just Warming Up: How the Nuclear Nonproliferation Treaty Can Effectively Combat Global Warming

Cameron Ward Henderson, CURO Research Assistant

Dr. Sara Kutchesfahani, International Affairs, School of Public and International Affairs

As the Nuclear Nonproliferation Treaty (NPT) nears its fiftieth anniversary, now is a critical time to reflect on the success of the treaty and where it can find new relevance in the twenty-first century. At the same time, climate change presents a newfound necessity for clean energy and international coordination. The convergence of these two events is the focus of this research. This paper attempts to fill a gap in climate policy research by analyzing how Article IV (the pursuit of civilian nuclear energy) of the NPT contains sufficient language to allow the nuclear nonproliferation regime to encourage and provide safety and security measures to respond to the global call for nuclear energy as a low carbon alternative to traditional fossil fuel power generation. Considering the ecological imperative to expand civilian nuclear power generation, the NPT will need to play a critical role in ensuring the safe transport of fissile material and the implementation of relevant security measures. The growing role of nuclear energy will present both a challenge and an opportunity for nuclear nonproliferation, but by capitalizing on the opportunity, NPT signatory states can guarantee that the NPT will maintain relevance in the twenty-first century and provide a new, more benevolent, face to nuclear energy.

Assessing Toxicity and Contamination in Lake Herrick

Sarah Hensey, CURO Research Assistant
Dr. Susan Wilde, Forestry, Warnell School of Forestry and Natural Resources

Located on the University of Georgia campus, Lake Herrick serves as a valuable recreational and institutional resource. In recent years, use of the lake by the public has been restricted due to declining water quality. High nutrient levels in storm water runoff have been linked to seasonal toxic algal blooms. This study aimed to monitor these seasonal algal blooms and assess the present levels of contamination and toxicity in Lake Herrick in comparison to previously collected data. Weekly water parameters of temperature, dissolved oxygen, and pH were recorded and water samples were screened microscopically for potentially toxic cyanobacterial species. Fecal coliform were assessed from the water samples using petrifilm *E. coli*/coliform count plates to evaluate contamination levels. In addition, toxicity was assessed through chronic and acute reproduction and survival tests of *Ceriodaphnia dubia*. We anticipated the presence of a toxic algal bloom in the warmer months of August through October but there was no persistent bloom due to a lack of rainfall events. We recorded a small-scale bloom of *Aphanizomenon* cyanobacteria, of which most forms are toxic, during October 2016. A frozen water sample from an *Anabaena planctonica* bloom (157,000 cells/mL) during a similar time in 2015 resulted in significant reductions in *Ceriodaphnia dubia* reproduction and survival in both acute and chronic tests ($p<0.05$). Our current results suggest that Lake Herrick is continuing to experience infrequent seasonal algal blooms resulting in harmful levels of toxicity. The water quality data from this study can help guide future remediation plans.

Biochemical Investigations of Congenital Disorders of N-Linked Glycosylation

Laurel Hiatt, Foundation Fellow, CURO Research Assistant
Dr. Richard Steet, Biochemistry and Molecular Biology, Franklin College of Arts and Sciences

Congenital Disorders of glycosylation are a group of rare inherited diseases caused by defects within the N-linked glycosylation pathway. Although decreased glycoprotein glycosylation is a common feature of these disorders, little is known about which proteins are most sensitive to loss of N-linked glycosylation and how the changes in glycosylation status affect their cellular function. These questions are being address utilizing new tools such CRISPR-Cas9 generated null cells for two subunits (STT3A and STT3B) of the OST complex, the enzyme complex responsible for adding N-glycans to newly synthesized glycoproteins. To profile how decreased N-glycosylation affects the cell surface abundance of glycoproteins, a new tagging methodology called SEEL (selective exo-enzymatic labeling) is being used. This method uses recombinant glycosyltransferases and biotin-modified nucleotide-sugars to tag cell surface glycoproteins via their terminal sugar chains. These glycoproteins can then be enriched, identified and

quantified to determine how impaired N-glycosylation affects their surface localization. Results to date demonstrate striking changes in the abundance of cell surface glycoproteins in the STT3A-null and STT3B-null cells. These data show that many of the sensitive glycoproteins that have been identified are involved in cell adhesion and migration including several integrins. Subsequent experiments involved performing scratch healing assays to determine whether the changes in cell surface integrins correlate with altered wound closure in the STT3A and STT3B cells. Surprisingly, it was observed that the motility of STT3A cells into the wounded area increased while the migration of the STT3B cells decreased in comparison to the wild type cells.

Investigating the Role of HPG27_395 in *Helicobacter pylori*

Jonathan David Hill, CURO Research Assistant
Dr. Timothy Hoover, Microbiology, Franklin College of Arts and Sciences

Helicobacter pylori is an Epsilon-proteobacterium that colonizes the human stomach and causes diseases such as peptic ulcers, gastritis, and gastric cancer. *H. pylori* synthesizes 2-6 flagella at a single cell pole and is necessary for colonization. In *H. pylori* strain G27, HPG27_395 is annotated as a hypothetical protein. In many Epsilon-proteobacteria, this gene is observed to be clustered with other flagella genes, and positioned immediately downstream of *flhF* and *flhG*. Both FlhF and FlhG have been identified in other model organisms to be involved in proper localization and numerical regulation of the flagellum. The role of HPG27_395 in flagella biosynthesis is currently unknown, but the relative position to *flhF* and *flhG* suggests this gene encodes a protein that is necessary for flagella biosynthesis. Therefore, I aim to identify the function of HPG27_395 during flagella biosynthesis. To begin our investigation, a counter selection method will be used to construct a HPG27_395 deletion mutant (ΔHPG27_395). Following the verification of the mutant, motility defects will be assessed using a semi-solid medium and flagella patterns will be visualized using Transmission Electron Microscopy. Subsequently, these two experiments will provide insight as to how HPG27_395 affects flagella biosynthesis and initiate future investigations.

The Necessity for Ethics in Developing Adaptive Management Strategies for Water Scarcity

Taylor Alicia Hill, CURO Honors Scholar, 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 scarce in the near future. Adaptive management is an interdisciplinary set of guidelines that are instated to formulate solutions to multifaceted issues, such as that of sustainable water management. Moving beyond an economic efficiency approach, adaptive management promotes the importance of participation, learning, and ethics. Although the importance of ethics is acknowledged, there are few empirical examples of how they may be included in water management. This project, based in the Vale do Jaguaribe and Paraiba do Sul watersheds in Brazil, applies an ethical lens as a tool in the development of water governance strategies for the basins, which face drought risks due to climate change. The goal of the current portion of the project is to develop a conceptual framework for analyzing water ethics, which will include the categories of social, economic, and ecological values. This framework will be used to assess the management settings in the two watersheds. The significance of this project is, in part, making ethics in governance explicit, rather than implicit. By making ethics explicit, not only can they be used as a framework by which to compare values in governance and as a framework in future management decisions, it also opens a forum for discussion of water values such as quality, quantity, as well as risk management regarding people, environment, and economy.

Shoring Up Dam Safety: Risk Assessment Via Simplified Inundation Mapping

Robert Erwin Hines, CURO Research Assistant
Shana Jones, Carl Vinson Institute of Government, Public Service and Outreach

Dam break emergency action plans (EAP) are essential for dam break emergency response because they allow local authorities to issue warnings to at risk areas, identify infrastructure

which may be compromised by flooding, and prepare emergency services to respond to affected flood areas quickly. Nationally, the high cost of formal, unsteady state inundation mapping studies prevents dam owners with limited resources from preparing EAPs. This study aimed to assess the capacity of simplified inundation maps to inform EAP construction. Simplified inundation maps were expected to be accurate enough for EAP development when formal, unsteady state models are unavailable. To assess simplified map acceptability, this project first compiled simplified inundation mapping recommendations to prepare a dam break modeling method using Arc GIS mapping techniques and HEC-RAS powered steady state modeling. Second, Federal Emergency Management Agency recommendations for EAP development were assessed to identify road crossing and building structures as the most relevant point of practical interest on inundation maps for EAP implementation. Third, simplified maps were qualitatively compared to formal, unsteady state maps, kindly provided by the Georgia Soil and Water Commission, to identify differences in potential emergency response operations. Developed case studies indicated that simplified inundation mapping technologies either overpredicted or underpredicted the extent of the flooding and would either overly concentrate or disperse emergency resources. However, because these case studies do not formally assess risk, future research should consider assessing risk by comparing potential simplified inundation map EAPs to historic emergency response operations performed without prewritten EAPs.

Trilobite Coquina in Siliceous Concretions from the Middle Cambrian Conasauga Formation, Southeastern USA

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

Before the Cambrian period, life on Earth was extremely different from life today. However, approximately 540 million years ago, rapid diversification of animal life took place. This Cambrian explosion led to the evolution of many different animal phyla, some of which are preserved within shales and siliceous concretions within the Conasauga Formation, southeastern USA. Previously, it was asserted that the concretions have abundant, diverse, and well-preserved skeletal and soft-bodied organisms in three-dimensional relief. However, there was little to no quantitative data to substantiate this claim. The purpose of my project is to collect quantitative data to determine whether the concretions contain diverse and well-preserved fossils. I examined 100 concretions, which yielded mostly trilobite fragments (99.3%, n=3356), and rarely brachiopod and hyolith fragments (0.4%, n=13 and 0.3%, n=9, respectively). Trilobite fragments were divided into categories based on morphology: complete skeleton, complete cephalon, crandium, glabella, fixigena, librigena, complete thorax, thorax segments, complete axial lobe, and pygidium. The most abundant type was cephalon (head) fragments (21% librigena, n=719, 12% cranidia, n=417). All brachiopod fragments were single valves and all hyolith fragments were portions of its conical shell. These concretions represent a low diversity assemblage of mostly epibenthic organisms, and not a highly diverse or well-preserved one as previously reported. I also anticipate results from stable oxygen isotope analysis to help determine if these concretions formed in seawater, which would be consistent with their formation Cambrian seas.

Development of a Droplet Digital PCR Assay for Pre-NGS Quality Assessment of DNA from FFPE Specimens

Jessica Ziling Ho, Foundation Fellow, CURO Research Assistant
Dr. Lance Wells, Biochemistry and Molecular Biology, Franklin College of Arts and Sciences

Because formalin-fixed, paraffin-embedded (FFPE) tissue samples undergo a preservation process that damages nucleic acids, they are not ideal candidates for downstream molecular studies. However, DNA extracted from FFPE specimens is often screened for hotspot mutations in cancer-related genes via next-generation sequencing (NGS), which requires a substantial input of quality DNA and is resource-intensive. Our work focused on developing a dual size amplicon-based ddPCR assay that would serve as a pre-NGS quality control for FFPE sample-derived DNA. We employed two primer sets targeting non-overlapping sites on the *RPP30* gene and defined amplicons of 109 base pairs (bp) and 195 bp. DNA was extracted from 84 FFPE tumor

specimens, and ddPCR was accomplished with Bio-Rad's QX200 Droplet Digital System and C1000 Thermal Touch Cycler. Data were processed with QuantaSoft software. To verify that both primer sets' PCR efficiencies were close to 100%, the ddPCR assay was first run with placenta DNA. Analysis of the data revealed that for most FFPE specimens, 24 ng of DNA yielded enough amplifiable copies for amplicon-based NGS testing. We noted a positive correlation between the amount of amplifiable *RPP30*-195 bp targets and the amount of library generated for NGS. There was also a significant reduction in the quality of NGS results for DNA samples with a RPP30-195 bp:*RPP30*-190 bp ratio of less than 0.3. The preliminary data suggest that our *RPP30* ddPCR assay is an inexpensive and accurate way to assess the quality of FFPE sample-derived DNA and to predict the likelihood of amplicon-based NGS success.

Genotype-Phenotype Correlations for POMGNT1 and POMGNT2 in Dystroglycanopathies

Jessica Ziling Ho, Foundation Fellow, CURO Research Assistant
Dr. Lance Wells, Biochemistry and Molecular Biology, Franklin College of Arts and Sciences

Dystroglycanopathies are a subtype of congenital muscular dystrophy that result from hypoglycosylation of α-dystroglycan (α-DG). POMGNT1 and POMGNT2 are glycosyltransferases involved in synthesizing O-mannosyl glycans on α-DG. Our work examines the role of the R311G, R605H, P303L, and D556N mutations in POMGNT1 and the R157H, G412V, and R445* mutations in POMGNT2 to define a genotype-phenotype correlation. The POMGNT2 mutations result in Walker Warburg Syndrome, the severest dystroglycanopathy. POMGNT1 mutations R311G, R605H, and P303L cause Muscle Eye Brain disease (MEB) and the D556N mutation causes limb-girdle muscular dystrophy (LGMD), a milder dystroglycanopathy with no neurological symptoms. The efn eytmspthy 3 Tw thosthe 9(n)tatiptspt hzdhch2.7(a)4.28(c)4.98H(y)5-3.5(12.7(4.8(ti(y)

human development levels pair with the status of freedom within a country and how these variable together correlate with indicators of environmental degradation, I will establish a link between human advancement, human rights securities, and environmental degradation. An integration of human rights securities and environmental protection policies should be more congruent through policies which address both environmental sanctity and access to human rights and this study will demonstrate the importance of this overlap.

Protospacer Structure and Cas Protein Function in Adaptation of the *Streptococcus thermophilus* Type II-A CRISPR-Cas System

Erin Hollander, Foundation Fellow, CURO Summer Fellow, CURO Research Assistant
Dr. Michael Terns, Biochemistry and Molecular Biology, Franklin College of Arts and Sciences

The CRISPR-Cas system works through a three-stage process of adaptation, expression, and defense, in which a "spacer" from an invader is incorporated into the genome of the host organism, transcribed into CRISPR RNAs, and combined with Cas proteins to recognize and cleave the invader upon subsequent attack. My work focuses on the Type II-A CRISPR-Cas system of *S. thermophilus*, a key bacterium used in the dairy industry, which contains four Cas proteins: Cas1, Cas2, Csn2, and Cas9. My current research project focuses on determining how the Cas proteins, CRISPR array, and invading nucleic acid interact in vitro to accomplish adaptation. Four protospacers (precursors to spacers) were tested for their ability to integrate into a plasmid containing a basic CRISPR array using various combinations of Cas proteins to determine the minimum necessary for integration. After adaptation assays, bands of possible adaptation were amplified and sequenced to determine the orientation of their integration into the CRISPR array. Adaptation could be completed using only Cas1 and Cas2, with the addition of Csn2 and Cas9 not providing any significant benefit. All four protospacers were able to integrate into both the plasmid containing the CRISPR array and the empty vector, and all four possible half-site integration orientations were observed. The lack of specificity found in these assays indicates there may be additional factors in vivo. With only four proteins, this system has great potential for a broad range of applications. Better understanding of adaptation is a crucial step in making these applications a reality.

Nitric Oxide Releasing Urinary Catheters as a Method to Prevent Urinary Tract Infections

Katie Homeyer, CURO Research Assistant
Dr. Hitesh Handa, Chemical, Materials, and Biomedical Engineering, College of Engineering

The chance of bacterial infection in urinary catheters increases by 3-6% each day the catheter is in place, approximately 50% after ten days, and over 90% after 28 days. 500,000 to 700,000 catheter associated urinary tract infections (CAUTIs) occur each year. Treatment of these infections amounts to over $350 million each year; therefore, there is a dire need to decrease the risk of bacterial infection from the placement of urinary catheters. Nitric oxide (NO) is one of the body's natural defense mechanism against bacteria and has been proven to effectively inhibit biofilm formation, the principal cause of CAUTIs. Consequently, this project aimed to create urinary catheters impregnated with S-Nitroso-N-acetylpenicillamine (SNAP), a NO donor, to develop a NO-releasing catheter. Three concentrations of the NO donor were incorporated into commercial silicone catheters and evaluated for their NO releasing properties, leaching and antibacterial activity. These properties were measured using various methods, such as chemiluminescence, UV-Vis spectrophotometer, and bacteria studies, to identify the optimal concentration that demonstrated the greatest NO release and greatest reduction in viable bacteria. The prepared catheters produced NO surface-fluxes > 0.5 X 10^{-10} $mol\ min^{-1}cm^{-2}$ for over ten days under physiological conditions, with minimal SNAP leaching from the surface of the catheter. These devices are proven to significantly reduce biofilm formation on the surface of the catheter over a 72-hour period by CAUTI causing bacteria species. Thus, NO-releasing catheters provide a successful approach to significantly reduce biofilm formation on catheters, and decreasing the risk of CAUTIs.

Multi-Rotor Marsupial Drone System for Point Cloud Data Processing

Peter Hong, CURO Research Assistant
Michael Anthony Piseno
Dr. Adarsh Kumar Chaurasia, Engineering, College of Engineering

With autonomous and multirotor technology becoming increasingly developed, task-specific applications for these are becoming more relevant. However, there are also complications with time-efficiency and accuracy of modern drone systems. The Multirotor Marsupial Drone System (MMDS) utilizes algorithms to autonomously coordinate multiple drones using Point Cloud data to construct models of objects in 3-D space. We will be using a depth-sensing camera and Intel's RealSense software development kit to integrate 3-D mapping capabilities into our drone system. We will measure the effectiveness of the MMDS versus a single drone in a controlled environment, and compare the error of the Point Cloud 3-D model. This will allow us to refine our algorithm to more efficiently model 3-D space. We expect to find that the single drone will have more distortion in the 3-D model when compared with the MMDS. We also predict that the MMDS will be more cost-efficient in completing its task with respect to time. Possible applications of the MMDS include integrated multi-satellite communication in orbit, mapping ocean currents, mapping buildings in dangerous areas, and monitoring soil erosion in agriculture.

Analogies between Numbers and Polynomials

Jackson Hopper, CURO Research Assistant
Dr. Paul Pollack, Mathematics, Franklin College of Arts and Sciences

Polynomials have several properties in common with the more familiar natural numbers. One example is that both are unique products of prime divisors. An open question in algebraic number theory is to find the extent to which analogies hold between deeper number theoretic properties of the two sets. One such question asks about the digital representation of numbers, which is related to the natural structure of polynomials. We have previously strengthened a theorem about digitally delicate prime numbers, or numbers that become composite if any single digit is changed. We asked a similar question of polynomials, finding that infinitely many prime polynomials are digitally delicate. We also study the growth of the polynomial Carmichael function, which gives algebraic information about the polynomials, in analogy with the Carmichael function for natural numbers. We have found that the function grows much slower for some polynomials than it does for natural numbers. We are currently investigating the typical behavior, and expect it to grow slower as well.

Diachronic Perspectives on Human Diet Variation in Greek, Roman, and Medieval Albania

Rachel N Horton, CURO Research Assistant
Dr. Laurie Reitsema, Anthropology, Franklin College of Arts and Sciences

Carbon and nitrogen stable isotope analysis of skeletal remains offers information about past human diet, which may be unavailable or incomplete in historical accounts. We assess carbon ($\delta^{13}C$) and nitrogen ($\delta^{15}N$) stable isotope ratios from human bone collagen to interpret paleodiet from two sites in present-day Albania: a rural village neighboring the Greek colony Apollonia (~5^{th}-4^{th} century BC) (n=11) and a more urban settlement, Durres (n=30), occupied since its foundation (7^{th} century BC) to modern day. Four animal bones are used for comparison. We test the null hypotheses that there are no isotopic differences between sites during the Archaic-Hellenistic period, no differences between time periods at Durres, and no differences between sexes in individual sites/periods. Mean (±SD) $\delta^{13}C$ and $\delta^{15}N$ values are -18.7±1.3 and 9.1±1.6 respectively at Durres, -19.4±1.0 and 9.8±1.3 at Apollonia, and -20.9±1.0 and 6.7±1.5 among animals. Nonparametric Kruskal-Wallis tests show no significant sex-based differences at Durres ($\delta^{15}N$, $p=0.201$; $\delta^{13}C$, $p=0.227$), no differences between sites ($\delta^{15}N$, $p=0.815$; $\delta^{13}C$, $p=0.212$), and no differences between Durres time periods ($\delta^{15}N$, $p=0.299$; $\delta^{13}C$, $p=0.426$). Diet at both sites comprises terrestrial and marine protein. Two individuals at Durres show isotopic values similar to fauna, suggesting a vegan diet. Apollonian village data show potential intrasite variations, suggesting some individuals may have originated

from another region or cultural background. Reconstructing past human diet is necessary for understanding, at broad temporal and regional scales, how people are linked to their environment through culturally mediated foodways.

Effects of a PUFA-Rich Diet on Coagulation and Inflammation Markers in Healthy Adults

Megan Houston, CURO Research Assistant
Dr. Jamie A Cooper, Foods and Nutrition, College of Family and Consumer Sciences

Saturated fatty acids (SFA), in contrast to polyunsaturated fatty acids (PUFA), are associated with increased risk of chronic diseases by elevating blood pressure, cholesterol, and inflammation and coagulation potential. To test whether a diet rich in PUFAs can negate the potentially harmful health effects of eating occasional meals rich in SFAs. 25 sedentary, normal weight adults were randomized into a treatment or control group. All participants were put on the same 3-day lead-in diet followed by a pre-diet visit (v1) where they were given a high-fat meal rich in SFAs for breakfast and lunch. Fasting and postprandial blood draws were taken for 8h. Participants then completed a 7-day diet rich in PUFAs (21% of total energy) or a control diet (7% of total energy as PUFAs) followed by a post-diet visit (v2) identical to v1. Plasminogen Activator Inhibitor-1 (PAI-1) (coagulation marker) and Tumor Necrosis Factor Alpha (TNF-α) (inflammation marker) were measured at both visits. Average changes in fasting PAI-I from v1 to v2 were not different between the two groups (-1.69±4.37 vs. -3.88±11.71ng/mL for PUFA vs. control, respectively). However, there was a significant difference in the change in fasting TNF-α from v1 to v2 for PUFA vs. control (0.88±0.41 vs. -1.85±0.99pg/mL, respectively; p=0.01). Compared to a control diet, the PUFA-rich diet did not lead to changes in PAI-I, but did elevate TNF-α concentrations. Since we only measured one inflammatory marker, conclusions about compensatory effects of PUFA-rich diets need to be explored further.

Genetic Determinants of Intracellular Survival and Growth of *Bordetella pertussis*

Katie Howard, CURO Research Assistant
Dr. Eric T Harvill, Infectious Diseases, College of Veterinary Medicine

Bordetella pertussis is a respiratory pathogen associated with the infant disease whooping cough. Although vaccines are mostly effective, there is growing concern that *B. pertussis* is reemerging through unknown mechanisms, even in highly vaccinated populations. Due to this, there is an increasing need for novel treatment. Our preliminary results have shown that *Bordetella* species utilize intracellular survival within host immune cells as the mechanism for persisting at undetected levels. This could explain vaccine failure and the increased persistence of clinical disease. From our 20 candidate genes, 5 constructions have been finalized and 15 genes are half way completed. While constructing the clones, we studied 30 mutants to determine their ability to survive inside immune cells. The mutant that showed most promise was RB50Δ*bsr*, a strain of *Bordetella* species lacking the gene encoding for a small regulator. Preliminary results showed that the presence of this gene is required for persistence of *Bordetella bronchiseptica*, an established model organism for *B. pertussis*, in mice: RB50Δ*bsr* was completely cleared from all organs, while wildtype *B. bronchiseptica* colonized chronically. When studying the immune response, we detected that the strains evoked different immune responses. We hypothesized that as there is a difference in the adaptive immunity, challenging immunocompromised mice with RB50Δ*bsr* should lead to severe, systemic disease, which we have confirmed experimentally. The systemic dissemination can be explained by RB50Δ*bsr* having greater recovery from macrophages and using this as a method of transport throughout the body.

Characterization of Cas4 Activity in the CRISPR-Cas Systems of Pyrococcus furiosus

Jesse Hu, CURO Summer Fellow
Dr. Michael Terns, Biochemistry and Molecular Biology, Franklin College of Arts and Sciences

Bacteria and archaea have evolved extensive protective systems to defend against genetic invaders. One component of this defense is

CRISPR-Cas (clustered regularly interspaced short palindromic repeats–CRISPR-associated), an adaptive prokaryotic immune system found in nearly all archaea and half of bacteria. This system is composed of a genomic CRISPR array and associated Cas proteins. The CRISPR array affords memory of past infections and contains identical repeats separated by variable sequences known as spacers, which are derived from foreign nucleic acids. CRISPR-Cas functions in three stages: adaptation, CRISPR RNA (crRNA) biogenesis, and crRNA-guided interference. During adaptation, new spacers are captured from the invader and incorporated into the CRISPR array. The CRISPR array is then transcribed during crRNA biogenesis, and the transcript is processed to generate small crRNAs complementary to invader DNA. Finally, during interference, the crRNA guides Cas proteins to the invader, cleaving foreign genetic materials. It has been previously demonstrated that two universally conserved proteins, Cas1 and Cas2, are necessary for the integration of spacers during adaptation. Recent unpublished work in the Terns lab using the model organism *Pyrococcus furiosus* (*Pfu*) has uncovered a requirement for a third, highly conserved Cas protein, (Cas4), in mediating adaptation. Through in vitro assays, we aim to elucidate the role of the *Pfu* Cas4 protein in spacer integration into CRISPR loci, thereby clarifying our understanding of prokaryotic adaptive immunity against viruses and other mobile genetic elements.

A Comparison of the Catalytic Activity of Tryptophan Synthase from *Salmonella* and *Photobacterium* at Various Temperatures and Pressures

Eric Wayne Hua, CURO Research Assistant
Devanshi Nayak
Dr. Robert S Phillips, Chemistry, Franklin College of Arts and Sciences

The purpose of this experiment is to determine the effect of various temperatures and pressures on activity of samples of the enzyme tryptophan synthase isolated from two different organisms, *Salmonella typhimurium* (PEBA) and *Photobacterium profundum* (Ppro). This significance of this research study lies in its capacity to enlighten our understanding of the structure and function of tryptophan synthase, which synthesizes an amino acid invaluable to the proteins and biochemical pathways essential for the sustenance of all living organisms. With increasing temperature, the catalytic properties of enzymes typically increase. However, since *Photobacterium* optimally grows in the cold depths of the sea, it is hypothesized that the optimal temperature range for the Ppro tryptophan synthase enzyme will be lower than expected. It is hypothesized that the optimal pressure for maximum enzyme activity should approximate the homeostatic pressure within the organism. Because *Photobacterium* is acclimated to extreme depths, the Ppro enzyme is hypothesized to maintain functionality at higher pressures, while maintaining sound function at normal atmospheric pressure. To conduct the experiment, first a sufficient amount of cells were cultivated from the cell culture. After cultivation, autoclaving, and sonication, the proteins were then purified through a phenyl sepharose column. A reagent solution and buffer were inserted in a spectrophotometer with the added enzyme, and the absorbance was measured over time to ascertain the enzyme's activity. Results at this time for enzymes from both organisms are congruent with those hypothesized. Tryptophan synthase activity peaks at the climate conditions that its organism is acclimated to.

Desires for Difference: Tastes and Collecting of Later Nineteenth-Century American Paintings

Catherine J Huff, CURO Research Assistant
Dr. Alisa Luxenberg, Art, Lamar Dodd School of Art, Franklin College of Arts and Sciences

During the latter half of the nineteenth century, the United States experienced unprecedented shifts into modernity as technology and industry expanded, resulting in changing lifestyles for many Americans. Collecting fine art became more desirable and accessible for the growing upper class, and American painting was especially sought. The evolution of taste during this period is thought to have responded to larger societal shifts, and is frequently reflected through the history of ownership of a single painting or the patronage of a single artist's production. Through new research on a small collection of little-studied American later 19th-century paintings recently gifted to a university museum, this paper will consider the

ways in which collectors of these paintings reflected evolving American tastes in fine art. It seeks to understand what type of collector was attracted to these kinds of paintings and how their interests might have differed over time. This new research includes formal analysis, provenance, market history, exhibition history and critical reception for these paintings. It will attend to similar qualities or evidentiary connections between them, as several of their artists knew each other and shared similar patrons. While the research primarily explores how preferences in American art collecting may have reflected the historical context of the 1880s-1900, this research also hopes to compare these paintings' later 20th-century collectors to their predecessors a century earlier.

Development of an Inducible Histone Methyltransferase System to Analyze Establishment of Repressed Chromatin Domains in *Neurospora crassa*

Mallorie Lee Huff, CURO Research Assistant
Dr. Zachary A Lewis, Microbiology, Franklin College of Arts and Sciences

H3K27me3 is a molecular hallmark of facultative heterochromatin and results in stable repression of silenced genes. Regulation of H3K27 plays an important role in X-chromosome inactivation and stem cell fate; alternatively, aberrant H3K27me3 is observed in certain types of cancer. Producing an effective model in which to study H3K27me3 deposition may provide insight into the activity of Polycomb Repressive Complex 2 (PRC2), a highly conserved histone H3 lysine 27 methyltransferase. Suz12, a component of PRC2, is essential for catalytic activity. Our method to study H3K27me3 in *Neurospora crassa* involves constructing a controlled system through inserting inducible promoters and a FLAG epitope tag in front of suz12 and transforming them into *Neurospora crassa* through linearized *E. coli* plasmids. Verification of the putative inducible systems will include western blotting with FLAG antibodies, ChIP with H3K27me3 antibodies followed by Illumina sequencing (ChIP-seq). The promoters undergoing transformation are Ptcu-1, Pccg-1, and Pqa-2. The aim of this project is to investigate currently uncharacterized H327me3 kinetics by controlling suz12 expression. Monitoring the spatial and temporal dynamics of H3K27me3 establishment will allow us to predict when PRC2 is recruited. Successful completion of this project will provide insights into a conserved enzymatic complex with important implications in human health and disease.

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

Brooke Hull, CURO Research Assistant
Dr. Jonathan Arnold, Genetics, Franklin College of Arts and Sciences

Circadian rhythms are a well-characterized emergent property 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 which 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 directly measure 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.

Religion in Fantasy: Christian and Wiccan Protagonists as Vessels for Gendered Religious Ideals

Kate Huller, CURO Research Assistant
Dr. Robert Foster, Religion, Franklin College of Arts and Sciences

Wicca is often stereotyped as promoting strong, female individuals who value their connection to the land and rebel against certain common cultural beliefs. Fundamentalist Christianity is known for its stories of men redeemed from lives of sin by their belief in God who then fulfill their male role

by becoming leaders within society. Rather than rejecting these stereotypes, certain strains of religious fantasy instead employ them by proffering the protagonists of their novels as embodiments of each religion's stereotypically gendered values. This project proposes to examine Patrick W. Carr's Christian series *The Staff and the Sword* and Anne Bishop's Wicca *Tir Alainn* trilogy as reflections of this trend within Christian Fantasy and Wiccan Fantasy, respectively. The focus will be on analyzing the way that the authors' character choices tie into the overall ideological viewpoint on the path to power presented by their respective publishing houses, Baker Publishing and Penguin House Inc. It will be further supported by the examination of texts which have been previously published by the publishing houses in order to detail trends in their publication of modern Christian and Wiccan literature. The potential effect on the readership of the publishers will also be noted, particularly emphasizing situations were religious ideas are communicated indirectly within the texts as opposed to the more obviously religious or gendered books released by the two publishing houses.

The Accuracy of SfM-Generated Dense Point Clouds Given Varying Image Quality

Nirav Ilango, Foundation Fellow, CURO Research Assistant
Dr. Marguerite Madden, Geography, Franklin College of Arts and Sciences

Structure-from-Motion (SfM) is an increasingly popular 3D modeling technique that allows images captured at different angles to be synthesized into a full 360-degree view of an object. An undergraduate-led team has been formed at the University of Georgia, with funding from the Air Force Research Laboratory, to develop a new SfM technique that uses satellite imagery to create 3D models of coastal environments. Demonstration of SfM with space imagery could lead to more accurate large-scale ecological models and could allow a researcher to avoid the large investment of time and money that characterizes UAV-generated imagery. In order to develop new SfM software that operates on a large scale, the UGA CubeSat team must understand how current SfM software adjusts to decreases in image resolution, as the images captured by the UGA satellite will have a much lower quality than typical UAV-generated imagery. This experiment studied the rate at which the density of SfM-generated point clouds decreases as image quality also decreases using standard commercial SfM software and open-source image manipulation software. By recording the number of points generated in each SfM point cloud, the researcher hoped to quantify a decrease in quality for these models. The experiment did not yield conclusive results, although it did reveal an inconsistency in SfM processing software that will need to be modified by the researchers for the satellite project.

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

Grace Anne Ingham, CURO Honors Scholar, CURO Research Assistant
Dr. Nina Wurzburger, Ecology, Odum School of Ecology

Heterotrophic soil respiration (HSR) is the largest terrestrial, non-anthropogenic source of CO_2 entering Earth's atmosphere and contributing to global climate change. HSR increases with rising temperature, and thus contributes to rising atmospheric CO_2 concentrations as part of a positive feedback loop. The degree to which HSR is heightened by rising temperatures may however be mediated by the presence of mycorrhizal fungi. Ectomycorrhizal (EM) fungi may depress HSR by limiting nitrogen availability in soils, while arbuscular mycorrhizal (AM) fungi may heighten HSR by stimulating the metabolic activities of heterotrophs as a nutrient acquisition strategy. Therefore, we hypothesize that EM fungi will dampen the response of HSR to increasing temperatures, but that AM fungi will further stimulate carbon loss. To test this hypothesis, we will sample soils from Coweeta Hydrologic Laboratory, where mycorrhizal composition ranges from completely AM to completely EM. We will incubate soils from plots along the mycorrhizal gradient at four temperature regimes (5, 15, 22, and 30°C), and measure CO_2 loss through HSR over time. We expect that HSR will increase more dramatically with increasing temperature in soils from AM dominated areas, and that the rise in HSR is muted when soils come from EM dominated areas. Our results will inform

models of carbon budgets as climate changes by illuminating the way that mycorrhizal composition of an area mediates the response of HSR to changes in temperature.

Optimization of MATLAB Code for Faster and More Consistent Image Analysis

Jawad Iqbal, CURO Research Assistant
Dr. Eric Freeman, Environmental, Civil, Agricultural, and Mechanical Engineering, College of Engineering

A Droplet Interface Bilayer (DIB for short) is a bilayer that is formed when two aqueous droplets dispersed in oil coated with lipid monolayers come in contact. Electrodes inserted within the droplets allow for characterization of the membrane properties by recording the current necessary for maintaining a prescribed transmembrane voltage. Combining these measurements with images of the droplets obtained through microscopy allows for measurements of secondary membrane properties such as thickness. My involvement was exploring how to best characterize the properties of a lipid membrane using this combination of microscopy and electrophysiology data. MATLAB is the primary tool used for DIB analysis. However, the existing code was cumbersome to use and involved many repetitive and time consuming tasks (i.e. manually changing the name of the file input for each image file to be analyzed; set of image files being 30+ images). Streamlining the process and assisting with the analysis was the primary focus of this work. Optimization of the code and process significantly reduced time on redundant tasks.

Determining the Development of the Parietal Eye in Brown Anoles

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

Circadian rhythmicity controls several physiological and behavioral responses in animals, and in people specifically, disturbances of circadian rhythms underlie mood disorders such as depression and seasonal affective disorder. The proper functioning of the circadian axis in humans and most other vertebrates is dependent on the pineal organ, a neuroendocrine gland that acts as the main synthesizer of melatonin, and the coordination of this hormone's production relies on perception of the photoperiod. However, the mechanisms governing this link between photoreception and melatonin production are not well understood. Because light is perceived in lizards through an additional parapineal structure that is not present in humans, the parietal eye, this extracranial organ offers a unique opportunity to study mechanisms of the pineal complex, as it is easily accessible and can be easily manipulated. As a first step toward better understanding these pineal processes, this project establishes *Anolis sagrei*, the brown anole lizard, as a new model organism by using a histological approach to characterize a timeline of parietal eye morphogenesis, providing a foundation for identifying molecular instrumentation mediating development. The expectation is that, because the parietal eye develops a cornea, lens, and retina similar to those of the lateral eye, the parietal eye and lateral eye will display similar molecular mechanisms of development that illuminate their relationships to the pineal gland.

The Prevalence of Science Misconceptions among the Human Body Systems: Understanding, Targeting, and Applying Misconception Findings to Effectively Teach Students about Diabetes

Stephanie Ann Jaipaul, CURO Research Assistant
Dr. Georgia W Hodges, Math and Science Education, College of Education

Research studies have repeatedly identified that students share consistent misconceptions regarding the human body systems individually and cooperatively. As part of a larger research project that addresses diabetes and obesity in humans, this literature review addresses misconceptions that students have about the musculoskeletal, cardiovascular, respiratory, endocrine, nervous, & digestive systems, which will inform the SYSTEMS team in the design of an educational game targeting diabetes and obesity learning objectives for elementary learners. This review began by identifying top misconceptions for each system separately as well as supportively, then conducting a thorough review on previous research regarding these misconceptions. Data

from the SYSTEMS project tested on students was analyzed for the misconception prevalence. The literature review and data analysis were used to prepare a full assessment on understanding, targeting, and reversing students' misconceptions of the body. I expected that I would find steady misconceptions across all grade levels, misconceptions built upon earlier misconceptions, and that misconceptions were due to a lack of science knowledge by both students and teachers along with methods of teaching that didn't incorporate misconception knowledge. The SYSTEMS project hopes to change the epidemic of obesity-related illnesses in the United States by teaching about pre-diabetic & diabetic conditions in a platform that concurrently teaches about body systems. This research is significant to the project by providing necessary resources used to understand and apply the way students think about and view the body systems, and to thus effectively teach about diabetes.

Depth Gradient Analysis of Potential *Vibrio* Pathogens in Subtropical Marine Water After the Arrival of Atmospheric Saharan Dust

Harris Jamal, CURO Research Assistant
Dr. Erin K Lipp, Environmental Health Science, College of Public Health

Every summer, Saharan dust is atmospherically transported to the waters of southeastern United States. Marine microbes, including *Vibrio*, have been shown to increase in response to the influx of iron found in desert dust, leading to blooms of potentially harmful bacteria. *Vibrio* is a genus of aquatic bacteria that can cause diseases in marine organisms and humans. The purpose of this project is to determine whether there are defined areas of enrichment of potential *Vibrio* pathogens in the water column after dust deposition. Water samples were collected from different depths at Looe Key Reef in Florida Keys, US, including the surface micro-layer (SML, top 1-1000 μm), sub-surface (~1 m below surface) and benthos (at reef depth, ~8 m). The SML is known to concentrate nutrients at the atmosphere-ocean interface, making it an important habitat for bacterial dynamics and nutrient exchange. We hypothesized that the increase in *Vibrio* population response would be greater at the SML and that the SML would be a hot-spot for potential *Vibrio* pathogens like *V. alginolyticus* that are highly responsive to Saharan dust. Species-specific PCR characterization of *Vibrio* pathogens was done on isolates collected from *Vibrio*-selective media for each depth, before, during and after a Saharan dust event in Florida. Discovery of high concentrations of *Vibrio* pathogens at the suggested depths would prove significant in that it would allow for predictive power over when and at what depth the risk of infection is higher in an effort to address increasing *Vibrio* infection rates in the US.

Mitochondrial Capacity in Young, Well-Controlled People with Type 1 Diabetes

Riley Jenkins, CURO Research Assistant
Dr. Kevin McCully, Kinesiology, College of Education

The role of mitochondrial capacity in the health consequences of type 1 diabetes (T1D) is not currently known. This study measured mitochondrial capacity of young people with T1D compared to controls. Participants with T1D (n=12) and controls (n=12) were tested for casual glucose, hemoglobin A1c (HbA1c), forearm adipose tissue thickness (ATT), and mitochondrial capacity. Mitochondrial capacity was measured in non-dominant forearm muscles using near-infrared spectroscopy as the rate constant of the rate of recovery of oxygen consumption after electrical stimulation exercise. T1D and conio1D efe. Tooimi-1.9ipc

Bent and Broken: Debating China Beyond the Great Firewall

Amanda Molly Joffe
Dr. Rongbin Han, International Affairs, School of Public and International Affairs

The book *Bend Not Break: A Life in Two Worlds* by the Chinese-American entrepreneur Ping Fu stirred up much controversy in both China and America. In her memoir, Fu tells readers her stories, particularly her childhood experiences in the Chinese Cultural Revolution. While applauded by Western media and readers, the autobiography received polemic comments from Chinese audience. This paper explores how Chinese and non-Chinese nationals debated on this book by exploring the review/comments section on Amazon.com and other online platforms. We attempt to explain why there were such fervent and polarized outbursts, and why certain emotions are portrayed by certain nationalities. Why do Western and Chinese audiences have such polarized comments on the same book? In particular, why is there such a fervent outburst of online criticism towards Fu among Chinese in and outside China? And why do overseas Chinese that have been exposed to freer flow of information feel so strong about defending the communist China? Using the reviews on this book, our research seeks to fill the gap in the current understanding of the manifestation of Chinese cyber nationalism and how it interacts with Westerners on overseas cyberspace. We will use modern tangible examples and phenomena to gain a newer, deeper, and updated understanding.

Pressuring Playwrights: New Play Development for Contemporary Stages

Abraham Branch Johnson, CURO Research Assistant
Dr. John Patrick Bray, Theatre and Film Studies, Franklin College of Arts and Sciences

In contemporary theatre, there is an understood development process for the new script. The unprofessional reading leads to a staged reading, which leads to workshops and dramaturgy, which leads to the fluid definition of full "production." This process, however, affects the seriousness with which scripts are invested in. How do different developmental structures affect new scripts? How does producibility alter vision? I will be directly experiencing these processes in action by producing three scripts with three different intentions: a staged reading, a workshop, and a full production. I will measure dynamic pressures from writing to funding, while consulting texts and fellow playwrights in their processes. Along with this, I will keep all edits to these scripts in an effort to document changes and holistic pressures that alter and enhance my vision. This research is deeply necessary and valid in understanding the fields of professional dramaturgy, new play development, and playwriting in general. Alongside this, my work draws attention to the decline of live theatre in recent years, answering important questions like: How are theatres investing in new plays with ticket sales at risk? Where does the funding come from? Who has the most authority and how does this shape script editing? I expect to find that financing is the most tangible pressure in all of these endeavors, and that the tastes of those funding new play development have vast sway in editing new scripts for performance.

Newborn Hearing Screening and Follow-up in the Northeast Health District

Breana Johnson
MacKenzie McGraw, Anna Marie Fink, Brianna Kelley, Lauren Langan, Meredith Anne Towey, Alexis Pope, Jennifer Smith, Sherry Sayavongsa, Aleah Norton
Dr. Sandie Bass-Ringdahl, Communication Sciences and Special Education, College of Education

Newborn hearing screening is the standard of care for the early identification of infants who are deaf or hard-of-hearing. Studies investigating the outcomes of children who are deaf or hard-of-hearing continually identify early identification as a key factor in successful language development. The current project explores the state of newborn hearing screening in the Northeast Health District (encompassing Athens-Clarke County and many surrounding counties). Data obtained through the Georgia Department of Public Health for the years 2010-2016 will allow for a close investigation of the screening process including the rate of identification of hearing impairment. The data will be analyzed for demographic trends and screening

patterns with the goal of enhancing early identification and the follow-up in the District.

An Inquiry into the Role of SUT5 and SUT6 in the Release of Exudate at the Extrafloral Nectaries of *Populus tremula x alba*

Chandler Elizabeth Johnson
Dr. C. J. Tsai, Genetics, Franklin College of Arts and Sciences

The aim of this study is to evaluate the role of sucrose symporters (SUTs) in the release of extrafloral nectar (EFN) of *Populous tremula x alba*. The EFN is exuded from a small, node-like nectary gland located at the proximal end of the leaf petiole. EFN is rich in a variety of sugars, including sucrose, glucose, and fructose, as well as amino acids and various protective enzymes. EFN plays an important role in the indirect defense against insect herbivory: a mutualistic relationship is established with an EFN consumer that, in exchange, offers protection against pernicious herbivores. Previous studies have implicated a role of SUTs in regulating the release of exudate, but the exact mechanism is not very well understood. A better understanding of EFN regulation may give insight into areas as broad ranging as the evolutionary origins, food web interactions, and ecological interactions pertaining to the species in question: *Populous tremula x alba*. Over a period of nine months, the frequency and volume of exudate produced in a sample population of poplar trees, mainly SUT3-, SUT4-, or SUT5-silenced transgenic plants, and wild type, was monitored. SUT3, SUT4 and SUT5 belong to three subgroups of the SUT gene family with different functions. Results showed a marked increase in exudate production in the cool season spanning from November to February, whereas EFN production was poor during the warm season from June to October. In order to gain insight into the regulation of SUTs, in situ hybridization is undertaken. In this process, gene-specific, DIG labeled probes are prepared using in vitro transcription. Chemical analysis of exudate composition by means of gas chromatography, and signal detection via in situ hybridization are ongoing.

Fostering Productive Beliefs about Failure and Intelligence to Improve Learning in STEM

Elizabeth Cara Johnson, CURO Research Assistant
Dr. Logan Fiorella, Educational Psychology and Institutional Technology, College of Education

The demand for workers in STEM fields is increasing, yet the number of students choosing to pursue STEM educational and occupational goals does not match this demand. Women and minorities are especially underrepresented in STEM fields. Contributing to this misrepresentation and demand are unproductive beliefs that students hold about learning in STEM subjects. For example, many students believe that success is based on innate ability and that struggle and failure are signs of one's lack of ability. By challenging these notions of intelligence and success, we hope to improve student motivation and academic performance. Using story-based intervention, the current study asked 51 sixth-graders to read a story about a successful scientist that either emphasized her struggles and persistence in the face of challenges (struggle group), or that emphasized the role of her innate talent and ability (control group.) Students were assessed on beliefs and math ability before and after reading one of the two stories. We anticipate that participants assigned to the struggle condition will have improved beliefs and performance on math tests due to reading the story about struggle and overcoming challenges. Using stories as a method of instruction may be a promising tool for shaping student's beliefs about intelligence and failure. This may help more students persist in the face of challenges, ultimately expanding students' opportunities for success in STEM careers.

How Do Parental Practices Influence Adolescent Food Choices?

Evan Simone Johnson, CURO Research Assistant
Dr. Alex Kojo Anderson, Foods and Nutrition, College of Family and Consumer Sciences

We studied parental habits such as modeling, home food environment, and rules that impact eating behaviors during independent eating occasions among low-income, multi-ethnic adolescents between the ages of 10 and 13 years.

Family food practices are an influential component of developing lifelong healthy eating habits, and understanding which practices are most impactful among adolescents could help health practitioners better counsel their patients. This was a mixed-method design with parent-child pairs in the Athens area involving 2 study visits. On the first visit, the parent and child were interviewed, and the child was provided guidance to take photos of everything consumed in a chosen 24-hour period to send to the research team. On the second visit, adolescents were asked about independent eating environment, food choices and the role of their parents and peers in food selection. Parents were also asked about how they instill healthy eating habits in their household. Both completed a survey at the end of the interview. The interviews were transcribed verbatim and analyzed for themes. Anthropometric measurements of weight, height and waist circumference were conducted on both the parent and adolescent. Findings suggest that adolescents adapt similar food habits as their parents. They also lean towards ready-made, easily accessible foods that can be prepared without much supervision. To control eating habits, parents often utilize bargaining or do not purchase foods that they do not want their child to eat. Most parents wished their child would consume more fruits and vegetables. The findings have the potential to shape nutrition education targeting parents and adolescents.

Metacognitive Regulation in Undergraduate Biology Students

Me'Shae Johnson, CURO Research Assistant
Dr. Julie Dangremond Stanton, Cellular Biology, Franklin College of Arts and Sciences

Metacognition is what we know about our thinking and how we are able to regulate our thinking in order to facilitate our own learning. Metacognition positively correlates with learning outcomes, academic performance, and problem solving. This project centers on understanding metacognitive development among undergraduate students so that we can develop effective ways to stimulate metacognition. The long-term goal of this research is to use metacognition to enhance student learning in undergraduate biology courses. Our research question is: how does the use of the metacognitive skills (planning, monitoring, and evaluating) compare between first- and fourth-year undergraduate students? We will compare data from introductory biology students with data from upper-level biology students to see how metacognitive regulation might progress over time. We will collect data using two open-ended assignments given after the first and second exam in an introductory biology course and a senior-level cell biology course. We will use qualitative methods such as content analysis to find evidence of students' use of metacognitive skills. This analysis will allow us to identify those students who effectively use metacognition and those who are working to adjust their learning strategies. Our findings will be used to design research-based curriculum for improving student metacognition.

Mothers' Childhood Emotional Neglect as a Predictor of Child Behavior Problems

Sara Carroll Johnson
Amber Madden
Dr. Anne Shaffer, Psychology, Franklin College of Arts and Sciences

Childhood emotional neglect (CEN) is a specific form of child maltreatment in which caregivers fail to make a significant emotional connection with their child, thereby preventing the development of healthy attachment bonds. Individuals who have been emotionally neglected in childhood are more likely to experience later psychological distress when compared to those who were emotionally neglected by male caregivers. Mothers' experience of CEN has also been shown to be predictive of poor parenting outcomes, but less research has examined relations between maternal CEN and their children's behavior. Maternal emotion dysregulation, or difficulties in modulating emotional responses, is of particular concern since emotion dysregulation is a significant mediator of the relationship between childhood maltreatment and parenting stress. Based on these relations, we hypothesized that emotion dysregulation would mediate the relations between maternal CEN and the occurrence of internalizing and externalizing behaviors in their children. This study utilized data collected from a sample of 58 mothers and their children aged 8-11. Measures included a measure of maternal childhood emotional neglect (CTQ), emotion dysregulation (DERS), and mothers' reports of child behavior problems (CBCL). A multiple mediation model considered all of the

DERS subscales simultaneously as potential mediators. Results indicated that low emotional clarity, a component of emotion dysregulation, was a significant mediator of the relations between maternal childhood emotional neglect and the occurrence of behavior problems in their children (indirect effect=.17, SE=.11, 95% CI=0.2-.46). Future research might further examine the relationship between emotion dysregulation and other parenting behaviors that may predict child outcomes.

Household Production of Health: Cambodian Refugees' Health Strategies in the United States

Abby Carden Jones, CURO Research Assistant
Dr. Denise Clark Lewis, Child and Family Development, College of Family and Consumer Sciences

A life course theoretical perspective and multidisciplinary Household Production of Health (HHPH) conceptual model illustrate Cambodian refugee families' processes for acquiring and maintaining health. Life course perspective provides a dynamic view of refugees' pathways from fleeing their home nation to resettlement in the United States. Social ties, family relations, traditions, and immigration stressors contribute to refugees' experiences and influence culturally relevant health production. The HHPH model used in our analysis of 125 Cambodian refugees' narratives gathered during ethnographic research conducted between 1997 and 2014, includes multiple factors that influence refugees' ability to acquire and maintain well-being in the US. The HHPH conceptual model takes into account multiple elements associated with beliefs and behaviors surrounding decisions about the desire for culturally responsive health services. Life course perspective and the HHPH conceptual model combine to reveal how refugees' transition to the host country influences health trajectories, the significance of linkages between individuals, families and communities, and how historical context informs individual and collective actions. Ultimately each element shown in the HHPH model affects what is viewed as a culturally relevant health service, how refugees attain such service, and which services are suspect and not viewed as culturally responsive. The HHPH conceptual model is based on interviews and interactions with Cambodian refugees; however, the HHPH model can be applied across other refugee groups to understand transitions associated with their household projection of health. It can be used to inform US policy makers and service providers of culturally specific needs of refugee families.

The Suburbanization of Poverty in Metro Atlanta

Phillip Jones, CURO Research Assistant
Dr. Laura Zimmermann, Economics, Terry College of Business

Over the last decade, there has been a substantial increase in poverty rates in suburban counties surrounding cities across the country. The metro Atlanta region, with exponential growth in size and population in recent decades, has exhibited this same suburbanization of poverty. The dominant perception is often that poverty remains a uniquely urban problem, and therefore the problem of suburban poverty is often left unaddressed. Recently, the city of Atlanta has refocused on creating sustainable mixed income communities that will serve all Atlanta residents, regardless of socioeconomic status. An example if this is the developing Atlanta Beltline Project. However, the question remains of whether public services, including convenient public transit, affordable housing, sustainable economic opportunities, and other resources are being developed and readjusted to account for metro Atlanta's rise in suburban poverty. Research has suggested that the current public policy and nonprofit framework concerning poverty is too urban-oriented and therefore ill-equipped to deal with the new challenges of today's suburban poverty situation. This research project will begin by quantifying the change in poverty rates in nineteen metro Atlanta counties since the year 2000. Next, it will review literature and other resources that may help explain why there has been an increase in poverty in these counties. Lastly, this project will suggest actions that should be taken by the private, public, and nonprofit sectors in order to spur economic growth and opportunity for Atlanta's suburban poor.

PCR Detection of the SRY Gene of Male Dog Mesenchymal Stem Cells in Female

Dog Brains with Experimentally Induced Ischemic Stroke

Susie Jones, Foundation Fellow
Dr. Buffy Howerth, Pathology, College of Veterinary Medicine

Intra-carotid-delivered mesenchymal stem cells (MSCs) may improve functional neurological outcomes after acute ischemic stroke (AIS). However, a large animal model is essential before beginning human clinical trials for patients with AIS. This study uses a dog stroke model in which female dogs with experimentally induced AIS receive male-derived MSCs via intra-carotid injection. It is hypothesized that the MSCs will successfully move to the site of infarction and participate in repair of damaged tissue. The objective of the present study is to target the Y chromosome in order to track the migration of the male-dog derived MSCs to various locations by using PCR. To detect the MSCs, two techniques were developed or modified from those in the literature to amplify the SRY gene on the Y chromosome. A previously described PCR technique and an original quantitative PCR technique were then tested using fresh brain samples from female dogs with experimentally induced AIS that were subsequently injected with male MSCs on the side of the stroke. Both techniques were able to detect the Y chromosome in the brain samples and are suitable for tracking male-derived MSCs in this dog model of stroke. These techniques may have future applications in determining the sex of canine subjects in forensic cases.

Evaluation of Middle-Miocene Barnacles as High-Resolution Paleoclimate Proxies

Reid Jordan, CURO Research Assistant
Dr. Sally Walker, Geology, Franklin College of Arts and Sciences

The Miocene Epoch stands in stark contrast with the global climate trends of the Cenozoic Era. The Middle Miocene Climatic Optimum (MMCO) disrupted a ~50-million-year cooling trend with three million years of relative warmth. Characterizing the MMCO were elevated sea levels, increased global temperatures and oceanic stagnation. Increased scientific understanding of the MMCO will allow for parallels to be drawn between modern global climate change phenomena and past climate and oceanic conditions. Relatively little data exists for Middle-Miocene oceanic seasonality in the Atlantic Margin. For my research, the barnacle, *Balanus concavus*, of the Maryland Middle Miocene, is evaluated for suitability as a high-resolution paleoclimate proxy. These large Maryland fossil barnacles are suspected to have grown year-round while sequestering carbon and oxygen isotopes near equilibrium oceanic values. As these barnacles age, calcium carbonate is secreted via cuticle -like tissues along the base of the external shell. This process is nearly continuous excepting interruption from breeding or molting events and brief cessations due to lack of nutrients. These events result in distinct growth lines and molting ridges within the external parietal plates and results in a subannual to multiannual record of oceanographic conditions during the time the barnacle was living. This study involves gathering transects from the oldest to the youngest shell of *Balanus concavus* for stable oxygen isotopic analysis. We anticipate oxygen isotope data to reveal either oceanic seasonality within the MMCO or little seasonality if the waters were warm year round.

Mapping Near Misses in Athens-Clarke County

Stephen Benjamin Jordan, CURO Research Assistant
Dr. Jerry Shannon, Geography, Franklin College of Arts and Sciences

The Bike Master Plan (BMP) is a developing road biking plan for the use and implementation by the Athens Clarke County Planning Commission. A major point of interest and concern is a comprehensive source of spatial recognition of near misses of bike riders in Athens-Clarke County (ACC). In order to correctly gauge the intended spatial analysis, this research endeavor will take part with a series of interviews of persons who regularly ride for various reasons, such as work, exercise, and/or environmental concerns. Interviews will consist of both qualitative and quantitative data questions regarding each individual's experience bike riding in ACC. Moreover, a sketch map will be drawn by interviewees of their routes taken and information along with that. Methodologies include, but are not limited to, interview analyses, digitization of

routes drawn and discussed by interviewees, geospatial integrated tools to find, spatial clusters and heat indexed routes, and comparative data analysis which will aid in the pursuit to provide the BMP with a comprehensive idea of target areas to address in order to improve bike riding conditions. The latter portion explains a part of the significance from which this research will provide; furthermore this data will provide the ACC Planning Commission a valuable source of information pertaining to future development projects that will ensure the safety of both bike riders and drivers on ACC roadways.

Attachment Orientation and Career Goal Pursuit: The Effects of Relationship Commitment and Workaholism

Amita Joshua, CURO Research Assistant
Dr. Malissa Clark, Psychology, Franklin College of Arts and Sciences

The goal of this study is to examine the relationship between attachment orientation and career goal pursuit and the moderating effects of relationship commitment and workaholism. Specifically, we seek to understand whether attachment at infancy can affect goal pursuit in adulthood, which is defined as the active pursuit of career-related goals through spending time dedicated to goals and accomplishing measurable achievements. In attachment theory, anxious attachment refers to an obsessive approach to relationships that is associated with low self-esteem and fear. Avoidant attachment is associated with maintaining security by avoiding intimacy in social and romantic relationships. Attachment is more often studied in infants; however, recent studies have found the effects of attachment orientation carry past infancy and further into development. The following hypotheses will be tested: 1) Whether higher avoidant attachment predicts higher career goal pursuit, 2) Whether higher anxious attachment predicts lower career goal pursuit, 3) Whether relationship commitment moderates these relations and 4) Whether workaholism moderates these relationships. Nearly 400 participants will be recruited from Amazon Mechanical Turk. Participants will be asked to complete the Experiences in Close Relationships-Revised Questionnaire, the Tenacious Goal Pursuit scale, the Commitment Inventory and the Work Addiction Risk Test. Multiple regression analyses will be used to test these hypotheses. The findings from this study will help to elucidate the role of developmental psychology within the field of industrial-organizational psychology.

Depression and Risky Health Behaviors: The Moderating Effect of Coping Responses

Amita Joshua, CURO Research Assistant
Dr. Anne Shaffer, Psychology, Franklin College of Arts and Sciences

The goal of this study is to examine the relations between depression and risky behaviors and the moderating the effect of coping responses in college students. This research has important treatment implications for young adults experiencing depressive symptoms. This study examined risky behaviors including tobacco use, drug and alcohol use, risky sexual behaviors and safety-related behaviors. The following hypotheses were tested: 1) Whether higher levels of depressive symptoms predict higher levels of risky behaviors and 2) Whether positive coping responses moderate (i.e., buffer) these relations. Data was collected from 1561 participants from an undergraduate research pool. Participants completed the Center for Epidemiological Studies Depression Scale, the Youth Risk Behavior Survey and the BRIEF Cope Inventory. Bivariate correlations revealed that depressive symptoms were significantly correlated with risky behaviors ($r=.16$, $p<.01$). Additional regression analyses were performed to determine whether coping responses moderated the relations between depressive symptoms and risky behaviors. Results indicated that coping responses significantly buffered the relations between depressive symptoms and risky behaviors ($R^2=.03$, $F(3,1614) =11.70$, $p <.01$). Specifically, students who reported high usage of positive coping responses engaged in fewer risky behaviors ($\beta=.30$, $p<.01$). These findings highlight the importance of developing individual's adaptive coping responses in clinical applications. Given that this study was limited to college students, future studies should consider whether these findings generalize to other populations such as early adolescents and non-college samples, as well as consider analyzing the effects of depressive symptoms and coping

responses on specific categories of risky behaviors.

Turbulence at the Edges of Diffuse Molecular Clouds

Mackenzie Joy, Foundation Fellow
Dr. Loris Magnani, Physics and Astronomy, Franklin College of Arts and Sciences

Diffuse molecular clouds can be observed with carbon monoxide (CO) spectra obtained from radio spectroscopy. Though the clouds are mostly composed of molecular hydrogen, they are much more difficult to detect from ground-based telescopes, so the known correlation between the presence of CO and molecular hydrogen is utilized in the detection of clouds. This research seeks to better understand the behavior at the edges of diffuse molecular clouds. Because of the interactions between the molecular gas at the edge of the cloud and the surrounding atomic medium, one would expect the clouds' edges to be more turbulent than the insides of the cloud. Turbulence can be measured via the width of the CO spectral lines with broader lines indicating more turbulent clouds. Recent observations, however, have shown narrow spectral lines associated with CO at the edges of diffuse molecular clouds, contradicting the previous assumption. This research will compare the width of CO spectral lines with the area under the best-fit Gaussian curve, a measure of line strength, in order to determine the nature of the relationship between the edges of clouds and their surroundings. These relationships will be determined by compiling data from spectra detecting the 1-0 rotational transition of CO and graphing the line width versus the line strength. The results of this study will have consequences for understanding the behavior of molecular gas at the atomic/molecular interface and the nature of diffuse molecular clouds in general.

Examining the Entropic: Locating Modernity in the Writings of Jane Austen

Jianna Justice
Dr. Roxanne Eberle, English, Franklin College of Arts and Sciences

Jane Austen, often cast by critics as a conservative spinster writing novels of niceties stained with the scent of afternoon tea and crumpets, is rarely heralded for her radicalism or innovative experimentation. My paper addresses how we can locate Austen in her writings as a progressive author, incredibly intrigued with the prospect of radical modernity. I argue that Austen appears consciously caught at a point of dialectical antithesis between competing pressures of residual Georgian tradition, and pulsing modernity fueled by the mechanization of 19th century England. The crux of my justification hinges on textual evidence of the entropic, or the inclination towards chaos and disorder, as a peculiarly modern symptom. In tracing elements of the entropic throughout Austen's texts, I ultimately locate two salient phenomena, one phenomenological and one philological, that mark a pivotal shift towards the modern. The first, concerns a contextual renegotiation of masculinity; the grizzled, decorated war hero is favored over the passive, leisured gentleman. The landed gentry's way of life is ultimately revealed as outmoded and unsustainable in the changing climate. The second offers a formal dissection of the em-dash as a peculiarly entropic mark, insofar as it allows for increased disorder and a novel assemblage of disparate ideas within the confines of the sentence. In examining Austen's approach to the modern, specifically her promotion of agility in syntax and subject, I hope to express her attraction to both the precariousness and intensive possibility held in the notion of the new.

Significance of MARCO in *Mycobacterium tuberculosis* Resistance

Mevelyn Kaalla, CURO Research Assistant
Dr. Kaori Sakamoto, Pathology, College of Veterinary Medicine

A macrophage scavenger receptor, Macrophage Receptor with Collagenous Structure (MARCO), has been previously shown by the Sakamoto lab to be important in binding to a virulence factor, trehalose 6,6'-dimycolate (TDM), in the cell wall of *Mycobacterium tuberculosis* (*Mtb*), the causative agent of tuberculosis (TB). A single nucleotide polymorphism in the MARCO gene, rSNP, has been identified to be associated with resistance to TB. The rSNP is thought to introduce a DNA-binding site for the transcription factor, C/EBP (CAAT-enhancer binding protein). To test this hypothesis, biotinylated wildtype MARCO

(MARCO-WT) and rSNP MARCO (MARCO-R) probes were incubated with nuclear extract, applied to a neutravidin resin column, then eluted and subjected to gel electrophoresis. They were then transferred to a nitrocellulose membrane and probed for two forms of C/EBP, C/EBPα and C/EBPβ. Both forms demonstrated enhanced binding to the MARCO-R probe relative to the MARCO-WT probe. Next, a luciferase reporter assay was performed to examine transcriptional activity of MARCO-WT and MARCO-R in macrophages, revealing reduced transcription attributed to MARCO-R. Therefore, enhanced binding of C/EBP downregulates transcription of MARCO, as seen with the rSNP. By downregulating MARCO, the rSNP may allow for less MARCO-TDM interaction, which may be involved in arresting phagosomal-lysosomal fusion. Individuals with the rSNP would therefore exhibit increased control over the *Mtb* infection. This project studies the mechanism whereby the rSNP mediates resistance. Examining MARCO expression and interactions with TDM and *Mtb* infection will result in a better understanding of the role and mechanism of action of MARCO in TB pathogenesis.

Identification of MAb109 Epitope in Pancreatic Cancer Cells

Manasa Kadiyala, Ramsey Scholar, CURO Summer Fellow
Dr. Hawkeye Pierce, Biochemistry and Molecular Biology, Franklin College of Arts and Sciences

Pancreatic adenocarcinoma (PDAC) is a lethal cancer with annual survival rates less than 25%. It currently lacks proper diagnosis and treatment, which leads to many patients being treated and screened after malignant tumorigenesis has already occurred. The progression of oncogenesis and tumor growth has been found to be linked to changes in glycan expression on the cell surface of pancreatic cells. These abnormal modifications can be specifically targeted, and their identification can serve as a potential therapeutic for the disease. Glycans and glycoproteins are useful objects of study as they are uniquely affected by changes in glycosylation that occur early on in oncogenesis. In order to identify the specific glycan target for pancreatic adenocarcinoma, researchers have identified a mouse monoclonal immunoglobin G (IgG) antibody (MAb109) that uniquely reacts with PDAC tissue but not normal, uninfected pancreatic tissue. The place where this antibody binds, its epitope, is N-glycan specific and is present on certain glycoproteins, one of which is CEACAM6 (Carcinoembryonic Antigen Related Cell Adhesion Molecule 6) in PDAC tissue. Identification of this MAb109 epitope using site-directed mutagenesis of N-glycosylation sites and truncation of CEACAM6 fragment 1 (C6f1) can set the stage for development of unique clinical screening and therapeutic tools and eventual treatment of pancreatic cancer.

How Does FoodCorps Contribute to the Pursuit of Farm to School Success?

Usha M Kaila
Dr. Jennifer Jo Thompson, Crop and Soil Sciences, College of Agricultural and Environmental Sciences

This project examines the impact of FoodCorps service members on the success of Farm to School programs in Georgia. Farm to School programs, which aims to bring healthy, locally grown foods, education about nutrition and agriculture, and school gardens to K-12 schools, are estimated to be in 42% of schools in the US. Nevertheless, Farm to School programs face a number of challenges, including cost and institutional support. FoodCorps is an Americorps service organization that aims to teach children about food and nutrition through hands-on experiences such as school gardens and culinary instruction. Since 2014, Georgia Organics has hosted FoodCorps service members placed in several school districts across the state. As part of an evaluation of Georgia Organics' farm to school programming, we conducted semi-structured interviews with FoodCorps members, their site supervisors, and school nutrition directors in their districts. We examine the data to determine how the presence of FoodCorps service members impacts student engagement and staff buy-in of Farm to School.

Characterizing the Ribonuclease Activity of *Staphylococcus epidermidis* Csm6

Joshua A Kalter, CURO Research Assistant
Dr. Michael Terns, Biochemistry and Molecular Biology, Franklin College of Arts and Sciences

CRISPR-Cas systems are adaptive immune responses that have emerged as powerful genomic editing tools to provide defense against foreign nucleic acids in prokaryotes. CRISPR-Cas systems have been categorized into several diverse groups but all function through specific interactions between a short RNA (crRNA) and CRISPR-associated (Cas) proteins. crRNA molecules provide specificity by base-pairing with foreign DNA and RNA molecules. Typically, several Cas proteins with varying structural and nuclease functions combine with the crRNA to form a CRISPR ribonucleoprotein complex, termed crRNP. In Type III-A (Csm) invader silencing, the crRNP contains five proteins (Csm1-5) with varying roles. Though it is not a member of the crRNP, invader silencing requires the presence and activity of an additional protein known as Csm6. Biochemical and structural data confirm the absence of Csm6 within the crRNP. Thus, understanding the contribution of Csm6 remains a major question. Studies have demonstrated that Csm6 is a single-stranded RNA-specific endoribonuclease that is necessary for anti-plasmid CRISPR-Cas immunity. We sought to characterize the ribonuclease activity of recombinant *Staphylococcus epidermidis* Csm6 in vitro, as well as to determine the presence of target specificity for this activity. We demonstrate that an introduced catalytic-site mutation results in diminished ribonuclease activity. We also demonstrate that *S. epidermidis* Csm6 degrades single-stranded RNA with a preference for purines. Not only is our work fundamentally important in determining the greater role of Csm6 in DNA targeting, but it will also lay the groundwork for the development of RNA-editing tools from the Type III-A CRISPR-Cas system.

The Effects of Two Different High-Fat Diets on Appetite Hormone Levels

Fatima Kamal, CURO Research Assistant
Dr. Jamie A Cooper, Foods and Nutrition, College of Family and Consumer Sciences

Eating a single meal rich in poly-unsaturated fats (PUFAs) results in greater suppression of the hunger hormone, ghrelin, and higher levels of the satiety hormone, PYY, vs. a meal rich in mono-unsaturated fats (MUFAs). We aim to determine the effect of a high-fat diet rich in MUFAs or PUFAs on ghrelin and PYY levels. Randomized, cross-over trails consisted of 2 trails that were each 10 days. Twelve adult males (ages 18-45) were recruited. Each 10 day trial consisted of a 3 day lead-in diet, two 9 hour testing visits (pre- and post-diet), and a 5 day intervention diet. During the 5 day diet, subjects received meals enriched with either cottonseed oil (high in PUFA) or olive oil (high in MUFA). The diets were 50% fat, 35% carbohydrates, and 15% protein. During each 9 hour testing visit, subjects received a breakfast and lunch meal, high in the fat designated for that trial. Blood was drawn every 30 minutes for 9 hours to measure appetite hormones. There was no difference in fasting ghrelin or PYY from pre to post diet in either PUFA or MUFA. Postprandial area under the curve was not different from pre- to post-diet for ghrelin in MUFA (pre: 518.6±145.8pg/ml, post: 505.3±182.7 pg/ml, p=0.7) or PUFA (pre: 499.3±113.0pg/ml, post: 541.6.±189.2pg/ml, p= 0.2). PYY was not different from pre- to post-diet in MUFA (pre: 1136.8±263.2pg/ml, post: 1085.0±208.0pg/ml, p=0.2) or PUFA (pre: 1064.4±197.0pg/ml, post: 1006.0±185.7pg/ml, p= 0.2). High fat diets rich in either MUFA or PUFA did not lead to changes ghrelin or PYY.

Are *Wolbachia* Co-Obligate Nutritional Symbionts in the Banana Aphid *Pentalonia*?

Bryan Kamalaker, CURO Research Assistant
Dr. Kerry Oliver, Entomology, College of Agricultural and Environmental Sciences

Many eukaryotes acquired ancient infections with microbial symbionts that allowed expansion onto novel feeding substrates. For example, the bacterium *Buchnera* colonized aphids 150 mya, and by providing essential nutrients, allowed aphids to exploit plant phloem resulting in more than 4500 extant aphid species. However, over time aphids and *Buchnera* became co-dependent resulting in major vulnerabilities to the partnership. The strict intracellular life and trans-generational bottlenecks of *Buchnera* resulted in small effective population sizes, which through relaxed selection have led to genome reduction and symbiont decay. Several processes potentially compensate for *Buchnera* decay. For instance, in a few aphid species, *Buchnera* has been replaced by other symbionts, while in other aphids, a normally facultative symbiont species, has joined the nutritional

partnership and become a co-obligate symbiont. Recently, a study suggested that *Wolbachia*, a ubiquitous heritable symbiont of arthropods, was a co-obligate symbiont in the banana aphid *Pentalonia*. In a small sample the authors found that all individual aphids were infected – a requirement for obligate status and unusual for *Wolbachia*, and that *Buchnera* had lost the ability to make Riboflavin while *Wolbachia* retained the missing components RibD and RibH. However, we screened diverse *Pentalonia* populations across the Pacific and found *Wolbachia* was not fixed (83% infected). Given its facultative status, we are conducted several assays reconsidering whether *Wolbachia* is genuinely a co-obligate partner. Early results indicate that in our non-fixed populations, *Buchnera* has indeed lost RibD & RibH, while *Wolbachia* retains them, which suggests that other compensatory mechanisms are operating.

Altered Neural Activity in the MCLS and NA linked to Alcohol Consumption

Aparna Kanjhlia, CURO Research Assistant
Dr. Lawrence Sweet, Psychology, Franklin College of Arts and Sciences

Alcohol use among adolescents and young adults has a significant impact on public health in the United States. Impulsivity has been linked with vulnerability to alcohol use and altered connectivity of the neural reward system. Several brain areas, such as the mesocorticolimbic reward system (MCLS) and nucleus accumbens (NA) have been associated with impulsive decision making. The present study aims to investigate whether neural activity in the MCLS and NA at rest is associated with risky alcohol related decisions through an analysis of functional connectivity. Nine healthy young adult participants from the rural southern United States participated in a functional MRI resting state scan using a 3T scanner as a part of a larger study conducted by the UGA Clinical Neuroscience (CNS) Laboratory. Alcohol use and associated behaviors were measured using the Alcohol Use Disorder Identification Test (AUDIT). Impulsivity was measured using the Monetary Choice Task (MCQ), a measure of delay discounting. Neuroimaging analyses will be conducted using Analysis of Functional Neuroimaging (AFNI) software and correlation and regression analyses will be conducted in SPSS. It is hypothesized that individuals with decreased connectivity of the MCLS and NA will report consuming alcohol at a higher frequency than those with higher connectivity. These findings may contribute to and extend the understanding of the link between alcohol and impulsivity in a yet unstudied population of emerging adults from rural communities.

Microaggression in the Eye of the Beholder: Perceiver Characteristics in the Detection of Microaggressions in the Workplace

Soundarya Kanthimathinathan, CURO Research Assistant
Dr. Brian Hoffman, Psychology, Franklin College of Arts and Sciences

Microaggressions are typically conceptualized as subjective and perceptual phenomena, defined as subtle verbal or behavioral discrimination based on the receiver's personal identity. Although much research has examined the impact of microaggressions on important work outcomes, scant attention has been paid to the characteristics of the perceiver of macroaggressions. To the extent microaggressions are believed to be subjective and perceptual phenomena, this study proposes that characteristics of the perceiver influence the likelihood that microaggressions will be perceived, specifically the perception of microaggressions by minority employees. Using Amazon's Mechanical Turk, data will be collected on the perceptions of microaggressions by minority employees working full time. Individual characteristics of the perceiver including personality, group identity, and familiarity with the microaggression paradigm will be examined as predictors of the perception of microaggressions. The association between perceiver characteristics and perceptions of microaggressions will be examined to shed light on the factors that contribute to the study of microaggressions. These findings will have important implications for the on-going debate as to how to address a subjective phenomenon such as microaggressions and thus, will provide insight for organizations seeking to reduce the harmful influence of microaggressions on employee outcomes through interventions or training.

Isolation of VAR2CSA DBL3x Binding Domains for Protein Expression

Rahul Katkar, CURO Research Assistant
Dr. David Peterson, Infectious Diseases, College of Veterinary Medicine

Placental malaria is contracted by pregnant mothers and latch onto the placenta, restricting nutrient delivery to the fetus causing premature birth and low birth weights. Whilst multigravid women develop immunity to Plasmodium falciparum, 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 which allow the protein to bind to chondroitin sulfate A receptors on the placenta, causing an accumulation of red blood cells thus disrupting the placental blood flow. Immune women have antibodies that restrict VAR2CSA, therefore it is hypothesized that the VAR2CSA found in immune women bind less well than VAR2CSA found in non-immune women. To study the binding domains encoded in the var2csa gene, the relevant regions of the gene must first be cloned. The cloning protocol uses vector plasmids, restriction enzymes and ligation to create plasmid constructs that are transfected into *E. coli* cells that clone enough of the gene to be sequenced and sent to be translated in wheat germ cell free protein synthesis. This protein synthesis technique was 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 is an excellent choice for a negative control. The proteins that are translated from these cloned genes can then be tested in binding affinity to CSA receptors, thus aiding in a possible vaccination development.

The Evolution of Religion in Africa: A Test of the Big God Hypothesis

Samantha Keating
Dr. Bram Tucker, Anthropology, Franklin College of Arts and Sciences

While throughout most of human history, people have lived in small-scale, hunter-gatherer societies, most people today live in large-scale, anonymous societies. Understanding why people cooperate in these large societies is a mystery that social scientists have attempted to solve. Psychologist Ara Norenzayan developed a cultural evolutionary hypothesis to explain this phenomenon, which states that the belief in moralizing high gods explains why people cooperate in large, anonymous societies. Therefore, the belief in moralizing high gods can universally be attributed to large-scale societies. However, this hypothesis is fundamentally flawed as it fails to take into account the diversity of humanity, and is therefore subject to testing. In order to test Norenzayan's hypothesis, data was collected on 11 African societies' sociopolitical structures and religious cosmologies, and statistical analysis was conducted on data from Murdock's Ethnographic Atlas on a global scale. Results show that Norenzayan's hypothesis is too simplistic and fails to account for human diversity. Of the sampled societies, belief in a moralizing high god was present in several small-scale, hunter-gatherer societies, while absent in some large-scale societies, thus falsifying the universality of Norenzayan's hypothesis. Due to the prevalence of claims of universal human nature in popular media, testing these widespread claims is critical as they perpetuate myths of human nature that are often untrue.

Environmental Consequences, Psychological Comorbidities, and Tic Symptom Severity in Children with Tourette Syndrome

Colleen Keeler, CURO Summer Fellow, CURO Research Assistant
Dr. Ronald L Blount, Psychology, Franklin College of Arts and Sciences

The present study evaluates the relationship between environmental factors (e.g., reactions to displaying tic symptoms [accommodation], family socioeconomic status [SES; as measured by parent income and education level]), tic symptom severity, and psychological comorbidities in children (aged 9-17 years) with Tourette syndrome (TS; n = 48). Caregivers (n = 48) reported on their children by completing the Tic Symptom Parent Report, Tic Accommodations and Reactions Scale, Behavioral Assessment System for Children – 2nd Edition, and Spence Child Anxiety Scale. Bivariate correlations were conducted to examine relationships between family SES, parent's accommodation behaviors for tics, tic symptom

severity, and comorbid psychological symptoms. Both family income level and parental education level were negatively correlated with children's social phobia symptoms. Separation anxiety was positively correlated with all other measured comorbidities. Children with TS whose parents reported higher accommodation of tic symptoms had higher parent-reported levels of separation anxiety, OCD, and hyperactivity than children of parents who reported less accommodation. Parents who reported higher accommodation of tic symptoms reported more severe tic symptoms than the children of parents who reported less accommodation. Findings indicate that parents of children with TS may benefit from behavioral interventions aimed at improving their responses to their child's tic symptoms, and that children with TS may benefit from family-focused interventions to increase positive coping strategies. Additionally, determining what factors associated with low SES that lead to the correlation between SES and symptom severity could help parents identify how they can alter their lifestyle in order to prevent the worsening of tic symptoms.

Functional Evaluation of Porcine Kidney: A Thorough PSF Organ Storage Study

Hannah Kemelmakher, CURO Research Assistant
Dr. John Peroni, Large Animal Medicine and Surgery, College of Veterinary Medicine

Organ persufflation (PSF), or gaseous oxygen perfusion is used to preserve organs outside of the body and has been studied in various tissues. Compared to the more universally accessible hypothermic storage method called Static Cold Storage (SCS), persufflation requires more characterization before it can be more widely accepted in the world of organ transplantation. There is promising evidence that PSF significantly improves tissue viability and survival rates of transplanted organs. Our goal is to compare the static cold storage method to organ persufflation in the kidney which is the most commonly transplanted organ. Our hypothesis is that persufflation will result in improved tissue viability than cold storage by preserving vascular and mitochondrial functions. We plan to harvest kidneys from pigs immediately after slaughter and preserving each for 24 hours with either PSF or SCS. Subsequently, renal parenchyma will be obtained to assess oxygen consumption rate, mitochondrial enzyme activity, endothelial dysfunction, spontaneous arterial tone development, and the presence of oxidative damage. To determine vascular function, renal vessels will be isolated while in a physiological salt solution using dissection microscopy. Their contractile function will then be measured using a small vessel wire myograph in a controlled temperature environment. We anticipate that organ persufflation will result in superior tissue respiration values and vascular contractility as assessed through measurements of mitochondrial and arterio-venous functions. This series of experiments will significantly impact the knowledge available regarding the effects of tissue persufflation of kidneys and may have a significant impact on the field of organ transplantation.

Electroformation of Giant Unilamellar Vesicles

Melanie Kemp, CURO Research Assistant
Dr. Eric Freeman, Environmental, Civil, Agricultural, and Mechanical Engineering, College of Engineering

The intent of this research is to develop a protocol for the creation of "empty" model cells known as giant unilamellar vesicles (GUVs). GUVs are typically composed of an aqueous fluid encapsulated by a bare or unmodified lipid membrane. The content of the lipid membrane can be modified to measure the link between the membrane composition and its mechanical properties, such as the bending modulus and surface tension. The GUVs also allow for the observation of the membrane responses to environmental stresses, including varying osmotic pressures. For the purpose of this experiment, Diphytanoyl phosphatidylcholine (DPhPC), 1,2-Dioleoyl-*sn*-glycero-3-phosphocholine (DOPC), and asolectin (soybean) lipids were dissolved in chloroform and evaporated with nitrogen within a polydimethylsiloxane (PDMS) well secured on an indium-tin-oxide (ITO) slide. The evaporated lipids were then diluted in various concentrations of sucrose and underwent electroformation with varying voltages, frequencies, and times. It was determined that DPhPC diluted in 20 mM of sucrose under a sinusoidal voltage signal of 1.5 V at 10 Hz for two hours consistently yielded reasonably-sized liposomes useful for image

analysis of their surface undulations. Further experimentation is being conducted to characterize membrane responses to various osmotic shocks by the use of a perfusion chamber.

Elucidating the Function of GABAergic Signaling during Neural Development in Larval Zebrafish

Benjamin Martin Kidd, CURO Research Assistant
Dr. James D Lauderdale, Cellular Biology, Franklin College of Arts and Sciences

The goal of my research project is to determine functional consequences of alterations in GABA signaling on brain activity and seizure dynamics in larval zebrafish. In all vertebrates, the GAD genes encode for the enzymes that produce GABA, which is the major inhibitory neurotransmitter in the central nervous system. There are two GAD genes, GAD1 and GAD2, and both function in GABA synthesis. We created a line of fish with a mutation in the GAD1 gene gad1b, which has increased neural activity. This project utilizes light sheet microscopy and electrophysiology to address our research goals. We are generating different lines of zebrafish that combine two fluorescent transgenes with the gad1b mutants with the goal of being able to visualize and assess the neurological effects of a reduction in local GABA levels in generating seizure activity in the brain. I will also be performing these experiments on a zebrafish seizure model that utilizes an alternative mechanism of generating seizures for comparison and proof of principle. I hypothesize that in the gad1b mutant zebrafish, I will observe over-excitation in the optic tectum of the zebrafish and the excitation will spread across the brain during a seizure event. We suspect that the inhibitory neurons will then corral the excitation to restore the brain to a non-seizure like state. If this hypothesis is supported, it will help us better understand the mechanism behind how seizures occur which could have implications in the design of novel anti-epileptic drugs.

A Computer Program for Truss Design Optimization

Sokngim Kim, CURO Research Assistant
Dr. Siddharth Savadatti, Environmental, Civil, Agricultural, and Mechanical Engineering, College of Engineering

Trusses are some of the most efficient load carrying structures that are extensively used in the design and construction of physical infrastructure like bridges, housing and power transmission towers. The ultimate purpose of this project is to develop a computer program that can provide the optimum design of a truss for a given set of loads. A standard truss analysis program has already been developed and it will be used for topology optimization using the harmony search method. The resulting truss will be shape optimized and can be used to design a truss either manually or automatically.

Research and Development of Satellite Software and Electronics

Adam King, CURO Summer Fellow, CURO Research Assistant
Dustin Mizelle, Anurag Banerjee
Dr. Marguerite Madden, Geography, Franklin College of Arts and Sciences

Is there an optimal way to interface electronic components and software such that the satellite adheres to mission specifications while mitigating all possible failure? The answer will allow the Small Satellite Research Laboratory (SSRL) to have UGA's first satellite in orbit by 2019. The first SSRL mission, SPOC, will acquire moderate-resolution hyperspectral imagery of coastal ecosystems and ocean color to enable mitigation of environmental damage by means of conservation, recreation, and development. Though hyperspectral imagery has been gathered from Low-Earth Orbit before, it has never been launched on the Cube Satellite platform, a modular structure standard consisting of 10x10x11cm units. Throughout the project, the SSRL has continuously been involved in writing extensive documentation for NASA to review our progress. To complete this mission, the electronics team first had to understand mission objectives, work with the SSRL mission operations team to determine operational modes and needed tasks, and to begin developing software corresponding to these specifications. The challenge comes when understanding hardware architecture and interfacing said hardware. The electronics team

will work with our primary manufacturers to determine what is needed to fulfill the mission. Namely, the SPOC optical payload will interface with our on-board computer as well as our electrical ground support equipment, a challenging step in the development of this mission, as various electrical communication protocols will have to be mapped correctly in order for software to interface correctly among all hardware. Preliminary hardware will be tested throughout this semester, and final design decisions will be finalized by April. Preliminary results indicate that optimal electronics and software design is characterized by working with both concurrently and building towards the functional "middle" of these systems.

Mild Traumatic Brain Injury (mTBI) Moderates Protection of Cognitive Flexibility by Cognitive Reserve

Evan Knox, Ramsey Scholar
Dr. Steve Miller, Psychology, Franklin College of Arts and Sciences

Cognitive reserve (CR) protects various mental faculties, including cognitive flexibility, from damage. One common form of this damage is mild traumatic brain injury (mTBI), often termed concussion. However, the interaction between mTBI and CR in predicting cognitive flexibility has not been explored. Such a relationship or lack thereof could further understanding of how CR relates to mTBI. A sample of 40 adults (mean age = 51.5, ages 36-68), with half having experienced at least two mTBIs during high school sporting events and the other half having experienced none, were surveyed for number of mTBIs, cognitive flexibility, and a proxy measure of CR. Moderation analysis was performed to assess interactions for both a no-mTBI/mTBI dichotomy and for a no-mTBI/two-mTBI/greater-than-two-mTBI split. Dichotomous moderation demonstrated a beta of .839 ($p < .001$) for the mTBI group, versus a beta of .569 ($p = .006$) for the no-mTBI group. Furthermore, this model (also accounting for age) gave an adjusted R^2 of .652 in the mTBI group, versus .391 in the no-mTBI group. The three-way moderation demonstrated a beta of 1.061 ($p < .001$) for the greater-than-two-mTBI group, versus a beta of .498 ($p = .001$) in the no-mTBI group. This moderation model also accounted for significantly more variance than a no-moderation model ($p = .005$). These findings suggest that cognitive flexibility is well-protected from mTBIs by high CR, while it is disproportionately at-risk in individuals with low CR.

Georgia Social Workers and DACA

David Kobe, CURO Research Assistant
Dr. Jane McPherson, Social Work, School of Social Work

There are approximately 2 million undocumented students in the US, many of whom immigrated with their parents when they were too young to understand the educational implications. To help these students Obama created Deferred Action for Childhood Arrivals (DACA) allowing certain immigrants special status to attend public school, get drivers licenses, and get jobs. Georgia and two other states have additional policies banning undocumented immigrants from attending selected public state universities. This ban in Georgia directly opposes the Equal Protection Clause of the Fourteenth Amendment and legally segregates public universities. The problem these students face is worthy of social work consideration. The Georgia Chapter of the National Association of Social Workers (NASW) released a statement declaring it does not support the ban. The University of Georgia (UGA) has an interesting position as a public university selected in the ban, yet home to a strong Social Work program. To understand opinions of the students and faculty of the School of Social Work at UGA we created a survey focusing on the awareness participants have of current policies surrounding DACA and immigration in Georgia. Having an accurate idea of how social work students view current policies that directly affect their clients is vital. If our social workers disagree with the code of ethics how can it be expected to be implemented? If there is an overwhelming agreement with the current code of ethics then why do the policies for our state contrast them so sharply and what can we do about it?

Characterizing Ty1 Gag - CCT Complex Interactions in Budding Yeast Through Co-Immunoprecipitation and Mass Spectrometry

Ellen Grace Krall

Dr. David J Garfinkel, Biochemistry and Molecular Biology, Franklin College of Arts and Sciences

Retrotransposons are mobile genetic elements that are able to actively replicate, reinsert into the host genome, and alter the expression of genes. Ty1 elements are the most abundant retrotransposon in the budding yeast *Saccharomyces* and represent a model for better understanding retroviruses like HIV as well as retrotransposons found in other organisms. Budding yeast lacks typical defense systems used to silence retroelements in other eukaryotes, and therefore has evolved a novel form of copy number control (CNC) to restrict Ty1 retrotransposition. Recent studies by Saha and Mitchell et al. in 2015 (*J. Virol.* 89:3922-38) show that an alternate Ty1 sense transcript (Ty1i RNA) encodes a 22-kDa protein which is necessary and sufficient for Ty1 CNC. It is likely that other cellular proteins associate with the Ty1 capsid protein (Gag) and influence virus-like-particle (VLP) assembly, Gag processing, and Gag-p22 interactions. Because systematic mutant screens are unable to identify essential or redundant gene products that associate with Gag, we have used proteomic analyses to characterize the Gag interactome. We have identified multiple subunits of the CCT complex, a conserved and essential protein chaperone that may interact with Ty1 Gag. Mutational analysis suggests that the CCT complex plays a role in Ty1 Gag processing and retrotransposition.

Tagging Fatty Acid Metabolism Proteins in *Trypanosoma cruzi*

Evelina Kravchuk
Dr. Rick Tarleton, Cellular Biology, Franklin College of Arts and Sciences

Trypanosoma cruzi infects millions of people worldwide, mostly in Latin America, causing potentially life-threatening sickness known as Chagas disease. This protozoan replicates within the cytoplasm of mammalian cells and persists in particular host tissues, especially muscle, leading to heart and gastrointestinal pathologies. There are currently no reliable drugs or vaccines for treatment or prevention of *T. cruzi* infection. An attractive target for new drugs is transporter proteins, enzymes, and molecules necessary for the pathogen to obtain energy from host cells. Previous investigations indicate that fatty acid (FA) transport and metabolism proteins are highly upregulated in intracellular amastigotes of *T. cruzi* and are essential for parasite survival. Interestingly, the genes encoding mitochondrial surface FA transporter proteins are duplicated in *T. cruzi* and modified, perhaps to allow localization to the parasite surface where they could compete with host cell mitochondria for FAs. We will use CRISPR/Cas9-mediated genome editing to tag the essential fatty acid transportation and metabolism genes in *T. cruzi* and thus document their cellular sublocalization. Homology directed repair will be used to insert a sequence encoding a fluorescent tag, which when incorporated into gene products can be visualized using fluorescence microscopy. We expect to find that *T. cruzi* has a duplicated set of FA transporters, one set that localizes to the parasite surface and another that localizes to the usual parasite mitochondrial surface membrane. If true, this will be the first reported example of a pathogen mitochondrial FA transporter being relocalized in order to scavage FA from host cells.

Understanding American and Cuban Perceptions of Migration to America

Mohammed Khalifa Kredan, CURO Research Assistant
Dr. Micah Gell-Redman, International Affairs, School of Public and International Affairs

More than 2 million Cubans currently reside in the United States, and roughly 60% are legal residents. Thanks in part to policies such as the Cuban Adjustment Act, Cuban migrants are able to secure a green card in just 1 year, and are more likely to be naturalized than immigrants from other nations. Major policy changes carried out by previous and incoming US administrations promise to impact all aspects of the relationship between the two nations, not least of which is the question of Cuban immigration to the US. Cuba promises to be an important case, answering many questions regarding immigrant motivations, and the perception of the effect of policy change. This is especially true, as other nations around the world send a mix of immigrant populations affected by similar political and economic motivations. We explore Cuba-US migration through a multi-method, binational approach. First, we conduct an electronic survey of Florida

voters to determine what qualities of Cuban immigrants are viewed as most "desirable." Second, through semi-structured interviews, we learn how Cuban nationals perceive the process of migrating to the US. By combining insights from these two lines of inquiry, we hope to identify gaps between US citizen beliefs about Cuban immigration, and the drivers that actually motivate potential migrants within Cuba.

The Role of LNFPIII-Dex on Cholesterol Efflux in Raw 264.7 Cells

Catrina Kure
Dr. Donald Harn, Infectious Diseases, College of Veterinary Medicine

Atherosclerosis is a major risk factor for cardiovascular diseases. Current means of prevention and treatment focus on lifestyle changes, including changing diets to include more anti-oxidants and anti-inflammatory foods and increasing physical activity when possible. In addition, statin therapy, to help control cholesterol levels. Each of these may help reduce plaques. In this regard, little research has been done examining potential immunotherapies related to plaque progression. LNFPIII is a biologically conserved human milk sugar, that when used as a conjugate, has been shown to function as therapeutic for treatment of several different inflammation based diseases, generally by activating anti-inflammatory (M2) macrophages. Gene arrays on cells stimulated in vitro along with analysis of cells from animals treated with LNFPIII-Dex conjugates both show an upregulatioin the transcription factor LxRα, which controls genes involved in cholesterol efflux. Thus, my research project asks if LNFPIII-Dex will induce cholesterol efflux from RAW 264.7 cells via downregulation of inflammatory genes and upregulation of mediators related to reverse cholesterol transport. This will be tested with RAW 264.7 macrophages that will be loaded with the fluor-tagged cholesterol (22-NBD-Cholesterol). We will first determine that we are able to successfully load the RAW cells with cholesterol by flow cytometry. Once we demonstrate we can load cholesterol into RAW cells, we will then stimulate the cells with positive and negative controls and LNFPIII-Dex for 3-12 hrs. We will then add the cholesterol acceptors HDL or ApoE, and allow efflux to occur. We will measure efflux in each well of cells using a plate reader. If we demonstrate that LNFPIII-Dex is able to induce cholesterol efflux from RAW 264 macrophages, we can propose LNFPII-Dex as a therapeutic to reduce plaque formation in vivo.

The Chromatin Remodeling Protein, ATRX, Regulates the Formation of Non-Canonical DNA/RNA G-Quadruplex Structures in Mammalian Oocytes

Ashley Elizabeth Lall
Dr. Rabindranath De La Fuente, Physiology and Pharmacology, College of Veterinary Medicine

One of the major chromatin remodeling proteins, alpha thalassemia mental retardation x-linked protein (ATRX) plays an important role in providing genomic stability that is essential for reproductive cells to successfully undergo cell division. The primary role of ATRX is to ensure proper heterochromatin formation in oocytes during meiosis. In transgenic (Tg) oocytes lacking ATRX, there are severe chromosomal abnormalities that often result in early loss of pregnancy. This experiment is aimed at elucidating the role of ATRX in the formation of non-canonical DNA/RNA quadruplex structures by using immunochemistry, epifluorescence microscopy, and super-resolution chromatin analysis of wild type (WT) and Tg oocytes. DNA G-quadruplex structures are associated with regions of guanine-rich DNA and cause genomic instability by affecting chromosome configuration. We hypothesized that Tg oocytes would have a higher prevalence of DNA/RNA quadruplexes as a result of the important role ATRX plays in regulation of these structures. Our results indicate that there is no statistically significant difference in the proportion of quadruplex formation between transcriptionally active WT (94%) and Tg (91%) oocytes. Notably, quadruplex RNA structure is resolved in 70% of transcriptionally inactive WT oocytes, while non-canonical RNA structure remains unresolved in 80% of Tg oocytes. These results suggests that ATRX deficient oocytes are unable to correctly remodel their chromosome configuration which results in a higher percentage of DNA/RNA quadruplexes and provides direct evidence that ATRX is necessary to resolve non-

canonical G-quadruplexe structures to maintain genome stability.

Retirement Planning Behavior and Retirement Plan Participation among Men and Women: An Examination of the Determining Factors

Sarah Landa
Dr. Swarn Chatterjee, Housing and Consumer Economics, College of Family and Consumer Sciences

As the largest cohort of the US population, the baby-boomers, continue to enter retirement, it is critical to examine the factors associated with better financial planning and investment participation decisions among households, and whether men and women differ in their approach to retirement planning. With this research objective in mind, our study uses a nationally representative dataset to examine whether men and women differ in their retirement planning behavior. This study also examines the factors that are associated with retirement plan participation among men and women. We use a multiple regression analyses to empirically test the key hypotheses of this study. Early findings reveal that a significant gender difference exists in the portfolio preferences and retirement planning behavior among households. Additionally, risk tolerance appears to affect retirement planning decision's differences for men and women. The implications of the key findings of our study will be discussed from a policy perspective.

Measuring the Expression Efficiency of Constructed Single Plasmid System in *Trypanosoma cruzi*

Tre Justin Landry, CURO Research Assistant
Dr. Rick Tarleton, Cellular Biology, Franklin College of Arts and Sciences

Our lab focuses on the host immune responses to infection with protozoan parasite *Trypanosoma cruzi*, the causative agent for Chagas disease, and how these responses may be modified or potentiated through genetic manipulation. My research addresses the technical obstacles to expressing multiple, potentially immune-modifying proteins in *T. cruzi*. In the past, this process has required the introduction of multiple plasmids encoding these genes and selection by multiple drug resistance markers. To make the process of genome modification more efficient, we have evaluated both viral-like 2A peptide sequences that induce a skip during translation, allowing for the production of two distinct proteins from a single gene transcript, and multiple head-to-tail expression cassettes that yield two separate mRNA transcripts from a single plasmid. We now show that both systems provide for the production of multiple protein products from a single plasmid but that different 2A-like sequences are differentially efficient in this process. Likewise, distinct intergenic regions impact on protein production from the expression cassettes. Future experiments will quantify the relative efficiency of the two systems, also comparing them to protein expression from multiple plasmids, and the positional impact (e.g. before or after the 2A skip sequence) on protein production. Additionally we plan to combine the 2 new systems in order to produce up to 4 different proteins from the same plasmid. These methods are facilitating the development of a conditional inducible expression system in *T. cruzi* that utilizes a tetracycline inducible ribosomal RNA (rRNA) promoter to control expression in transgenic parasites.

The Development of a Pathogen-Specific Diagnostic Device for Pneumonia

Laura Lanier
Dr. Ramana Pidaparti, Environmental, Civil, Agricultural, and Mechanical Engineering, College of Engineering

Pneumonia is one of the single largest infectious diseases in the world, affecting 450 million people globally and killing nearly 4 million people each year. More than 30 strains of bacterial and viral pathogens can cause this infection of the lungs—a fact that poses a significant challenge to improving accuracy in diagnostics for an appropriate pathogen-specific treatment. In this project, we are developing a pathogen-specific diagnostic device with the principles of Raleigh scattering. We are currently in the stage of proving this concept of particle-caused light scattering, with our experiments focused towards developing a forward scatter laser system where particles of known size and shape resembling the real pathogens are tested. The scattered beam

information from these particles is captured on a sensing device and this signal data, after noise removal, is processed for particle size range by applying various classifier algorithms. Identification of particle size range can provide baseline diagnostics for the disease, and further refinements for identifying pathogen types by their size are possible. After this proof of concept, we plan to embed this system into a portable, low cost mask, which can be integrated with a cell phone. It is our hope that patients can then breathe or cough into this mask, releasing particles for identification and diagnosis. This device, once realized, is expected to become a powerful diagnostic tool for the populations most affected by pneumonia, particularly in developing and underdeveloped countries.

Unlock the Vote: The Implications of Felon Disenfranchisement Laws on the Political Power of African Americans

Magali Lapu
Dr. Sarah Shannon, Sociology, Franklin College of Arts and Sciences

This policy paper seeks to answer why felon disenfranchisement has decreased civic participation among the African American community as a whole, examines literature on differing state-by-state laws, and offers policies to reverse and alleviate their disparate effect on that demographic. Per the ruling of the 1974 Supreme Court case *Richardson v. Ramirez*, there is a legal precedent that allows states to continue to restrict the voting rights of anyone who has served time for a felony. This includes non-incarcerated felons who have either completed their sentences or are on parole or probation. Because of disproportionate incarceration rates for convicts of color, a disproportionate number of minorities are barred from voting. Disenfranchisement laws have shut out minority demographics, given advantages to politicians in parties that do not have a large minority voter base, and affected law abiding citizens without a criminal record. After analyzing the effectiveness, cost, equity, public approval, and political feasibility of the three proposed policy alternatives against the status quo, this paper finds that the best option is to incentivize non-profits to mobilize voters in communities with large disenfranchised populations and low voter turnout of enfranchised community members.

Socioculturally Attuned Family Therapy: Guidelines for Equitable Theory and Practice

Lauren Jayne Lauterbach, CURO Research Assistant
Dr. J. Maria Bermudez, Child and Family Development, College of Family and Consumer Sciences

Family therapists practice based on diverse family models, but have recently lost sight of the social context in which families live. This scholarly book views a plethora of different models from a different perspective. This perspective is referred to as a socioculturally attuned lens. This lens strives to incorporate social context, power, and culture into the current family therapy models. The question we dive into in this text is, "How can practitioners integrate awareness of societal systems across models into their everyday work with individuals, couples, and families?" This question is addressed chapter-by-chapter, covering ten different family therapy models and intertwining third party change and a sociocultural lens with these models. There is a disconnection between family therapy models and the integration of social context, culture, and power, and this often leaves family therapists uncertain on how to use current family therapy models while supporting social equity. This book offers practical advice on incorporating sociocultural attunement into their everyday practice. We strive to educate family therapists on helpful ways to practically incorporate social context, power and culture through what we refer to as a sociocultural attuned lens. We believe that therapist can incorporate this lens with any type of family therapy practice, but in this text we focus specifically on ten different therapy models.

Blood Transfusion Related Zika Virus Transmission

Casey Lawrence, CURO Research Assistant
Dr. José F Cordero, Epidemiology and Biostatistics, College of Public Health

Zika Virus (ZIKV) is an arbovirus of the *Flaviveridae* family, transmitted primarily by *Aedes*

aegypti and *Aedes albopictus* mosquitos. ZIKV was first discovered in the Zika forest in Uganda in 1947 and has presented itself sporadically since then, with the most notable outbreaks occurring in Yap Island in 2007 and Brazil, likely beginning in 2014. ZIKV is roughly 80% asymptomatic, which could lead to major issues maintaining a safe blood supply. Many ZIKV infections go undiagnosed or misdiagnosed and evidence has emerged that blood donations have been compromised. The objective of this review is to examine past arbovirus outbreaks, and intervention and policies strategies that were used to protect blood donations. We searched PubMed, Google Scholar and Web of Science for literature related to blood and organ donation policy changes and interventions that were associated with outbreaks of dengue, chikungunya, West Nile virus, and other arboviruses. Our results focused on findings from the United States but also include relevant information from other countries. It is essential that blood and organ donation supplies are protected in during an infectious disease outbreak. This review presents recommendations for preventing ZIKV transmission from blood and organ transmission. Traditional blood donor screening and laboratory testing may not be sufficient prevention measures. Emerging detection strategies such as Nucleic Acid Testing (NAT) and pathogen inactivation techniques may be effective tools. Blood and organ donation safeguards must be flexible to the threats of emerging pathogens including but not limited to ZIKV.

Structural Design and Optimization of the SPOC Cube Satellite

Megan Le Corre, CURO Research Assistant
Graham Grable
Dr. Susanne Ullrich, Physics and Astronomy, Franklin College of Arts and Sciences

The primary purpose of a satellite's chassis or structure is to ensure that the satellite survives the rigors of launch, including dangers posed by the vibration and acceleration imposed by the launch vehicle. Launch is the first danger that a satellite faces once its mission begins. If the satellite structure fails in launch, the failure is irredeemable. The purpose of this research is to determine optimal structural design for the SPectral Ocean Color (SPOC) imaging satellite being built by the University of Georgia's Small Satellite Research Laboratory. Accomplishing this task requires several iterations of the engineering design process and conduction of analyses of increasing complexity. Structural analyses were primarily conducted in ANSYS; analyses conducted include modal analysis and inertial loading analysis. Two of the satellite subsystems, the payload and core avionics, were simulated as representative masses within the structure. It is important to recognize that this adds additional rigidity to the satellite, but is a necessary step to determine areas of optimization. First natural frequencies seemed to be nominal, ranging from 180.73 Hz to 246.94 Hz, depending on orientation during launch. Yield factors of safety ranged from 1.06 to 4.72 and ultimate factors of safety ranged 1.39 to 5.77. Though not indicative of failure, these values are uncomfortably low. Changes to be implemented as a result of this research include addition of stack interface ribs and an optimization of the payload structure in order to reduce inertial loading.

Determining Reoccurring Tick and Tick-Borne Disease Associations with Mammal Hosts

Jenna Kay Lea, CURO Research Assistant
Dr. William Park, Ecology, Odum School of Ecology

I am utilizing the Global Mammal Parasite Database to study associations between several species of ticks and parasites causing tick-borne diseases (TBD) on or in mammal hosts. I intend to find which hosts share ticks and TBDs, and identify common characteristics they have that make them more susceptible to the vector and/or pathogen. I will do this by creating two networks using R Studio: one describing the connections between hosts and ticks and the other comprised of connections between hosts and TBDs. This will not only create an easily interpretable visual representation of the data, but will build a foundation for further research to be done on parasite sharing. For instance, my preliminary data analysis will identify centralized hub host species that share ticks or TBDs with several other host species. This lays the groundwork to characterize common characteristics (e.g., body size, diet, and longevity) of hosts that play a disproportionate role in parasite sharing between species. The

extent to which the two networks are congruous is currently unknown, but I expect to find stronger associations between ticks, TBDs, and hosts that are herbivorous and long-lived. An herbivorous diet would result in a more frequent contact rate with vegetation containing ticks, and a long-lived host will have more opportunities to encounter ticks that transmit TBDs. Identifying which characteristics make hosts more susceptible to ticks and TBDs has the potential to help predict the risk of host-tick associations and TBD transmission, as well as identifying hotspots for risk of human-acquired TBDs.

From Trash to Fashion: Converting Polyethylene Terephthalate into Fabric

Cathy Lee, CURO Research Assistant
Dr. Suraj Sharma, Textiles and Merchandising, College of Family and Consumer Sciences

The impact of the clothing industry has been highly detrimental to the environment due to the overconsumption of resources and the increase of cheap, mass-produced garments that have short life spans. Plastic water bottles, made of polyethylene terephthalate, also accumulate waste, which can be combatted by creating a cradle-to-cradle life cycle in a sustainable way. This can be achieved by integrating the two polluting sources by converting the discarded polymers, found in local landfills or recycling facilities, into filament yarns than can be weaved into a wearable fabric. The developed process involves first the reduction of the recycled material into a pellet form that can then be extruded into filament fiber form. To do this I assembled and calibrated the dual-band extruder to the best temperature for the pellets and calculated the amount of yarn and fabric one bottle created. The yarn is extruded from a die with a 1/10,000-inch diameter and a round cross-sectional shape. The filaments are then subjected to standard textile testing methods outlined by the AATCC, and its performance characteristics is further compared to similar non-recycled synthetic fibers to determine qualities such as yarn strength. The results from the textile testing processes are forthcoming but when released I will also compare the statistical performance data of standard fibers, yarns, and fabrics and the recycled synthetic material to measure the wearability of the new fabric. These studies will aid sustainability efforts in the fashion industry through this developed process and compilation of testing data and analysis.

Interactive Animatronics in Consumer Environments

Christina Lee, Foundation Fellow
Dr. David Z Saltz, Theatre and Film Studies, Franklin College of Arts and Sciences

Entertainment and consumer industries around the world are striving for innovative yet economical ways to interact with consumers and craft more personalized and unique experiences. In this project, I am fabricating an interactive animatronic puppeteered through radio-transmittance. The trans-locational motion of the form is controlled with medium-range radio frequencies and is separate from the rest of the system. The input sensory devices, such as the microphone, and the output sensory devices, such as the voice modulation and nontrans-locational motion, are integrated into a singular system and run from a programmed microcontroller housed within the unit. Some challenging aspects of this project are ensuring that the input and output devices are strong enough to provide a suitable range for interaction while providing sufficient power to necessary motors without surpassing weight parameters of the figure. The project includes the design, fabrication, and optimization of the movement, sensory input, voice modulation, and sensory output of the figure. I will be comparing the final project with interactive animatronics currently in use in industry environments such as theme parks and haunted attractions.

A Preliminary Evaluation of Supplemental Vitamin E Form on Serum α-Tocopherol Levels and Oxidative Stress Parameters Measured in Response to a Novel Exercise Challenge

Kendall Lee
Dr. Kylee Duberstein, Animal and Dairy Science, College of Agricultural and Environmental Sciences

Vitamin E is a component of the antioxidant system and is commonly included in commercial horse feeds in the form of synthetic α-tocopherol acetate. The purpose of this research was to assess

the effect of supplemental vitamin E form on serum α-tocopherol levels and oxidative parameters in mature horses at rest and in response to an exercise challenge. Sixteen horses first underwent a 2wk low vitamin E wash-out period and were then randomly assigned to one of four treatment groups, each receiving the control diet plus 4000 IU/day of vitamin E for 14 days: (1) synthetic all rac-α-tocopherol acetate powder, (2) natural RRR-α-tocopherol acetate powder, (3) micellized RRR-α-tocopherol liquid, (4) micellized RRR-α-tocopherol powder. At the completion of the feeding trial, horses began a two day standard exercise test. Blood was collected at days 0, 7, 14 of the feeding trial and pre and post exercise. Serum α-tocopherol was higher on days 7 and 14 as compared to day 0 in all treatment groups with no differences between treatment groups. Average serum α-tocopherol levels were higher in horses supplemented micellized forms as compared to synthetic and natural acetate powder over the three exercise time point sampled ($P<0.05$). Additionally, horses fed micellized RRR-α-tocopherol maintained whole blood GSH-T levels following exercise, whereas horses receiving acetate bound forms showed a post exercise decrease in whole blood GSH-T ($P=0.03$). Findings of this study indicate that micellized RRR-α-tocopherol is superior to other vitamin E forms in maintaining serum α-tocopherol and antioxidant status in response to a novel exercise test.

All Things in Moderation: The Effect of Moderation Messages on Food Perceptions

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

Heart disease is the number one cause of death in the United States and obesity has been increasingly linked to being a cause of it. Although it is easy to point to overeating as the cause of obesity, there is no clear explanation for why people overeat. The purpose of the present study was to study the effect of how different messages on consumption habits impact people's perceptions of food. We hypothesized that exposing people to different messages about healthy eating habits would change how healthy they thought certain foods were. In order to test this hypothesis, participants came to the lab and saw one of four different messages regarding how to maintain healthy eating habits. Participants then saw images of various foods and asked to rate how healthy they perceived those foods. Results found that telling people that eating foods in moderation is okay results in people considering more foods as healthy than they would otherwise. This suggests that one reason for overeating is that when people are told that eating unhealthy foods in moderation is acceptable they are more comfortable with the idea of eating them. A study examining consumption is testing this idea.

The Effect of Lutein and Zeaxanthin Supplementation on Emotional Well Being

Paul Lee, CURO Research Assistant
Dr. Lisa Renzi Hammond, Psychology, Franklin College of Arts and Sciences

Dietary carotenoids lutein (L) and zeaxanthin (Z) are the only carotenoids in the neural retina and are the dominant carotenoids in the neocortex. Here, L in particular is thought to directly influence neural communication. Past research suggests that supplementation with L and Z can improve visual processing speed, reaction times and cognitive function across the adult lifespan. Despite the fact that L is widespread in the neocortex, past research has focused predominantly on only one output of a healthy brain: cognitive function. If L influences neural communication throughout the brain, other behavioral outputs of a healthy brain should also be observable, such as emotional processing. The purpose of this study was to test this hypothesis in 51 healthy older adults and 51 healthy young adults from the UGA and surrounding Athens-Clarke County community. Participants were randomized into two groups, one that received 12 mg / day L+Z, and one that received a visually identical placebo. Emotional processing data were collected using the CNS Vital Signs computerized testing platform at baseline, 4-months, 8-months and 12-months of intervention. L+Z status was measured in the neural retina as macular pigment optical density (MPOD). Analyses are ongoing, and results will be presented at the symposium.

Current Investigations of Chromium Photocatalyzed [4+2] Cycloadditions

Sang M Lee, CURO Research Assistant
Dr. Eric M Ferreira, Chemistry, Franklin College of Arts and Sciences

Photoredox catalysis is an emerging field in modern organic chemistry with visible light as the source of energy to enable transformations previously inaccessible by traditional means. Recently, earth-abundant photocatalysts have been employed in a radical cation Diels-Alder cycloaddition of electron-rich dienophiles. Current literature suggests that the electron-rich alkene is rendered electron-poor after single electron oxidation by the catalyst, allowing it to cyclize with the diene. Electron-poor dienophiles have also been employed in this net [4+2] reaction, but because the Cr complexes themselves are not strong enough to oxidize electron-poor olefins, current research in the lab promotes the idea that it reacts with the diene through an alternative pathway. Experimental evidence suggests a light-mediated [2+2]-cycloaddition, followed by a Cr-catalyzed vinylcyclobutane rearrangement. This rearrangement yields the net [4+2] product with reversed Diels-Alder regioselectivity. Current understanding of the cycloaddition requires further studies on the effects of electronics and sterics in order to elucidate the mechanism. For this study, dienophiles of various steric bulk and electronics were used to determine the efficiency of the cycloadditions based on these criteria to assess π-π stacking interactions in a putative catalyst-substrate association complex.

Effect of Reproductive State on Parasite Infection in Wild Rodents

Soo Min Lee
Dr. Vanessa Ezenwa, Ecology, Odum School of Ecology

Sex steroid hormones are known to have strong effects on the mammalian immune system. Testosterone has been shown to suppress immune function in males, while estrogen can enhance certain mechanisms of the immune system in females. Importantly, these hormone-associated changes in immunity can affect parasite susceptibility. Since rodents tend to shift in and out of actively reproductive states on relatively short time scales, changing their hormone levels, this study focused on wild cotton mice (*Peromyscus gossypinus*) and hispid cotton rats (*Sigmodon hispidus*) in Georgia. We will test to see whether the reproductive and non-reproductive states alter the intensity of parasite infection. Additionally, we will examine the number of parasite species between males and females. To assess differences in parasite infection, we will use fecal samples collected from each species during non-reproductive and reproductive periods to measure the intensity of the gastrointestinal parasites. We expect reproductively active individuals to be infected with a higher intensity of parasites and a greater number of parasite species. Additionally, the reproductive males are expected to be more infected than the reproductive females. This study will reveal the effect of reproductive state on the parasitic infection.

Off-Target Effects of the Inhibitor MRS2578 on the Formation of Neutrophil Extracellular Traps

Tae-In Lee, CURO Research Assistant
Dr. Balazs Rada, Infectious Diseases, College of Veterinary Medicine

Within the joints of patients with gout, the deposition of monosodium urate crystal drives the accumulation of polymorphonuclear leukocytes. At the site of infection, neutrophils primarily engulf pathogens exposing them to antimicrobial compounds such reactive oxygen species produced by the NADPH oxidase. However, in gout in response to monosodium urate crystal deposition, PMNs undergo another antimicrobial activity called NETosis which is the release of chromatins, granule proteins and DNA into the extracellular space to form neutrophil extracellular traps. NETs immobilize pathogens preventing further dispersal, but uncontrolled formation of NETs also leads to several diseases such as gout. Previously found, MRS2578 inhibits a purinergic P2Y6 receptor in THP1 macrophages and keratinocytes yet at a higher level than the inhibitor's IC_{50} value. Therefore, MRS2578 loses its inhibitory effect around its IC_{50} value proposing potential off-target effect. Here, we examined the effect of MRS2578 at much lower concentrations and of zinc—an inhibitor of proton channels—on NET formation. Zinc reduces NET formation stimulated by MSU crystals suggesting the involvement of the proton channel. Since NETosis is dependent on NADPH

oxidase and phorbol-12-myristate-13-acetate (PMA) triggers NETosis by activating protein kinase C, which activates NADPH oxidase, PMA was used for positive control of NET formation. Our data indicate that the purinergic MRS2578 inhibitor can have off-target effects, likely inhibiting the NADPH oxidase or its associated proton channel, which sheds novel light on its potential use for inhibiting neutrophil activation in diseases including gout.

A Study of Interstellar Intermediate Velocity Gas Clouds

Bjorn Leicher, CURO Research Assistant
Dr. Robin Shelton, Physics and Astronomy, Franklin College of Arts and Sciences

Intermediate Velocity Gas clouds (~80 km/s) are enormous clouds of neutral atomic Hydrogen that travel throughout the galactic halo; the area of dust and gas surrounding our galaxy. As a result, the gas clouds experience numerous changes in their characteristics. In this research, we use hydrodynamical simulations to analyze the changes in these characteristics over the duration of its lifetime (~5-10Myr). Three different simulations are run for three different speeds of the cloud (60, 80, and 100km/s). By using speed as a control variable, we can see how it affects the other aspects of the cloud. Through the analysis of IVCs, we attempt to answer questions such as where these clouds come from and how they play a role in the galactic fountain process, if any. Because IVCs have not yet been extensively studied, the primary focus of this study is to gain a better understanding of the clouds holistically.

Competing Pressures: Tipping the Scales in the Prosecution of Rape and Sexual Violence

Zoe Li, Foundation Fellow
Dr. Maryann Gallagher, International Affairs, School of Public and International Affairs

The treatment of the issue of rape and other forms of sexual violence in international law is continually evolving. Prosecutors are coming across increased cases of rape and sexual violence crimes that can potentially be brought to trial. Of those that could be brought forth, however, only a fraction of them actually pursue the charges. This begs the question, why? This paper presents a potential explanation involving opposing pressures that prosecutors in the international criminal courts face when choosing which cases to take on: "win" pressure and "outsider" pressure. In this argument, "win" pressure refers to the internal pressure applied by prosecutors upon themselves to "get the win" or take on cases they deem most likely to garner a conviction. On the challenging side, there is "outsider" pressure, which refers to the influence of any other actors outside the Office of the Prosecutor, including judges, non-governmental organizations, international organizations, and individuals outside the court. Inner "win" pressure usually acts as a discourager for rape and sexual violence cases, while "outsiders" are usually sources that push for increased rape and sexual violence indictments. It is in the way that these two competing pressures are reconciled that determines whether or not rape/gender-based violence crimes are charged against perpetrators in the international courts. The study of these prosecutorial motivations can enhance our understanding of international humanitarian law and contribute to the development of the most effective ways to reform and ameliorate it.

Nanofibrous Pectin Scaffolds for Biomedical Applications

Nathan Likens, CURO Research Assistant
Dr. Sergiy Minko, Chemistry, Franklin College of Arts and Sciences

In today's rapidly growing field of biomedical applications, biocompatible materials are increasingly sought after. Pectin, a polysaccharide found in plant cell walls, is one such material. This heteropolysaccharide is composed of homogalacturonans, rhamnogalacturonans, and substituted galacturonans. The goal of this experiment is to create scaffolding from crosslinked pectin nanofibers for tissue engineering and drug delivery use. Many previous attempts at creating nanofibrous scaffolding involved the use of toxic or flammable solvents which is not conducive for a biocompatible application. The process of elecrospinning the pectin polymer into nanofibers creates a high surface area to volume ratio which is ideal for cell adhesion, proliferation and differentiation. Previous experiments have been conducted with

chitin, which produced promising results; however, the addition of pectin enhanced the mechanical structure of the scaffold. Our goal is to find an ideal concentration of pectin to optimize the tensile strength, cell viability, and ultimate decomposition of the nanofibrous scaffold.

Sensitive Liquid Chromatography/Tandem Mass Spectrometry Method for the Determination of a Novel Highly Lipophilic Anti-Cancer drug Candidate in Rat Plasma and Kidney Tissue

Michael Linzey, CURO Research Assistant
Dr. Michael Bartlett, Pharmaceutical and Biomedical Sciences, College of Pharmacy

Prostate cancer (PCa) is the second leading cause of cancer related deaths in males. When PCa forms metastasis they develop onto the bone and it is these migratory tumor cells that cause most morbidity and mortality. There are currently no satisfactory treatment options for bone metastatic PCa. There is a great need to further develop treatments that will fill this need. There is a group called amino-bisphosphonate derivatives that have shown promise in targeting bone metastatic PCa. These compounds have been shown to be highly lipophilic so understanding where they partition is extremely important. LG1980 is a representative molecule of this class. It selectively induces apoptosis in aggressive PCa cells. This particular candidate is in pre-clinical studies to test its toxicity and pharmacokinetic properties in animals. There needs to be an accurate and reproducible method for quantifying the drug concentrations in various organs. The purpose of this investigation was to develop and validate a selective, sensitive, and robust LC-MS/MS method for quantification of this highly lipophilic anti-cancer drug candidate in rat plasma and kidney tissue. This bioanalytical method was validated in accordance with current FDA guidelines including accuracy and precision of inter- and intra-batch variation, specificity, linearity, limit of detection, limit of quantitation, recovery, and stability. While this specific drug candidate may fail, it is worth noting that this method could be applicable for the quantifications of other amino-bisphosphonate derivatives in biological samples with minor modifications to the method.

Consumers as Curators: Brand Use in Social Media

Lydia Liu, CURO Research Assistant
Dr. John Hulland, Marketing, Terry College of Business

Online consumer curation describes the behavior of gathering, selecting, and assembling online content into a display. Consumers may use art, photos, text, product images, and brands in their curation efforts. This behavior is an understudied way in which consumers are engaging with brands online, and thus is important for marketers to understand. The current research is focused on uncovering what information about curated brands is related to the popularity of an online display, in order to understand what characterizes an influential display. To address this question, data were collected from a social media site centered on the creation of curated displays. A regression analysis will uncover what information about the curated brands (e.g., the general popularity of the items, price statistics, and the number of unique brands) is related to the popularity of the curated display. Further, results will be compared across two groups on the social media site in order to address the generalizability of our findings. This research will move our knowledge of online consumer behavior forward and provide important information for managers about how consumers are using brands online.

Distribution of Ticks on Cervids and Prevalence of Selected Tick-Borne Pathogens in These Ticks from Kentucky

Bessie Lockwood, CURO Research Assistant
Dr. Michael Yabsley, Forestry, Warnell School of Forestry and Natural Resources

In recent decades, white-tailed deer (*Odocoileus virginianus*) populations have increased dramatically, partially due to the conversion of farmland to forests. Furthermore, more people have moved to areas adjacent to woodland habitats. Thus, vector-borne diseases are becoming increasingly more prevalent in humans and domestic animals. Vector-borne pathogens can also cause disease in various wildlife species.

In this study, ticks were collected from cervids in Kentucky, identified to species, and selected species tested for causative agents of Lyme disease (*Borrelia burgdorferi*) and spotted fever (*Rickettsia parkeri*). Four different tick species were collected including the winter tick (*Dermacentor albpictus*), lone star tick (*Amblyomma americanum*), black-legged tick (*Ixodes scapularis*), and the Gulf coast tick (*Amblyomma maculatum*). *D.albipictus* was detected in 42 counties, *I.scapularis* was detected in 41 counties, *A.americanum* was detected in 16 counties, and *A.maculatum* was detected in 7 counties. These four tick species were detected throughout Kentucky indicating the risk of tick-borne pathogens statewide. Of 173 *I. scapularis* ticks tested for *B. burgdorferi*, 11% were positive. Of 43 *A. maculatum* ticks tested for *Rickettsia sp.*, 19% were positive and sequence analysis indicated several *Rickettsia spp.* were detected. Further research will be done to determine the exact species of *Rickettsia* present. The data provides important data on the current distribution of tick species present in Kentucky and their associated pathogens.

Investigating the Role of Cyanogenic Glycosides as a Potential Defense for *Passiflora incarnata* against *Agraulis vanillae*

Atul Lodh, CURO Research Assistant
Dr. Rodney Mauricio, Genetics, Franklin College of Arts and Sciences

Plants produce the largest variety of secondary metabolites of any organism on the planet. However, the evolutionary forces that generate this diversity are still unknown. A leading hypothesis is that these metabolites serve as defenses against insect herbivores that utilize plants as a food source and that herbivores evolve to combat these defenses in response. To test the hypothesis that cyanogenic glycoside is a defensive metabolite and therefore is under natural selection by insect herbivores, a common garden experiment was conducted using the plant species *Passiflora incarnata*. Furthermore, a second experiment looking into *Agraulis vanillae* (Gulf Fritillary) performance on *P. incarnata* plants from different regions of the United States was conducted. The results of the common garden experiment suggested that a relationship between cyanogenic glycoside production and fitness was unable to be determined. Furthermore, from the herbivore performance experiment, a significant interaction between toughness and cyanogenic glycoside production on female pupae weight was observed. This work provides further insight into the importance of metabolites in mediating plant-herbivore coevolutionary interactions.

Evaluating Woody Tissue in Chicken Breast Samples with X-Ray, CT, and MR Imaging – A Pilot Study

Mary Catherine Lollis, CURO Research Assistant
Dr. Mark A Haidekker, Electrical and Computer Engineering, College of Engineering

The trend to grow larger chickens has posed a problem to the quality of meat, a muscle condition known as Woody Breast. The affected muscle tissue is characterized by the presence of hardened fibers, which affect the texture and can be tough to chew. Methods are sought to help identify the affected tissue to prevent it from consumer consumption and to analyze the factors involved in the hardening of the tissue. Using x-ray imaging, computed tomography (CT), and magnetic resonance imaging (MRI), absorption values of healthy muscle tissue and woody breast were examined for significant differences. The guiding hypothesis was that there is a difference in radiological absorption between healthy and diseased tissue. Using CT, the healthy tissue was found to be in the expected range of about 45 to 60 Hounsfield units, but the woody tissue showed an approximate 18.5% decrease in density compared to healthy tissue ($P<0.01$). A lower density was also found in x-ray imaging, dependent on the density ratios between 25 and 30 kVp and 25 and 35 kVp. The trend was not statistically significant. The variability in x-ray values can be explained by the variations in sample thickness. MRI relaxation times were not found to relate to the disease, but MR images served as a visual control to eliminate low-density samples caused by fatty striations. While this pilot study established the principal benefit of dual energy imaging, a larger study is needed to obtain more representative values and to eliminate unrelated influences.

Tail Ischemia Associated with Arterial Catheters in the Coccygeal Artery: A Case Series

Daiannette Lopez, CURO Research Assistant
Dr. Jane Quandt, Small Animal Medicine and Surgery, College of Veterinary Medicine

A case series study is intended in order to detail the presence of tail ischemia as a complication after an arterial catheter has been placed on the coccygeal artery of a cat or dog prior and during surgery. The study is limited to cases presented at the College of Veterinary Medicine (CVM) at the University of Georgia. Dog and cat cases presented at the Soft Tissue Surgery service with tail necrosis and/or amputation will be reviewed to see if it was subsequent to a surgery where an arterial catheter was placed in the coccygeal artery. Although correlation does not indicate causation, it is possible that the arterial catheter created blood clots that could have caused the tail ischemia, which could end in amputation. Another possible cause of tail ischemia is the occlusion of blood flow to vessels near the arterial catheter, or proximal to it, due to the catheter's size. The standard gauge of the catheter placed in the artery on the ventrum of the tail is twenty-two gauge and one-inch long. It is of importance that these cases are reported since no articles reporting cases of cat's or dog's tail ischemia caused by arterial catheters placed in the coccygeal artery have been published.

The Sustainability and Performance of Metakaolin and Blast Furnace Slag in Mass Concrete Production

Victor Lopez, CURO Research Assistant
Dr. Mi Chorzepa, Environmental, Civil, Agricultural, and Mechanical Engineering, College of Engineering

The search for sustainable concrete mixtures has been on the rise in recent times. Cement binds four other constituents together to create concrete, but is also the constituent that requires the most energy to be produced and must be manufactured separately in a cement plant. As a result, the entire concrete mixing process is unsustainable. Substituting cement with certain materials will not only produce a more sustainable mixture, but improve performance. This study involves researching viable cementitious materials, materials that exhibit properties similar to cement, and substituting a percentage of cement with these materials. The cementitious materials observed in this study are metakaolin and blast furnace slag (BFS). In terms of performance, metakaolin possesses specific qualities that contribute to long-term concrete strength as well as reduction of shrinkage, an issue involving reduced volume due to water loss. Alternatively, BFS can also replace a percentage of cement. Along with being recyclable, BFS is also used to increase concrete durability. Several concrete mixtures will be produced and tested for strength and durability, then compared to control specimens. 9 tests will be conducted on the specimens. Stength tests include Compression, Split Tension, Modulus of Rupture (MOR), and Modulus of Elasticity (MOE), and durability tests include Rapid Chloride Permeability (RCP), Alkali-Silica Reaction (ASR), Dry Shrinkage, Sulfate Resistance, and Coefficient of Thermal Expansion (CTE). These tests will determine the benefits of these cementitious materials based on environmental impact and performance.

Investigating Diet and Stress in Medieval Polish Individuals Using the Bone Density Fractionation Method

Janae Marie Lunsford, CURO Research Assistant
Dr. Laurie Reitsema, Anthropology, Franklin College of Arts and Sciences

Stable isotope analysis is well-established method for reconstructing diet and stress in past populations. However, the relative inertness of bone presents a challenge for reconstructing diet and stress during the last years and months of life. The bone density fractionation method offers a means to overcome this problem. As it allows one to see the changes in diet and stress over time in a person's life, the bone density fractionation method was used in order to better understand the diet and stress of a Medieval Polish sample. Using the ribs of three Medieval Polish adults and one subadult, the cortical bone was separated into different densities prior to undergoing stable carbon and nitrogen isotope ratio analysis. Stable isotope ratios of carbon can show whether or not a person was eating more C3 or C4 plants. Stable isotope ratios of nitrogen can demonstrate where a person was eating on the food chain and can

signal weaning in subadults. Through stable isotope analysis of the different densities, one can reconstruct patterns in diet and nutritional stress in the final years and months prior to death in adults and can test for patterns of weaning in subadults. This research allowed the application of the bone density fractionation method to a Medieval Polish sample in order to explore the changes in health and stress in those individuals until their deaths.

Forensically Influential Beetle Fauna in the Fall of 2016

Alexandria Lushaj, CURO Research Assistant
Dr. Marianne Shockley, Entomology, College of Agricultural and Environmental Sciences

What beetle fauna colonize carrion in the fall, and at what stage of decay do we find each of the different beetle families? Forensic entomology is very influential in urban and criminal court cases. Insects are the keys to unlocking hidden truths behind investigations that may otherwise not be discovered without their aid. Unfortunately, there is not much information about beetle fauna found in Georgia and much of the south so that is why the interest in conducting this experiment is so great and influential. For my experiment, I will be examining beetle fauna that colonize carrion during the fall of 2016. The point of this research is to compare what I and several other researchers collected in the spring of 2016. The continuation of this experiment is crucial in creating a substantial and solid database. The trial conducted in the spring of 2016 was very successful and helped guide the continuation of research on beetle fauna in the fall of 2016. As mentioned, there has not been much exploration behind beetle fauna research and its importance. The science we will uncover will aid investigators in estimating a post-mortem interval in potential homicide cases. In starting my quest in my experiment, a pig that is killed by a single gunshot to the head will be obtained. Next, the pig will be placed in a cage to be protected by scavengers. After the stimulation of a crime scene, pitfall traps will be placed around the cage to obtain the beetle fauna necessary to properly examine. The data from spring 2016 will be used as a comparison so a clear correlation and trend is visible.

Mechanical Characterization of Lipid Membranes Using Micropipette Aspiration

Katherine MacManus, CURO Research Assistant
Dr. Eric Freeman, Environmental, Civil, Agricultural, and Mechanical Engineering, College of Engineering

The study of the mechanical properties of liposomes will provide further insight to cell membrane fusion events such as endocytosis and exocytosis. The purpose of this experiment is to measure the mechanical characteristics of liposome membranes by using the micropipette suction technique. With this technique, data will be collected that can measure the membrane area expansion modulus and the in-plane Young's modulus, allowing for the mechanical characterization of the liposomes. The experiment is divided into two parts: the creation of the liposomes through electroformation, and the study of their membrane properties using a pressure clamp. The pressure clamp allows for the aspiration of the electroformed liposomes within a micropipette through maintaining a holding pressure. The data collected from the pressure clamp is then combined with the measured curvature of the deformed liposome using a MATLAB script, and the membrane resistance to mechanical deformation is calculated. This technique can be used for various kinds of lipids, developing the knowledge and understanding of the complex structures and properties of the lipid membrane.

A Correlational Study: The Relationship between Critical Flicker Fusion Thresholds of Postpartum Women and Infants

Neha Arun Madangarli
Dr. Janet Frick, Psychology, Franklin College of Arts and Sciences

Macular pigment, found in the center of the retina, is composed of the carotenoids lutein (L), zeaxanthin (Z), and meso-zeaxanthin. Studies by Hammond, Bovier, and Renzi (2013) and by Hammond and Renzi (2010) have shown that macular pigment optical density (MPOD) correlates negatively with visual motor response times (shorter response times indicate better performance) and positively with visual temporal

processing speed, quantified via measurement of critical flicker fusion thresholds (CFF), in adults. CFF thresholds represent the fastest frequency of a flickering light that an individual can discriminate as flickering; lights flickering at speeds above an individual's CFF will appear solid. The present study investigates the relationship between the MPOD of 20 postpartum women and the CFF thresholds of their 4.5-month-old infants. Customized heterochromatic flicker photometry was used to test the women's MPOD with a 1° 460nm and 570nm stimulus flickering in counter phase. Infant CFF was measured using a forced-choice preferential looking (FPL) paradigm in which the infant was presented with two stimuli (one solid and one flickering at a particular frequency) on either side of their midline and a naïve observer judged the side with the flickering stimulus based on the infant's looking behavior. This was repeated until a threshold estimation could be made by the second experimenter. Based on the previous research outlined above, it was hypothesized that the MPOD of postpartum women would positively correlate with their 4.5-month-old infants' CFF thresholds, meaning that women with higher MPOD should have infants with faster visual temporal processing speeds. Data collection is ongoing.

Effect of Invasive Macroalgae *Gracilaria vermiculophylla* on Feeding Behavior of *Callinectes sapidus*

Katie Maddox, CURO Summer Fellow
Dr. James E Byers, Ecology, Odum School of Ecology

Within the past decade the invasion of southeastern estuaries by a non-native seaweed, *Gracilaria vermiculophylla*, has greatly altered the physical structure of previously bare mudflats. With the creation of novel habitat, this invader could have major impacts on the trophic relationships of Georgia's estuarine communities. *Callinectes sapidus*, or the Atlantic blue crab, is a common intermediate predator found on the mudflats along the southeastern United States. Blue crabs feed on a wide range of invertebrates such as worms and clams, which are some of the species that proliferate in mudflats where *G. vermiculophylla* is often present. My study aims to quantify the effect of the emergence of this landscape-altering seaweed on the foraging behavior of *C. sapidus*. To study this effect, I conducted feeding trials in which *C. sapidus* had the option of feeding in the presence or absence of *G. vermiculophylla*. We found that blue crabs showed no preference for foraging in areas with *G. vermiculophylla* versus without the invasive seaweed. A tethering experiment was conducted in order to study predation on the mudflats. We quantified the foraging pressure on *Mercenaria mercenaria*, a clam commonly found on the mudflats where *G. vermiculophylla* is present. Again, we found that there was no significant difference in foraging pressure within *G. vermiculophylla* mats versus on bare mudflats. We also conducted a long-term predator exclusion experiment to quantify the effect *G. vermiculophylla* has on invertebrate diversity. We expect our results to show that *G. vermiculophylla* has no effect on invertebrate diversity.

The Effect of ePortfolio Use on Real-World Application of Classroom Skills

Carter Patrick Maguire III
Dr. Leslie Gordon, Institute of Higher Education, Senior Vice President of Academic Affairs

The introductory linguistics class is often more difficult than students expect, due in large part to its emphasis on active analysis of language over simple memorization of facts. Under the experiential pedagogy of ePortfolio, the abstract concepts students encounter become more accessible. Undertaken in an introductory Spanish linguistics class, the project studied the implementation of ePortfolio, a web-based collection of student work and reflections that provides evidence of learning. The ePortfolio is a unique way for students to personalize learning, encouraging the application of concepts and skills outside of the classroom. Two Honors students were used as peer tutors, reviewers of ePortfolio construction, and collectors of formative classroom data on the project's effectiveness. Three surveys taken at the beginning, middle, and end of the semester gauged variables such as the effectiveness of peer tutoring and the pace of progress through the assignment, among others. The two Honors students wrote blogs describing the experience of acting as a peer tutor, and provided accounts of the project from the student perspective. The data from the surveys and the

Honors students' blogs demonstrate that students engaged in critical observation of language use and applied course concepts to these observations. Analysis of the project shows that one semester of ePortfolio use increases the likelihood that students will apply course concepts to their observations of real world language use.

Effect of Polarization on Hierarchies of Committee-Representative Networks: Social Network Analysis

Emily Maloney, Foundation Fellow
Dr. Dawn T Robinson, Sociology, Franklin College of Arts and Sciences

The dramatic increase in party polarization within the United States Congress over the past decade has logically been linked to the government shutdown in 2012, general gridlock, increased filibustering, and an overall decline in productivity. The mechanism by which polarization plays out within US legislative bodies may be the practice of "rewarding" partisan members of Congress with preferential committee positions, because this allows the majority party to design and prioritize influential ideological legislation. Since committees originate new legislation, they are substantial actors in the production of new laws that guide the nation. This research aims to answer the question, "Does polarization and majority party control in state Houses of Representatives have an effect on the hierarchy and extremism of committee-Representative networks?" To analyze this question, datasets of Representative – Committee relationships will be constructed, along with matrices of roll call voting data. Next, a myriad of social network analysis methods will be conducted on this data, such as centrality to identify key legislators, singular value decomposition to measure partisanship, and hierarchical clustering to show cohesive subgroups. The research questions answered through this analysis are important because they can explain how polarization of parties has affected the structure of state legislative bodies and thus legislation produced, and it can begin to identify the link between polarization of parties and intentional actions in order to maintain power within the legislative body.

Local Perceptions of Wildlife in Samburu, Kenya

Erin Malsbury
Dr. Vanessa Ezenwa, Ecology, Odum School of Ecology

Wildlife conservation initiatives, guided by threat classification systems such as the IUCN red list, often focus their work on rare species with a high risk of extinction. These threat classifications are largely produced by international organizations that may be geographically and culturally distant from the area of implementation. Local people, who are critical to the success of conservation programs, may have different perceptions of wildlife in their region, and disconnect between local communities and conservation organizations has been implicated as a factor in conservation success. Thus, to improve conservation initiatives, it is imperative to understand local human-wildlife relationships and the level of awareness surrounding endangered wildlife. We conducted one-on-one interviews with members of communities in Samburu, a northern region of Kenya which harbors 51 species of large and mid-sized mammals, many of which are threatened, in order to assess local perceptions of wildlife abundance and diversity, extinction threats, and why people believe wildlife should be valued. Our results indicate that people are more likely to care about a species if it is rare but generally lack awareness about the rarity of Samburu's wildlife. Almost all participants indicated that wildlife abundance and diversity have decreased over their lifetime; however, the majority of interviewees felt that extinction is not possible. This view was largely attributed to the protection of local wildlife by recently established community-led conservancies. These results have implications for the design of conservation narratives.

The Effectiveness of Music Therapy Techniques for Improving Second Language Acquisition in Adult ESL Students

Aisling Mohini Manison, CURO Research Assistant
Dr. John Roy Kennedy, Music, Hugh Hodgson School of Music, Franklin College of Arts and Sciences

ESL teachers are always exploring creative methods for increasing second language acquisition (SLA) in their students. Music has long been recognized as a close relative of language and an effective tool for teaching. However, while music is frequently used in elementary schools, it is less popular with adults, who struggle the most with language learning. Is music just play? Or can it be just as useful for adults? The purpose of this study is to investigate the effectiveness of music therapy techniques for SLA compared with traditional classroom methods alone. Participants will be composed of adult non-native speakers with starting L2 acquisition levels spanning early beginner to mid-intermediate. The control group will be taught with traditional ESL classroom methods, while the experimental group will receive 30 minutes of supplemental instruction with music therapy techniques at the end of their traditional class once per week. Each group will take the BEST Literacy test and a Writing/Story Retelling checklist as a pre- and post-test at the beginning and end of the study. It is anticipated that students who receive music as a supplemental portion of their ESL classes will progress more quickly through their ESL levels than students without supplemental music. This study is especially significant for ESL programs whose funding is determined by their retention and graduation of students the program. In accord with Krashen's hypotheses, music therapy techniques can facilitate and expedite SLA, development of fluency, and overcoming student's affective filters by making the learning experience more authentic and enjoyable.

The Effects of Salinity on *Helianthus*

Grace Manning
Dr. Lisa Donovan, Plant Biology, Franklin College of Arts and Sciences

Food scarcity has become a growing problem as the Earth's population increases while global food production has remained relatively stagnant. In addition to this, the locations where population growth is projected to be largest are also the parts of the world that are expected to be influenced greatest by climate change. A major effect of climate change is drought along with rising seawaters. These changes will have an adverse effect on soil salinization and agriculture production. In this experiment we will be assessing the effects of salinity on 11 genotypes of *Helianthus*. Each of these genotypes will be undergoing four treatments 0mM NaCl, 100mM NaCl, 200mM NaCl and 300mM NaCl, where the treatment will initially start at 0mM and will be slowly ramped up over the course of 30 days to their final concentrations. Plants of each genotype will be harvested at the 10, 20 and 30-day marks of treatment and will be analyzed for relative growth rate (RGR), dry biomass (roots, stems and leaves), as well as the ion concentration in the leaves. We have two hypotheses: If the plant has been previously found to have salinity tolerance there will be a higher ion concentration in the leaves at higher salinity concentrations than there will be in the less tolerant genotypes; and there will be a maximum limit for the ion concentration, which will be higher in the genotypes that are previously found to be tolerant and lower in the susceptible genotypes.

Decoding Higher-Order Relations in Biological Data by Learning Markov Networks

Aaron Martinez
Dr. Liming Cai, Computer Science, Franklin College of Arts and Sciences

With the exponential growth of the amount of biological data, there is a rapidly growing need for machine learning and data mining methods that can comb through massive data repositories to answer important biomedical research questions. In particular, learning of Markov networks is viable for discovery of correlations and causality networks among biomedical entities/processes based on observed phenomena/data. The central task of learning is to compute the optimal topology of such networks through optimization computation of the joint probability distribution function, a task that in general is computationally intractable. However, recent breakthrough by the RNA Informatics Lab at UGA proves that Markov networks for tree-like (i.e., k-tree) topologies can be learned efficiently from biological sequence data, leading to successful applications such as bio-molecular structure prediction. Based on this work, the current project is progressing toward the goal of decoding higher-order relationships crossing two or more molecules with significant applications, for example, in RNA-RNA and RNA-protein 3D

structure complex predictions. Specifically, we have developed two optimization algorithms for Markov k-tree learning, for variable k, on both one and two-backbone graphs. The algorithms, which were implemented into software packages OSkT1 and OSkT2 in Java language, have already been applied to Markov network learning from miRNA-target duplex data, which can be effectively used for miRNA target prediction. To make the software scalable to larger biological sequences, our on-going research is improving the computation efficiency, including deploying the packages on parallel computers.

Bone Characterization in the Treatment of Hypophosphatasia with Mesenchymal Stem Cells

Ana Maslesa, CURO Research Assistant
Dr. Luke Mortensen, Animal and Dairy Science, College of Agricultural and Environmental Sciences

We present the use of second-harmonic generation (SHG) images produced by two-photon microscopy to characterize bone morphology using Hypophosphatasia (HPP) as a model. Hypophosphatasia (HPP) is a rare genetic disorder caused by mutations to the tissue-non-specific alkaline phosphatase (ALP) gene. Diminished ALP activity prevents the enzyme from dephosphorylating inorganic pyrophosphate (PP_i), a potent inhibitor of mineralization, resulting in disarticulated collagen and porous bones. Current treatments only alleviate symptoms in the long bones of patients with HPP and do not address premature loss of teeth and craniosynostosis. A promising treatment is mesenchymal stem cell (MSC) therapy, which has been used in clinical studies along with myeloablation and full bone marrow transplants. However, many patients in need do not qualify for bone marrow transplants as they are too sick for such a harsh, risky procedure. The impact of MSCs on bone structure has yet to be described due to the limitations of current technologies, microCT and DEXA. Image J will be used to analyze characteristics of bone such as pore size, number, and spacing along with collagen fiber density. We will use SHG images to examine the collagen microstructure in cranial bones to assess the impact of MSCs in their local environment. We predict that bones will have smaller, fewer pores and denser collagen fibers when the mouse is treated with MSC therapy. This data will be used to determine the effectiveness of MSC therapy for HPP and will establish SHG as a means for characterizing bone morphology for bone diseases.

Is Serum Bacteria-Killing Ability in the African Bush Rat Driven by Complement?

Isabella Mateu
Dr. Vanessa Ezenwa, Ecology, Odum School of Ecology

Vertebrate innate immunity provides a rapid and nonspecific response to invading pathogens. This form of immunity consists of anatomical barriers, phagocytes, natural antibodies, and opsonizing proteins. The complement system is a vital component of the innate immune response. Its enzyme cascade lyses targeted pathogen cells through either direct-attack or by marking them for subsequent phagocytosis. Previous work has suggested that wild African bush rat (*Aethomys spp.*) possess a highly robust innate immune response that destroys pathogenic bacteria significantly more effectively than the response of laboratory mice. The primary objective of this project is to test whether complement activity plays a key role in driving this robust response. To explore this issue, the bacteria (*E. coli*) killing ability of bush rat serum exposed to the complement inhibitor, 6-amidino-2-naphthyl p-guanidinobenzoate dimethanesulfonate (futhan) will be compared against untreated and heat-inactivated serum. We anticipate that, if complement is the major driver of bacteria killing in bush rats, that the futhan and heat-treated samples will exhibit very low killing compared to untreated samples, due to the inactivation of complement in these samples. This study will provide insight into precisely which aspect of innate immunity wild bush rats use to fight off bacterial infection.

Perceived Severity of Conditions Related to Obstructive Sleep Apnea among At-Risk College Students: Consequences That May Influence Academic Performance

Jamarcus Gregory Mathis, CURO Honors Scholar, CURO Research Assistant

Dr. Matthew Lee Smith, Health Promotion and Behavior, College of Public Health

Obstructive sleep apnea (OSA) is a condition that typically impacts middle-aged and older adults. However, with the rise in obesity nationwide, OSA and other forms of disordered breathing are increasing among younger populations. The ramifications of OSA among college-aged students may impact their academic performance due to inadequate oxygen intake and reduced sleep quality. The purposes of this study were to: identify familial risk factors for OSA among at-risk college students; and compare severity perceptions about OSA-related conditions that may influence academic performance. An internet-delivered survey was used to collect data from 334 overweight (57.5%) and obese (42.5%) college students who snored. Pearson correlations were performed to assess the strength and direction of severity perception associations between OSA-related conditions. Then, a series of paired *t*-tests were used to compare perceived severity levels between OSA-related conditions. Compared to overweight participants, obese participants reported their mothers had significantly more OSA-related risk factors. On average, the OSA-related conditions perceived to be most severe was cardiovascular disease (CVD) followed by depression, decreased memory, decreased concentration, daytime sleepiness, and low sex drive. Strong positive correlations were observed between the majority of severity perceptions about OSA-related conditions ($P<0.01$). In paired *t*-tests, severity perceptions were consistent for overweight and obese participants. On average, CVD and depression were perceived to be significantly more severe than other OSA-related conditions ($P<0.01$). Understanding at-risk college students' OSA-related severity perceptions can inform interventions about the importance of OSA screening and obtaining one's family health history.

Bioactive Scaffold Design for Bone Tissue Engineering

Ridge Maxson, CURO Research Assistant
Dr. Cheryl Gomillion, Chemical, Materials, and Biomedical Engineering, College of Engineering

A significant number of bone grafting procedures are performed annually in the United States. Autografts and allografts have historically been used to repair fractured bone; however, they present myriad complications, including limited tissue availability and rejection of allograft donor tissues. 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. In this work, we aimed to fabricate polymer scaffolds to include a combination of natural and bioactive molecules, and then assess various formulations to identify the optimal bone supporting scaffold. Scaffolds were fabricated using poly (lactic-co-glycolic) acid) (PLGA), a synthetic biodegradable copolymer consisting of lactic and glycolic acid. Varying combinations of tricalcium phosphate, a ceramic component associated with osteoconductivity, was blended with the polymer to improve the mechanical strength and cell supporting potential of these scaffolds. Scaffolds were prepared using a porogen leaching method, and characterized using a variety of techniques, including mechanical testing, in vitro degradation tests, and swelling studies. In addition, an in vitro cell study to examine the interaction of bone cells with these materials was used to evaluate bone cell attachment, proliferation, and mineralization. The long-term goal of this work is to develop a composite, multi-functional scaffold that addresses current limitations, mimics the properties of native bone, and supports the creation of new bone.

Communicating the Importance of Microbial Symbionts to the Public

Johnathan Martin Mayfield, CURO Research Assistant
Dr. Gaelen Burke, Entomology, College of Agricultural and Environmental Sciences

Spanning across the eastern seaboard from Maine to our own state of Georgia are Hemlocks (*Tsuga canadensis* and *T. caroliniana*) as well as the invasive and destructive sap-feeding insect Hemlock Woolly Adelgid (HWA). The successful management of this species will require the public

and its support as well as continued research by professionals into both management policies and the basic biology of the HWA. The University's mission, "to teach, to serve, and to inquire into the nature of things," serves as the foundation for this research project that aims to understand the interplay between adelgid life cycles and their microbial symbionts, and how to relay this to the public. We intend to survey community members in Athens-Clarke County about their knowledge of adelgids, their life cycles, and their symbionts before and after a program designed to simulate aspects of and increase understanding of HWA biology. Specifically, we have designed an activity to demonstrate the life cycles of adelgids and the importance of the nutritional benefits that their microbial symbionts provide. Anticipated results include increased expressed appreciation for research on insects and their impact upon the environment. Furthermore, we intend to publish the activity and other resources online for use by educators outside of the UGA community. Through our various outreach methods we believe that we can both inform the public about a research project being actively conducted in the Entomology department at UGA and the impact of adelgids and other invasive insect pests upon our environment.

Primordial Chemical Composition Through the Reionization Period

Ryan McArdle
Dr. Phillip C Stancil, Physics and Astronomy, Franklin College of Arts and Sciences

The focus of this research is to model and explore the chemical evolution of the primordial universe, from the Big Bang through the reionization period. We use code developed by Christopher Gay for his dissertation, which models the chemistry of the universe from its beginnings through the recombination period under the effect of the CMBR. The goal of our project is to further develop this code in order to extend the model through the end of the reionization period, in which primordial gas clouds collapse into the first stars and radiate their surroundings. The radiation released by the newly formed stars results in a shift in compositional evolution that differs from the evolution produced by the CMBR alone, and an accurate modeling of the influence of these stars is necessary for a proper model of chemical composition through the early period of the universe. Our current model provides data that largely indicates a dying out of activity following the recombination period, in which the abundances of the different compounds remain at rather stagnant values. However, with an appropriate model of stellar influence, one would expect another period of compositional evolution to coincide with the existence of these primordial stars, and we hope to accurately model these changes in development.

Improved Nitric Oxide-Releasing Polymer with Surface Exposed and Crosslinked Zwitterionic Polymer for Antimicrobial Applications

Jennifer McCarty, CURO Research Assistant
Dr. Hitesh Handa, Chemical, Materials, and Biomedical Engineering, College of Engineering

Accumulation of bacteria, proteins, and platelets on medical device surfaces is a leading cause of nosocomial infections and device failure. If this fouling of medical device coatings could be eliminated, then the safety of implantations, catheters, and stents would increase exponentially. By applying a zwitterionic polymer topcoat (antifouling agent) to a nitric oxide (antimicrobial agent) releasing medical grade polymer, we can dramatically decrease protein adhesion and reduce bacterial attachment synchronously. The zwitterionic polymer (2-methacryloyloxyethl phosphorylcholine- co-benzophenone, BPMPC) was tested for protein adhesion by analyzing its surface properties using ellipsometry and contact angle measurements. This zwitterionic polymer was then crosslinked to the surface of the NO releasing polymer that contains NO donor molecules. The test samples containing the NO donor with the zwitterionic topcoat were tested for NO release behavior to ensure sustained drug release. This combination was tested with *Staphylococcus aureus*, a common pathogen detected in nosocomial infections, for its antimicrobial efficacy. This study aimed to prove that a zwitterionic antifouling topcoat, when paired with a nitric oxide donor, could significantly decrease microbial adhesion. This coating has significant antifouling benefits, allowing for many applications in the biomedical field.

Insects as a Nutritional Source in Horse Feed

Jacki McCollum, CURO Research Assistant
Dr. Marianne Shockley, Entomology, College of Agricultural and Environmental Sciences

There has been a rise in Entomophagy lately as it is a more sustainable food source for both people and animals. It is both nutritional and sustainable, so I decided to research insects as a feed source for horses. I set out to find, based on what is already known, if the nutritional content in insects seems to correlate with what horses need in their diets, and also what people who buy horse feed would think of such a feed. I began by getting as much information as I could about the nutritional needs of horses compared to the nutritional content that insects contain. This proved to be difficult, as I found that insects as a food source for horses has not been studied before, but based on what is known, insects should be able to fill many nutritional requirements of horses. After drawing conclusions from my findings, I created a survey that I have sent out to people that ride horses in order to understand what the public's opinion on such a feed would be. Based on the responses, the people that buy horse feed would be open to trying an insect based feed if it were proven to be beneficial to the horse.

The Conservation of Allostery in *C. Elegans* UDP-Glucose Dehydrogenase

Weston Ellis McDonald, CURO Research Assistant
Dr. Zachary Wood, Biochemistry and Molecular Biology, Franklin College of Arts and Sciences

The human enzyme UDP-Glucose Dehydrogenase (hUGDH) catalyzes the NAD+ - dependent reaction of UDP-Glucose to UDP-Glucuronic acid. The product is essential to glucuronidation, a detoxification pathway of drugs in the human body. This process enhances the rate at which drugs are excreted, and leads to many drugs failing clinical trials. hUGDH catalysis is dependent on its hexameric structure, which is allosterically regulated by a downstream feedback inhibitor, UDP-Xylose. The binding of UDP-Xylose in the active site induces the formation of a distinct inactive conformation of the enzyme through the translation of a conserved allosteric switch. Identifying ways to inhibit UGDH by studying the evolution of this switch and the cavities it occupies could provide ways to influence glucuronidation. Bioinformatics studies identified *C. elegans* UGDH (cUGDH) to be one of the more divergent versions of UGDH that still conserve the allosteric switch. Structural studies with cUGDH show that UDP-Xylose induces the same conformational change in the enzyme. Sedimentation velocity studies show that UDP-Xylose stabilizes the cUGDH hexamer in solution. These results suggest that the allosteric mechanism is preserved between the divergent enzymes. However, steady-state kinetic studies show that the affinity for UDP-Xylose in cUGDH is reduced by more than an order of magnitude. Future studies will aim at solving which structural changes in the functional allosteric switch causes a lesser affinity in cUGDH. I am currently refining the X-Ray crystallographic data of UDP-Xylose-bound cUGDH, and will overlay the refined structure to discover any observable differences.

Rapid Control of New Infections with *Trypanosoma cruzi* in Previously Infected Mice

Caroline McElhannon
Dr. Rick Tarleton, Cellular Biology, Franklin College of Arts and Sciences

Chagas disease, caused by infection of the protozoan parasite *Trypanosoma cruzi*, remains the leading cause of human congestive heart failure worldwide. Particularly prevalent in South America, recognition and treatment are limited, and prevention relies primarily on control of the insect vector. In this study, whole mouse imaging and transgenic parasites expressing luciferase were used to monitor control of parasites at the initial site of infection. Unsurprisingly, previously infected mice controlled skin-introduced parasites more effectively than naïve animals. Mice with a chronic infection, though, had significantly greater control of reinfection than mice with an active acute infection. Additionally, this control in chronically infected mice occurred much faster than expected: within 3-4 days post-challenge. This result suggests that a resident population of T cells may be providing early recognition of challenge parasites. However, experiments to test the requirement for resident memory T cells in this rapid control have so far not supported this

hypothesis, and attempts to transfer this phenotype through T cells of chronically infected mice have failed. This early control also does not appear to be dependent on type I interferon, as mice lacking type I IFN receptors exhibit the same patterns as wild-type mice. Future experiments will use T cell depleting and migration inhibiting treatments to determine the role of non-tissue-resident T cells in the very early control of *T. cruzi* infection in chronically infected mice. These results and future studies will inform on mechanisms that may be required for effective vaccination against *T. cruzi* infection.

Fluidity of Identity among Older Gay Men

Maddie McGarrah, CURO Research Assistant
Jacklyn J Byrd
Dr. Denise Clark Lewis, Child and Family Development, College of Family and Consumer Sciences

Using case study analysis, we will explore how two cisgender gay men reach their decision to "come out," revealing their sexual identity. Otis and Harley (2016) propose that identity is constructed by three fundamental components. Identity is (1) socially constructed, (2) fluid, and (3) continuously evolving through social interaction and meaning-making. Using these three components, we consider various individual factors that form one's identity in later life. Possible factors include age, social & community support and values, as well as race or ethnicity. We recognize that it is not feasible to generalize findings from singular case studies to an entire population; however, case study analysis allows us to identify and generalize theoretical positions. In addition to our findings, we will also discuss whether factors identified in these case studies coincide with broader LGBT literature, particularly addressing additional contributing factors in accepting or rejecting one's sexual identity and the pathways that lead these men to revealing their identity to those around them.

Endurance Training in Patients with Friedrich's Ataxia

Nicole McGarrell, CURO Research Assistant
Dr. Kevin McCully, Kinesiology, College of Education

Friedrich's Ataxia (FRDA) is a rare autosomal recessive disease that results from a faulty mitochondrial protein known as Frataxin. Patients with FRDA have progressive loss of motor function. This case report evaluated muscle adaptation to neuromuscular electrical stimulation (NMES) training. A 36-year-old female with FRDA completed twelve 30-minute training sessions using NMES over 30 days. Pre and post measurements of muscle specific endurance and oxidative capacity were taken. Oxidative capacity was measured using near infrared spectroscopy and muscle specific endurance was measured using twitch stimulations and an accelerometer and recorded as an endurance index. Training sessions started with 4,200 contractions and progressed to 9,420 contractions. Muscle-specific endurance increased by 14% at 2 Hz, 17% at 4Hz, and 51% at 6 Hz. No measurable quantitative difference was observed in the patient's mitochondrial capacity. Patients with FRDA are able to be trained via NMES to improve muscle-specific endurance indicated by increases in training volume and endurance index values. It is not certain if mitochondrial capacity in these patients is able to be improved significantly within a measurable range. This study supports the use of the mitochondrial and endurance tests as a way of obtaining outcome measures for clinical trials for people with FRDA.

An Analysis of Early Vocalization Development from the Natural Environment of Two Young Children with Autism Spectrum Disorder

MacKenzie McGraw
Anna Marie Fink, Brianna Kelley, Lauren Langan , Meredith Anne Towey, Alexis Pope, Jennifer Smith, Sherry Sayavongsa
Dr. Sandie Bass-Ringdahl, Communication Sciences and Special Education, College of Education

Autism Spectrum Disorder (ASD) is a diagnosis that includes a wide range of symptoms and levels of impairment. The most common symptom that prompts parental concern is the delay in onset of spoken words, including delayed or disrupted onset of babbling (beyond the typical 6-10 months of age) and gesture usage (Baranek, 1999; Mitchell et al., 2006). Early identification and intervention

are widely recognized as critical to language development and are significant variables in the development of communication (Yoshinaga-Itano, 1998). Children with ASD who have undergone early intervention demonstrate gains in verbal and nonverbal communication, intelligence test scores, and peer interaction (Wiggins et al., 2006). Unfortunately, the diagnosis of ASD often occurs well past the first year of life often, in part, due to the failure of a child to develop spoken language. The current study is an analysis of data from two young participants with ASD. A 12-16 hour vocalization recording was collected in the home using the LENA device. The recording was analyzed to determine the degree of vocalization development and for the presence of canonical babble, a milestone for first word production. In addition, the recordings were analyzed for the presence of background noise, and its impact on each child's productions. The results of this analysis may provide insight into the early vocalizations of children with ASD thus allowing for earlier identification and intervention. The results may also have implications for maximizing learning in the home by modifying the environment.

Effects of 25-Hydroxycholecalciferol on Bone Growth and Development in Laying Pullets

Luke McGrory
Dr. Woo Kyun Kim, Poultry Sciences, College of Agricultural and Environmental Sciences

Avian osteoporosis leads to serious economic and welfare issues in the laying hen industry. Avian osteoporosis, which is very similar to osteoporosis in humans, is described as the reduced activity of osteoblasts with increased activity of osteoclasts. Osteoblasts build bone to be stronger and osteoclasts break down bone. As a result, this leads to a lack of bone density and increased fractures. In order to counteract these issues in laying hens, it is vital to promote proper bone health prior to onset of egg production. One method of fighting osteoporosis in laying hens is through the use of pro-osteogenic agents. 25-Hydroxycholecalciferol (25-OH VitD3), an intermediate of active VitD3, is hypothesized to be a more potent stimulating agent to increase bone density and prevent bone degradation in layers than normal VitD3. The main objective is to evaluate the effects of 25-OH VitD3 on laying pullets. This will be done by introducing the 25-OH VitD3 and normal VitD3 into the diets of two different groups of layers as well as a third control group. From here, bone samples will be collected and analyzed using micro-CT and UV injection dye technologies. We expect that the 25-OH VitD3 will be more effective than both the VitD3 and control groups in promoting bone growth and development. The overall goal is that this study will introduce an effective strategy in allowing for optimal egg production by reducing osteoporosis in laying hens.

A Comparison of Muslim and Jewish Cultural Impacts on Spanish Society in Relation to Punishments for Practicing These Religions during the Spanish Inquisition

Anna Kay McKenzie
Dr. Dana Bultman, Romance Languages, Franklin College of Arts and Sciences

Spanish culture displays a profound Muslim inheritance due to the Islamic kingdoms of the Iberian Peninsula that reigned from 711 to roughly 1492. This influence is seen in the architecture, language, customs, and clothes. Despite the impact on the nation, Muslims within Spain were persecuted greatly during the Spanish Inquisition, which lasted from 1478 to 1834. The persecution, which began under the reign of Ferdinand and Isabel, most famously affected Spanish Jews. The punishment mandated to Spanish Jews was much more severe than that mandated to the Muslims. Interestingly, Jews inhabited Spanish lands for much of Spain's history, yet there does not appear to be as strong a lasting cultural impact from their presence. Due to persecution during the Inquisition, many Muslims and Jews practiced crypto-Islam and crypto-Judaism, respectively. This practice entailed public devotion to Catholicism even though the new converts continued to practice their original religions secretly within their homes. Despite the secrecy, the Catholic rulers discovered these practices and began persecuting those who performed them by holding trials. By examining records of trials during the Inquisition and books discussing the cultural impacts of these minorities on Spain, I aim to find a correlation between the

impact on Spanish culture from the Jews and Muslims with regard to their relative punishment during the Inquisition. Through preliminary investigation, I believe that those who practiced crypto-Islam were persecuted less than those who practiced crypto-Judaism because of the kinds of cultural impacts each group had on Spanish society.

Climate Change and Gene Flow Rates in *Boechera stricta*

Kathryn McKibben, CURO Research Assistant
Dr. Jill Anderson, Genetics, Franklin College of Arts and Sciences

Climate change affects plant populations by altering natural selection on traits and changing the fitness values of current adaptive traits. The research investigates the evolutionary effects of climate change in plants by conducting field and lab studies of the ecological model species *Boechera strica*, a mustard plant native to the Rocky Mountains. To distinguish whether traits are caused by genetic and/or environmental factors and to determine the extent of phenotypic plasticity, we quantify traits of individuals transplanted in five common gardens at varying elevations in the Rocky Mountains. At each elevation, half of the plants were exposed to current climate conditions and the other half were exposed to early snow removal which effectively simulates future climates in this region. I have examined traits such as stomatal density, epidermal cell density, and leaf area. Extensive phenotypic plasticity was found which I will present. We are about to begin a study to determine gene flow rates across populations and ultimately to map quantitative trait loci for traits and fitness using genome-wide association studies. We predict that the amount of gene flow in the populations will not be sufficient to keep pace with climate change. We will collect data on several thousand single nucleotide polymorphisms across the genome to quantify gene flow and allelic turnover. By integrating genotypic and fitness data from the same plant families, we can predict whether gene flow facilitates adaptive response to climate change. Results of this genotyping work may not be available for the CURO presentation.

Testicular Toxicity of Bisphenol AF: Induction of Multinucleation of Spermatogonia

Emily Measel, CURO Research Assistant
Dr. John Yu, Environmental Health Science, College of Public Health

Bisphenol A (BPA) is a widely studied endocrine-disrupting chemical (EDC) due to its potential adverse effects on animals and humans. Many BPA analogs such as BPAF have been synthesized and are now used as substitutes for BPA. However, there is a paucity of information available on the effects of these substitutes on human health and the environment. Using an automated multi-parametric high-content analysis (HCA) in spermatogonial cells, we compared these effects on nuclear morphology, DNA content, cell cycle, cytoskeleton integrity, and DNA damage responses. BPAF exhibited higher testicular toxicities, especially the formation of multinucleation (MNG) of spermatogonia as compared to BPA. Induction of MNGs has been reported following gestational exposure EDC, and may link to the testicular dysgenesis syndrome (TDS). However, the molecular mechanism is still unclear. In this study, we tested the hypothesis that the formation of MNGs is due to the failure of cytokinesis after exposure to BPAF, resulting from alterations of mechantransduction pathways such as Src, p190, RhoA, lamin A/C, and LINC complex. Dose and time-dependent alterations of these proteins were examined using Western blot analysis. Furthermore, we developed a single cell based HCA to examine the temporal and dose-dependent alteration of protein expression of lamins, LINC complex components SUN1, SUN2, as well as p190. We found alterations of lamin A/C and p190 were associated with nuclear morphology, cell cycle progression, and cytoskeleton integrity. Understanding the mode of action of BPAF induced MNGs will provide essential information for the risk assessment for the safety of the public.

Admit One: Analyzing the Myriad Pathways into the Design Industry

Reilly Megee, Foundation Fellow, CURO Research Assistant
John Weatherford, New Media Institute, Grady College of Journalism and Mass Communication

This research will dive into the ever-evolving industry of design. In today's professional climate, design is becoming increasingly recognized as pivotal, as efficiency and aesthetics become paramount to survival in the business world. As all eyes turn towards design, the field and the people within it are being put under the microscope. This research will examine how design professionals, with their myriad skills and backgrounds, find their way into the industry. It will focus on the path designers take to enter the field and the challenges they face while doing so. How do people become aware of different design-centric career paths, and how do they know when or how to choose those paths? In addition, this research will look into whether the gender, race, and sexual orientation of designers present additional challenges to entering the field. Primarily, data will be gained through in-depth interviews with current design professionals. This data will be analyzed, supplemented with outside data, and presented in a public, online format. In examining this topic, this research hopes to uncover places where design education and awareness could be improved, including, but not limited to, secondary education, higher learning, and specific geographic areas of the US. It contends that there are large gaps in education and awareness about design-based careers and seeks to draw attention to this deficiency, should one be found.

Trait Activation Theory and Academic Performa(m)-3(e)2. (e)5()2.1(D)u tndAaoneera

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and brain), organs, and intestines. N-glycans were obtained by enzymatic hydrolysis using PNGase F followed by MALDI-TOF and ESI-MS and bioinformatic analysis. Thus far, glycome analysis has revealed significant differences in the glycan composition and abundance of the control intestine as compared to the treated samples. There are also notable differences between the glycan composition in the intestine and carcass samples. Identification of the glycan structures is still in progress. These findings will aid in elucidating the physiological responses of organisms to chronic, low dose IR.

Evaluation of Residential Basement Wall Concrete Mixtures for Water-Tightness and Reduction in Traditional Reinforcing Steel

Jake Michael, CURO Research Assistant
Dr. Stephan A Durham, Environmental, Civil, Agricultural, and Mechanical Engineering, College of Engineering

The Atlanta housing market is expected to grow 7% in total households during the next five years. With this potential economic opportunity, it is advantageous to develop innovative methods of constructing more economical homes. Ready Mix USA is interested in evaluating concrete mixtures for basement walls that provide equivalent water-tightness to that of current installation methods and have the potential to decrease the required area of temperature and shrinkage steel. The 2015 International Residential Code (IRC) requires foundation walls that retain earth and enclose interior spaces and floors below grade to be dampproofed. This study evaluated novel concrete mixtures for use in basement walls that satisfy the IRC without having to provide an exterior damproof/waterproof membrane and the novel mixture that utilized a permeability reducing admixture was found to reduce the seepage through concrete specimens. This study also examined the use of macrofibers and shrinkage reducing admixtures to potentially reduce the reinforcement required in the basement wall. This allows for a quicker and more economical installation of residential basement walls. The study was completed in three phases (1) establishing the property characteristics of novel concrete mixtures, (2) modeling and analyzing basement walls with the novel concrete mixture using Finite Element Analysis, and (3) constructing a full-scale basement wall to demonstrate the placeability of the novel concrete mixture.

Nanocellulose Based Drug Loaded Micro/Nanoparticluate for Therapeutic and Drug Fate Analysis

Betsi Micholas
Dr. Jaya Sundaram, Chemical, Materials, and Biomedical Engineering, College of Engineering

Nanoparticles provide massive advantages regarding controlled and targeted delivery with their potential to combine diagnosis and therapy, emerge as one of the major tools in nano-medicine. Curcumin has anti-cancerous and anti-inflammatory benefits, specifically for the colon. The main issue with drug delivery to the colon is that the drug often degrades in the gastrointestinal tract before reaching the colon. Encapsulation of drug into bio-based polymer is a common practice in pharmaceutical industries. Nanocellulose is classified as a biopolymer and has unique properties allowing it to be a good candidate for site-specific drug delivery through nano-encapsulation. This project is proposed to make nanocellulose encapsulated curcumin nanoparticles to have site-specific controlled delivery at the colon. Cellulose nanocrystal (CNC) was dispersed in water and used to encapsulate curcumin. A measured amount of curcumin was dissolved in the required amount of ethanol, and added slowly to CNC solution by continuously stirring the mixture. Once the mixture was homogeneous, it aged for 24 hours and curcumin encapsulated CNC particles were separated using vacuum filtration. The filtered cake was dried at low temperature in a vacuum dryer and stored for further analysis. Analysis of curcumin-loaded nanoparticles follows surface morphology analysis, physicochemical analysis, bioavailability, biodegradability and in vitro release study using artificially simulated intestinal and stomach fluids. The specific aims are to have a controlled delivery of the drug in the intestinal fluid and to increase the bioavailability of curcumin. The developed nanoceullose encapsulated curcumin will improve the current drug delivery methods of colon cancer treatments.

The Call of the Crypt Keeper: E.C. Influences in the Films of George A. Romero

Audrey Miller, CURO Research Assistant
Dr. Christopher Sieving, Theatre and Film Studies, Franklin College of Arts and Sciences

When discussing the foundations of his style, George A. Romero, like many 'Horror New Wave' directors of the 1960s and 70s, frequently and unapologetically points to the early influence of popular 1950s titles from the notorious Entertaining Comics (E.C.) over the horror films of his childhood. While this nod to comics is reasonably well documented—he felt indebted enough to direct an explicit homage in 1982's *Creepshow*—few studies have attempted any closer interpretation of the kinships between the two horror mediums. This paper will ask more explicitly what it means for a film or director to claim a distinctly comics-inspired style. Grounded in discussions of the visual, narrative, and thematic connections between E.C. stories and Romero's film texts, this paper argues that Romero's comics-inspired style, more than constituting a passing anecdote, can be precisely articulated and its functionality as a means by which Romero broke from previous cinematic horror traditions explained. This paper will further demonstrate how a film like Romero's 1968 *Night of the Living Dead*, through its more adept integration of a comics visual style into a language coherent as film, represents a more compelling application than *Creepshow*, which insistently, though arguably superficially models itself after E.C. anthology comics. Though much of the discussion surrounding film and comics is about the incommensurable differences of language that often give rise to ineffective adaptations, this paper argues that Night represents a site for considering how the two mediums can be used productively together.

Self-Assembled Chitosan Nanoparticles for Breast Cancer Therapy

Jeremy Miller
Dr. Cheryl Gomillion, Chemical, Materials, and Biomedical Engineering, College of Engineering

Breast cancer is among the most common causes of death among women in the United States, with a mortality rate slightly less than the second most common cancer, lung cancer. 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 all three receptors, and thus cannot be treated with conventional therapies. These 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. Therefore, the objective of this work was to fabricate and characterize polymeric nanoparticles useful for treating these specific tumor cells. Chitosan was selected as the biopolymer of choice for this application. Chitosan, a polysaccharide derived from the deacetylation of the chitin, has multiple unique properties that make it ideal for drug delivery. Specifically, it is biocompatible, maintains antimicrobial and analgesic properties, and its positive charge allows it to act with the negative part of cells' membranes. Chitosan nanoparticles were successfully prepared via self-assembly with tripolyphosphate (TPP). Current and future work includes determining the viability of these particles as a drug delivery vehicle for cancer therapy. Fabricated particles will be characterized to assess drug loading capacity, drug encapsulation efficiency, etc. The particle shelf-life and batch reproducibility will be important factors for determining the efficacy of these particles for cancer therapy.

Refugee Health and Migration

Prabhjot K Minhas, Ramsey Scholar
Dr. Susan Tanner, Anthropology, Franklin College of Arts and Sciences

In today's globalizing world, migrant and refugee health has become an increasingly important topic in public health, medicine, and anthropology. Research suggests that understanding the backgrounds of migrants helps in the delivery of high quality healthcare. This research focuses on nutrition and health within refugee populations and is part of a larger, ongoing project designed to understand the relationship between acculturation and maternal-child health in the US. Specifically, I conducted a literature review to examine

healthcare experiences among US refugees. Research themes concerning refugee health and migration were traditional medicine, nutrition and health, obstacles to healthcare, and the effect of language and culture on the healthcare experience. The literature suggested that health and nutrition changes in resettled migrants, and the next generations, are influenced by interactions of culture, history, language, ethnicity, and social relationships. A second literature review focused on the Karen refugee community, diet, and nutrition. Overall, both literature reviews showed that much research has been conducted on diet and nutrition change among refugees and migrants; however, little has investigated refugees' and migrants' perceptions of these changes. To study the perception of food and diet changes, I have developed a set of nutrition and diet-related questions to be included in a questionnaire exploring maternal-child health. Throughout the semester, I will investigate the role of perceived quality of diet and nutrition among refugees and migrants in the Athens area. The information gathered with this research has the potential to help healthcare professionals better understand and work with patients.

Employer Expectations and Experiences of Gratitude

Molly Eleanor Minnen, CURO Research Assistant
Dr. Michelle R vanDellen, Psychology, Franklin College of Arts and Sciences

Gratitude—recognition of goodness outside the self—is a positive emotion often experienced in close relationships. Research has not yet examined how work-related traits (e.g., self-control) affect experiences of gratitude at work. We expect employers may feel more grateful when a low self-control employee performs an organizational citizenship behavior (OCB) or resists a counterproductive work behavior (CWB) than when a high self-control employee performs or resists the same behavior. In prior work, we observed employers to be habitually grateful for high self-control employees. Thus positive extra-role behaviors or resisted missteps may not produce a material increase in gratitude. When a low self-control employee exceeds expectations, employers may experience noticeably more gratitude. The goal of this study was to assess both trait and state gratitude for employees. Specifically, we examined how employers react to employee work behaviors. Participants imagined they were a supervisor in a company and were randomly assigned to read about either a high or low self-control employee. They were additionally randomly assigned to read a report of an OCB or a CWB taking place at the office. Participants learned the target employee either committed the OCB or did not commit the CWB. We assessed their reactions. We found that participants expressed more trait gratitude for high self-control employees but more state gratitude for low self-control employees. Results from this study could provide novel insight into why low self-control employees might receive more recognition for positive behaviors than high self-control employees.

Redefining the Boundaries of Healthcare Technology Policy

Simran Modi, CURO Research Assistant
Dr. R. Vincent Pohl, Economics, Terry College of Business

In recent years, the rise of healthcare technology such as mobile applications, telemedicine, and remote patient monitoring systems has become more prominent. However, the regulations that govern these devices and applications are not clear and do not serve to benefit the patient population. In 2011, Teladoc, a telemedicine company, filed a suit against a Texas Medical Board for limiting the scope of telemedicine practice. Other cases and lack of clear definition call for a meta-analysis to assess these policies. This study examines several state policies that can be expanded to the federal sphere in order to benefit the patient population. The purpose of this study is to identify policy initiatives that will provide clarity for the scope of practice and use of medical technology. The effectiveness of the healthcare technology policies will be analyzed using three criteria: cost of policy implementation, economic benefits, and expanded accessibility to healthcare. The analysis will point towards extended benefits and appropriate implementation techniques.

The Language of Leadership: Investigating Speech as a Predictor of Leadership Capacity

Amanda Moeller

Dr. Karl Kuhnert, Psychology, Franklin College of Arts and Sciences

Previous research done on leadership indicates that there are four distinct levels of leadership maturity that individuals can possess, each of which are characterized by distinct behavioral patterns, perceptions, and priorities (Kegan, 1982; 1994; Kegan & Lahey, 2009; Eigel & Kuhnert, 2016). These four Leadership Development Levels (LDLs) are appraised to individuals by multiple raters who conduct and evaluate their in-person interviews and assess according to criteria outlined by Lahey, L., Souvaine, E., Kegan, R., Goodman, R., & Felix, S. (1988). LDLs have been found to be predictive of job performance, even surpassing the predictive ability of the Big 5 personality assessment and 360-degree performance feedback ratings. (Strang & Kuhnert, 2009). Using transcribed in-person interview text as well as language and text-processing software, such as the Linguistic Inquiry and Word Count (LIWC) software developed by Pennebaker & Francis (1996) and The University of Cambridge Psychometrics Centre's Apply Magic Sauce (AMS) word processing engine, this study will aim to analyze the language of leadership by seeking out differences in speech indicative of emotional state, personal concerns and priorities, and different thinking styles between LDLs. Our sample consists of nine Fortune 50 executive leaders' transcribed interviews that span across each of the four LDLs. Each transcription ranges between 3436 and 9685 assessable words. If significant language-based differences between LDLs are found, it may result in a new quantitative method being applied to judge potential employees' leadership capacity.

Small Molecule-Stimulated MSC Adhesion to Enhance Atopic Dermatitis Therapy in Companion Animals

Adir Mohaban, CURO Research Assistant
Dr. Luke Mortensen, Animal and Dairy Science, College of Agricultural and Environmental Sciences

Decades of research have shown the potential of stem cells therapies as a remedy for chronic illnesses due to their anti-inflammatory and immunomodulation capabilities. While there is much hope for viable stem cell therapies, a major limitation can be linked to inefficient cell homing due to poor expression of surface adhesion receptors. Could surface modification of MSCs allow for more efficient homing? In a previous study, pretreating MSCs with Ro-31-8425, a molecule shown to upregulate the *CD11a* gene which codes for surface receptors, led to an increase in static adhesion to plates coated in intercellular adhesion molecule 1 (ICAM-1). ICAM-1 is expressed in increased levels by endothelial cells at sites of inflammation. In this study, we hope to expand on this by observing static and shear adhesion levels of pretreated MSCs to canine endothelial cells expressing ICAM-1. This will be accomplished by inducing shear stress over MSCs firmly adhered to endothelial cells (static adhesion) or by flowing MSCs over an endothelial cell monolayer (flowing adhesion) at measured levels of shear stress, using a syringe pump and a parallel plate flow chamber. White blood cells will be used as a positive control for comparison. We expect to observe increased adhesion of pretreated MSCs to the endothelial cells. This would indicate the possibility of using MSCs pretreated in Ro-31-8425 as a viable therapy for diseases causing inflammation, such as atopic dermatitis. We hope to move on to clinical trials with diseased canines once we determine the efficiency of pretreated MSC homing.

The Difference Between Men and Women in the Effects of Exercise on Circulating Angiogenic Cells

Sydney Michelle Mohr, CURO Research Assistant
Dr. Nathan T Jenkins, Kinesiology, College of Education

Physical activity reduces the rates of cardiovascular mortality by several mechanisms including promoting angiogenesis and increasing shear stress. Previous research has shown circulating angiogenic cells (CACs) are affected by exercise. CACs are specialized white blood cells, more specifically peripheral blood mononuclear cells (PBMCs), which can maintain vascular homeostasis, repair the injured vascular endothelium, and promote angiogenesis. We hypothesize that women, especially those in the luteal phase, will experience greater exercise induced increases in the number and function of CAC compared to men. Thus far 4 men have had

a body composition test and performed a graded

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

Leadership theorists are increasingly conceptualizing leadership as a relationship that is co-constructed as two or more people 'claim' and 'grant' influence (DeRue & Ashford, 2010). Although certain individuals may be motivated to influence others, the endorsement of followers (i.e. granting) is necessary for leadership to occur. The purpose of the present study is to test two hypotheses. First, we expect that an individual's levels of Big Five personality traits of (H1a) extraversion and (H1b) conscientiousness will positively predict the likelihood that they are granted leadership influence by their teammates. Second, we hypothesize that the Big Five trait of agreeableness (H2) will positively predict the likelihood that individuals will grant leadership to others. We test our hypotheses in a sample of 240 undergraduate participants assembled into 20 unique 12-member teams that were tasked with combining disciplinary knowledge in a complex problem-solving task. Participants responded to self-report sociometric measures of leadership claiming and granting in relation to their teammates. We test our hypotheses using a class of inferential models of network emergence called exponential random graph models, which identify key predictors of networked relationships.

The Effect of Galanin on Stress Resilience in Rats and the Relationship between Stress and Inflammation

Emily Stewart Moore, CURO Research Assistant
Dr. Philip Holmes, Psychology, Franklin College of Arts and Sciences

Galanin is a neuropeptide that modulates the actions of classic neurotransmitters in the central and peripheral nervous system. It has three G-protein coupled receptors, GALR1-GALR3, that have been shown to influence depression and anxiety disorders. Several studies have been done on galanin's effects on anxiety-like behavior in different animals, with variable findings depending on animal species, injection site, and behavioral models used. This study focuses on the effects of galanin on stress resilience in male Sprague-Dawley rats, as well as the relationship between stress and inflammation, which has been shown to induce anxiety-like behavior in animal models. Complete Freund's adjuvant (CFA) was injected into the back-left paw of rats to induce chronic inflammation in the area, then galnon, a galanin receptor agonist, was injected into the peritoneum for the following nine days. Control rats were injected with saline. Following injections, rats were exposed to stress via the forced swim test, then underwent a series of behavioral tests (sucrose preference, open field, and elevated plus maze) to test for anxiety-like behavior, exploratory behavior, and locomotor activity. Brain tissues were processed using ELISAs and HPLC for galanin and monoamine content. CFA is expected to increase anxiety-like behavior in the elevated plus maze, open field, and sucrose preference tests, while galanin is expected to block the effects of CFA. Dopamine is expected to decrease in the ventral striatum as an effect of CFA and galanin is expected to decrease in the ventral tegmental area.

Development of an Indoor Guidance System for Unmanned Aerial Vehicles with Power Industry Applications

Julian Moore, CURO Research Assistant
Dr. Zion Tse, Electrical and Computer Engineering, College of Engineering

Unmanned aerial vehicle (UAV) systems are experiencing a period of rapid growth as the constituent technologies are reaching maturity and the potential for industrial and commercial applications are arising. Conventional UAV technologies focus on outdoor large area navigation, utilizing GPS, which has proven to be less effective in enclosed environments. We aim to develop an indoor navigation system, specifically designed for these industrial applications which require custom sensing technologies to aid in pilot navigation. A custom sensing array, featuring ultrasonic transceivers used to measure displacement and a hardware angle correction system, was developed to localize drone position in an enclosed known environment and provide pilot feedback during navigation. Six subjects were recruited to pilot the drone with and without the navigation system in an enclosed room to a preset target at a known location in two cases: (1) with a clear line of sight, and (2) without line of sight. Flight duration, number of collisions, and distance from target were recorded and used to quantify performance of the navigation system. Upon using

the navigation system, subjects were able to reduce their flight duration on average by 19.7% during an obstructed line of sight, illustrating the increased ability and confidence in piloting the drone using the navigation system. This study serves to prove the potential of this device as an essential tool for indoor drone localization and commercial inspections.

Effect of Heliox through Airflow and Aerosol Deposition in Oral Airway

Miranda Moore, CURO Research Assistant
Dr. JongWon Kim, Engineering, College of Engineering

It is feasible, in principle, to treat breathing difficulty using Heliox (rather than air). The main effect of Heliox usage is to transform turbulent flows into laminar flows. Heliox (20% Oxygen, 80% Helium) has approximately five times lower kinematic viscosity. For a given inhalation velocity, the Reynolds number is five times less than air. The objective of this study is to investigate the effect of Heliox flow in an oral airway through airflow characteristics and particle deposition with an oral airway model. Specifically, one normal condition with air is simulated, and this is compared using Heliox. Lagrangian tracking models were used to simulate the respiratory airflow and aerosol dynamics. Apparent discrepancies in airflow characteristics and aerosol distributions were observed by Heliox transport. Furthermore, Heliox flow compared to airflow gave a different aerosol pattern that was clearly suggestive to treat breathing problems. For any given breathing problem, Heliox persists for different particle sizes considered, even though their detailed distributions vary. Results of this study indicate that the use of Heliox led to less particles deposition due to the intrinsic properties of the gas phase. Heliox with inhaled aerosols appears to be non-invasive enough to be a practical tool for respiratory system, which may disclose clinically relevant clues about the severity of respiratory disease.

Are Urban Birds in South Florida Reservoirs of *Salmonella spp*. for the American White Ibis (*Eudocimus albus*)?

Tyler Moore
Dr. Sonia Hernandez, Forestry, Warnell School of Forestry and Natural Resources

In the last two decades, populations of the American White Ibis (*Eudocimus albus*) have become increasingly more urbanized in South Florida. This sudden urbanization has given rise to an increase in contact between the White Ibis, various other species of urban birds, and people. Urban birds (e.g. wading birds, waterfowl) with which White Ibis come into direct, frequent contact may be reservoirs for *Salmonella spp*. and may play a role in the infection rate of white ibis. In previous studies, the prevalence rate of *Salmonella* of white ibis averaged 13%. Due to increased contact, we predict that the prevalence of *Salmonella spp*. will correlate and, as potential reservoirs, might be higher than the White Ibis. In order to discover if urbanized birds are reservoirs of *Salmonella spp*. for the American White Ibis, fecal samples were collected from waterfowl and wading birds from four urban sites in Palm Beach County, Florida. Simultaneously, we collected feces from white ibis at the same sites. *Salmonella spp*. was isolated from various species, including Muscovy ducks (*Cairina moschata*) and Mottled ducks (*Anas fulvigula*), at a prevalence of 19.1%, at four urban sites. *Salmonella* isolates were submitted to the National Veterinary Laboratory to determine serotype and strain type, allowing us to further understand the relationship between *Salmonella* isolated from ibis and other birds at these sites. Overall, understanding the mechanistic effects of wildlife interactions due to human-dominated landscapes will help us to better control our impacts on wildlife ecosystems and the spread of pathogens among them.

Development of a Novel Three-Dimensional Model to Study Breast Cancer Metastasis

Bryanna Moppins
Dr. Cheryl Gomillion, Chemical, Materials, and Biomedical Engineering, College of Engineering

The mechanism behind breast cancer metastasis, or spreading, to patient bones is poorly understood. This may be attributed to the usage of traditional two-dimensional (2D) culture surfaces to study breast cancer cells, which lack structural properties of native tissues in the body. Tissues of

the body are composed of multiple layers of cells, forming three-dimensional (3D) structures. In addition, breast cancer cells secrete signals to neighboring cells that stimulates migration to other regions of the body, so utilizing a 2D surface limits the actual amount of signaling that takes place. Therefore, we aim to study breast cancer cells on a 3D surface because they will ideally behave more closely to how they would in the body. Our 3D system for modeling breast cancer metastasis to bone will be composed of chitosan-based hydrogel scaffolds that will be hir8t5 oa1.7163(d)1(3)-d-2()1.3(ll h.3(n9(um.3(n)-8(2)12n.7(tos)-3.6(a)49(7933 Tc 0. (n)]-4.9((t)-2.4(3]TJTwc(c)J0 -1n.3(l-4c(c)

dependent thermotolerance growth assay; shunted motifs allow growth at high temperature. The Ydj1-endoding plasmids were isolated and sequenced, yielding 123 novel CaaX motifs that allowed for strong isoprenylation of Ydj1. Analysis of these sequences is being used to determine a set of rules that can predict isoprenylation better than current prediction methods, and to determine whether all or part of the sequences promote shunting.

An Analytical Evaluation of the Compounding Skills of Pharmacy Students

Kyana Breche' Morris
Dr. Deborah Lester Elder, Pharmaceutical and Biomedical Sciences, College of Pharmacy

According to the FDA, compounding pharmacy is a specialty in which a pharmacist "alters drug ingredients to create a medication tailored to… a patient." The American Association of Colleges of Pharmacy (ACCP) assembled a committee that offered its member institutions recommendations on their compounding curriculum. This study evaluates the compounding techniques of pharmacy students at the University of Georgia's College of Pharmacy based on the guidelines set forth by ACCP. The analysis included, second year pharmacy students (n=137) who compounded a 1mg/mL aqueous solution using salicylic acid powder, USP 99.5% purity and a 1mg/mL aqueous suspension from prepared 10mg salicylic acid tablets. After being stored at -2°C, suspension samples were thawed at room temperature and centrifuged at 5,000 RPM for 10 minutes. Solution samples were not centrifuged following thawing. To acquire the theoretical concentration of 0.01mg/mL, 0.25mL of each sample was transferred to a 25mL volumetric flask and diluted with distilled water. The dilutions were thoroughly mixed before transferring 8mL to test tubes and adding one drop of ferric nitrate reagent. Ultraviolet spectroscopy was used to determine the concentrations of each sample. Sample concentrations were compared to linear concentration curve made from a 1% salicylic acid stock solution. The results displayed that roughly 30% of students were able to compound within the deviations set by ACCP. This proves that quantitative analysis is indeed a useful way to measure the compounding skills of pharmacy students. Further continuation of this study will hopefully show that students can improve their skills over time.

Pregnancy Planning and Prevention

Andrea L Morrison, CURO Research Assistant
Dr. Kathrin F Stanger-Hall, Plant Biology, Franklin College of Arts and Sciences

Unintended pregnancies and the results of those pregnancies are important and pertinent issues in modern society. By analyzing the effectiveness of current education strategies and examining their shortcomings, researchers can improve upon those strategies in order to best prevent unintended pregnancies. The purpose of this research study is to analyze and evaluate the knowledge of UGA students regarding sexual health topics. In particular, this study focuses on the data analysis of pregnancy planning and prevention. The data were obtained via an anonymous, online survey sent out to all UGA undergraduate students in spring 2015. I quantified and analyzed all answers to the survey questions on sexual health, pregnancy prevention, and fertility awareness. The results demonstrate what information UGA students do and do not know about reproductive health, and also reflect the students' opinion on topics such as sex education and family planning. These topics are often under-discussed and under-reported for young adults, making an accurate account of their knowledge and a concrete plan for improvement difficult. This study will be a first step to changing this lack of knowledge by sharing the results with the University Health Center as well as opening a door to collaboration with the Health Center to develop educational materials.

Discovery of Foliar Endophytic Nitrogen Fixation in *Pinus palustris*

Kelsey Morton, CURO Research Assistant
Dr. Nina Wurzburger, Ecology, Odum School of Ecology

Longleaf pine (*Pinus palustris*) savannas are highly diverse ecosystems that once dominated the Southeastern United States, covering 94 million acres. The distribution of this ecosystem has been greatly reduced due to land-use change, but recent restoration efforts have increased its coverage to 4.3 million acres. Therefore, many longleaf pine

savannas are in early stages of development and require a substantial amount of nitrogen (N) to grow. Longleaf pine savannas are N-limited and known inputs of N (from herbaceous N-fixing legumes) do not account for N demand by growing pines. Here, we investigated whether longleaf pine foliage contains bacterial endophytes that fix N, and whether the rate of endophytic fixation differs across stand age and site. We collected foliage from plots along an age gradient at two sites in GA and FL. We used acetylene reduction assays on surface-sterilized foliage samples to quantify N fixation. We detected significant fixation activity in foliage from both study sites. We found that fixation rate did not differ by stand age but was greater at our FL site than our GA site. This finding suggests that heterogeneity in soil nutrients, climate, or other factors may affect the capacity of endophytes to fix N. Our future work will explore these possibilities. Endophytic N fixation is thus a newly discovered source of N to longleaf pine savannas, and determining the factors that control this biotic process will improve our resolution of the nitrogen budget of these ecosystems.

Comparing the Incomparable: A Methodological Investigation of Water Limitation Treatments

Liana Mosley, CURO Research Assistant
Dr. John Burke, Plant Biology, Franklin College of Arts and Sciences

As climate change progresses, environmental conditions will become increasingly unpredictable, burdening Earth's fragile resource supply. Agricultural crops are no exception to this trend, specifically considering the resource of water. Agricultural drought, or water limitation stress, has been shown to negatively affect crop productivity, reducing crop yield necessary for human consumption. To mediate the effects of drought, plant scientists aim to develop methods that increase water use efficiency across crop species. While there are many valid ways to implement water limitation stress in a laboratory setting, often times, results gathered utilizing one method are compared with results using a different method. To determine the comparability of water limitation methods in cultivated sunflower, we established seedlings of three diverse genotypes for 25 days followed by a 10 day water limitation stress. Water limitation was simulated with four treatments: two osmotic stresses, polyethylene glycol (PEG-6000) and salt (NaCl; 100mM), as well as a 20% maintained dry down and a three day repeated dry down, all of which were compared to a well watered control. Phenotypic results, such as above and below ground biomass, specific leaf area, and stem height and diameter, were measured. Experimentation is ongoing; however, we do expect to find significant differences in phenotypic variation across water limitation treatments that outweigh phenotypic variation by genotype. This methodological study not only highlights the issue of equating water limitation treatments, but also provides a basis for further study into the optimal design of water limitation implementation.

Updates on Current Circumscribed Interest Object Categories of Children with ASD and Accuracy of Parent Reports

Sanjida Jahan Mowla
Dr. Ashley Johnson Harrison, Educational Psychology and Institutional Technology, College of Education

The present study aims to examine previously defined categories of circumscribed interest (CI) objects among children with ASD to determine if updates are warranted. To further aid in this investigation, the study will also consider the convergent validity between parent reports of CI objects and children's gaze allocation to these objects. Seventy two CI object pictures were obtained from parents of both typically developing children and children with ASD. Using operational definitions, these objects were compared across categories of CI objects from other studies (Baron-Cohen & Wheelwright, 1999; Sasson & Touchstone, 2014; South, Ozonoff, & McMahon, 2005) and coded by multiple raters to determine whether the categories identified in past studies adequately represented the objects provided by parents in this study. Parents were asked to rate children's preferred items using a visual analogue scale. In order to establish the validity of parent reports, these ratings were compared to eye tracking data of children's gaze allocation to their ideographic CI objects. The goal of the study is to identify a more inclusive and relevant way to categorize CI objects for

children with ASD as well as establish the accuracy of parent reports of their children's CI objects.

Adaptation of a DNA Purification Protocol for 3rd Generation Sequencing of *Eimeria* Species

Adrea Mueller, CURO Honors Scholar, CURO Research Assistant
Dr. Brian Jordan, Population Health, College of Veterinary Medicine

Coccidiosis is an economically significant enteric disease in chicken that is caused by several *Eimeria* species parasites. Among the different species of *Eimeria* that infect chickens, the independence of the species' *E. mitis* and *E. mivati* is controversial. Previously, *Eimeria* have been speciated based on gross morphology, pre-patent period, and region of the gut parasitized. More recently, molecular identification has been used to identify species. Full genomes of 7 *Eimeria* species have been published, but no molecular genomic data is present for *E. mivati*. The purpose of this study is to use genomic sequencing of a pure strain of *E. mivati* from a vaccine stock to determine similarities and/or differences between it and published *E. mitis* genomic sequence. For this, a DNA purification protocol that can isolate large fragment genomic DNA will be established. The genomic DNA will then be sequenced using next generation sequencing. The previously published genomes of other *Eimeria* species will be used to align the genomic sequences into a functional genome, and then specific genome markers will be compared. Understanding the similarities and differences in the genomic structure of this contested *Eimeria* will allow us to accurately determine its relatedness to other *Eimeria* and, ultimately, determine if it is truly a separate species.

Application of Heel Lift during Squat Task Decreases Trunk Flexion Overcompensation

Chandler Mulford
Dr. Cathleen Brown Crowell, Kinesiology, College of Education

Trunk flexion is an important characteristic of an overhead squat, and may change depending on heel height. The purpose of this study was to determine if differences in trunk flexion existed during assisted and unassisted squats in university club athletes. Eighteen ultimate frisbee players (14 males, 4 females; age=20.1±1.8yrs; height=185.7±25.7cm; weight=75.4±8.8kg) completed informed consent and underwent infrared camera motion analysis while wearing fifty-nine reflective markers. Participants were instructed to perform the unassisted squats while holding a bar directly overhead along the frontal plane of the body and lowering the pelvis to the lowest point possible. For the assisted squats a 2"x4" plank was placed under participants' heels to relieve gastrocnemius tightness and followed the same procedure as the unassisted squats. Trunk flexion was defined as anterior movement of the trunk along the sagittal plane as displacement from vertical. Overcompensation of trunk flexion during a squat was qualitatively measured and defined as the wrist markers passing a longitudinal reference line from the marker placed on the tibial tuberosity. The frequency of overcompensation for each condition was determined. A paired t-test was used to compare differences in frequency means between the two conditions ($\alpha<0.05$). The frequency of overcompensation in assisted squats (3.8±4.1) was significantly less than in unassisted squats (8.0±3.2) ($t(17)= 4.42$, $p<.001$). The lifted platform placed under the participants heels during the assisted squats resulted in increased ankle mobility and less trunk flexion overcompensation. Gastrocnemius stretching should be considered to decrease trunk flexion overcompensation and increase depth of bodyweight squats.

Meat Consumption as an Indicator of the Near Term Stability of Each Country's Food Supply in the Global Marketplace

Dylan Munn, CURO Research Assistant
Dr. John R Schramski, Environmental, Civil, Agricultural, and Mechanical Engineering, College of Engineering

Trends show that as countries inevitably become more urban, incomes will increase, but more importantly more meat is consumed. The human diet has been profoundly affected by globalization throughout the past half century. Research into the energetics of the food system and the

increasing urbanization of the world shows that the increased percent urbanization and per capita gross domestic product of a country is negatively and predictably affecting the per capita dietary energy production (per capita food calories grown decreasing) while the percent meat in citizens' diets is increasing. Because of the large energetic inefficiencies and water needs attributed to meat production, an increased strain will likely occur on national dietary energy production (calories grown in country), perpetuating an ever increasing reliance on international trade while simultaneously enhancing unsustainable practices within national borders, thus creating a self-enhancing feedback loop towards failure of the global food supply system. The over-reliance on global food trade to accommodate an increased focus on the production of meat is a dangerous position in the face of unstable geopolitics. International trade has provided food security to many countries enabling meat to become a larger source of calories for diets around the world, but data shows this is enhancing an unsustainable food supply in the near future. We provide an easy four quadrant metric to assess each country's trajectory in this cycle over the period of 1965 and 2005.

Non-Vocal Sounds in a Group of Western Lowland Gorillas

Maria Munoz, CURO Research Assistant
Dr. Roberta Salmi, Anthropology, Franklin College of Arts and Sciences

Previous studies in non-human primate communication have focused on vocalizations as a way to bridge the gap to understand the origins of language in humans. This study aims to investigate the use of non-vocal sounds (i.e., chest beating and hand clapping) in one group of habituated western lowland gorillas (*Gorilla gorilla gorilla*) at Mondika Research Center. Given that western gorilla habitat is dense, auditory gestures become important for understanding the communicative repertoire of the western gorilla. Focal and ad libitum samplings were used to collect behavioral data during two study periods (June - August 2007 and May 2009 - May 2010). Ten behavioral categories were identified, including: foraging, resting, playing, travelling, travel-pose, aggression, display extra-group, display within-group, vigilance and mating. Hand clapping, which has been observed with rarity in the wild, was observed during both study periods and was only observed in adult females, juveniles and infants. Its absence in adult males provides a good argument for intentionality and flexibility. In adult females, the majority of observances of hand clapping occurred during vigilance to alert individuals to potential threats. Hand clapping during play is predominantly done by infants, though females were observed to hand clap during play with infants. Chest beating occurs across age-sex classes in contexts of displays, within- and extra-group and in play. Auditory gestures, like chest beating are recognized as species-typical signals which are termed inflexible, but these findings suggest that western gorillas use gestures flexibly and differently depending on age-sex class.

The Effect of Aerobic Exercise on White Matter in Overweight Children: Studying the Effect of an 8-Month Exercise Program

Megan Murphy, Ramsey Scholar, CURO Research Assistant
Dr. Jennifer McDowell, Psychology, Franklin College of Arts and Sciences

Obesity has become an epidemic in America, with rates increasing dramatically over the past decade. Obesity is associated with multiple physiological problems but also causes deficits at the level of neural white matter (WM). Lowered integrity of WM is associated with deficits in cognitive control (CC), and these deficits are evident in obese children as they exhibit lowered academic performance and worse classroom behavior than their healthy-weight counterparts. However, aerobic exercise is shown to improve cognitive functioning and integrity of WM. This study sought to investigate the link between obesity, WM, CC, and aerobic exercise by comparing diffusion tensor imaging (DTI) brain scans before and after children participated in an 8-month program, in which they were assigned to either an aerobic exercise group (n=14) or sedentary group (n=9). The results showed decreased WM integrity in both groups over time in the left and right cingulate gyrus, the forceps major, and the right inferior longitudinal fasciculus. There was no significant interaction detected between groups as a function of exercise.

Novel Object Recognition: A Promising Approach to the Comparative Study of Memory in Porcine Vascular Cognitive Impairment Studies

Richard Dunstan Murray, CURO Research Assistant
Dr. Franklin Delano West, Animal and Dairy Science, College of Agricultural and Environmental Sciences

Dementia is a major threat to public health. The National Institute of Neurological Disorders and Stroke Progress Review Group recently cited "prevention of vascular cognitive impairment (VCI)" as a major research priority. Numerous therapies for dementia have failed in human clinical trials indicating a clear need for rigorous testing in a translational large animal model with brain anatomy and physiology more comparable to humans. Therefore, we are developing a novel VCI pig model in order to test an inexpensive treatment method known as remote ischemic conditioning (RIC). One of the major assessment tools used to determine if a potential VCI treatment is effective is by observing changes in cognitive function, specifically learning and memory. In the present study we evaluated the cognitive ability of normal six month-old male pigs via novel object recognition testing (NORT). The animals tested in this study will serve as a baseline for normal pig cognition and their performance will be compared to non-treated and RIC treated VCI pigs in the next phase of the study. NORT showed no significant difference in exploration time between similar objects during the sample trial, but a significant difference in exploration time between the familiar and novel objects during the test trial. There was also a significant difference in exploration time of the familiar objects between the sample and test trials. This data demonstrates pigs are capable of forming memories and the efficacy of a potential VCI treatment such as RIC can be evaluated using NORT in future VCI studies.

Biocompatible, Biodegradable and Antimicrobial Skin Substitute with Nitric Oxide Release for Instant Burn Wound Treatments

Sai Nagula, CURO Research Assistant
Dr. Hitesh Handa, Chemical, Materials, and Biomedical Engineering, College of Engineering

Severe skin injuries, some of the most common non-chronic medical conditions, require hospitalization to heal completely. Annually, over 100,000 patients die due to infection of these wounds during the skin healing process. We explored the potential clinical application of combining a biodegradable skin substitute with an antimicrobial agent to serve the dual purpose of effectively regenerating skin tissue, while also preventing pathogenic infection. After background research of various polymers commonly used for skin healing, we pursued a novel combination of hyaluronic acid, a naturally occurring polymer in humans, and alginate, a biodegradable polymer derived from algae. As an antimicrobial agent, we added GSNO (G-nitrosoglutathione) to this polymer combination. GSNO releases nitric oxide, a natural antimicrobial mechanism found in our bodies. After performing nitric oxide release kinetics, an optimal skin substitute composed of 1:1 of 2%(wt/v) hyaluronic acid to 2%(wt/v) alginate with 20% (wt) of GSNO was found. Various physical characterization experiments were performed, including contact angle, moisture content, SEM, degradation studies, as well as biological characterizations, including cytotoxicity studies and zone of inhibition with *S. aureus* and *P. aeruginosa*. From the results, we observed data that were consistent with currently available skin substitutes. The cytotoxicity results indicated that the GSNO levels were not toxic to mammalian cell types, and the zone of inhibition studies showed inhibited growth of both bacteria types. Overall, these results demonstrate the potential for the novel combination of hyaluronic acid, alginate, and GSNO for future clinical studies in preventing death from infection of severe skin wounds.

Investigation of Nap1 as Reporter for CaaX Protein Post-Translational Modification Shunt Pathway

Christina Marie Najjar, CURO Research Assistant
Dr. Walter K Schmidt, Biochemistry and Molecular Biology, Franklin College of Arts and Sciences

All DNA genetic material in eukaryotes is packaged into nucleosomes, a process necessary for 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 (Nap1p) that is encoded by the *NAP1* gene. Limited evidence suggests that Nap1p 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 carboxylmethylation. In plants, AtNap1p is known to be farnesylated, a modification associated with CaaX proteins. It is unclear whether proteolysis and carboxylmethylation occur. In humans, HsNap1 appears to be farnesylated, but the presence of farnesylation is inferred. 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 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. His8, GFP) for use in biochemical, genetic, and cell-based assays. Thus far, farnesylation in human and yeast homologs have been confirmed and current studies are underway to establish the impact of mutations on function and localization of Nap1.

Glycosylation in Spores

Sholeh Namdari
Dr. Maor Bar-Peled, Biochemistry and Molecular Biology, Franklin College of Arts and Sciences

Endospore forming bacteria produce a dormant spore that is resistant to harsh environmental conditions. We examined the function and role of rare carbohydrate produced during spore formation in pathogenic bacteria belonging to Bacillus cereus group. We identified an operon encoding several enzymes that are involved in nucleotide-sugar synthesis. Purified recombinant enzymes were tested for their specific activities by LC-MS/MS. In addition, the use of in microbe approach helped to identify the enzymatic products produced by the four different genes. Using LC-MS/MS and HPLC, I have determined the initial function of each of the enzymes and helped elucidating an unknown metabolic pathway in this group of bacterial strains. I was able to trace the biochemical changes that form and transform a simple sugar-phosphate to three different activated nucleotide-sugar forms. Furthermore, I am working on the molecular mechanisms that facilitate the incorporation of these sugars into surface glycoproteins that are displayed on the outermost surface of spores of *Bacillus cereus* and examined their potential role in biofilm formation and or host recognition.

Examining Stigma and Social Functioning in Young Adults with Autism

Maggie Naughton, CURO Research Assistant
Dr. Ashley Johnson Harrison, Educational Psychology and Institutional Technology, College of Education

There is mounting evidence demonstrating the negative impact of stigma experienced by parents of children with autism spectrum disorder (ASD; Gray, 2002; Farrugia, 2009; Mak & Kwok, 2010). Little research has investigated the consequences stigma has on the diagnosed individual, particularly adults. The current study assesses the relationship between stigma (with subscales measuring discrimination, positive aspects of the disorder, and disclosure) and social variables, including self-esteem, self-efficacy, and social satisfaction in adults with ASD. Participants (n = 20) were recruited from university disability resource centers, autism-related events, and other support services. Participants (M = 26.77 years, range = 18.59-57.94) completed psychometrically supported measures to assess stigma, self-esteem, self-efficacy, and social satisfaction. Results showed that adults experiencing more self-reported stigma have lower self-efficacy and lower overall social satisfaction. Additionally, those who experience more discrimination have lower social satisfaction, and those who express more positive aspects of their diagnosis have higher self-esteem. As rates of ASD continue to rise, more individuals with ASD will likely enter post-secondary education or professional settings; therefore, exploring variables that impact adaptive social

function among young adults has increasing importance. More specifically, examining how stigma affects the social outcomes of adults, such as self-esteem, social competence, and social satisfaction, may provide educational institutions or workplaces with information that is necessary to develop and implement more appropriate support structures for students or employees with ASD.

Implementation of Structure from Motion from a Cube Satellite in Low Earth Orbit

Hollis Neel, CURO Summer Fellow, CURO Research Assistant
Dr. Marguerite Madden, Geography, Franklin College of Arts and Sciences

The UGA Small Satellite research laboratory's mapping and ocean color imager mission utilizes an algorithm known as structure from motion (SfM) which recreates 3D maps of a surface. In order to achieve this we have to consider factors such as computational complexity, hardware constraints, atmospheric distortion, and orbital optimization. To maximize the effectiveness, we will attempt to write custom SfM software specifically for our system using the Scale Invariant Feature Transform algorithm. This algorithm creates thousands of key points in any image and if two images have the same key point it is then possible to tie them together. This allows us to calculate the geometry of the object we are imaging. This is calculated by knowing where the cameras precise position was at the time of each picture and then using epipolar geometry to triangulate the location for the rest of the tied points. To optimize this for in orbit applications, we will be able to make estimations on where the tied points should occur in each image. This paired with the near constant attitude to reduce computing camera position shows promise to greatly reduce the computational complexity of the algorithm. We also plan to implement our algorithm in software from either a field programmable gate array or a graphical processing unit. This shows promise to also reducing the computation time even farther due to SfM's computationally greedy past. Pairing all of this with a custom SfM testing suite in blender has allowed us to simulate these scenarios on a to-scale model.

The Effects of Aging on Neuroblast Proliferation in the Pivotal Lateral Ventricle Region: A Canine Model

John Newman
Dr. Buffy Howerth, Pathology, College of Veterinary Medicine

Through the studies of legendary neuroscientist Santiago Ramón y Cajal, it was previously thought that the adult brain lacks the ability to regenerate neurons. In modern science, adult neurogenesis has been well established in the hippocampal region of rodents. Since this landmark, many studies of adult neurogenesis in the hippocampus of gyrencephalic species, such as bovine, have been conducted. However, the ontogeny of neurogenesis in the canine brain, particularly in the lateral ventricle region, is poorly understood. Data concerning the importance of the lateral ventricle and its accompanying cerebrospinal fluid in trauma repair, nutrient delivery and waste removal is burgeoning. Therefore, it is vital to elucidate the neurogenic properties of this region, and the tissue surrounding it. Here, we evaluate the relationship between age and proliferation of neuroblasts, or immature neuronal precursors, in the Subventricular Zone (SVZ) of the lateral ventricle region of the canine brain. The SVZ is a proven hotspot for robust neuroblast proliferation, and thus an excellent target for evaluation. Also, considering the canine brain is similar to humans in that it contains many gyri, there is ample opportunity for neuroblasts to migrate through the SVZ via the Rostral Migratory Stream (RMS). We hypothesize that as age increases, the robustness of neurogenesis in the canine brain will decrease, as indicated by decreasing numbers of DCX and Ki67 immunopositive cells. To address this, formalin fixed brains from dogs of various ages submitted for postmortem examination and with known pathologies were evaluated. Immunohistochemical staining of transverse sections of forebrain for doublecortin protein (DCX) and Ki67 were performed in order to assess the density of migrating neuroblasts, and general cell proliferation, respectively.

Simulation of Small Satellite Photovoltaic Power Generation System

Khoa Minh Ngo, CURO Research Assistant

Dr. Marguerite Madden, Geography, Franklin College of Arts and Sciences

A satellite is artificial body placed in orbit around the earth or moon or another planet in order to collect information or for communication. One example of a satellite is a retroreflector sphere. A retroreflector is a small spherical object that has retroreflector built across its outer surface area to directly reflect any laser back to its origin. This type of satellite does not require a power system and it is use to study geo-referencing methods in orbit. However, many satellites require a power system in order to power its payload and transmit data to ground. Typically, powered satellites will be equipped solar panels for Earth orbiting mission. Solar panels, also known as solar powered photovoltaic (PV) panels, convert the sun's rays into electricity by exciting electrons in silicon cells using photons of light in the sun. This electricity can then be used to give an energy supply of electricity or used to charge a battery. Because the amount of electricity generated from photovoltaic cells are tied to the amount of photons hitting the cells, we can estimate a satellite's solar power generation by estimating the amount of sun light shining on the solar panels. This research focuses on estimating the power generation of a CubeSat in orbit using rough order-of-magnitude (ROOM) predictions and complex orbital simulation analysis. The result of this research will allow us to better understand how satellite power generation potential is affected by orientation, seasons, and orbital parameters.

Evolution of Body Size in *Drosophila subquinaria*

Amy Nguyen
Dr. Kelly Dyer, Genetics, Franklin College of Arts and Sciences

Selection can shape trait variation and can be studied by examining the interplay between genes and environment in natural populations of *Drosophila*. *Drosophila subquinaria* occurs throughout western North America. Initial observations indicate that coastal populations have a substantially larger body size than inland populations despite extensive gene flow across the range. It can then be hypothesized that large body size in coastal populations of *D. subquinaria* is a derived trait and due to differences in selection. To better understand the role life history evolution has played in populations of *D. subquinaria*, questions regarding if coastal (large) females are more fecund and lay larger eggs than inland (small) females. Egg size is an important life-history character that is positively associated with offspring fitness and affects development rate (egg-larva and egg-adult). Likewise, fecundity is a critical life-history character in that the more fecund a female is the more opportunity she has to spread her genes to the next generation and beyond. This will be examined by measuring female wing size and oriole size in different iso-female lines and its correlation with the number of eggs laid and the size of the eggs laid. By understanding the variation in egg size/number in populations of *D. subquinaria*, determination of the sources of selection acting on body size and the benefits to maintaining a larger body in coastal populations can be achieved.

Investigation of Antimicrobial Resistance in *Salmonella* and *Escherichia coli* isolated from the Upper Oconee Watershed

Anh Hoang Thi Nguyen
Dr. Jonathan G Frye, Microbiology, Franklin College of Arts and Sciences

Bacterial contamination of surface water from agricultural runoffs, sewage drainage, and natural sources can contribute to disease transmission. This is concerning due to increasing antimicrobial resistance (AR) in bacteria. Overuse of antibiotics and the spread of mobile genetic elements (MGEs) encoding AR has contributed to the emergence and dissemination of resistant bacteria. Pathogens, like *Salmonella* and *Escherichia coli*, can acquire AR through MGEs such as plasmids. To determine if bacteria in surface water were resistant to antimicrobials or carried MGEs, water samples were collected from the Upper Oconee Watershed in Georgia; *Salmonella* and *E. coli* were isolated from the samples and characterized. Fifty-four *Salmonella* and *E. coli* isolates were resistant to the antimicrobials tested. Resistant isolates were assayed for the presence of plasmids and were genetically fingerprinted using Pulsed-field Gel Electrophoresis (PFGE). Plasmids were detected

in 7/22 *Salmonella* including the IncN and IncA/C plasmids. One *S. Newport* isolate contained an IncA/C plasmid and was resistant to 10/14 antimicrobials tested, including tetracycline, ceftriaxone, and streptomycin. This resistance profile matched *S.* Newport strains associated with foodborne outbreaks. *Salmonella* isolates containing the IncN plasmid were resistant to tetracycline and trimethoprim and/or sulfamethoxazole. Approximately 69% of PFGE profiles determined for the *Salmonella* isolates were identical or similar to PFGE profiles of clinical isolates from the Centers for Disease Control and Prevention PulseNet database. Approximately 78% of the *E. coli* isolates contained at least one plasmid. These results show the potential role of surface water in harboring antimicrobial resistant bacteria that may cause human infection.

Instant Clotting Patch to Prevent Excessive Bleeding during Emergency Injuries

Dieu Thao Nguyen, CURO Research Assistant
Dr. Hitesh Handa, Chemical, Materials, and Biomedical Engineering, College of Engineering

Excessive blood loss continues to be one of the leading causes of death at in war fields, road accidents, surgeries, and other emergency situations. In addition, the presence of common bacteria exacerbates the wound by diverting the inflammatory response away from healing the injury and toward eradicating the infection. The objective of this research is to fabricate a bio-inspired wound dressing which can form instant blood clot and also minimize bacterial reduction. The internal layer of the bilayer wound dressing is composed of an adhesive suspension of propolis, fibrin, and Tranexamic acid. Propolis, a natural antimicrobial agent, prevents bacteria from adhering and proliferating on wounded areas, reducing the susceptibility to infection. Fibrin provides a platform onto which platelets and blood cells can attach, forming blood clots. Tranexamic Acid, an antifibrinolytic, reduces the degradation of blood clots, thus stabilizing them. The external layer consists of a nitric oxide (NO) releasing agent. NO is a crucial cellular signaling molecule which has a proven role in wound healing process via regulation of cell proliferation, angiogenesis, inflammation and prevent of infection. The wound dressing will be characterized for antibacterial potential, biocompatibility, mechanical testing, surface properties, NO flux analysis, hemocompatibility, gene expression and in vivo animal studies. The preliminary tests have shown promising results and the novelty of the wound dressing provides an innovative approach to ensure a greater promise for recovery from injuries.

Using Serological Tools to Measure the Prevalence of Filarial Infection after Mass Drug Administration

Stephanie Nguyen, CURO Research Assistant
Dr. Patrick J Lammie, Cellular Biology, Franklin College of Arts and Sciences

Evaluating the success of mass drug administration (MDA) programs to eliminate lymphatic filariasis (LF) requires monitoring of infection in sentinel communities. At the beginning of MDA, LF programs monitor the levels of parasites in the blood stream, but as infection levels decline, parasite antigen and antifilarial antibody prevalence are used to assess progress. In this study, I will analyze blood serum samples by using serological tools to determine the status of LF infection in the community of Saut D'eau, Haiti. Serological tools, such as Immunochromatographic Card (ICT) tests and Multiplex assays, will provide a comprehensive evaluation of LF antigen and antibody prevalence, respectively. Participants were tested for LF antigen by ICT and dried blood spots (DBS) were collected for assessment of antibodies to LF and other infections by Multiplex. By evaluating other other parasitic antibodies, such as Malaria, Tetanus, Measles, Cysticerosis, and Toxoplasma, I will achieve a greater understanding of the overall health status of the community. After data collection, I will create age prevalence curves via Excel® to determine the presence of particular antibodies in respect to aging. In addition, I will compare the percentage of individuals positive for LF antigen in ICT versus LF antibodies in Multiplex to assess which assay is more sensitive to the presence of infection. Conducting these experiments will allow me to determine the status of particular infections and the progress of the MDA LF program in Saut D'eau.

Examining the Arrhythmogenicity of Dobutamine When Used in Conjunction with Isoflurane or Sevoflurane

Emily Nieves, CURO Research Assistant
Dr. Rachel Reed, Large Animal Medicine and Surgery, College of Veterinary Medicine

Dobutamine is an inoptric agent typically administered to counteract the low cardiac output associated with isoflurane, sevoflurane, and other types of anesthesia, but has been known to cause arrhythmias as well. The increased risk of arrhythmias during surgery may lead to an increase of complications during surgery, as irregular heartbeats can mean decreased blood flow to vital organs. Previously, halothane was administered to maintain anesthesia, and was found to cause a significant number of arrhythmias when coupled with dobutamine. Since isoflurane and sevoflurane replaced halothane as a means of maintaining anesthesia, there have been few studies investigating the occurrence of arrhythmias when dobutamine is used in conjunction with isoflurane or sevoflurane. This experiment serves to bridge that gap in knowledge by examining the arrhythmogenicity of dobutamine when given to horses that have been anesthetized with either isoflurane or sevoflurane. This experiment was conducted as a retrospective study. The data was collected using anesthesia records from the UGA Veterinary Teaching Hospital. 200 horses were studied and variations in heart rate and other variables were recorded as well as any documentation of arrhythmias. It is expected that the occurrence of arrhythmias will be much lower in the horses studied than in the horses that were administered halothane in previous studies.

Facilitating the Continuous Expression and Secretion of the Influenza Surface Glycoprotein, Hemagglutinin, within Human Cells

Santosh Nimkar, CURO Research Assistant
Dr. Ted M Ross, Infectious Diseases, College of Veterinary Medicine

Influenza is a viral infection that causes severe respiratory illnesses and, during epidemics, is responsible for 250,000 to 300,000 deaths per year worldwide (WHO). Due to antigenic shift and drift, many different antigenic combinations occur resulting in pandemics and seasonal epidemic infections. Hemagglutinin (HA), a surface glycoprotein on influenza virions, initiates the viral binding to human host cells, thereby initiating the infection. One of the major mechanisms of protection from influenza infection is the ability of specific antibodies to bind to the viral surface of, particularly, the HA glycoprotein. Given the central role of HA in influenza infections due to it being a major target of the humoral immune response, study of this protein is critical to understand, not only, the immune response to the virus but also the biology of the virus, itself. Therefore, the goal of my project is to clone HA genes of various pandemic and seasonal influenza viruses and insert them in mammalian expression vectors for the stable transfection of human embryonic kidney (HEK)-293T cells. Ideally, this will allow for continuous expression and secretion of this protein for purification. Up to this point, through polymerase chain-reaction (PCR), restriction enzyme (RE) digestion and ligation followed by transformation and mini-prep purification, I have successfully obtained the ideal DNA plasmids for transfection. Later on, positively-transfected HEK-293T cells will be evaluated for HA expression and subjected to antibiotic (Zeocin) selection from which resistance is conferred by the transfecting plasmids.

Archaeometry of Argentinean Rock Art

Autumn Nobles, CURO Research Assistant
Dr. Tina Salguero, Chemistry, Franklin College of Arts and Sciences

From the famous Lascaux cave paintings in France to Cueva de las Manos in Argentina, naturally occurring pigments have been used as colorants since antiquity. The pigments used were typically composed of common minerals found in the region of the artist. The high availability of these inorganic compounds coupled with their high resistance against weathering made them a key ingredient in early artwork. The primary goal of this project is to identify the mineral composition of the pigments used in cave art samples from Santa Cruz, Patagonia and to compare them to local mineral sources. Studies on rock art pigments have been conducted in Argentina, but there have been few studies comparing these samples to the natural pigments to minerals found in the surrounding region. The

beginning stages of this project focused on analyzing ~20 soil samples from the Southern Deseado Massif region of Patagonia with X-ray Diffraction (XRD), Electron Dispersive Spectroscopy (EDS), and Raman Spectroscopy. The chemical composition and structural information gathered from these techniques were then used to compile a database of possible pigment sources. For the second part of this project, Patagonian cave art samples were analyzed with Scanning Electron Microscopy (SEM) and EDS. In order to achieve high quality images and data, each sample was embedded in epoxy, polished and carbon-coated. The elemental data from the cave art samples was then compared to that of the soil samples, in order to search for a link between pigment and source.

The Effect of Macrocyclic Lactones on the Canine Immune Response towards the Heartworm Parasite *Dirofilaria immitis*

Connor Matthew O'Neill, CURO Summer Fellow, CURO Research Assistant
Dr. Adrian Wolstenholme, Infectious Diseases, College of Veterinary Medicine

Dirofilaria immitis is a parasitic nematode that causes heartworm disease in cats and dogs. To prevent *D. immitis* infections, which primarily occur in the pulmonary arteries of an infected dog or cat, macrocyclic lactone (ML) drugs – like ivermectin (IVM) and moxidectin (MOX) – are typically administered to healthy animals each month. In the last 10-15 years, loss of efficacy (LOE) cases have been reported where IVM treatments appeared not to have worked, primarily in the Mississippi Delta Region of the United States. Previous work at UGA has resulted in the isolation of *D. immitis* isolates that have been confirmed to be resistant to IVM in vivo. Work in our laboratory has shown that, in vitro, the drug increases recognition of IVM-susceptible larval worms by cells of the dog innate immune system, neutrophils and mononuclear cells. Therefore, the end goal of this project is to answer whether or not there is a correlation between the effects of different MLs at various concentrations on cellular recognition of parasite larvae in vitro and the ML resistance of the *D. immitis* strain being tested. To date, MOX has been found to significantly increase PBMC binding to susceptible strains of *D. immitis* at concentrations above 0.1 μM while IVM has done so above 1 μM. Likewise, MOX has significantly increased PBMC binding to resistant strains of *D. immitis* at 0.1 μM, while IVM did not do so at any concentration. We are currently examining two other strains of *D. immitis* for resistance towards ML drugs.

Attention-Deficit/Hyperactivity Disorder (ADHD) Subtypes: Cross-Informant Agreement and Stability from Childhood to Adulthood

Selin Odman
Dr. Jason Nelson, Psychology, Franklin College of Arts and Sciences

Attention Deficit Hyperactivity Disorder (ADHD) is a complex disorder that is challenging to accurately identify. When clinicians diagnose ADHD, they assign a specific subtype to their patients. Minimal research has investigated the reliability of these subtype designations. The purpose of this study was to investigate the reliability of assigning ADHD subtypes across time and informants within the following ADHD subtypes: inattentive, hyperactive-impulsive, combined (inattentive and hyperactive-impulsive), and other specified. Participants (N = 634) were individuals who were diagnosed with ADHD via a neuropsychological evaluation at a university-based clinic. Participants and their parents completed measures of childhood and current ADHD symptoms using the 18 DSM symptoms of ADHD. Kappa values measuring agreement across time and informant ranged from slight agreement to fair agreement for all subtypes. In addition, preliminary analysis shows a 59% agreement for child subtype rating between raters, a 45% agreement for current subtype rating between raters, a 68% agreement for self subtype rating across time, and a 53% agreement for other subtype rating across time. In conclusion, the currently accepted and wide-spread ADHD subtype assignments show low agreement across time and informants. This ultimately causes challenges for clinicians, who have to assign labels to their patients using contradicting information from different sources.

Characterization of Genes Predicted to Function in Signaling for Expression of RNA Repair Operon in *Salmonella*

enterica serovar Typhimurium

Obi Okafor, CURO Research Assistant
Dr. Anna Karls, Microbiology, Franklin College of Arts and Sciences

Salmonella enterica serovar Typhimurium, a food-borne human pathogen, must survive an arsenal of host defenses during infection. Understanding pathogen survival strategies facilitates the design of antimicrobials and vaccines. Our laboratory has previously shown that the RNA repair operon of Salmonella increases survival of the pathogen under conditions that damage nucleic acids, such as exposure to the antibiotic mitomycin C (MMC). The purpose of this project is to identify the genes that are involved in generating the signal that activates RtcR, a transcriptional regulator of the RNA repair operon. A reporter strain for quantitating transcription of the RNA repair operon was created in *S*. Typhimurium by replacing the first gene of the operon with *xylE*; the gene product of *xylE* converts catechol to a quantifiable yellow compound. The BEI Resources collection of *S*. Typhimurium deletion mutants, which has nonessential genes replaced individually with kanamycin- or chloramphenicol-resistance cassettes, is a source for deletions/substitutions of genes that are predicted to play a role in generating signaling molecules. Initially focusing on the *rna* (RNase I) or *rpoS* (sigma factor S) genes, I used PCR to confirm the Δ*rna*::Kan^R and Δ*rpoS*::Kan^R mutations in the BEI resource mutants and P22 transduction to move the mutations into the *xylE*-reporter strain. MMC treatment will be used to induce RtcR-dependent expression of the RNA repair operon and the level of *xylE* expression will be measured in the wildtype and mutant strains to determine whether *rna* or *rpoS* are required for generating the signal that activates RtcR.

Justice for All: Addressing Codified Discrimination in the Georgia Justice System

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

This policy research investigates the troubling prevalence of codified discrimination within the judicial system of Georgia, particularly within the jury selection process and against the state's public defense system. Discriminatory practices widen the division between minority members and law enforcement, and increase the skepticism many groups harbor about the equity of the justice system as a whole. The overworking and underpayment of state public defenders undermine the constitutional rights of Georgia citizens, while also exacerbating the issue by deterring potential law students from careers in public interest, like public defense. Leniency against attorneys who use peremptory challenges to stack juries through the elimination of minority groups result in cursory decision-making within juries, a lack of diversity in race and perspective, and wasted court time. To address these issues, three policy alternatives were formulated: a reduction in peremptory challenges, third party presiding sources for Batson challenge reviews, and pay parity for prosecutors and public defenders. After analyzing the effectiveness, cost-benefit, and feasibility of each alternative, this policy paper asserts that the third party presiding source is the best option.

Majority Party Factionalism and Gridlock in State Legislatures

Rob Oldham, CURO Summer Fellow, CURO Research Assistant
Dr. Anthony Madonna, Political Science, School of Public and International Affairs

Congressional gridlock is often blamed on majority party factionalism. After the 2010 elections, a group of strongly conservative Republicans, sometimes referred to as the Tea Party or the Freedom Caucus, prevented Congress from passing legislation on salient issues even when there was a bipartisan majority that supported it. Conservatives took advantage of institutional rules and a polarized electorate to obstruct legislation with majority support such as government funding bills and comprehensive immigration reform. Although obstructionism has been well documented at the national level, there have not been similar studies at the state level. I attempt to fill this gap by examining the relationship between majority party factionalism and gridlock in state legislatures from 2001 to 2013. Using McCarty and Shor's (2015) ideological scores for state legislators, I calculate a measure of factionalism in majority party caucuses. I examine

the effect of factionalism on legislative output and on the enactment of major policy items. I hypothesize that increased majority party factionalism will lead to heightened levels of gridlock, especially when supermajoritarian rules facilitate obstructionism.

Examining Younger Age at Menarche in Mexican-American Girls

Ginny Lee Olivier
Virginia Olivier
Dr. Jennifer L Gay, Health Promotion and Behavior, College of Public Health

During the past century girls have been having their first menstrual period (attaining menarche) at younger ages. This may be due in part to increased body fat in childhood and adolescence. Previous studies also have found a correlation between girls' age at menarche and mothers' age at menarche, although this may be moderated by overweight or obesity. Because prior research has mainly studied Caucasian populations, the aim of this study was to determine if the relationship between daughter's age at menarche with mother's age at menarche varied by body composition in a sample of Mexican-American girls. Data were obtained from 446 girls from a larger cross-sectional survey of Mexican-American students in grades 4-12 in south Texas. Height, weight, BMI, and body fat percent were measured. Girls and their mothers self-reported age at menarche. A general linear model was tested with age at menarche as the dependent variable. Interestingly, girls in this sample attained menarche at a significantly younger age than their mothers by 1.5 years ($p=0.000$). The relationship between mother's and daughter's age at menarche approached significance ($p=0.082$) in the general linear model. This relationship did not vary by body fat percentage. Because of this study's cross-sectional nature, a future longitudinal study of Mexican-American girls could determine if there is an association between childhood body fat and age at menarche. As earlier age at menarche has been shown to be associated with greater cardiovascular disease risk, this factor may be considered in prevention efforts.

The Effect of High-Fat Diet in Altering the Metabolism of Mice with Differing Expressions of RGS10

Erik Olsen
Dr. Jae-Kyung Lee, Physiology and Pharmacology, College of Veterinary Medicine

Regulator of G-Protein signaling protein (RGS) 10 has shown to negatively modulate levels of inflammation by inhibiting macrophages and microglial activation. Although immune response is an important part of brain health when functioning normally, abnormal or chronic inflammation is known to be a risk factor not only in brain health but also in peripheral system. The mechanism of RGS10 in immune cells and other cell types has not identified, yet. Interestingly, when RGS10 knockout mice were characterized by Jackson Laboratory, they reported RGS10 knockout (KO) mice displayed impaired glucose tolerance. We also observed that RGS10 knockout mice gained more weight with aging (unpublished observation). These imply its role in metabolism and/or obesity. To better understand the role of RGS10 in metabolism and obesity, we have conducted a study that investigates the effect of high fat diet on RGS10 KO mice. RGS10 KO mice and wild type (WT) control mice were fed a diet of low fat (LF) or high fat (HF) for 8 weeks. At week 8, HF-fed RGS10 KO mice displayed significantly increased body weight compared to HF-fed WT mice. HF-fed RGS10KO mice displayed significantly increased retroperitoneal adipose tissue and liver weights. Especially, HF-fed RGS10 KO mice displayed insulin resistance which implicates in metabolic disregulation in these mice. This study is the first time one has investigated the role of RGS10 in metabolism and obesity. With further research, this understanding can be used to search for a deeper understanding of the biochemical regulation pathways that play large roles in both metabolic disorders and neurodegenerative disease.

The Rules Change the Game: Delegate Allocation Variations and Presidential Primary Season Length

Paul DuPont Oshinski, CURO Research Assistant
Dr. Joshua Tyler Putnam, Political Science, School of Public and International Affairs

Scholars examining presidential primaries have long-discussed how the primary rules that govern

the allocation of delegates in each state play significant roles in the primary process as a whole. As there are myriad primary rules that alter delegate allocation methods, this research argues that different rules favor different candidates, depending on a candidate's positioning in the primary race. This paper finds that candidates leading in the primary race (i.e. frontrunners) receive more delegates in winner-take-all primaries than in any other delegate allocation method, including proportional representation, winner-take-most, or any hybrid delegate allocation method. The success of front-runners in winner-take-all primary states yields a shorter primary season for both the Republican and Democratic parties. Variables such as momentum, frontloading, primary contest type, and electorate preferences are controlled for in a regression analysis examining the effect of delegate allocation methods on presidential primary length. The study uses delegate count data from Republican and Democratic primaries in the 2008 and 2012 presidential elections and analyzes which delegate allocation methods produce a quicker primary victor. By examining delegate counts in these two elections, this study uncovers which delegate allocation methods both offer the front-runner the greatest delegate payoff and lead to a quicker primary season for both Republican and Democratic parties.

Introductory Biochemistry Students' Use of Learning Objectives

Bethany Osueke, CURO Research Assistant
Dr. Julie Dangremond Stanton, Cellular Biology, Franklin College of Arts and Sciences

Learning objectives are tools used to articulate the knowledge and skills instructors intend their students to acquire by the end of a particular section of material or an entire course. Learning objectives make goals and expectations clear while providing organization for teaching and learning. By aligning course instruction and assessment, learning objectives have been shown to enhance student performance. There have been many studies on how faculty should write and use learning objectives in the classroom. Yet little attention has been given to understanding how students use learning objectives in order to study effectively. Academic faculty should be invested in engaging with learning objectives from a student-centered perspective. This study employed two open-ended surveys to explore students' perceptions and uses of learning objectives. Participants were undergraduate students taking Introductory Biochemistry at one institution (n=185). The surveys were completed after the students' first and second exams. We used content analysis to identify key ideas within students' answers. Most participants used learning objectives by answering them as if they were questions. Students perceived the purposes of learning objectives to be showing them what is important to learn, providing organization, and helping them meet their instructors' expectations. Students also reported that the learning objectives helped focus their study for exams and for learning purposes. Ongoing research is centered on how students' use of learning objectives affects their exam and course grades.

Investigating a Potentially Novel Cache Valley Virus Variant in a Clinical Case in Missouri

Isabel Ott, CURO Honors Scholar, CURO Research Assistant
Dr. Daniel Mead, Population Health, College of Veterinary Medicine

The Southeastern Cooperative Wildlife Disease Study (SCWDS) investigates wildlife mortality events in the southeastern United States. In July of 2015, the Missouri Department of Conservation submitted samples from a white-tailed deer (*Odocoileus virginianus*) euthanized after showing signs of hemorrhagic disease. Submitted samples tested negative for hemorrhagic disease viruses and other major viruses of white-tailed deer using reverse transcriptase polymerase chain reaction (RT-PCR). Further tests detected an *Orthobunyavirus*, a genus of arthropod-borne RNA viruses distributed worldwide, showing highest similarity to Cache Valley virus (CVV). CVV, better known as a cause of severe neurological birth defects in sheep, has previously been isolated from asymptomatic deer. The deer's unusual clinical profile suggested the potential presence of a genetically variant strain. Variant or novel orthobunyaviruses emerge relatively frequently, as they lack replication proofreading mechanisms and frequently exchange genetic material between species. To explore this possibility, partial segments of the isolate's genome were amplified

and sequenced using RT-PCR and short-read Sanger sequencing. Sequence data analysis showed a high similarity between the isolate and two different lineages of CVV, suggesting that genetic exchange between traditional Continental US and Mexico lineages had occurred. The Mexico lineage, introduced to the Northeastern US in 2010, has caused more severe birth defects than previous strains. Further genetic characterization of the clinical isolate, along with analysis of historical Georgia isolates, should better define the virus's ancestry and potential causes for its unusual pathogenicity.

From Ancient Artifacts to 3D Printers: Using Modern Engineering Tools to Enhance Our Understanding of Classical Athenian Elections

Chris W Overbaugh, CURO Research Assistant
Dr. Naomi Norman, Classics, Franklin College of Arts and Sciences

This project is an interdisciplinary effort between UGA's departments of Civil Engineering and Classics. To better serve the nationwide classics pedagogy developed in part by Dr. Naomi Norman, Reacting to the Past, 3D modelling and additive manufacturing are employed to create high-fidelity, low-cost replicas of artifacts pertaining to Athenian Democracy. By using information found from excavations at the Athenian Agora in Greece, models of ballots and other artifacts were created in AutoCAD. Pictures were analyzed to develop fonts representative of inscriptions on the ballots, and a trial and error process varying the weight, size, and style of the font (2D characteristics) and depth and shape of inscription (3D characteristics) were used to select the most legible representation. The models were refined for more efficient and higher-quality 3D printing by breaking the artifacts in to various pieces to be joined in post-processing. Replicas were printed on Makerbot Replicator+ machines using PLA filament and models will be shared via an online community for universities using Reacting to the Past to print. The use of the replicas in Dr. Norman's FYOS seminar will be observed to assess impact. The design process will be presented as findings alongside all existing artifact replicas. Additive manufacturing is becoming commonplace in educational systems to create effective hands-on teaching tools. The replicas created in this research/design process are both effective tools and highlight the benefits that an engineering perspective and expertise can bring when applied to other disciplines. This project will set precedence for future collaboration at UGA.

Exploring Uncertainty in Models of Mosquito Vector-Borne Disease

Jack Owen, CURO Research Assistant
Dr. Courtney Murdock, Infectious Diseases, College of Veterinary Medicine

Understanding the dynamics of the spread of mosquito-borne diseases such as malaria and dengue virus are important public health challenges, as these diseases affect millions of people around the world. Mosquitos, like most ectotherms, are heavily influenced by the temperature of their environment. Recent work suggests that mosquito traits and thermal performance follow a unimodal response to temperature, with an "optimal range" in the middle that decreases as the temperature moves in either direction. Global climate change data indicate that different parts of the world may move into the mosquitos' optimal range in the coming years, changing the prevalence of mosquito-borne illnesses in those areas. Little empirical work, however, has been done to validate data gathered from metadata studies from which the unimodal thermal performance was generated. This experiment monitored mosquito mortality, bite rate, and fecundity across a range of temperature points in laboratory incubators. From the results, we will be able to further specify which variable is the most important driver of mosquito transmission potential.

The Effects of Temperatures on the Stability and Infectivity of Arboviruses

Hannah Packiam, CURO Research Assistant
Dr. Melinda Brindley, Infectious Diseases, College of Veterinary Medicine

Viral stability can affect how long viral particles remain infectious in the environment. In addition, the stability, or lack of stability, of viral particles may impact experimental outcomes if particles are easily inactivated. In this study, we investigate the effects of temperatures on the stability and

infectivity of arboviruses. Understanding how both high and low temperature treatments alter particle infectivity may enable us to design better experiments concerning chikungunya virus, dengue virus, and Zika virus in our lab. To specifically examine the stability of the arboviral particles, I determined the temperature that inactivated particle infectivity as well as examined how freezing affects the viral titers. Dengue virus was less thermally stable than attenuated chikungunya virus and Zika virus, and was inactivated at a lower temperature. To determine if freezing viral stock alters the titer, I produced viral stocks and titered them immediately, as well as after short freezing periods (4 and 24 hours) and compared to a full-week time period. Preliminary results suggest that the viral titers remained similar to unfrozen material when frozen for short periods, but decreased significantly after being frozen for 7 days. Thorough understanding of viral particle stability and how infectivity can change due to temperature exposures will be informative as the lab undertakes additional experiments comparing how arbovirus infectivity and transmission potential changes over a range of temperatures.

South African Wineries and the US Wine Market

Kavi Pandian, Foundation Fellow, CURO Research Assistant
Dr. William Finlay, Sociology, Franklin College of Arts and Sciences

This research investigates the presence of South African wineries in US wine markets as well as what factors may influence that presence. Using a dataset consisting of stores in the US that sell different wines from South Africa, my research mentor and I analyzed the market presence of the different wineries. Initial results appear to indicate that the US market for South African wines is a "winner-take-all" market in which a few wineries vastly outweigh the other wineries both in market presence as well as volume of wine sold. Unlike many other "winner-take-all" markets, this one does not consist of a few large wineries dominating the smaller ones; instead, it consists of many small wineries competing against other small wineries. Our research seeks to explain why such a market exists. We also use data about wine quality, as established by *Platter's Wine Guide*, to argue that quality ratings have a negligible impact on market presence. Initial results of our analysis appear to indicate that the most important factor in winery market presence is what distributor each winery is connected to.

Reducing School Discipline Disparities and Excesses in K-12 Education in the State of Georgia

Kavi Pandian, Foundation Fellow, CURO Research Assistant
Dr. Sarah Shannon, Sociology, Franklin College of Arts and Sciences

This policy research investigates the high rates of discipline in public schools in Georgia as well as the ways in which this discipline is administered unequally based on characteristics such as race, gender, and ability status. After conducting a review and analysis of relevant literature and research, some root causes have been identified for why these rates of discipline are so high and disproportionately affect students of color and students with disabilities. These include implicit biases from teachers who do not understand the culture of their students, undiagnosed medical issues, undiagnosed behavioral issues, and psychological characteristics inherent in developing children. To address these causes, three policy alternatives were developed: a policy proposing the implementation of restorative justice practices in schools and school districts throughout Georgia, an optical health medical intervention policy modeled after one which has been implemented in Florida, and a policy calling for changes in record-keeping and other bureaucratic measures to increase accountability and reduce rates of discipline for vague, undefined offenses. After analyzing effectiveness, feasibility, and the costs and benefits of each policy, this policy paper asserts that working to implement restorative justice in districts and schools throughout the state is the best option to reduce school discipline disparities and excesses in the state of Georgia.

Identity, Cosmology, and Subsistence in Madagascar

Rose Parham, CURO Research Assistant
Dr. Bram Tucker, Anthropology, Franklin College of Arts and Sciences

Southwestern Madagascar is characterized by one of the most inconsistent and variable climates in the world. This high degree of unpredictability would seemingly indicate a need for humans living in the area to reduce subsistence risks associated with high variability by diversifying subsistence strategies and increasing mobility, but in this region of Madagascar, ethnic identity relates to subsistence strategies, which limits economic diversification, and religious cosmology involves ancestor reverence, which limits mobility. These limiting cultural traits seem as if they would be maladaptive due to the high subsistence risk associated with this region. This research will explore whether these cultural traits are most likely regional adaptations versus traditions shared widely throughout Madagascar. This will be accomplished using a cross-cultural dataset of cultural groups throughout Madagascar. The research will compile previously published data from various cultural groups across Madagascar, which will then be compared using frequency statistics such as chi-squared analysis. Findings are suspected to suggest that while there is some cosmological variability across Madagascar, it stays fairly consistent across the island. Ethnic identity is expected to be more variable, especially with the unique trait of identity being related to subsistence strategy in southwestern Madagascar. On a broader scale, this research explores different ways in which humans can adapt to various environments, as well as how culture and socioreligious institutions affect the ways that people interact with their environment.

Effect of Different Concentrations of 25-Hydroxycholestrol on Osteogenic Differentiation of Mesenchymal Stem Cells (MSC) from Broiler Compact Bone

Diane Park, CURO Research Assistant
Dr. Woo Kyun Kim, Poultry Sciences, College of Agricultural and Environmental Sciences

MSC are multipotent progenitors that can differentiate into various tissue cells. The objectives of the study were to 1) isolate MSC from broiler compact bone and 2) study the effects of 25-hydroxycholestrol on osteogenic differentiation of MSC. This is important for the production and welfare facets of the poultry industry as chickens develop orthopedic problems such as lameness, tibial dyschondroplasia, and osteoporosis. MSC were isolated from the femurs and tibia of day-old chicks and left to confluent, with the media changed every 2-3 days. The cells were passaged until P4 and plated in 24 well plates at density of 20,000 cells/cm^2. Upon confluency, cells were treated with the following treatment: control, osteogenic media (OM), and OM with 0.5, 1, and 2 uM 25-hydroxycholesterol. Cytochemistry conducted on day 7 and 14 to detect osteogenesis. Cells treated with OM, and 25-hydroxycholestrol induced higher proportion of Alizarin Red and Von Kossa stain (mineralization), and Alkaline Phosphatase (early osteogenic marker) compared to control cells. However, 2uM 25-hydroxycholesterol was toxic to cells, causing cell death. Results indicated that 25-hydroxycholesterol has a stimulatory effect on MSC ostegenesis. Current results provide rationale for further study on regulatory mechanisms of 25-hydroxycholesterol on MSC which can help to address skeletal problems in poultry. RNA extraction then RTPCR will be conducted at 7 and 14 days to analyze gene expression and obtain a broader understanding of the effects of 25-hydroxycholesterol on MSC. A positive result will show a significant expression of pathways activated by osteogenesis such as BMP and BGP.

The Isolation of *C. elegans* Germ Cell Line

Yeonsoo Park, CURO Research Assistant
Dr. Edward Kipreos, Cellular Biology, Franklin College of Arts and Sciences

The nematode *Caenorhabditis elegans* is one of the most important model systems for biological research. Despite many advantages of *C. elegans*, it lacks a critical tool - there are no *C. elegans* cell lines. Germ cells that are isolated from tumorous germline mutants can be maintained in a tissue culture media that was created by the Kipreos laboratory. However, the germ cells do not divide continuously, which is a requirement for generating an immortal cell line. This study focused on testing different mutant combinations in order to isolate a continuously-dividing germ cell line. We tested two different combinations of tumorous *C. elegans* mutants: glp-1(ts/gf); cki-2(lf); daf-16(lf); and glp-1(ts/gf); cki-2(lf); daf-16(lf); let-60(gf). We compared how effectively germ cells from these two different mutants can proliferate

in the tissue culture media. To carry out the experiments, the mutant strains were disrupted to release their germ cells, and then the germ cells were transferred to tissue culture media. The ability of the cells to proliferate was followed by measuring the level of DNA in the culture over time. To measure DNA levels, we set up a DNA quantitation assay using the fluorescent DNA stain Hoechst 33342, which was analyzed with a fluorometer. The level of DNA in the culture was measured as the cells were incubated over several days. The study also tested the effect of bacterial folates, which are a germ cell stimulatory signal, on the ability of the cells to replicate over time.

Implicit Subjectivity Assessment and Guilt-Shame Proneness in Work-Family Conflict, Family-Work Conflict and Workaholism

Dillon Patel, CURO Research Assistant
Dr. Malissa Clark, Psychology, Franklin College of Arts and Sciences

Workaholism, work-family conflict, and family-work conflict are emerging topics of profound interest and endless possibilities. Current studies on these topics have been largely limited to studying a small number of antecedents and the reliance on assessing self-reported perceptions of work-family conflict and family-work conflict. Though these forms of study have been able to yield interesting and powerful results, there is an implicit subjectivity in assessing one's own perception of workaholism, work-family conflict or family-work conflict. As such, this study aims to evaluate the validity of a behavioral checklist assessment, which would mitigate subjectivity, in relation to the pre-existing subjective work-family conflict, and family-work conflict measures. In addition, this study aims to investigate guilt/shame proneness, an antecedent that has yet to be investigated in consideration with workaholism, work-family conflict, or family-work conflict. Data collection has been completed through a Qualtrics questionnaire with a sample size of 300 working class adults. We anticipate that the behavioral work-family and family-work checklists will be positively related to self-perceptions of work-family and family-work conflicts. Additionally, we anticipate that guilt/shame proneness will be positively correlated with workaholism, in that individuals that feel a higher degree of guilt or shame are more likely to feel guilty for not devoting themselves to work enough.

Task Allocation between Established and Impromptu Dyads: A Test of the Transactive Goal Dynamics Theory

Divya Patel
Lindsay Burr, Grant Butschek
Dr. Michelle R vanDellen, Psychology, Franklin College of Arts and Sciences

The transactive goal dynamics theory suggests that the compatibility of a couple is characterized by their ability to allocate tasks when pursuing their goals, rather than by having similar traits or values. More compatible couples should have higher efficiency in task allocation, resulting in better goal outcomes and higher relationship satisfaction. In our research, we examine how relationship partners and random pairs of individuals allocate tasks when pursuing a shared goal. In the experiment, researchers invite two couples to each session and inform them that they are to complete a series of tasks as well as a questionnaire about the nature of the couple's relationship. This experiment is a 2x2 design in which researchers randomly assign participants, firstly, to be either on a team with their relationship partner or with an impromptu partner from the other couple, and secondly, to choose their own tasks to complete or receive designated task assignments from the researchers. In the free choice condition, participants allocate sixteen tasks, including darts, dancing, anagrams, and mental math between themselves and their partner in an attempt to maximize their total score. Tasks in assigned conditions are yoked on basis of previous participant choices. Data collection is ongoing and predicted results will be presented. We hypothesize that established relationship partners will be able to allocate tasks more effectively and efficiently than random pairs of individuals and this superior performance will be dampened when the tasks are assigned (i.e., not chosen by participants).

Cytotoxic Effects of Novel Compounds on Clinically Challenging Cancer Cell Lines

Hiral Patel, CURO Research Assistant

Dr. Mandi M Murph, Pharmaceutical and Biomedical Sciences, College of Pharmacy

Current therapeutic options aimed at cancer diagnoses include targeted therapy, immunotherapy, surgery, chemotherapy, and radiation to eliminate the present tumors. Each class of drugs strives to combat the cancer cell's ability to hijack their surrounding healthy systems, and therefore, a multifactorial approach to patient therapy is often ideal. However, 70% of patients do not respond to initial chemotherapy and the five-year survival rate for patients who display resistant behavior ranges from 10 to 30%. Cancer cells are able to prevent drug influx and therefore, buildup of chemoresistance often results in therapeutic failure. In this study, the cytotoxic effects of the provided compounds on are observed. We hypothesize that exposure of various melanoma and ovarian cancer cell lines to these potential cytotoxic compounds will greatly reduce cell viability, and possibly yield a novel therapeutic agent to combat malignant tumor growth. Alterations of functional groups on the original set of compounds may also enhance or decrease cytotoxic effects and is currently being explored through creating variations of successfully tested candidates. We utilized cytotoxicity assays depicted as dose response curves to represent our results and determine IC_{50} and statistical values. The three most effective compounds were D5, D9 and C2 as a majority of their IC_{50} values fell under the ideal 10 μM across the different cell lines. For future work, we plan to continue testing variations of the three successful compounds to yield the most potent candidate for in vivo testing.

Building the Genetic Tools to Make *Methanococcus Maripaludis* the Next-Generation Model Chassis for Biochemical Production

Hirel B Patel, CURO Research Assistant
Ben Park, Kyler Herrington, Ghazal Motakef
Dr. William Whitman, Microbiology, Franklin College of Arts and Sciences

Current bacterial chassis use expensive sugars as feedstocks, which limits profitability. Using the archaeal model *Methanococcus*, we are developing an archaeal chassis that feeds on inexpensive CO_2 and H_2 or formate instead of sugars, for next-generation biochemical productions. Our team is developing tools and methods for modulating protein expression in *M. maripaludis*, an archaeal model. Our focus is engineering the Ribosomal Binding Site (RBS). We use a mCherry reporter developed by our team previously to measure protein expression levels in a library of RBS mutants. We are now working to (1) determine the effects of mutations in the spacer region and the role of mRNA secondary structure, (2) expand our Archaeal Interlab study to encourage more iGEM teams to collaborate with us and standardize our fluorescence measurement protocol, and (3) continue metabolic modeling to evaluate the effect of alternate carbon sources on cell growth and geraniol production in *M. maripaludis*.

A Method for Enrichment of Maize Stem Cells and Leaf Primordia

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 will use cell-type specific fluorescent lines, coupled with fluorescence-activated cell sorting, to acquire homogenous samples of stem cells and cells of young leaf primordia. We plan to use the Assay for Transposase-Accessible Chromatin (ATAC) to map accessible chromatin and transcription factor binding sites genome-wide. The ATAC-seq uses a hyperactive Tn5 transposase to insert Illumina sequencing adapters into sterically accessible

DNA, which will provide a genome-wide map of open chromatin. We have confirmed the presence of SAM- and leaf primordia-specific fluorescence in transgenic maize lines and we are optimizing a method for dissecting SAMs and processing for fluorescence-activated cell sorting.

Substrate Specificity of the Lactoperoxidase/Thiocyanate/Hydrogen Peroxide Cell-Free System to Inactivate Influenza Virus

Urmi Patel, CURO Research Assistant
Dr. Balazs Rada, Infectious Diseases, College of Veterinary Medicine

Influenza virus (IV) is a deadly pathogen that has the ability to affect large populations by infecting the airways. NADPH oxidase family's Dual Oxidase 1 has shown to play a role in antiviral defense through the production of hydrogen peroxide (H_2O_2) in tracheal airways. Lactoperoxidase (LPO), an enzyme present in tracheal airways, uses H_2O_2 to oxidize thiocyanate ions (SCN^-) into antimicrobial hypothiocyanite ($OSCN^-$). A similar reaction is seen in the formation of hypoiodous acid (HOI). Our previous work has shown that $OSCN^-$ inactivates Influenza A virus (IAV) H1N2 strain in a cell-free system where H_2O_2 is not generated by Duox1 but by the glucose/glucose oxidase system. To further confirm the hypothesis, rat tracheal cells were infected with different strains of IAV and Influenza B virus (IBV) in combination with SCN^-, I^- and LPO. Once the supernatants were collected, they were used to perform plaque assays. These antimicrobials resulted in viral inactivation of both IAV and IBV. The data obtained indicated several log reductions of infective virus via inactivation in the 3 component systems (LPO, I^- and SCN^-). Per the comparisons between I^- and SCN^-, in the cell-free system, IAV strains, such as H1N1 and H1N2 displayed higher susceptibility to HOI than $OSCN^-$ substrate. However, IBV displayed a greater inactivation by the $OSCN^-$ substrate compared to the HOI substrate system. These differences seen could lead to future studies that would develop our knowledge of the Duox1 system and enhance applied research in the direction of possible treatments of IAV and IBV.

Photodissociation of Carbon Monosulfide in Interstellar Environments

Ryan Pattillo, CURO Research Assistant
Dr. Phillip C Stancil, Physics and Astronomy, Franklin College of Arts and Sciences

Photodissociation occurs when a molecule absorbs a photon of light and breaks apart into separate atoms or molecules. The molecule is initially rotating and vibrating at a certain energy level, and it transitions to an excited, unbound state upon absorbing the photon. This process is a major source of molecular destruction in a variety of interstellar environments with a strong radiation field such as circumstellar disks, protoplanetary disks, and diffuse and translucent clouds. To reliably estimate the abundances of molecules in these regions, it is important to have accurate photodissociation rates. Typically, photodissociation rates for a molecule are computed for transitions from only its ground rotational-vibrational level. For the carbon monosulfide (CS) molecule, we instead compute photodissociation cross sections for transitions from several thousand rotational-vibrational levels to six excited molecular states. This yields comprehensive cross sections which can be applied to calculate accurate photodissociation rates in a wide range of interstellar environments. We achieve this computationally using a two-state quantum perturbation approach. A detailed look into the modeling of this process, as well as some example applications of the cross sections, is presented.

Cambodian Mental Health Therapists' Experience in Clinical Supervision: A Phenomenological Exploration

Amanda Peclat-Begin, CURO Research Assistant
Dr. Desiree M Seponski, Child and Family Development, College of Family and Consumer Sciences

Decades after the Khmer Rouge genocide in Cambodia, the country is still continuing to develop and rebuild, including mental health treatment services. While there is extensive research on mental health attitudes, practices, and treatments with Cambodian refugees around the world, there has been a lack of focus on the effectiveness of therapies in native Cambodia or

Cambodian therapist's personal experiences in providing mental health treatment. Psychotherapy is a field that is highly stigmatized, unregulated, underfunded, and still developing in Cambodia. In 2011, the first cohort of therapists graduated from the Royal University of Phnom Penh's Master's program in clinical and counseling psychology, which is currently the only program of its kind in the country. Given the influx of newly trained therapists and implementation of mental health treatments, it is important to understand their experiences of psychotherapy and how treatments can be made more culturally responsive. This study explores the psychotherapy practice experiences of Cambodian therapists, and their utilization of clinical supervision. Thirteen practicing therapists were interviewed in the winter of 2015-2016 and asked about their experiences practicing therapy and receiving supervision, usually from a supervisor not native to Cambodia. Preliminary analysis of the data show that while supervision is usually regarded as a positive experience for therapists, there are some difficulties that commonly arise. Issues understanding one another (as sessions are conducted in English) and a lack of cultural understanding of Cambodian culture could lead to discouragement among the therapists. As the first ever certification course for clinical supervision in Cambodia is currently in progress of development, data driven suggestions for a culturally responsive approach to supervision for non-Cambodian supervisors are explored.

Variation in Egg Development in Deceased *Extatosoma tiratum* Females

Linden Pederson, CURO Research Assistant
Dr. Marianne Shockley, Entomology, College of Agricultural and Environmental Sciences

Through the dissection of a deceased female *Extatosoma tiratum* (a large species of phasmid endemic to Australia) it became apparent that the specimen has a multitude of eggs in her ovarioles and ovipositor that had yet to be laid, and presumably would have been laid had the female not died. In this study ten deceased female *Extatosoma tiratum* will be dissected in order to examine their ovarioles and the eggs arranged in their ovipositor. Previous research shows that there is considerable variation in the developmental rates of embryos in eggs that have already been laid. Despite this, I anticipate a distinct level of internal development of the eggs in the females' ovipositors — that there is a certain developmental point eggs must reach before being laid. The internal structure of the eggs in the ovipositor will also be compared to the eggs which are of similar exterior development located in the females' ovarioles. This comparison will be used to discern if there is a difference between the development of eggs that would have been laid imminently and those that would have been laid at a later date had the female not died. Better understanding the nature of reproduction of this species will hopefully maximize their fecundity as well as promote the health of colonies reared in labs and zoos.

Do Changes in the Quality and Quantity of Leaf Litter Inputs Affect Growth Rates and Emergence of Stream Macroinvertebrate Consumers Following Reach-Scale Removal of Rhododendron?

Reed Peloquin, CURO Research Assistant
Dr. Catherine Pringle, Ecology, Odum School of Ecology

Rhododendron is a locally invasive shrub that grows along small southern Appalachian streams that inhibits the growth of other riparian vegetation. The USDA Forest Service is experimenting with removing this shrub along several streams in the Wine Springs watershed in the Nantahala National Forest of North Carolina in order to promote the growth of hardwoods. This study focused on two second-order steams, Kit Springs and Holloway. Kit Springs was treated as a reference stream, while Rhododendron at Holloway was cut and piled away from the bank and herbicide was used to inhibit growth of Rhododendron stumps. Rhododendron leaves are of lower quality than hardwood litter, and removal of this riparian shrub could affect the quality of leaf litter resources in streams, affecting stream macroinvertebrates that feed on leaf litter. When stream insects metamorphose into their adult winged forms to reproduce, they also provide an important food source for terrestrial predators. Removing Rhododendron from the riparian zone could have several effects on stream insects that consume leaf litter. Low-quality Rhododendron leaves have been shown to reduce the growth

rates of insect consumers, while high-quality litter (contributed by hardwood trees recruited after Rhododendron removal) may increase growth rate of insects that consume leaf litter. Excessively high growth rates have been shown to cause insects to develop faster and emerge at smaller sizes. This could cause a desynchronized emergence, with a portion of the population emerging before the rest of the population does in a usual mass emergence. Other studies of desynchronized emergence have observed that early emergence is dominated by males, potentially interfering with later-emerging females finding mates and affecting reproductive success. The potential for these effects will be explored by examining the size distribution of populations of two different insect taxa: *Tallaperla maria* and *Pycnopsyche sp*. in stream reaches where Rhododendron has been experimentally removed. We hypothesize that desynchronized emergence will occur in the Rhododendron removal reach, with individuals emerging early in the emergence window at a smaller size than individuals from the reference stream.

Using Syndemics Theory to Examine the Correlation between Wealth, Disease Knowledge, and Zoonotic Diseases in Panama

Kara Pemberton, CURO Research Assistant
Dr. Susan Tanner, Anthropology, Franklin College of Arts and Sciences

Syndemics are defined as "two or more afflictions acting synergistically, contributing to excess burden of disease in a population" (Merrill Singer. 2009. *Intro to Syndemics*.) Historically the term has been used to describe interactions of diseases and social conditions such as Substance Abuse, Violence, and AIDS (SAVA), but syndemics may also be a useful framework to examine synergistic interactions between wealth, humans, and zoonotic diseases. This paper draws on previously collected data from a collaborative project in Panama that investigated two zoonotic diseases (Chagas disease and American leishmaniasis) in six rural communities. Data analysis will examine correlations between a person's knowledge of zoonotic diseases, socioeconomic condition, and access to health care infrastructure. This will involve several measures of household economic status, results from a knowledge test of zoonotic disease, and the presence of a community health post. Preliminary analysis suggests an association between household wealth and disease knowledge. Health is a holistic thing that extends beyond the body, to the physical, social and economic environment in which we live. Syndemics are a starting point for understanding how that environment affects the body. Negative social conditions can weaken our bodies and exacerbate disease, and treatment should involve preventative care of conditions making our bodies vulnerable. Further research into how a government can manage syndemics, through funding policies, health care resources, or other methods, will help inform global health policy.

Parental Support for Autonomy as a Predictor of Anxious and Depressed Behaviors in Elementary School Children

Julia Marie Petros
Chantal Van Landeghem
Dr. Anne Shaffer, Psychology, Franklin College of Arts and Sciences

Previous research has consistently demonstrated the positive influence of parental support for autonomy on children's psychosocial development. Findings are mixed regarding the relationship between support for autonomy and child internalizing problems, however. For the current study, we hypothesized that parental support for autonomy would be negatively correlated with child internalizing problems, and this relation would be mediated by the child's emotion regulation. The study used a diverse community-based sample of 64 children, ages 8-11, and their mothers. Measures of autonomy support were obtained through observations during a series of interaction tasks, child anxious/depressed behaviors and emotion regulation were assessed via parent report (CBCL, ERC). Multiple regression analyses were used to test the mediation model. Partially consistent with the hypotheses, maternal support for autonomy did not directly predict internalizing problems (B=.39, SE=.35, CI =-.30 to 1.09), but it did have a significant indirect effect, with child emotion regulation acting as a significant mediator (B=-.20, SE=.13, 95% CI =-.56 to -.01). The mediation model was not significant when child gender and maternal education were included as covariates,

however. Because maternal support for autonomy does not appear to be a direct predictor of young children's internalizing problems but still plays a role in child outcomes, future studies should analyze related maternal behaviors that may interact with support for autonomy to impact child development. It may also be that support for autonomy is more relevant at older ages, such as adolescence, suggesting a need for longitudinal research.

Mechanisms of Drug Resistance Based on Computational Studies of Taxol

Amanda Pham, CURO Research Assistant
Darby Lyle Woodling, Marisa Stewart
Dr. Paul Xie, Electrical and Computer Engineering, College of Engineering

Microtubules are known to have a dynamic intracellular structure that is involved in a variety of cellular mechanisms including intracellular transportation, structure stability and cell division. From previous research on this important molecule, microtubules have been found to be primarily correlated with developments of cancer and chemotherapy resistance. Further studies have found a breakthrough anticancer drug, Paclitaxel, which targets to the "Taxane site," on the β-tubulin heterodimer structure that aids in creating the overall microtubule structure. As a result, this has provided multiple advancements for treatment of several tumor cancers. However, drug resistance is a major challenge associated with Paclitaxel and for the overall response and survival of cancer patients. Microtubules play a major role as drug targets in cancer treatment due to their key role in cell division. Understanding the binding of Paclitaxel and the interactions between Paclitaxel and its binding residues is important for revealing the mechanisms of drug resistances and identifying new drugs. However, the determined structures have bad resolution which caused arguments to the overall "binding pattern." In this research through computer drug discovery, we have applied ligand docking on tubulin proteins through a specialized program, Schrodinger, and will compare the docking structures from our projected list of tubulin proteins. Our predicted results will provide new evidences for the disagreement of binding conformations and the mechanisms of observed drug resistances.

A Look into the Contents of Faculty Learning Community Meetings of STEM Professors

Jamie Pham
Dr. Paula Lemons, Biochemistry and Molecular Biology, Franklin College of Arts and Sciences

US policy makers and education researchers are calling for college biology professors to adopt new teaching strategies that include the use of assessment data in teaching decisions. To do so, a number of biology professors have joined a project called Automated Analysis of Constructed Responses (AACR). In this project, the professors incorporate pre-made AACR questions into their classroom. AACR questions are constructed-response questions focused on key concepts in biology that can be analyzed by a computer. After sending off their students' results, faculty receive an AACR report that shows them the student misconceptions. Seeing these data allows faculty to modify their teaching in order to address the misconceptions. In order to learn to use AACR, these faculties participate in faculty learning communities (FLCs), where they have the opportunity to discuss various topics related to the project with their colleagues. This paper reports on the investigation of AACR FLCs at six institutions and focuses on the research question, "How is time utilized during AACR FLC meetings?" FLC meetings are studied from transcripts of audio recordings. The transcripts are analyzed using qualitative content analysis to identify meeting topics and emphases. These analyses reveal that each AACR FLC spends their meeting times differently to accommodate the group's needs. This new knowledge is important because it allows greater insights into faculty teaching obstacles, their thoughts on teaching and learning, and their motivations for changing their teaching style. This knowledge will assist in the development of future professional development opportunities.

Animism and Foraging Economies

Matt Pieper
Dr. Bram Tucker, Anthropology, Franklin College of Arts and Sciences

This research will test recent anthropological claims that "animism" or "perspective cosmology"

(in which humans, animals, and plants have similar souls) is either an adaptation to a foraging economy or a cultural tradition shared amongst Native American societies. The hypothesis will be tested through cross-cultural analysis of indigenous North American cultures and foragers from Africa. The research will use existing published data as well as data collected from individual research participants. Participatory data collection was deemed necessary as preexisting ethnographic information proved to be insufficient. Africa was chosen as a cross-cultural reference point due to a comparable presence of foraging economies; an imperative parallel in identifying potential cross-cultural patterns. These patterns, if observed, have the ability to further contribute to substantive discussion regarding the topic of psychic unity v. cultural relativism in regards to human behavior. I anticipate that the data will reflect a trend in which animism is shown to be associated with foraging economies and not a cultural adaption unique to the indigenous peoples of North America.

Effect of Sample Collection at Various Collection Sites on the Detection of *Mycoplasma synoviae* by Real-Time PCR

Stephanie Alexandra Pierre
Dr. Naola M Ferguson-Noel, Population Health, College of Veterinary Medicine

Mycoplasma synoviae (*MS*) is a prevalent and economically significant poultry pathogen, causing respiratory tract infections and infectious synovitis. Tracheal swabs are considered the standard collection site for sampling to detect *MS* by culture or PCR but various sites in the upper respiratory tract have been used to detect avian *Mycoplasma spp.* and other respiratory pathogens in commercial poultry. It is important to identify which of the collection sites produces optimal PCR results when performing diagnostic tests, to ensure that *MS* is rapidly and correctly identified for the protection of poultry breeding flocks. The objective of this study was to compare the detection of *MS* by quantitative real-time PCR (qPCR) from three collection sites (trachea, choanal cleft and ororphaynx). Two groups of broiler-type chickens were inoculated with different strains of *MS* (a virulent strain and a potential vaccine strain) and sampled. The qPCR results (mean Ct values and MCNlog10) showed that all three of the sampling sites were appropriate for PCR, as there were no significant differences ($P< 0.05$) with respect to percent positives or MCNlog10 among the sites. Overall the tracheal swabs had the stronger PCR results leading to the conclusion that it should remain the standard for research purposes.

Promotion, Patronage and Merit in the Royal Navy during the Napoleonic Wars

Stephen Robert Pokowitz, CURO Research Assistant
Dr. Jennifer Palmer, History, Franklin College of Arts and Sciences

Naval promotion during the Napoleonic Wars in the Royal Navy started shift away from the Captain's List towards more merit based promotions that allowed the Royal Navy to maintain naval superiority against other European powers. An analysis of how prevalent merit based promotions were, along with an analysis on the success of these early promotions, will be based on a collection of primary and secondary sources. The primary sources will consist of letters and dispatches from leading figures within the Admiralty and publications such as the *Naval Chronicle* and the *London Gazette*, which had a large impact on public opinion and advancement. The secondary sources will be drawn from academic books and will allow for a more broad analysis on specific cases and the overall impact of merit promotion. The research has shown that merit promotions were a mixed bag, with the Captain's list becoming more irrelevant in favor of merit promotion, but also that merit promotion wasn't always used on deserving Commanders. This shift might also be seen as a response to the individualism of the French Revolution. The shift more toward merit promotion was the start of more professional modern militaries that placed less emphasis on social status and more on ability.

Investigating the Use of mRNA Transfection to Treat Hypophosphatasia

Trey Powell, CURO Honors Scholar, CURO Research Assistant, CURO Summer Fellow
Dr. Luke Mortensen, Animal and Dairy Science, College of Agricultural and Environmental Sciences

Hypophosphatasia (HPP) is a rare genetic disease that impairs the process of bone mineralization due to low activity of tissue-nonspecific alkaline phosphatase (TNAP). Severe hypophosphatasia also manifests with complications including hypercalcemia, vitamin B6-dependent seizures, and craniosynostosis. Many patients suffering from these symptoms die from respiratory failure. Other forms of HPP include perinatal, childhood, adult, and odonto-HPP with symptoms ranging from stillbirth to loss of teeth. Current treatment for HPP, enzyme replacement therapy, hinders the livelihood of HPP patients, as it requires daily intravenous treatment, and does not impact craniofacial or tooth defects. Mesenchymal stem cells derived from bone tissue have shown promise to treat HPP with a low allogenic transplantation rejection rate, and yield increased bone mineralization and muscle mass in patients. To enhance mesenchymal stem cell (MSC) therapy as a treatment for HPP, I studied the application of mRNA transfection in MSCs using the CRE lox system. The transfection of mRNA may be used to alter protein expression in therapeutic MSCs to increase cell production of alkaline phosphatase or enhance transplanted cell engraftment. Here, mRNA transfection was used to express fluorescent proteins. Three experiments analyzed the transfection optimization and indicated that 1:3 and 1:5 mRNA to transfection reagent ratios produced the greatest overall cell fluorescence. Our results indicate the power of mRNA transfection to alter MSC behavior, which will be useful for in vitro and in vivo studies.

An Investigation into the Dynamics of Faculty Learning Communities

Briel Power, CURO Research Assistant
Dr. Paula Lemons, Biochemistry and Molecular Biology, Franklin College of Arts and Sciences

A growing emphasis on reform in US higher education has led many college faculty members to consider changing their teaching strategies. In particular, many are now implementing active learning, which consists of teaching methods that encourage students to cognitively engage with the material during class. Research focuses on the dynamics of Faculty Learning Communities (FLCs) and their use as professional support for the implementation of active learning strategies in undergraduate science courses. The FLCs under investigation arose through a multi-institutional project known as Automated Analysis of Constructed Response (AACR). AACR provides data to faculty about their students' thinking. AACR FLCs support faculty in understanding the data-heavy AACR reports and how to modify teaching accordingly. Transcripts of FLC meetings from multiple institutions are analyzed by qualitative content analysis, which involves exploring the transcripts for thematic patterns. These data reveal the interests and perceptions of AACR FLC participants. This knowledge will lead to improved professional support for faculty groups and should and may improve the implementation of active learning strategies in the undergraduate classroom.

The Persistence of Small Pollen Grains in Populations of *Ipomoea purpurea*

Darien Power, CURO Research Assistant
Dr. Shu-Mei Chang, Plant Biology, Franklin College of Arts and Sciences

This research project uses the common morning glory flower, *Ipomoea purpurea*, to examine how different pollen grain sizes contribute to male reproductive success. This is important since most studies examine female fitness only. The Chang laboratory found previously that when large and small pollen grains are in direct competition in greenhouse experiments, large pollen grains fertilize more ovules than small ones. The current project investigates whether or not this remains true when the flowers are exposed to natural pollinators. The plants used in this study were from artificially selected lines that diverge in pollen size and were naturally pollinated by bees. These samples were allowed to flower naturally so that the flower number represented the normal display size. The seeds produced from this pollination array study were collected and planted in the greenhouse. Once these seeds grew, I collected leaf tissue samples from 84 individuals and extracted their DNA using a modified CTAB protocol. Polymerase Chain Reactions for seven different microsatellite loci were run on each individual. I conducted paternity analyses on the computer to determine whether the paternal parent was a large- or small-pollen parent. Contrary to the greenhouse results, I found that small pollen grains were more reproductively successful than large ones. This result points to

the importance of understanding why we see different patterns in greenhouse experiments and field studies. It also contributes to our understanding of why both large- and small-pollen grains are produced in natural populations.

Chikungunya Virus-Like Particles Vaccine Formulations that Elicit Balanced Th1/Th2 Response in Mice

Matthew Prellberg, CURO Research Assistant
Dr. Ted M Ross, Infectious Diseases, College of Veterinary Medicine

Chikungunya virus (CHIKV) is a mosquito-borne alphavirus that is responsible for large epidemic outbreaks in South-East Asia, India, Europe, and recently the Americas. CHIKV causes severe fever, rash, and joint pain, and represents a serious public health threat in countries where *Aedes spp.* mosquitoes are present. Vaccination remains the best strategy to prevent most vector-borne diseases, as they offer means to induce rapid and long-lived immunity with negligible risk of serious adverse reactions. In order to develop such a vaccine to protect against CHIKV infection, we developed CHIKV virus-like particles (VLPs) produced in insect cells by recombinant baculoviruses. We then paired them with different adjuvants aimed at modifying VLP's T-helper (Th) cell polarization to induce a balanced Th1/Th2 response, which is believed to be productive against chronic infection. Vaccine candidates will be tested in mouse models of CHIK infection and will be evaluated for immunogenicity and protection. CHIKV antigen-specific antibody responses in immunized C57BL/6 mice were determined using ELISA. We are interested in measuring mouse total IgG, IgG2c, and IgG1 antibody responses against CHIK VLP antigens paired with differing adjuvants. Measured IgG2c and IgG1 antibody ratios will be used to evaluate Th1 vs. Th2 response for vaccine candidates respectively. The final vaccination-challenge in mice against wild type CHIK infection will be done to examine vaccine efficacy. Vaccines displaying balanced IgG2c and IgG1 antibody ratios are hypothesized to stimulate superior protection.

Metabolic Responses to Diets of Varying Fatty Acid Saturation

Leah Nicole Prine , CURO Research Assistant
Dr. Jamie A Cooper, Foods and Nutrition, College of Family and Consumer Sciences

Studies show that composition of dietary fats has differential influences on fat oxidation, playing a role in obesity. Determine the effects of a high-fat (HF) diet rich in either poly-unsaturated fatty acids (PUFAs) or mono-unsaturated fatty acids (MUFAs) on fat oxidation. Fifteen normal weight men (18-45 years) completed a randomized, cross-over design of 2 feeding trials. Each trial included a 3 day lead-in diet, pre- and post-diet study visits, and a 5 day HF diet. 5 day diets were rich in either cottonseed oil (PUFA) or olive oil (MUFA). During the 2 study visits (before and after the 5 day diet), indirect calorimetry was used to measure fasting respiratory exchange ratio (RER) and substrate oxidation. There was a two week washout period between trials. Area under the curve (AUC) was calculated and used to assess differences within groups. RER AUC decreased significantly from pre to post in the PUFA-rich diet (pre=0.85 ±0.06units/h, post= 0.83 ±0.03units/h), but not in the MUFA-rich diet (pre= 0.84 ±0.06units/h, post=0.83 ±0.05 units/h). Fat oxidation AUC increased significantly from pre to post in the PUFA-rich diet (pre= 8.9±0.7 g/8h, post= 10.5 ±0.4 g/8h), but not in the MUFA-rich diet (pre= 10.0 ±0.7 g/8h, post=10.5 ±0.7 g/8h). Significance was expected at $P< 0.05$. Chronic ingestion of a PUFA-rich HF diet may decrease RER (indicating higher fat oxidation) in normal weight men whereas a MUFA-rich diet does not have the same effect.

In Vitro Activity of Gallium Maltolate against Drug-Resistant *Rhodococcus equi*

Maggie Pritchett
Dr. Steeve Giguere, Large Animal Medicine and Surgery, College of Veterinary Medicine

Rhodococcus equi is a Gram-positive bacterial pathogen causing severe pneumonia in foals. Recently, emergence widespread resistance to macrolides and rifampin, the two types of antibiotics currently used to treat infection caused by *R. equi*, has become a major problem facing the horse industry. The only viable long-term approach to prevent emergence of resistant *R. equi*

will be to decrease widespread use of commonly used antibiotics in foals. Gallium maltolate (GaM) is a semi-metal that is active against many types of Gram-positive bacteria. If GaM proves to be active against *R. equi*, its use in infected foals might be a way of decreasing selection pressure for antibiotic resistance. The objectives of this study were to compare the in vitro activity of GaM to that of other antimicrobial agents against R. equi and to determine if exposure of *R. equi* to GaM in vitro will select for resistance. The minimum inhibitory concentration (MIC) and the mutant prevention concentration (MPC) of GaM, macrolides, and rifampin were determined for both antibiotic susceptible (n= 30) ant antibiotic resistant (n=30) isolates of *R. equi*. Gallium was active in vitro against all isolates of *R. equi* with a median MIC of 8 μg/mL (range 4 to 32 μg/mL). However, the MPC was ≥ 512 μg/mL, indicating that resistance to GaM occurs readily in vitro. Additional in vivo studies will be required before GaM can be used for the treatment of pneumonia caused by *R. equi* in foals.

No Longer Used: Designing Non-Exploitative Communication for Organizations Seeking to End Human Trafficking

Emma Katherine Protis, CURO Research Assistant
Dr. Maria Len-Rios, Journalism, Grady College of Journalism and Mass Communication

A common approach nonprofits use in developing external communication to publics is to stress emotional detail and capture the intense circumstances of the people they serve. At times, this results in over-portraying elements of pity and helplessness regarding these circumstances. This can be an effort to generate funds or support from the general public. Even so, when this is the predominant tone for all storytelling, it can exploit the survivors, even if unintentional. This research seeks to answer how to effectively conduct external communications for nonprofits seeking to end human trafficking without exploiting the survivors. This study takes a novel approach using theory to design ethically responsible communication. It focuses primarily on representing the trafficked person with dignity in communication materials calling for support to end human trafficking. In-depth interviews with professionals at organizations who advocate for an end to human trafficking will be synthesized into a qualitative study from which I will create a guide of best communicative practices to achieve non-exploitative storytelling. The guide will provide recommendations for nonprofits practicing advocacy work, ultimately strengthening efforts to bring justice to the estimated 20-30 million humans held captive in slavery today.

Persistence of Extractive Foraging in Humans and Wild Tufted Capuchins (*Sapajus libidinosus*) Abstract

Mackenzie Rose Pryor, CURO Research Assistant
Nam Money, Jessica C Respress
Dr. Dorothy Fragaszy, Psychology, Franklin College of Arts and Sciences

Wild tufted capuchin monkeys (*Sapajus libidinosus*) are the only New World primates that use stone tools for extractive foraging. Stone tool use is an extremely energy intensive practice for these monkeys, and their behavior has been described as persistent in nature. This study examined persistence of humans during an extractive foraging task and compared it to footage of wild capuchin monkeys practicing extractive foraging by cracking nuts with stone tools. Thirty human participants were provided a choice of ten tools to open a pomegranate, extract each seed, and deposit them individually into a receptacle. Foraging behavior frequency, variability, and task length for both humans and capuchins were coded and collated. Preliminary analysis suggests that capuchins will be more persistent than humans and it appears that capuchins tend to spend more time foraging, and use less diverse foraging techniques than humans. This implies that monkeys can maintain focused attention on an extraction problem for as long as humans. We discuss the hypothesis that working with a tool can promote the development of sustained attention.

Effects of Form and Level of Vitamin E Supplementation on Kinematic and Physiological Measures of Muscle Damage Following Intense Exercise in Horses

Lauren A Purvis
Dr. Kylee Duberstein, Animal and Dairy Science,

College of Agricultural and Environmental Sciences

Vitamin E is an essential dietary antioxidant thought to have a role in preventing delayed onset muscle soreness in exercising subjects. Previous research has shown that horses supplemented with natural α-tocopherol are able to achieve higher blood α-tocopherol levels as compared to those supplemented with the more commonly used synthetic acetate form. The purpose of this study is to determine if this confers any physiological advantage to the exercising horse. Eighteen horses will be placed on one of three diets for a seven week feeding trial: control diet fed 1000 IU α-tocopherol acetate; control diet plus 3000 IU supplemental α-tocopherol acetate; or control diet plus 3000 IU natural α-tocopherol. Horses underwent a 6 week exercise program of increasing intensity following one full week of supplementation. A standard exercise test (SET) was performed immediately before and immediately after the 6 week program. Blood was drawn pre- and 2 hours post-SET and analyzed for creatine kinase and aspartate aminotranserase (measures of muscle damage). Additionally, horses were filmed trotting (4 mps) in hand using high speed cameras. Filming was conducted immediately prior to each SET, and 24 hours post-SET to assess kinematic changes to the gait that may be induced by muscle soreness. Physiological measures of muscle damage were correlated to stride parameters such as swing and stance times as well as suspension of the gait. Findings from this study should show whether higher blood levels of α-tocopherol confer a physiological advantage to the performance horse.

Early Rehabilitation to Augment Skeletal Muscle Function Following Volumetric Muscle Loss Injury

Anita Qualls, CURO Research Assistant
Dr. Jarrod A Call, Kinesiology, College of Education

Significant loss of skeletal muscle tissue from severe trauma or surgical removal is known as a volumetric muscle loss (VML) injury. Muscle repair following VML injury is attenuated due to prolonged inflammation, increased fibrosis, and poor muscle regeneration, which results in extensive skeletal muscle function impairments and mitochondrial dysfunction. The purpose of this study was to implement early rehabilitation strategies that augment muscle function and mitochondrial capacity via range of motion, intermittent electrical stimulation, and supplementation with guanidionpropionic acid (GPA) (a drug to enhance mitochondria). Surgical VML injury was performed on the hind limb of male C57/B6 mice. Mice were randomized into three rehabilitation intervention groups: passive ankle range of motion (ROM), range of motion with intermittent electrical stimulation (ROM-E), and ROM-E with addition of 1% GPA mixed in standard chow (ROM-E-GPA). All groups performed two 30-minute rehabilitation therapy sessions per week beginning 72 hours post VML injury. Passive isometric torque, a measure of muscle stiffness, was recorded from each therapy session. Prior to sacrifice, peak isometric torque was assessed via an in vivo contractile test. Mitochondrial content and function were analyzed via citrate synthase activity and state three mitochondrial respiration rates from permeabilized muscle fibers, respectively. Following two months of rehabilitation, peak isometric torque was significantly greater in both ROM-E and ROM-E-GPA groups compared to ROM ($p=.0212$). Passive isometric torque decreased during individual therapy session in all groups (~15-40%). Preliminary muscle torque data indicates that early rehabilitation intervention techniques improve functional recovery and regeneration following VML injury.

Time is Brain: Expanding Access to Stroke Care in Rural Georgia Communities

Anita Qualls, CURO Research Assistant
Dr. Pamela Whitten, Communication Studies, Franklin College of Arts and Sciences

There is a lack of access to acute stroke care in rural Georgia, particularly with respect to the absence of neurological expertise and appropriate infrastructure, such as "stroke-ready facilities" to accurately identify and treat stroke victims. This issue stems from the extremely common and serious nature of stroke, the time-sensitive delivery for the treatment, and an underlying poor health condition correlated with a significantly higher incidence of stroke mortality in Georgia. Regional disparities in quality of healthcare services and

funding have been sustained through history and continue to create detrimental symptoms, including increased chance of death from stroke in rural areas and excessive spending to cover the expenses of stroke and disability throughout the nation. An analysis of root causes and symptoms was conducted to gain a better understanding of why these issues persist after multiple policies have been instituted to ameliorate these issues. To address these causes, three policy alternatives were developed: continued stroke education for physicians, community based stroke prevention coalitions, and state-wide implementation of telemedicine services. After analyzing the effectiveness, cost-benefit, and feasibility of each alternative against the status quo, it was determined that the best option for short-term implementation is continued stroke education for rural emergency physicians and the best long-term goal is state-wide implementation of telemedicine services.

Applications to Prolonging Data Collection Efficiency in Stream Channels

Matthew Quinn, CURO Research Assistant
Dr. John Dowd, Geology, Franklin College of Arts and Sciences

Within small first- and second-order streams, such as tributaries of the North Oconee River watershed, the response time to precipitation is fast. This response makes repetitive measurement of discharge and water chemistry necessary. Continual data collection in streams can be more efficiently measured with an automated system. The discharge of a stream is easily determined by a pressure transducer, but water chemistry proves to be more problematic. Probe calibration is prone to drift if continually left in the water. Three electrical conductivity systems are compared in this study. One system is a probe that remains in the stream taking measurements every five minutes. The second system is driven by peristaltic pumps that draw from the stream in order to fill a reservoir for measurement. The system measures conductivity every hour. The last system is a track that lowers a probe into the water on the hour and then raises it. The anticipated result is that the peristaltic pump apparatus will be the most efficient system due to more isolated measurement and greater protection from the stream. However, early failures have occurred when the air temperature drops below freezing or the intake is buried under shifting sands of the channel. The submerged probe has also failed from burial. When operating properly both systems have shown similar results, however the probe that stays submerged displays more drift in calibration over time. This research exhibits how reliable chemical data can be collected in remote areas where field visits are infrequent.

Investigations on the Distinct Isoforms of Duffy Antigen Receptor for Chemokines

Zehra Rahman
Dr. Melissa B Davis, Genetics, Franklin College of Arts and Sciences

The Duffy Antigen Receptor for Chemokines, also known as DARC, is a promiscuous chemokine receptor encoded by the DARC gene. This receptor protein is found, along with other cell types, on the surface of erythrocytes and helps to maintain chemokine homeostasis. DARC accomplishes this by sequestering chemokine activity, which indirectly helps to control the movement of immune cells to or away from the site of inflammation via a chemokine gradient. DARC has seven transmembrane domains with the extracellular binding region localized at the amino terminus. It is considered a promiscuous receptor because it can bind two structurally distinct classes of chemokines. The DARC gene also has two isoforms, A and B. These two isoforms are a result of two distinct promoters producing alternative transcripts. They are co-expressed in many tissues, but the functional differences between them have not been well-characterized. Using breast cancer cells that have been transiently overexpressed with both isoforms separately, our research seeks to investigate the functional roles of these isoforms. This will allow us to determine any distinct chemokine binding profiles between the two isoforms. We will accomplish this by using downstream applications such as co-immunoprecipitation and western blotting to validate overexpression and determine any protein-protein binding interactions. We will also perform ELISA assays to quantitate differences in chemokine concentrations in the media of the transfected cells. Our investigations will aid in the determination of any distinct chemokine binding between the isoforms, in

addition to better characterizing their role in a breast cancer context.

Branched-Chain Amino Acid (BCAA) Transporters: Mechanism, Physiological Function and Roles in Cancer

Simran Rajput, CURO Research Assistant
Dr. Takahiro Ito, Biochemistry and Molecular Biology, Franklin College of Arts and Sciences

Branched-Chain Amino Acids (BCAA) are amino acids with aliphatic side chains. Valine, leucine, and isoleucine are the three proteinogenic BCAA among the nine essential amino acids in humans. Besides their importance in nutrition, recent studies have shown the utilization of BCAA in cancer. Because cancer cells proliferate more rapidly than normal cells, they rely more on nutrients such as glucose and amino acids. In order to be used in cellular processes, BCAA need to be transported into cells. Therefore, the role of BCAA transporters is essential to understanding how they contribute to cancer growth. In this study, we used previous scientific literature and human gene expression databases to focus on the three BCAA transporter protein families expressed in various types of tumors, namely SLC6, SLC7, and SLC3 families, and discuss their mechanistic functions in cancer development. The gene expression of the solute carrier family 6 member (SLC6 family) transporters is upregulated in tumors of epithelial origin, such as cervical, pancreatic, breast, and colon cancer. BCAAs are highly enriched in lung tumor cell lines as a result of overexpression of SLC6A15. The SLC7 family members are highly expressed in nine different cancer types including endocrine lung carcinomas and pancreatic cancer. Our research guided us to look deeper into a SLC3 transporter (SLC3A2), because SLC3A2 is involved in guiding and targeting SLC7A5 and SLC7A8 in the plasma membrane. The identification of specific BCAA transporters that are essential for growth or survival of cancer cells may reveal a therapeutic target.

Healthcare for All: A Roadmap for a Healthier Georgia

Vineet S Raman, Ramsey Scholar, CURO Summer Fellow, CURO Research Assistant
Dr. Barbara Schuster, Clinical and Administrative Pharmacy, College of Pharmacy

The Patient Protection and Affordable Care Act (ACA) signed into law on March 23, 2010 is the most significant attempt to overhaul the American healthcare system since the creation of Medicare and Medicaid under the Great Society of President Lyndon B. Johnson. The ACA stopped short of reforming the multiple different systems of healthcare provision in the US. Instead, it focused on outlawing less consumer-friendly insurer practices and expanding insurance coverage by widening the definition of "low-income" to include childless adults under 138 percent of the Federal Poverty Level (FPL). The passage of the ACA was quickly followed by a June 2012 case in the Supreme Court that largely upheld the ACA, but struck down the stipulation requiring states to expand Medicaid to remain eligible for federal funds. Despite this overhaul, almost one in seven Georgians is uninsured, and over 300,000 Georgians have fallen into a coverage gap created due to the failure of Georgia to expand Medicaid. Rural and urban health facilities struggle to maintain their services and remain viable, causing their surrounding communities to suffer. Thirty-two states have expanded Medicaid, with seven of these expanding their Medicaid programs through non-traditional methods using Section 1115 waivers which allow for flexibility with federal funds. This policy paper asserts that the best option for Georgia is to expand Medicaid to 138 percent FPL, as originally mandated by the Patient Protection and Affordable Care Act (ACA).

Tablet-Based Data Collection for Leprosy Field Surveys

Vineet S Raman, Ramsey Scholar, CURO Summer Fellow, CURO Research Assistant
Dr. Corrie Brown, Pathology, College of Veterinary Medicine

Though previously rare, leprosy surveys have seen a recurrence as public health organizations seek to gauge the increase in leprosy prevalence in South Asia. All of these surveys are conducted mainly using paper-based methods. With the recurrence of leprosy surveys and the popularity of tablet-based data collection, this study seeks to implement a tablet-based form created using

Open Data Kit Software functioning on an Android operating system for a leprosy survey, and gauge the initial experiences of veteran paramedical field workers. The experiences of the field personnel were recorded through an interview and subsequently analyzed. The objectives of this study and paper therefore, are to assess the experiences of paramedical field workers with a novel survey tool, describe the tool, and evaluate its efficacy.

Incorporating Individual Consumer Physiology into Our Current Understanding of *Littoraria-Spartina* Interactions within Southeastern US Salt Marshes

Hend Rasheed, CURO Research Assistant
Dr. Craig W Osenberg, Ecology, Odum School of Ecology

Salt marshes are some of the most productive ecosystems on the planet. In the Southeastern US, this high productivity results from the seasonal turnover of a highly productive grass, *Spartina alterniflora*. A ubiquitous grazer in these marshes, the snail *Littoraria irrorata*, has been shown to exert varying degrees of top-down control on *Spartina* in marshes spanning Florida to New England. Variability in *Littoraria-Spartina* interactions can be linked with population biomass of *Littoraria*, which in turn is a function of population size structure and density. To date, however, no previous studies have disentangled the direct effect of *Littoraria* body size on feeding rates. Furthermore, the potential for the effect of body size on feeding rates to vary across a gradient in temperature has yet to be explored. To investigate the effects of temperature and *Littoraria* body size on feeding rates, we will conduct laboratory based feeding assays along a temperature gradient. We will then construct thermal response curves to better visualize this relationship and to directly parse out the effect of body size. We expect that temperature will be positively related to feeding rates up to a thermal optimum, after which feeding rates will decline. Furthermore, we anticipate that smaller individuals will respond more strongly to temperature changes than larger individuals owing to their metabolic demand. Knowledge of feeding rates across a range of temperatures will yield valuable insight into grazer physiology, their interactions with plant resources, and the potential for these interactions to shift with climate change.

Biophysical Characterization of Human Transketolase (TKT) and Transketolase-Like Protein (TKTL-1) Interactions with the Thiamine Diphosphate Cofactor

Aamanya Raval, CURO Research Assistant
Dr. Scott Pegan, Pharmaceutical and Biomedical Sciences, College of Pharmacy

Transketolase is a ubiquitous thiamine pyrophosphate (TPP) and Ca^{2+} dependent enzyme in both the glycolytic and pentose phosphate pathways (PPP). TKT catalyzes the reversible transfer of a ketose phosphate to an aldose phosphate, thus providing a reversible link between the PPP and glycolysis. A variant of TKT, known as TKTL-1 (Transketolase-like protein 1), is highly expressed in malignant tumors indicating its potential role in the phosphoketolase pathway analogous to TKT. However, the exact physiological role of TKTL-1 is yet to be identified. If TKTL-1 requires TPP as a cofactor for its catalysis, then it will be involved in pathways similar to TKT. The expression and purification of TKT and TKTL-1 from *E. coli* extracts as His6-tagged proteins. This process uses protein isolation procedures, nickel affinity chromatography, and isothermal titration calorimetry (ITC). ITC displays the initial binding titrations of thiamine and interactions with its phosphate linked analogues. Exothermic values should indicate that there are two possible binding sites within the enzyme and a high KD shows a weak binding affinity of TKT for the TPP cofactor. The information provides us with greater understanding about the physiological role of TKT-L and designing inhibitors for the enzyme which can later be used for anticancer drug development.

Variant Identification Using RNA-Seq Data for Improvement of CRISPR gRNA Design in Hybrid *Populus*

Jacob Reeves, CURO Research Assistant
Dr. C. J. Tsai, Genetics, Franklin College of Arts and Sciences

CRISPR is a powerful tool for genome editing; however, designing CRISPR guide RNAs (gRNAs) is more challenging for outcrossing species such as *Populus* because of sequence heterozygosity. Though many programs have been borne in hopes of facilitating gRNA design for CRISPR experiments across a variety of genome-sequenced organisms, none of them have yet considered SNPs. Our research aims to incorporate sequence variants into existing gRNA design programs, thereby improving the gRNA specificity and CRISPR editing success rates. Our lab has previously developed a web-based tool that allows users to query the *Populus tremula* × *alba* 717-1B4 (Pta717) genome for SNPs and indels in custom gRNA sequences based on genome re-sequencing data. However, some genomic regions have less than 5 times the coverage due to shallow sequencing. To address this issue, we exploited deep genome sequencing data of Pta717 from the Department of Energy's Joint Genome Institute to obtain high-confidence SNP and/or indel calls with an average of 576 reads per nucleotide. The completion of this version is expected to improve CRISPR editing reliability for *Populus* researchers engaged in genome editing experiments.

African Agency in Policy and Project Autonomy: An Analysis of Investment Promotion Centres in Rwanda, Botswana, and Lesotho

Rara Reines, CURO Honors Scholar, CURO Research Assistant
Dr. David O Okech, Social Work, School of Social Work

African agency is a relatively new concept in the field of International Relations. This idea insists on viewing African states and actors as serious, real subjects in their own right rather than as non-participants in International Relations or as passive actors. The dominant focus of the African agency literature has been on relations between states and the collective impact of African groupings of states in international fora. Thus, the current literature on African agency is limited in two major ways: the literature is state-centric in a world where non-state groups and organizations exert increasing influence; and the literature has neglected the role of the private sector as a major driver of development processes on the continent. This research posits Branding Agency as the term for understanding agency in the context of the private sector, which can be analyzed through the activities of Investment Promotion Centres. Branding Agency concerns how domestic and international actors, be they individuals, institutions, or private sector firms, are actively pursued to invest in and contribute to a nation's prospective and ongoing development projects. The research methodology includes a literature review of African agency, comparative analysis of major development projects' leadership, funding, and ownership, and case studies of development projects exerting strong agency. This research aims to develop a framework for a holistic conceptualization of agency, including Branding Agency, and impact how the reality of development is viewed in Africa regarding the relationship between African governments and the private sector.

Lassa Virus GP1 Glycoprotein Receptor Binding Site Characterization

Hayley Reynolds, CURO Research Assistant
Dr. Melinda Brindley, Infectious Diseases, College of Veterinary Medicine

Lassa virus (LASV) is an Old World arenavirus endemic to West Africa. It is responsible for severe cases of hemorrhagic fever and is the cause of 5,000 deaths per year. No effective human vaccine currently exists and the only treatment available is ribavirin, which is costly, must be administered early after infection to be effective, and has many side effects. LASV infection is initiated by the viral glycoprotein complex (GPC), which binds to the cellular receptor, facilitating viral entry and fusion with the target cell. Our project's goal was to define the receptor binding site(s) in the LASV GPC. Structurally defining the receptor binding site will provide targets for new entry inhibitors and vaccines. Site-directed mutagenesis was implemented on charged, hydrophobic, and glycosylation site residues in order to functionally characterize domains in the GP1 subunit of LASV GPC. Constructs were first evaluated for cleavage efficiency and fusion activity, and then for transduction efficiency. In general, there was observed high correlation between cleavage efficiency and cell-to-cell fusion activity, demonstrating that properly processed GPC was able to mediate cell-to-cell fusion. Due

to the BSL4 classification of LASV, vesicular stomatitis virus (VSV) pseudotyped particles were utilized to display LASV GPC's and mimic viral entry in HAP1, HAP1-ΔDAG1, and Vero cells. By using cell types with differential production of cellular receptors, we compared transduction efficiencies and were able to identify several residues that potentially play a role in alpha dystroglycan (a-DG) and lysosomal associated membrane protein 1 (LAMP1) interactions.

Assessment of Spatial Distributions of Sea Turtle Nests In Relation to Artificial Lighting in St. Kitts, West Indies

Jessica Lauren Reynolds
Dr. John Maerz, Forestry, Warnell School of Forestry and Natural Resources

Light pollution associated with coastal development is a widely recognized threat to sea turtle populations. In addition to causing disorientation in hatchlings, artificial lighting poses a threat to sea turtles because it can deter females from nesting in suitable areas and increases nesting in less-suitable but unlit habitats. St. Kitts in the northeastern Caribbean Sea is an important nesting area for the endangered green (*Chelonia mydas*) and critically endangered hawksbill (*Eretmochelys imbricata*) sea turtles and St. Kitts has had a significant rise in tourism-related development. Our goals are to determine whether: light pollution levels on St. Kitts beaches are positively correlated with the probability of a false crawl and are negatively correlated with sea turtle nest density; there is a threshold level of artificial light pollution above which no sea turtle nesting is observed; and there are longer-term spatial trends indicating effects of coastal development on the number of sea turtle nests. In 2016, we used GIS data to quantify development along coastal beaches and we measured light pollution using a Unihedron Sky Quality Meter. We are modeling beach light levels as a function of development and correlating those measurements with nest survey data from the St. Kitts Sea Turtle Monitoring Network (SKSTMN) for hawksbill and green adult female emergence events collected from 2010 to present. Our ultimate goal is to inform management decisions, minimizing coastal light pollution and development impacts on sea turtle nesting.

Neuroanatomical Correlates of Functional Decline during Normal Aging

Joshua Reynolds, CURO Research Assistant
Dr. Steve Miller, Psychology, Franklin College of Arts and Sciences

Previous research has shown that age-related neural atrophy and cognitive decline predicts declines in functional independence (FI), or the ability to perform daily activities. The current study aimed to test whether volumetric brain differences predict FI in a sample of community-dwelling older adults, whose data was drawn from two neuroimaging studies of brain changes in aging (N=109, mean age=73.4 years, 63% female, 98% Caucasian). We additionally aimed to determine whether cognition mediates the relationship between brain volume and FI. Cognition was measured using the Repeatable Battery for Assessment of Neuropsychological Status (RBANS; Study 1, N = 48) and the CNS Vital Signs (Study 2, N = 61). FI was measured using the Direct Assessment of Functional Status (DAFS). Analyses were conducted for total gray matter volume (GM) and five regions of interest: dorsal-lateral prefrontal cortex (PFC-DL), orbitofrontal cortex (PFC-OF), primary motor cortex (MC), and dorsal (DS) and ventral (VS) visual processing streams. All brain volumes were corrected for intracranial volume (ICV). Initial regression analyses using the combined sample confirmed that GM (r^2=0.175, p=0.000), PFC-DL (r^2=0.085, p=0.002), MC (r^2=0.092, p=0.001), and VS (r^2=0.135, p=0.000) volumes predict FI. Mediation was tested separately in the two samples using bootstrapping analysis. Results showed that cognition partially mediated the relationship between GM, PFC-DL, MC, and VS and FI. These findings provide support for the hypothesized model of brain structural, cognitive, and functional decline in aging and suggest that improving cognition in older adulthood may mitigate the negative effects of brain atrophy on FI.

Rare Earth Elements Distributions in the Critical Zone: Possible Roles of Pine Versus Hardwood Vegetative Covers

David Forest Richards IV
Dr. Paul A Schroeder, Geology, Franklin College of Arts and Sciences

Rare Earth Elements (REE) are metals used in technology that enable global economic growth. Though these elements are titled as rare, they are only rare in abundance. Soil-forming processes can concentrate REE. This study hypothesizes that modern surface biogeochemical weathering in the Critical Zone redistributes the concentrations of REE. Furthermore, vegetative cover controls relative pH, redox, and hydrologic flux conditions, which can affect REE mobility. The study site is in Calhoun, South Carolina on a degraded landscape due to farming. The samples were collected from 0 to 350 cm depth at proximal sites, including a hardwood forest and a site extensively farmed until the 1950s cultivated as pine forest. All REE's were measured by Induction Coupled Plasma Mass Spectrometry (ICPMS), enriched relative to normalized chondrite values. Both sites are mostly concentrated in REE. The B-horizon is enriched in Ce relative to La for both pine and hardwood; however, Ce is enriched at depth in the hardwood. The mobility of Ce^{3+} under reduced conditions versus Ce^{4+} under oxidized conditions could occur by lessivage, soil organic matter complexation, leaching percolating water, and adsorption by iron-, aluminum-oxides and clay minerals. Ce enrichment correlates with goethite in the profile, suggesting that pine vegetative cover and active agricultural land management may differently mobilize REE. If compared to erosional histories and conditions of vegetation cover, REE may be a record of land use history. The REE patterns developed in saprolite offer great potential in understanding environments responsible for saprolite formation rates and insight to sustainability of land resources.

Digital Timeline of Mina Loy's New York Years 1937-1953

Jesse Riley, CURO Research Assistant
Dr. Susan Rosenbaum, English, Franklin College of Arts and Sciences

I am creating a digital timeline of poet and visual artist Mina Loy's life and work in New York during the years 1937-1953. This timeline is a part of a larger digital platform project *Mina Loy: Navigating the Avant-Garde*, which is in the process of being approved for an NEH Digital Humanities Advancement Grant. The timeline will be placed on the platform's website (mina-loy.com) with a goal of creating multimodal access to Mina Loy's life and work. The timeline was created digitally using a variety of sources, including Loy's biography and archives. The project hopes to develop a theory of *en dehors garde* that accounts for the contributions of women and people of color to the historical avant garde. We expect to find that en dehors garde is not a supplement for or plea for inclusion in the *avant-garde*, but rather a marginalized movement of women and people of color creating their own artistic spaces to drive change.

in development. Four of the plants grown were identified as triple mutants, lacking all three of the genes. Further experimentation will be performed to determine the enrichment of these genes for certain histones and the modifications of those histones, as well as the levels different RNA fragments (ps-RNA and m-RNA) in the chromatin and nuclear environments. The model of post-transcriptional splicing will give insight into the machinations of DNA formatting and gene expression.

Laboratory Operations Support for Small Satellite Research Laboratory

James Hugh Roach, CURO Research Assistant
Paul Hwang
Dr. Marguerite Madden, Geography, Franklin College of Arts and Sciences

As members of the laboratory operations team for the Small Satellite Research Laboratory (SSRL), we provide a wide array of support services and provide necessary infrastructure to ensure mission success. One such vital service is the community outreach and graphics resources provided by our team lead Paul Hwang. Through a process of intensive design, Paul ensures that things like our mission patches and website meet the high levels of aesthetic quality necessary to attract the highest levels of student ability here at the University of Georgia. We also handle the organization of internal lab structure, to include onboarding, leadership hierarchy, internal clearance levels, and more, all of which are vital to smooth operation of the lab. On the technical side, our backend developer, James Roach, ensures all software infrastructure needed by our team is both available and at an acceptable level of stability so our labmates can proceed with their workflows in the most efficient way possible. This software architecture includes, but is not limited to: computational servers, our public website, version control systems, and the digital security of our lab. Our team mission is to provide whatever is needed for the success of our colleagues and the overall SSRL mission objectives.

traditionally served as loading controls. Unfortunately, very little research in the avian model has employed quantitative Western analysis, thus little is known about good loading controls for use in the chicken. Bio-Rad has recently developed Stain-free technology, a new method that allows for total protein quantification and normalization using haloalkylated tryptophan fluorescence. We recently compared this stain-free technology to the standard practice of using loading controls, chicken anti-beta-actin and GAPDH, for quantitative Western analysis in the avian model system. Our results show that the stain-free technology was superior for quantitative comparison of protein expression between different chicken tissues (liver, heart, muscle, kidney, spleen, lung) and within the same tissue.

Books for Keeps' "Stop Summer Slide!" Program and its Impact on Literacy Levels in Clarke County Schools

Miranda Russell
Dr. David B Mustard, Economics, Terry College of Business

I aim to answer the question "Does Books for Keeps' 'Stop Summer Slide!' program increase literacy levels for elementary students in the Clarke County School District (CCSD)?" Books for Keeps is a 501(c)3 non-profit founded in Athens, GA that works to improve childrens' reading achievement. Books for Keeps' signature program "Stop Summer Slide!" provides each child with 12 new books of their choosing at the end of the school year. The Clarke County School District supports the "Stop Summer Slide!" program and believes that it has had positive effect on their students' reading levels since the program began 7 years ago in 2009. This research is significant because an empirical analysis will allow Books for Keeps and the CCSD to determine where the program is succeeding and where changes could be made to better support the students. I will answer my question by comparing the students' spring and fall SRI Lexile levels, a metric that determines the reading level of a student. My thesis is that schools without Books for Keeps' intervention program will demonstrate the expected "summer slide"—that is, that students will "slide back" and decrease their reading levels during the summer. I believe that students that do participate in the intervention program, however, will demonstrate either a constant reading level or even a slight increase. Using econometric tools, I will also control for the variables of gender, socioeconomic status, race, special education status, gifted status, English fluency, number of yearly behavior referrals, and number of yearly absences.

An African American Oral History: Historic and Contemporary Experiences of Gentrification in the Hancock Corridor

Adam Salway, CURO Research Assistant
Dr. Jerry Shannon, Geography, Franklin College of Arts and Sciences

This research considers the risk of displacement due to gentrification experienced by residents of the Hancock Corridor, a historic African-American neighborhood in Athens, Georgia. In this project, we are working alongside neighborhood residents, UGA archival librarians and a team of community researchers to synthesize archival, interview, and geospatial data in order to create a robust digital story mapping platform that reflects the historical and cultural importance of the Hancock Corridor. We seek to create this online digital experience in a way that documents the important voices of the Hancock Corridor residents, while showing their contemporary experiences with displacement pressure in the face of ongoing development that threatens the identity of their community. This participatory approach enables community-based researchers to conduct oral history-style interviews with residents directly affected by urban development. Upon synthesizing these data, narratives of contemporary displacement based upon continued disinvestment in the Hancock Corridor are elucidated. We argue that there is a considerable disparity between the local knowledge of African-American history in the Hancock Corridor and the diligence with which it is and has been documented. Further, contemporary knowledge about resident experiences of displacement pressure are lacking from important discussions on future development decisions by city officials. By collecting available sources of data pertinent to this history and present, this project will reveal both the cultural and historical value of the Hancock Corridor and its current vulnerability to on-going and unchecked urban development.

All-Source Fusion in Combatting The Global Terrorist Threat

Peyton Sammons
Dr. Loch Johnson, International Affairs, School of Public and International Affairs

The technology of the 21st century has created a set of unique challenges for the intelligence community, in that it is easier than ever before for terrorists and other transnational criminals to coordinate on a global scale. The purpose of this research is to examine the role of all-source fusion as a tool by which intelligence communities in the US, the UK, Canada, and Australia counter terrorist threats within their borders, and how each respective intelligence community uses all-source fusion to protect the civil liberties of their populations. By examining quantitative and qualitative data to identify the elements of all-source fusion that have been successful in countering terrorism, I have conducted a comprehensive literature review on all-source fusion with a specific focus on the four aforementioned case studies. Through my research, I have found that all-source fusion is by far the most effective intelligence collection method that allows intelligence officers to provide policymakers with the most comprehensive picture of the "who, what, when, where, and how" of each issue area. By combining all of the INT's means that the weaker links, such as HUMINT, in the collection process are accounted for and counteracted.

Legislative Complexity in an Increasingly Competitive Electoral Environment

Adrien Sandercock, CURO Research Assistant
Dr. Anthony Madonna, Political Science, School of Public and International Affairs

I hypothesize that as electoral competitiveness has increased over time, legislation has gotten more complex due to both the majority parties' use of procedural methods to control the legislative process, increased minority party leverage, and an overall desire to make opaque an increasingly transparent legislative process. This is criticized as being potentially harmful, but there is little documentation of this phenomenon. I will model the relationship between electoral competitiveness and legislative complexity by building on data already collected as part of the University of Georgia Amending Process Project. Specifically, I will take data on landmark bills and add additional variables related to their consideration and passage. Electoral competitiveness will be measured as the average margin of victory in House and Senate races in a particular year; legislative complexity will be defined by a multi-variate measure that includes factors such as bill length, number of companion bills, whether or not a bill is an omnibus, how frequently a bill references other bills, and how much time was spent discussing the bill.
I anticipate that as elections have grown more competitive, legislation has grown more complex. In cycles with higher competition (lower average margin of victory), there will be more complex legislation, while less competitive electoral cycles will have less complex legislation. This research is significant because there is not a comprehensive measure of how complex legislation is; creating one will contribute to research in this field substantially. This relationship could provide new insight into the legislative process and its motives.

Utilizing Cultural Advisors in Marriage and Family Therapy Practice

Emily Sands, CURO Research Assistant
Dr. Desiree M Seponski, Child and Family Development, College of Family and Consumer Sciences

Mental health practitioners assist ethnically and linguistically diverse clients, a portion of which are refugees who have experienced trauma, as they have a heightened risk of mental illness compared to the overall population (Fazel, Wheeler, & Danesh, 2005; Porter & Haslam, 2005). Despite the increase in client diversity, research is lacking on cross-cultural psychotherapy and in particular with marriage and family therapy and trauma treatment of refugee populations. The purpose of this study is to explore cross-cultural clinical practices by North American marriage and family therapists and advocate for the use of cultural brokers. This study is driven by the following research question: How can North American marriage and family therapists' use of cultural brokers enhance refugees' therapy experiences. In this qualitative study, data were collected through open-ended interviews to gain detailed and thick transcriptions of the data. Thematic analysis was

utilized to identify emerging themes. This study's preliminary findings support the use of cultural brokers in culturally responsive therapy.

United States Corporate Tax Reform: Keeping Capital within US Borders

Nancy Saucedo, CURO Research Assistant
Dr. Chris Pope, Banking and Finance, Terry College of Business

Since the 1980s, the United States has seen an increase in the number of corporate tax inversions. A corporate tax inversion is a strategy that companies employ to reduce their tax payments. This typically occurs when a domestic company changes its domicile to a country with lower taxes while maintaining the same level of operations in its country of origin. This practice has brought about much debate regarding what should be done to reform current corporate tax law. With one of the highest foreign corporate income taxes in the world at 35%, the US has struggled to keep corporations on American soil. Many US companies manage to keep trillions overseas using inversions and tax loopholes. Despite Congress and the US Treasury implementing laws to stifle tax evasion, the US still fails to compete with tax havens around the world. We will begin by taking a closer look at the intricate history of International tax law, analyze the worldwide system implemented by the US, and examine the shortcomings of using this tax system instead of a territorial tax system. From there, we will evaluate proposed solutions from the Trump Administration, GOP, and various tax experts, evaluating the advantages and disadvantages of each proposal. Finally, our quantitative case study will analyze a US company's failed attempt at inverting. We will evaluate and compare the company's taxes under various tax reform proposals to determine which would have the most positive effect on taxes.

Nanoparticles Transport of FDA-Approved Drugs Across the Blood Brain Barrier in a Porcine Stroke Model

Kelly Marie Scheulin, CURO Research Assistant
Dr. Franklin Delano West, Animal and Dairy Science, College of Agricultural and Environmental Sciences

Stroke is the leading cause of disability and the fourth leading cause of death amongst adults in the United States. Despite the devastating effects of stroke, there is only one FDA-approved treatment, which in itself is only advantageous in a small fraction of strokes. Our research team has developed two enabling technologies 1) a highly lipophilic, biodegradable nanoparticle (NP) delivery platform that has a high zeta potential and the novel ability to cross the blood brain barrier (BBB) and 2) a novel translational pig stroke model. We hypothesize that this novel NP technology will be able to deliver FDA-approved, hydrophilic drugs past the BBB into the damaged brain tissue in our pig model, which will help reduce the cytotoxic environment for future stem cell transplant therapy. In preliminary studies, we have determined the FDA-approved drugs, Co-Q-10 and Tetracycline, can be successfully incorporated into our novel NP vehicle (at concentrations of 304.92 ug/mL and 186.24 ug/mL, respectively). To trace NPs delivered into the injured brain tissue, we successfully incorporated the fluorescent Cyanine 5.5 dye into NPs. We have demonstrated that intravenous injection of NPs leads to high Cyanine 5.5 fluorescence concentrations in the brain, heart, lungs, kidneys, liver and spleen in a piglet neural injury model. These results suggest that NPs can cross the BBB and transport FDA-approved drugs to the injured site of our novel pig model. This study will provide a novel approach to stroke treatment and will likely lead to more success in human clinical trials.

Investigation of Visual Event Related Potentials in Schizophrenia, Schizoaffective, Psychotic and Non-Psychotic Bipolar Disorders

Zoe Schneider, Ramsey Scholar
Dr. Brett Clementz, Psychology, Franklin College of Arts and Sciences

Event related potentials (ERPs) are electrophysical responses to stimuli that can be measured non-invasively in electroencephalographic (EEG) studies. Previous studies have used ERPs to evaluate early processing deficits present in individuals with schizophrenia. The goal of this research is to compare early visual processing over time across five diagnosis groups (Healthy

Control: HC, Schizophrenia: SZ, Schizoaffective disorder: SAD, Bipolar disorder with psychosis: BD-WP, and Bipolar without psychosis: BD-NP) using four different visual tasks. 407 individuals (HC = 153, SZ = 64, SZAFF = 79, BD-WP = 65, BD-NP = 46) completed each task at five BSNIP2 sites while 64 sensor EEG data was recorded. A black square was placed in the subject's central, left, right, or bilateral visual field. Grand average ERPs identified peak sensors across all groups. One-way ANOVAS were run on each 10ms time bins for each visual task to identify group differences. We hypothesized that all three psychosis groups would show a reduced response to the visual stimuli in the first 500 ms, and the BP-NP and HC groups would display similar responses. These tasks will allow us to test central visual processing, interhemispheric visual processing, and contralateral visual processing in all diagnosis groups. These results give insight into the dysfunction of common neural paths and the pathophysiology of psychotic groups. They may also provide greater e
and mechanisms of early visual deficits in individuals with psychosis.

Intersectional Failure: The Effect of Zero-Tolerance Policy on Girls of Color

Chloe Schra.8(l p)0.9(r)]TJ0 Tc 0 Tw 5.924 0 Td(.)Tj=0.001 Tc 0.001 Tw -5.924 -1.12 Td[(D)-1.7(r)-5(.)0.6(N)-1.7(ic)2.9(h)-1.9(

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immigrants by providing contextualization of the acculturative process.

Understanding Toxicity of *Botrytis cinerea* Mutant

Patrick Thomas Seethaler, CURO Research Assistant
Dr. Maor Bar-Peled, Biochemistry and Molecular Biology, Franklin College of Arts and Sciences

Botrytis cinerea is a devastating pathogenic fungi that affects the yield of over 100 crops. It causes a gray mold and rot disease that drastically damages important agricultural crops. Previous work in the lab found that a mutation in the nucleotide-sugar metabolism leading to UDP-rhamnose gave rise to fungi that are unable to effectively infect plants. This research also helped to identify the potential toxic intermediate UDP-KDG. The exact mechanism for toxicity remains elusive. To identify the toxicity, we mutate the enzyme involved in the conversion of UDP-galacto-pyranose to UDP-galacto-furanose (UDP-galactomutase) so as to mimic and intensify the toxicity pathway. In doing so, we can compare the initial substrates to the end products to determine the pathways of metabolism. Through the use of alditol acetate and analysis through LC/MS and GC/MS, we hope to see differences in the final concentrations of water-soluble metabolites inside the cells and the glycans in the cell wall when the wildtype and knockout gene strains are compared. This will show us the specific pathway that the toxicity occurs through.

Saharan Dust Increases Amount of Vibrio Pathogens in the Florida Keys

Roland Francis Seim, CURO Research Assistant
Dr. Erin K Lipp, Environmental Health Science, College of Public Health

Vibrio is a genus of bacteria found in marine habitats world-wide but usually represents a minor portion of the microbial community. Previous studies show that *Vibrio* populations can grow explosively in response to annual Saharan Dust events. While *Vibrio* has been shown to increase in response to dust-associated nutrients, e.g. iron, species-specific characterization is not known. This information is important to determine if dust deposition leads to an increase in pathogenic species. Here, using species specific PCR we examined the presence of *Vibrio* pathogens among isolates cultured at Looe Key Reef in the Florida Keys, US before, during, and after a Saharan dust event. Specifically, we determined if dust was associated with the presence of human pathogens such as *V. alginolyticus*, *V. cholerae*, and the coral pathogen *V. coralliilyticus*. *V. cholerae* is known to cause cholera; *V. alginolyticus* can cause wound and ear infections. Data collected to date indicated that the abundance of pathogenic *Vibrio* species increased in response to these dust events. We collected approximately 300 isolates over a four-day period during a Saharan Dust event during the summer of 2016 and extracted DNA for PCR and gel electrophoresis to identify the *Vibrio* species present. This research has broader implications in public health, environmental health, and microbiology. It is important to understand the *Vibrio* response to these dust events and the impact it might have on the health of residents living in the Florida Keys.

Characterizing the Species Distributions of North American *Pyractomena* Fireflies

Pearl Shah, CURO Research Assistant
Dr. Kathrin F Stanger-Hall, Plant Biology, Franklin College of Arts and Sciences

Different *Pyractomena* species differ greatly in the biogeographic distribution across the United States. Extensive research has been done on the distribution patterns of birds, mammals, and plants and the relationship, but what determines the spatial distribution of *Pyractomena* fireflies is currently unknown. We investigated the impacts of environmental variables, including average precipitation, average temperature, elevation, and soil characteristics on the distribution of the 16 species of North American *Pyractomena* fireflies, using field records from the past 50 years, national data bases and ArcGIS mapping software. Soil was tested because the vast majority of a firefly's life is spent during the larval stage, where these insects largely prey upon gastropod mollusks and other semiaquatic invertebrates. Understanding the biogeographical patterns of species distributions will ultimately contribute to habitat and species conservation.

Using Electrical Stimulation to Lower Post-Prandial Blood Sugar in People with SCI

Nivita Sharma, CURO Honors Scholar, CURO Research Assistant, CURO Summer Fellow
Rachel Aldridge
Dr. Kevin McCully, Kinesiology, College of Education

Type II Diabetes is prevalent among individuals with spinal cord injuries (SCI) because of their limited mobility. Exercise has been shown to lower post-prandial blood glucose levels in able-bodied people. Electrical stimulation of the muscles causes similar muscle contractions that occur when an individual exercises. Muscle contractions act like insulin to allow cells to consume glucose from the blood. We aim to observe changes in blood glucose levels when six muscle groups (quadriceps, hamstrings, and calves of both legs) are electrically stimulated after the consumption of a carbohydrate rich meal in able-bodied and individuals with SCI. We hypothesize that electrical stimulation will cause a clinically relevant decrease in post-prandial blood glucose levels. Continuous glucose monitors (CGM) will be used to measure the blood glucose levels throughout the three-day experiment. Electrical stimulation will be performed using a medical grade electrical stimulator (Theratouch 4.7, Rich-Mar). The first day will include insertion of the CGM, the second day will involve sedentary conditions after the consumption of a carbohydrate-rich meal, and the third day will involve 60 minutes of electrical stimulation after the consumption of a carbohydrate-rich meal. All meals provided to the participants will be established using their estimated caloric intake and physical activity. CGM data on the sedentary day will be compared to the electrical stimulation day to test for effects of stimulation. Significance: If effective, post-prandial electrical stimulation can be a simple method to decrease the risk of Type II Diabetes in individuals with SCI.

Unalterable Roots

Sachi Shastri, CURO Honors Scholar, CURO Research Assistant
Dr. Christopher R Lawton, History, Franklin College of Arts and Sciences

The history of Putnam County, Georgia, has long been told through a biased, whitewashed perspective that completely neglected the relevance of African Americans in Putnam's development. Historical markers posted at antebellum mansions celebrate the achievements of white planters, while ignoring that their houses, their lives, and the county of Putnam, itself, was built upon the labor of slaves. Ignorance of black contributions is a common characteristic of small Southern towns, but Putnam is unique in that both Alice Walker, author of *The Color Purple*, and Joel Chandler Harris, teller of the *Uncle Remus* tales, grew up in the same Putnam neighborhood nearly a century apart. More remarkable is that both internationally famous authors, in their own way, chronicled the lives of Putnam's African American communities that historical markers still miss. The project has been to begin developing a book proposal for UGA Press that will expand the history of Putnam with an eye towards making visible the intersectionality and inclusivity recognized by both Harris and Walker. The work began with a literature review on the relevance of geographical locations to history, and will soon progress to setting up community events that will allow local people to tell their personal stories. By understanding the history of Putnam as told by a diverse group of people, and using those histories to create context for narrative elements from both Harris and Walker, the book proposal will create a space for telling Putnam's more authentic, more inclusive, more complicated history.

Infant Sleep Duration among White Breastfed and Black Formula Fed Infants at 16 Weeks

Olivia Shealy
Dr. Leann Birch, Foods and Nutrition, College of Family and Consumer Sciences

The National Sleep Foundation recommends daily sleep duration of 12-15 hours for infants (4-11 mo) as appropriate for health and well-being. Insufficient sleep and poor sleep quality have been linked to adverse effects on development and behavior, as well as increased risk of obesity. Both race and feeding mode have been examined as possible factors affecting infant sleep patterns, with variable results. Further research is needed to clarify these associations. This study examines the differences in infant nighttime sleep duration, and

total sleep over a 24-hour period at 16 weeks among a sample of black formula fed (BFF) and white breastfed (WBF) infants. Black and white mothers (n=44) participating in the Maternal and Infant Growth Study reported infant sleep duration (hrs) via self-completed questionnaire at a 16-week postpartum study visit. Infant feeding mode (>80% of intake), breastfed (n=23) or formula fed (n=21), was determined using mother-provided bi-monthly feeding logs. WBF infants slept longer than BFF infants over a 24-hour period (p=.047) and overnight (p= .000). These results suggest a difference in infant sleep duration between groups. BFF infants' shorter overall sleep duration could play a role in increasing the risk of obesity among African American children.

Parasite Infection, Group Size, and Feeding Behavior in Grant's Gazelle

Caroline Shearer, Foundation Fellow
Dr. Vanessa Ezenwa, Ecology, Odum School of Ecology

Group size is known to affect feeding behavior in animals because individuals living in larger groups benefit from the vigilance of others which frees up more time for feeding. Thus, group size influences the way animals distribute their time among various behaviors, and typically the time spent by animals feeding increases with group size. This study examines whether parasite infection modifies the relationship between group size and feeding behavior. Female Grant's gazelles (*Nanger granti*) were treated with an anti-parasitic drug to reduce their nematode parasite burdens, and the feeding behavior of treated and untreated individuals was tracked through time. Using data on the duration and occurrence of feeding behavior, we tested the hypothesis that parasite treatment eliminates the relationship between group size and feeding. Results of this study will increase our understanding of the factors that determine group size in wildlife.

Proteomics of CBL0137-Treated *Trypanosoma brucei*

Shanlin Shoemaker, CURO Research Assistant
Dr. Kojo Mensa-Wilmot, Cellular Biology, Franklin College of Arts and Sciences

Human African Trypanosomiasis (HAT) is a parasitic disease endemic to parts of sub-Saharan Africa. The disease-causing protozoan, *Trypanosoma brucei*, proliferates in the blood, lymph, and ultimately the central nervous system of both humans and cattle. Nearly 70 million people are at risk of contracting HAT, which is fatal without treatment. Drugs currently used to treat HAT are toxic and difficult to administer, highlighting a need for the discovery of safer and more effective drugs. We identified Curaxin-137 (CBL0137) as a lead anti-HAT drug. This orally bioavailable drug cures mice infected with *T. brucei* and has completed phase I clinical trials for other indications, making it an excellent "drug repurposing" candidate for treating HAT. A 6-hour CBL0137 treatment of *T. brucei* in vitro followed by a 48-hour incubation in drug-free media revealed a "delayed killing" effect, suggesting that *T. brucei* commits irreversibly to death within the first few hours of exposure. In this study, we aim to understand why this drug is successful in killing *T. brucei* by identifying changes in the proteome of CBL0137-treated trypanosomes compared to untreated trypanosomes. We will first compare the protein profiles of treated and untreated trypanosomes using a combination of silver staining and phosphoprotein staining. Then, we will identify specific proteins affected by CBL0137 treatment through mass spectrometry. Determining the possible protein effectors of CBL0137 may reveal essential proteins in the trypanosome that may be tested genetically, thereby validating new targets for drug development to cure HAT.

Formation of Natural Product Glucosides by *Escherichia coli* in Controlled Conditions

Kimberly Mercedes Shumaker, CURO Research Assistant
Dr. Mark A Eiteman, Chemical, Materials, and Biomedical Engineering, College of Engineering

Flavonoids consist of a large group of natural polyphenols found in fruits, vegetables and cereals. Many possess anti-oxidative and vasodilation effects. Many flavonoids are water insoluble, and bioavailability can be increased through O-glucosylation of flavonoids by the action of enzymes called glycosyltransferases. This research describes the conversion of a model

compound, maltol, into its O-glucoside using UGT73B3 by *E. coli* strains under various fermentation conditions. We compared the production of maltol-O-glucoside by *E. coli* with and without a deletion in the pgi gene coding phosphoglucose isomerase. We also compared the formation of maltol-O-glucoside under nutrient limited growth conditions.

An In Vitro Model Demonstrating the Direct Current Stimulation Mediated Recovery from Neuronal Injury

Naomi Afnan Siddiquee, CURO Research Assistant
Noah Goldstein
Dr. Lohitash Karumbaiah, Animal and Dairy Science, College of Agricultural and Environmental Sciences

The goal of this study is to create an in vitro model of Traumatic Brain Injury (TBI) in order to assess treatments targeted to help repair disrupted neural networks and return lost function. Since moderate-to-severe TBI can cause a surge in glutamate, leaving behind damaged neurons, mouse embryonic stem cell derived neurons were exposed to 100 μM of L-glutamate to mimic the excitotoxicity after a moderate-to-severe TBI. Utilizing a high density Multi-Electrode Array (MEA) recording system, we recorded neuronal activity in a 12 well plate equipped with 64 recording electrodes per well used to record extracellular action potentials (EAP). We then assessed the whole well and electrode specific spiking activity over a period of four weeks. L-glutamate exposure at a concentration of 100 μM two weeks post-seeding resulted in a high Mean Firing Rate (MFR) that sharply declined ($P < 0.001$) and dysregulation of neural networks demonstrated by lower synchrony ($P < 0.01$) by week 4 and less frequent and shorter bursts ($P < 0.001$) by week 3. These electrophysiological changes were accompanied by a subsequent decrease in Beta-3 Tubulin+ neurons ($P < 0.001$) and oligodendrocytes ($P < 0.01$). We propose that the evaluation of these parameters followed by the immunocytochemical evaluation of motor neuron cultures will allow for a robust assessment of the effects of excitotoxicity on neurons, glia, and neuronal network repair in vitro.

Plasma Purification Method for Agglutination Assays in White Ibis

Olivia Lauren Sieverts, CURO Research Assistant
Dr. Sonia Hernandez, Forestry, Warnell School of Forestry and Natural Resources

As the everglades continue to disappear, many species of animals, including the American white ibis (*Eudocimus albus*) are being forced to urbanize. Urbanization may affect pathogen prevalence as these ibis aggregate in large densities, and mixed species flocks for food. Many of these birds are hand fed by people providing an opportunity for pathogen transmission between birds and humans. We used the Elementary Body Agglutination (EBA) assay to determine if the ibis in this study were infected by the zoonotic pathogen, *Chlamydia psittaci*. We used banked plasma for this assay as available; however, the preferred sample for this assay is serum. We obtained a prevalence of infection of X (n=X), which was unexpected. We suspected that the positive results were a result of cross-reactivity between proteins in the plasma and the antigen. Thus, we tested a method to purify immunoglobulin from the plasma. We used an ammonium sulfate solution to precipitate and remove nonspecific proteins present in plasma, to determine if they were interference with our assay. In order to test that we had in fact preserved and concentrated immunoglobulin in our purified sample, the sample was run through a protein gel and transferred onto a cellulose membrane, where it reacted with anti-bird antibodies. Our validation method confirmed successful recovery of immunoglobulins from the plasma. The purified samples were re-tested using the EBA assay—all were negative. Based on these findings we theorize that the initial results were false positives as the purified immunoglobulin samples tested negative.

Fatigue, Executive Functioning, and Activities of Daily Living in Older Adults

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

Fatigue is a common symptom in a wide cross-section of elderly patients, caused by a myriad of reasons. The purpose of this study was to evaluate how fatigue, a physiological measure, may mediate

the relationship between declining executive functioning (EFs) and activities of daily living (ADLs). The current sample consisted of 189 community-dwelling older adults (ages 54-101, M= 77.94, SD= 8.717). Participants completed the Neurobehavioral Cognitive Status Examination (NCSE), an ADLs Checklist, as well as a Physical Symptoms Checklist. The assessed EF domains included judgment, similarities, and attention. Based on our mediation model, we hypothesized that fatigue would mediate the negative effect of declining EF on functional outcomes (ADLs). Results showed a significant R^2 change when fatigue was included in the model, R^2= .021, F_{change} (2, 187) = 4.765, p= .03, however, there was no significant relationship between fatigue and EF, making it difficult to conclude significant mediation is occurring, r= .059, p= .325. Further exploratory moderation analysis showed that there was no significant interaction effect between EF and fatigue, indicating that the relationship between the EF and ADLs did not change at the level of fatigue, R^2 = .194, F_{change} (3, 186) = .093, p= .760. There was a significant correlation between EF and ADLs, which supports existing literature on functional independence and EF in late life. However, the absence of an effect of fatigue on this relationship may be due to the restricted range of fatigue symptoms in our sample, and limitations of our fatigue measure.

The Chthonic Elements of Mithraic Worship

Michael Sloman
Dr. Charles Platter, Classics, Franklin College of Arts and Sciences

My paper examines how traditionally chthonic elements exist in Mithraism, a Roman cult dedicated to a sun god. It will isolate the specific symbols and practices that are associated with chthonic worship in the scene and examine their role in the Mithraic context as well as the greater religious context of the time period. This paper proposes that these elements are remnants of hero cult, standard across mystery cults in the Greco-Roman world. The Eleusinian Mysteries and the cult of Cybele share similar tropes and scenes and serve as an example for the possible development of this iconography. This question is important because a cosmological interpretation of the Mithraic cult, and therefore its symbols and iconography, has become more widely accepted. Although Mithras is worshipped as the Unconquered Sun, this cosmological interpretation denies half of his divine heritage. We must ask why chthonic elements are so prevalent in the worship of this cult. This paper will argue that these chthonic elements of Mithraism must have grounding in previous religious practice. The notion that they could have spontaneously arisen from nothing is doubtful given the long tradition of religion and cult in the ancient Mediterranean world. More reasonably, they exemplify traditional ritual of mystery cults which mix the heavenly origins of gods with the earthly works of heroes. Although perhaps a product of celestial worship, Mithraism is indebted in its practices to the worship of predecessor deities in Middle Eastern culture.

Phosphorous Efficiency in Cultivated Sunflower

Alex Morgan Smith, CURO Research Assistant
Dr. Lisa Donovan, Plant Biology, Franklin College of Arts and Sciences

Cultivated sunflower, *Helianthus annuus L.*, is an important global oilseed crop. Phosphorus is needed for the normal growth and maturity of this commercial crop, and has been shown to affect yield quality/quantity in sunflower. Historically, breeders prefer sunflowers that have high phosphorous acquisition efficiency (plant uptake per nutrients available in the soil). Unfortunately, global sources of phosphorous are rapidly depleting, which makes genotypes with both high phosphorus utilization efficiency (yield per gram tissue phosphorous content) and high overall yield highly desirable. Furthermore, phosphorous can be allotted differently above than below ground. To get a better understanding of the link between overall yield and phosphorus use efficiency, we measured phosphorus concentrations of 12 diverse lines of sunflower grown under 4 different nutrient treatments. To account for the effect of organ type, we analyzed above and below ground tissue separately. We hypothesized that roots contain more phosphorous than shoots under high-fertility conditions; phosphorous allocation between above ground and below ground matter shift with low-nutrient stress, such that the proportion of root: shoot phosphorous increases

(i.e., more phosphorous will be allocated to roots relative to control); and genotypes with higher phosphorous utilization efficiency: phosphorous acquisition efficiency ratio preform best under low-nutrient conditions. Our results will better inform genetic breeding efforts in cultivated sunflower.

Effects of Vegetation Structure on Nest Predation of Artificial Diamondback Terrapin Nests

Kayla Jordan Smith, CURO Research Assistant
Dr. John Maerz, Forestry, Warnell School of Forestry and Natural Resources

Nesting is an important component in animal life cycles. Human activities often interrupt nesting behavior by degrading nesting habitats. For turtles, altering vegetation structure can increase predation rates. Diamondback terrapins (*Malaclemys terrapin*) occupy salt marshes, nesting in sparsely vegetated areas above high tide. Terrapin females show nest-site fidelity, and may continue nesting in human-degraded areas. My objectives are to: evaluate the effect of shrub habitat maintenance on terrapin nest predation; determine whether spatial patterns of vegetation-driven nest predation contributes to terrapin population decline; and evaluate whether vegetation management improves terrapin nest survival. Building off of long-term terrapin studies on the Jekyll Island Causeway (JIC) and a dieback of Northern raccoons (*Procyon lotor*), I measured predation rates using artificial nests in hedgerow, cleared hedgerow, and open, sparse vegetation. Using the results, spatial patterns of nest mortality along the JIC were used in a population viability analysis to estimate terrapin population persistence. I found predation rate on nests in hedgerows (62.5% of nests) was double that of nests in open sites (31.7%), while rates in cleared hedgerow remained high (71.5%). Nest predation was 39% lower (45.7% of nests) compared to a 2013 study at the same locations (75.4%), consistent with local raccoon dieback. These results confirm vegetation structure as a driver of unsustainable predation, and natural raccoon dieback or culling can significantly improve nest survival. Despite effects of vegetation on nest predation, vegetation removal may not immediately reduce predation. Future research is needed to determine long-term benefits of vegetation management.

Affect of Capsiate on Perirenal and Epididymal Fat in Rats Fed a High Fat Diet

Sierra Megan Smith
Dr. Buffy Howerth, Pathology, College of Veterinary Medicine

Obesity has become an epidemic in many parts of the developed world. Because of its relatively recent emergence, scientists have been looking for a remedy to help people who are suffering from the disease. This project aims to evaluate whether oral capsiate can ameliorate the effects of a high fat diet. The specific objective in this project was to evaluate the size and number of fat cells in epididymal fat and perirenal fat of rats on a high fat diet supplemented with capsiate. The anticipated findings are that capsiate will reduce the size and number of fat cells in rats on a high fat diet. Fat cells were evaluated in epididymal and perirenal fat in fixed tissue that was paraffin embedded, sectioned and stained with hematoxylin and eosin. Digital images from three fields were captured, and the total number of fat cells and cell area were determined. Results will be compared to rats fed a low fat diet and a high fat diet without capsiate.

The Novel Function of RGS10 in Obesity

Isabelle Veigh Snider, CURO Research Assistant
Dr. Jae-Kyung Lee, Physiology and Pharmacology, College of Veterinary Medicine

In previous research exploring the relationship between neuroinflammation and neurogenerative diseases, the Regulator of G-protein Signaling (RGS10) gene was found to negatively regulate microglial activation. In addition to neuroinflammation and damage to their dopaminergic neurons in response to systemic inflammation, RGS10 knockout (KO) mice showed lower levels of glucose in serum and gained more weight while aging. Although there's enough evidence to support a relationship between inflammation and metabolic diseases, detailed mechanisms are still unclear. Our objective is to investigate the role of RGS10 in this relationship. RGS10 KO and wild type (WT)

mice were fed a low fat (LF) diet and a high fat (HF) diet for eight weeks. We performed glucose tolerance and insulin sensitivity tests along with monitoring their weight and collecting serums and tissues at the end of 8 weeks. On both diets, the RGS10 KO mice displayed impaired glucose tolerance. On the HF diet, the KO mice displayed impaired insulin tolerance and higher body weights than WT mice, implicating that the RGS10 plays a role in metabolism and obesity. We're currently processing adipose and liver tissues and extracting the RNA in order to perform quantitative real-time PCR to determine the detailed mechanisms. We'll compare the mRNA expression of metabolism-related genes including sterol receptor element binding protein 1c (srebp1c), peroxisome proliferator-activated receptor-gamma (PPAR-g), fatty acid synthase, adiponectin, and leptin. We hope to gain a better understanding of the mechanism of metabolic disorders so that a treatment can be created to prevent or mitigate the disease.

Designing Relevant In Vitro Models of Muscle Metabolism with Inclusion of Energy Expenditure

Madeleine Holden Snidow, CURO Research Assistant
Dr. Chad M Paton, Foods and Nutrition, College of Family and Consumer Sciences

Typical protocols for in vitro studies of lipid metabolism use free fatty acids (FFA's) as the lipid source, whereas in vivo, triglycerides (TG) are the predominant lipid. In the absence of increased energy expenditure (EE), the study of lipid metabolism in vitro is unlikely to reflect in vivo metabolism. We hypothesized that a more realistic replication of in vivo metabolism should use TG and not FFA and incorporate EE. C2C12 muscle-like cells were used to assess differences in response to FFA versus TG. Cells were treated for 4h with either 16:0, 18:1, 18:2n6, or 18:3n3 as FFA or TG alone or in the presence of AICAR (an adenosine monophosphate mimicking molecule). Total mRNA and protein were collected to assess changes in gene and protein expression respectively. Studies are ongoing, however preliminary results suggest that FFA's produce numerous changes in C2C12 cell functions including inflammation, cell stress, and oxidation with only minor changes associated with TG's. In the presence of AICAR, TG effects are noted and FFA's are somewhat blunted. These results suggest that EE may drive metabolic function in vitro and may provide a more realistic foundation for assessing lipid metabolism compared to simple addition of FFA's. This in vitro discovery plays an essential role in better understanding metabolism and the way human muscle processes lipids. The study of TG's impact on muscle cells provides a better reflection on the true physiological response of FFA metabolism and helps to refine procedures for in vitro models of discovery.

Automatic Recognition of Periocular Facial Alterations

Ryan Snowden, CURO Research Assistant
Erica Anstey
Dr. Larry Hornak, Electrical and Computer Engineering, College of Engineering

Currently, there is no rapid, automated, repeatable method to detect and quantify periocular changes from chemodenervation. Multi-spectral imaging, including the visible, near and short-wave infrared spectrum, may provide novel information. We aim to detect and quantify periocular change, including position and texture changes, over time in participants who underwent periocular rejuvenation with BOTOX injection. Using eye location algorithms developed in MATLAB, face images of subjects are registered and cropped to the periocular region. These face images were captured immediately before and after injection, then at 1 day, 1 week, 1 month, 3 months, and 6 months. Different camera sensors were used to collect the aforementioned data including the visible, near and short-wave infrared bands. The individual regions where BOTOX was injected (corrugator supersilii, procerus, and orbicularis oculi muscles) are extracted and geometrically normalized via a set of algorithms. The normalized regions are processed using an algorithm that compares the extent of texture-based facial alterations before and after treatment. It is expected that most change will occur along the upper brow in the furrow region and in the crow's feet region, although the extent of these texture changes will continue being analyzed through the usage of more sophisticated image processing algorithms. The ability to objectively quantify subtle position and textural changes in

the periocular region in an automated, reliable way has vast potential. For example, detection of subtle change may lead to earlier cancer diagnosis, or even guide cancer resection.

Investigating CRISPR/Cas9 as a System for Gene Editing in *Trypanosoma cruzi*

Lilith Renae South, CURO Research Assistant
Dr. Rick Tarleton, Cellular Biology, Franklin College of Arts and Sciences

Trypanosoma cruzi is the protozoan responsible for human Chagas Disease. This disease is prevalent in Latin America and has no vaccine or effective drug treatment. Development of new drugs and vaccines has been hobbled by the difficulties of genetic manipulation which could lead to better understanding of the complex parasite biology. CRISPR (clustered regularly interspaced short palindromic repeats)/Cas9 (CRISPR associated gene 9) is a useful gene editing system recently borrowed from bacteria and widely applied to efficiently manipulate the genomes of many diverse species. The system utilizes a nuclease Cas9 protein and a guide RNA which directs Cas9 to cut a target gene. We have previously shown that SpCas9 protein, derived from *S. pyogenes*, can be expressed by *T. cruzi* and used to target parasite genes for editing. Although this method is relatively effective, expression of SpCas9 is somewhat toxic to *T. cruzi*. Here we show that the smaller recombinant SaCas9 protein from *Staphylococcus aureus*, but not SpCas9, can be electroporated into *T. cruzi* for effective gene editing. This procedure has shown nearly 100% knockout (KO) efficiency using a fluorescent reporter protein. SaCas9 fused to GFP – thus creating a protein comparable in size to SpCas9 – also fails to achieve reporter gene KO. These experiments demonstrate a new and highly efficient gene editing protocol for *T. cruzi* that depends on the ability of the smaller SaCas9 protein to traverse the *T. cruzi* cell membrane that appears impermeable to the larger SpCas9 protein.

ROS-Responsive and pH Inhibiting Polymer Nanoparticle Platform for Cancer Treatment

Jonathan Spagnoli, CURO Research Assistant
Dr. Jin Xie, Chemistry, Franklin College of Arts and Sciences

Cancer is a deadly disease ravaging the lives of many people around the world. As a result, there is a significant need for new research and treatment methods aimed at inhibiting the growth of cancer cells while maintaining as much healthy tissue as possible. This study aims to determine the anticancer activity of intracellular pH change by utilizing the higher hydrogen peroxide levels in cancer cells as a substrate in a reaction including ethanol and $FeCl_2$, which react to form acetic acid in the cellu5mch9(o)-1(h2( )[(P)-1h)-1.8()6(o)9(g)1.3(d[(in))-1.8(r(c)1

orbicollis larvae do not. *N. Orbicollis* larvae have smooth mandibles, and do not develop the serrations until the second instar. There are no allometric differences in the mandibles between

will reduce muscle blood flow and reduce oxygen levels during electrical stimulation. With lower oxygen levels, we hypothesize that muscle endurance will be reduced. Our primary aim is to test the influence of reduced blood flow (due to elevation) on the measurement of muscle endurance. In addition, if limb elevation does provide a good model of PAD, future experiments evaluating treatments (including exercise training) for reduced blood flow and PAD will be possible. Limb elevation experiments could then be performed on older adults with comorbidities and intact circulation to better understand PAD.

Mentoring as a Protective Factor of the Association between Child Maltreatment and Substance Use in Adolescence

Jordan Srochi, CURO Research Assistant
Dr. Assaf Oshri, Child and Family Development, College of Family and Consumer Sciences

Maltreated youth are at significant risk for substance use behaviors in adolescence. Although role models have been shown to facilitate positive youth development (PYD) among at-risk and maltreated youth, less is known about what types of adult mentorship can buffer the link between child maltreatment and adolescent drug use. In this research study, a secondary data analysis will be conducted to examine how mentors or role models buffer the relationship between adverse childhood experiences, such as maltreatment, and substance use behaviors in adolescence. The present study will utilize three time points from the LONGSCAN study, which includes data from maltreated and non-maltreated youth and their caretakers (N = 1,354). A structural equation model will be used to compare protective effects of different mentoring experiences (i.e., natural mentors, program mentors, or both). I hypothesize that utilization of any type of mentor would lower substance use for children who experienced maltreatment, and that natural mentors would have more of a protective effect than program mentors. Preliminary results indicate that both natural and programmatic mentors buffer the relationship between maltreatment experiences and substance use. This study is important in order to target appropriate interventions aimed at reducing substance use and promoting resilience among at-risk youth.

A Movie without a Hero: Casting Becky Sharp in Early Hollywood Cinema

Gabrielle Stecher, CURO Research Assistant
Dr. Tricia Lootens, English, Franklin College of Arts and Sciences

This interdisciplinary project explores early film adaptations of William Thackeray's 1848 novel *Vanity Fair* in attempt to determine the ways in which the enigmatic Becky Sharp was translated, successfully or not, into early Hollywood cinema. This particular novel and its leading lady inspired the production of various film adaptations from 1911 to 1935, including four silent films and the first film shot in full-spectrum Technicolor. Yet, the casting of Miss Sharp was no easy feat— the Becky of the novel wavers between charming coquette and femme fatale in a way that, at times, seems almost impossible for a camera lens to capture completely. This project investigates the 1932 adaptation of *Vanity Fair* starring Myrna Loy as Miss Sharp as a pre-code exploration of seduction and control that succeeds in fully realizing novel Becky's transformation from wily coquette to psychologically manipulative vamp. After comparing this film to its similarly pre-code precursors, I pit pre-code performances of Becky against the post-code exploration of Miss Sharp in the Technicolor world of the 1935 adaptation *Becky Sharp* in attempt to understand the combined influence of casting decisions and the censorship of the Hays Code on the performances and critical reception of this infamous female lead. Ultimately, a feminist theoretical lens will be applied to my study of the adaptations in order to reveal how the Hays Code and early twentieth-century audiences conceived the cultural ramifications of the temptress on-screen.

Carbon Monoxide Line Emission from Region of Molecular Cloud MBM 55

Amanda Stricklan, CURO Research Assistant
Dr. Loris Magnani, Physics and Astronomy, Franklin College of Arts and Sciences

We are analyzing the CO line emission from a region containing a translucent molecular cloud MBM 55. Over 1000 spectra were taken with the Arizona Radio Observatory 12 meter mm-wave radio telescope on Kitt Peak. The data were part of a project to compare sensitive CO observations

from 88 lines of sight through and around the cloud in an effort to determine how much low-level emission there was from the environs of the cloud core. To do this each of the 88 points was "mapped" using a 13-point pattern. For the original project, the 13 points were added together to produce one final spectrum for each of the 88 points. Our project is to look at each of the 13 paintings individually to see how the CO emission varies on small scales (the beam size is about one arc minute which corresponds to a linear size of about 0.03 parsecs at a distance of 100 parsecs). In addition to seeing how the CO line varies on small scales, we are also looking for individual points with isolated line emission. It is conceivable that some of the 88 lines of sight with non-detections, when all 13 points are added together, may have detections along a single or at most 2-3 lines of sight. By adding a few weak signals with about 10 lines of sight of non-detections, we will be able to determine the smallest connected regions with CO emission.

Bacteria-Phytoplankton Interactions in Understanding the Marine Carbon Cycle

Stephanie Stromp, CURO Research Assistant
Dr. Mary Ann Moran, Marine Sciences, Franklin College of Arts and Sciences

The marine carbon cycle is of major significance on a global scale. With the ever-increasing pressure of climate change, understanding factors that affect carbon flux in the ocean has become more important. The transfer of dissolved organic carbon from phytoplankton to marine bacteria is a major step in the marine carbon cycle, but many key compounds that link phytoplankton and bacteria through trophic interactions are unknown. A model microbial system using the marine diatom *Thalassiosira pseudonana* CCMP1335 and the marine bacterium *Ruegeria pomeroyi* DSS-3 is being used to investigate phytoplankton metabolites passed to bacteria. Genes encoding transporter proteins that were highly upregulated in the model system were identified previously. This project tests whether mutants with deletions in three of the highly upregulated transporter systems grew more poorly on phytoplankton-derived substrates than wildtype bacteria. Mutants for a sulfonate dihydroxypropanesulfonate (DHPS) transporter, a glycine betaine/proline transporter, and a possible allophanate transporter were used to compare growth differences of mutants compared to the wildtype strain. Growth was measured by optical density and flow cytometry. Decreases in observed growth rates for the mutant cultures compared to wildtype are being used to estimate the importance of each substrate as a source of carbon to bacteria growing on phytoplankton metabolites. Future studies will identify the importance of these compounds for natural bacterial communities inhabiting the surface ocean, and help in understanding importance of microbial interactions to carbon flux in our oceans.

In Vivo Assessment of Olfactory Receptor Neurons and Projection Neurons Using Appetitive Olfactory Inputs in *Drosophila* Larvae

Rajeev Subu, CURO Research Assistant
Dr. Ping Shen, Cellular Biology, Franklin College of Arts and Sciences

How smell or taste is translated into appetitive behavior remains poorly understood. *Drosophila melanogaster* has proven to be a powerful model to manipulate and to examine reception and perceptual processing of appetitive olfactory inputs in higher-order olfactory centers. In *Drosophila* larvae, olfactory information is encoded in the antennal lobe where the olfactory receptor neurons form a network with projection neurons in a one-to-one relationship in a complex sensory encoding system. It has been found that *Drosophila* larvae display impulsive feeding of sugar-rich food when presented with appetitive odors, such as pentyl acetate (PA) and 1-octanol (OCT). This finding has prompted us to investigate the potential functional differences in the brains of the third-instar larvae that are treated with distinctive appetitive odors through fluorescence-based imaging analysis. We will first screen for the ability of different appetitive odors to induce neuronal activity using CaMPARI. Following this, laser lesioning of neurons will be used on the screened projection neurons. We hope to determine which specific olfactory receptor neurons and their projection neuron counterparts are responsible for the appetitive odor-induced behavior through the use of behavioral assays using the odors. The successful outcomes from

this proposed study may help us better understand the olfactory circuits in higher-order organisms.

Open Versus Structured Rules: Examining the Policy Effects of Rule Choice in the House of Representatives, 2003-2016

Jessica Jin Suh, CURO Research Assistant
Dr. Anthony Madonna, Political Science, School of Public and International Affairs

This research examines the usage of special rules in the US House to restrict amending activities. Scholars have argued that the House majority party can bias policy output away from the floor median through the usage of restrictive rules, including both structured and closed rules. Scholars suggest that as a result, majority party centrists can incur a policy loss from restrictive rules. I argue that structured rules vary in their ability to restrict amending opportunities, distinguishing between that of closed rules. Accordingly, I argue that in order to secure the passage of restrictive rules, the majority party often makes concessions to majority centrist members through amending opportunities. To test my theory, I build off an earlier study that examined a new dataset of proposed amendments from the 109th to the 111th Congresses under structured rules. For each amendment, the amendment proposal, allowance, and adoption for each House were coded. This research extends that dataset to include amendments from the 108th, 112th, 113th, and 114th Congresses. Additionally, I include all amendments to bills considered under open rules. These amendments under open rules serve as a control group of sorts for my study.

Evolving Racial Perspectives in Haiti, 1785-1820

Christian Michael Sullivan
Kathryn Kostel
Dr. Jennifer Palmer, History, Franklin College of Arts and Sciences

This presentation analyzes contemporary perceptions of the relationship among race, politics, and socioeconomic classes during the Haitian Revolution. The goal of this project is to display that power struggles and economic inequalities served to prolong the conflict and overshadow the inherent racial disparities within Haitian society. The research was done by analyzing treatises and newspaper articles written by European observers. White observers highlighted the strenuous power struggles and economic inequalities alongside racial disparities. They recognized that the Haitian Revolution was not simply a conflict between French plantation owners and their slaves; rather it was a conflict with constantly dynamic opponents. As conflict unfolded, observers tended to shift towards viewing the war as a struggle for economic equality and control. Thus, a conflict that might initially appear on the surface to be only about race was actually a complex and dynamic power struggle that had economic and political inequalities at its core.

Nitrogen Use Efficiency across Soil Fertility Treatments in Cultivated Sunflower

Becca Sussman, CURO Research Assistant
Dr. Lisa Donovan, Plant Biology, Franklin College of Arts and Sciences

Cultivated sunflower, or *Helianthus annuus L.*, is heavily dependent on access to nutrients for proper growth, with Nitrogen being one of the main limiting nutrients available for sunflowers. Sufficient N treatments have been found to increase crop productivity and yield. In our study, we examined how nutrient utilization efficiency (NUE) and nutrient acquisition efficiency (NAE) contribute to sunflower productivity. NUE refers to the amount of mass produced in relation to the amount of nutrients the plant obtained. NAE refers to the amount of nutrients the plant obtained in relation to the amount of nutrients available to the plant. Furthermore, we studied root systems and shoot systems separately to differentiate between the harvestable crop and the soil-bound portions of the plant. Plant tissue from 12 diverse lines of cultivated sunflower grown in a randomized complete block design under 4 nutrient treatments were ground and then analyzed for N content. We hypothesized that: roots will contain more nitrogen than shoots under high-fertility conditions; nitrogen allocation between above and below-ground matter will shift with low-nutrient stress, such that the proportion of root:shoot N will decrease; and genotypes with a higher NUE:NAE ratio to perform best under

low-nutrient conditions. From our results, we will be able to inform genetic breeding efforts of low-input sunflower cultivars.

Cognitive Control Differences in Bipolar Disorder in the Presence or Absence of Psychosis

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

Cognitive control is responsible for attention, inhibition, and working memory. Rapid eye movements called saccades have been used to index both the behavioral and neural processes underlying cognitive control. Prosaccade tasks index automatic-like orienting responses by requiring subjects to glance toward a suddenly appearing visual stimulus. Antisaccade tasks index the inhibition of automatic–like orienting responses by requiring subjects to look away from the sudden visual stimulus. Both tasks have been extensively used to study cognitive control deficits in people with psychosis, which are often manifested as higher antisaccade error rates, slower correct antisaccade latencies, and sometimes faster prosaccade latencies. Bipolar disorder can be manifested with or without psychosis symptoms, but it is unclear if deficits in saccade performance by people with bipolar disorder with psychosis also exist in the absence of the same disorder without psychosis symptoms. In this study, healthy comparisons (n=81), people with psychotic bipolar disorder (n=51), and people with non-psychotic bipolar disorder (n=62) completed pro- and anti-saccade tasks. We analyzed the three aforementioned saccade metrics used to index cognitive control in people with psychosis. Differences were assessed with one-way ANOVAs on all three metrics. Preliminary analyses show no significant differences between antisaccade reaction times. Antisaccade error rates in healthy controls were significantly different from both BD-P and BD-NP groups, although BD-P and BD-NP were not significantly different from each other. This indicates that although there are slight disparities in cognitive control between groups, the cognitive deficits between psychotic and non-psychotic bipolar disorder are not significantly different.

Clay Abyss: Underclays of the Şile Region Critical Zone

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

The Şile region of Turkey contains large amounts of economically significant clay deposits used mainly in the ceramics industry. These clays originate from the weathering of the Upper Cretaceous indurated and altered volcanic andesite in the paleo-lacustrine of the region. This research hypothesizes that composition of the plastic underclays will vary along a gradient that transitions from oxidized to reduced zones. Methods employed to measure the clay fraction include X-ray diffraction (XRD) using treatments of sodium (Na^+), magnesium (Mg^{2+}), and potassium (K^+) cation saturations. Saturations were examined using oriented slides in XRD in their air-dried, ethylene glycol, and heated (330 °C) states. Phases identified included quartz, kaolinite, discreet illite, mixed-layer illite-smectite (I-S), goethite, hematite, and bayerite. Simulations using NEWMOD® indicated the I-S is randomly ordered with a greater than 50% smectite. As depth increases in the critical zone below the oxidation front I-S decreases in abundance. There is a loss of smectite and goethite in the reduction zone. The crust layer is goethite-rich underclay, which marks the extent of the weathering front. This study suggests that significant weathering occurred deep under the surface leading to a low abundance of smectite and goethite with depth and the presence of bayerite. Greater concentrations of I-S were found to occur in the oxidized zone compared to the reduced zone. The suitability of the clays for industrial ceramic applications may therefore be influenced by the extent of modern post-depositional alteration in the critical zone.

Effects of Condense Tannins from *Lespedeza cuneata* on Oxidative Stress in Horses

Cody Alan Swint
Dr. Kylee Duberstein, Animal and Dairy Science, College of Agricultural and Environmental Sciences

Gaining popularity due to its anthelmintic effects in small ruminants, sericea lespedeza (*Lespedeza cuneata*) is becoming increasingly common and more readily available on the feed market. Sericea lespedeza is a legume that, when harvested correctly, has a high nutritive value. It is believed to have high levels of condensed tannins, which is what most researchers think causes the anthelmintic effects in small ruminants. Health benefits from lespedeza, such as reduced oxidative stress and treatment of inflammatory conditions, have been documented in humans. As well as the health benefits shown in humans, sericea lespedeza has a nutrient profile comparable to other high quality equine forages, and may prove to be advantageous as a feed source if it is able to reduce oxidative stress in performance horses. The objective of this study was to determine if incorporating sericea lespedeza hay into equine diets improved antioxidant capacity and reduced oxidative stress in response to a bout of moderately intense exercise. Twelve horses were used in a 6 week feeding trial, during which time half of the horses were fed 1% of their body weight daily in sericea lespedeza hay and the remaining six were fed 1% of their body weight daily in Russell bermudagrass. At the conclusion of the feed trial all twelve horses underwent an incremental standardized exercise test (SET). Blood was collected pre and post SET and tested for antioxidant capacity via assaying total, reduced, and oxidized glutathione, as well as markers of lipid and protein oxidation.

Hunting for Homology: The Role of Working Class Pride in Modern Skinhead Subcultures

Ryan Switzer, CURO Research Assistant
Dr. Cas Mudde, International Affairs, School of Public and International Affairs

The skinhead youth subculture has spent nearly fifty years divided. Beyond the classic Neo-Nazi skins popularized in film and news media, the skinhead community boasts an ideologically diverse corps ranging from SHARP (Skinheads Against Racial Prejudice), to apolitical skins, to gay skins, to Christian skins. This multiplicity of internal factions has led scholars to declare that the skinhead subculture has failed in achieving homology. The thinking goes: "beyond classic skinhead fashion and rowdy music, there is little that holds the community together." I argue that the Doc Martens and Oi! music hold the symbolic key to the subculture's homogeneity. Regardless of the skinhead's ideology, their aesthetic displays working class pride. It is the proletariat disposition that holds the skinhead community together. This study captures the multiplicity to the skinhead youth subculture, while identifying the factors that bind them in the contemporary world. In line with post-subcultural theory and Bauman (1998) globalization provokes multi-faceted transformations. The political, economic, and social alienation that led to the original emergence of skinhead subculture is amplified in its modern precarity (Butler 2013). Through an ethnographic, qualitative analysis of scholarship, skinhead biographies, fanzines, online forums and discography I trace the roots of skinhead proletariat pride from its roots in mid-century United Kingdom to its current fragmented state. I conclude by discussing my finding's implications for our understanding of post-subcultural value systems, cross-class alliances and the mission of white nationalist skins. This study adds to the neglected body of literature concerned with the relationship between aesthetics and politics.

Congressional Complexity: Modernizing Financial Legislation

Andrew Michael Teal
Dr. Anthony Madonna, Political Science, School of Public and International Affairs

The Financial Services Modernization Act of 1999 was acclaimed by both Republicans and Democrats as necessary legislation to push America's economy forward. The Act repealed key elements of the 1933 Banking Act (or "Glass-Steagall Act"). However, following the 2008 financial crisis, many politicians and political observers changed their tune and suggested the repeal played a causal role in the financial crisis of

this increased difficulty for members of Congress to participate in the drafting and consideration of the act. This led to a great deal of deference being given to special interests and lobbyists who possess knowledge on this subject. Using a dataset compiled by the University of Georgia Congress Project, I examine all amendments to the Financial Services Modernization Act and other landmark financial reform bills. I argue that the average number of floor amendments offered to these measures has decreased over time. Further, I argue that the few amendments offered are significantly more likely to be offered by Banking Committee members who receive a great deal more in campaign contributions from the financial sector than other members.

Ferrohydrodynamic Separation of Prostate Circulating Tumor Cells

Chase Tenewitz
Dr. Leidong Mao, Electric and Computer Engineering, College of Engineering

Prostate cancer, the second leading cause of cancer death in men, is an uncontrollable propagation of cells in the prostate gland. As a disease that can be treated with the correct therapies, a search for a reliable, accurate biomarker that can predict responses to a treatment has begun. In addition, a need for an accurate biomarker that can provide a prognosis for the patient is needed. Circulating tumor cells (CTCs), cells that are shed from a primary tumor site that travel in the peripheral blood, can provide a marker of prognosis through their enumeration and molecular analysis. Our microfluidic device, which incorporates the principles of ferrohydrodynamics, can be used as a dependable resource to extract the CTCs from blood due to its low-cost, label-free, easy usage, high throughput and high efficiency.
Viability was tested with a control group and a group after cell separation. The separation experiment was conducted using a syringe pump with a flow rate of 100 μL/min with 100 CTCs spiked into 1 mL of blood. The cell separation efficiency was calculated by dividing the number of target cells found after separation by the number of cells spiked in the blood sample. This device successfully separated PC-3 cells at a separation efficiency of 82%. With the biocompatible ferrofluid, the cells remained viable after separation from the WBCs. Because this device is label-free and the cells remained alive, further analysis can be done on the CTCs.

The Contribution of Double Electron Capture Processes to Charge Exchange with Multielectron Targets

Jason Terry, Foundation Fellow
Dr. Phillip C Stancil, Physics and Astronomy, Franklin College of Arts and Sciences

Previous investigations into charge exchange and its applications to X-ray spectroscopy have tended to focus almost exclusively on single electron capture processes. Mounting evidence suggests that ignoring the contribution of double electron capture will yield inaccurate results. Accordingly, charge exchange cross sections for single and double electron capture are calculated using multichannel Landau-Zener theory for the system Ne^{10+} + He. (n,l,n',l')-resolved double electron cross sections are generated then used in conjunction with branching ratios to determine cross sections for double capture with and without autoionization. These cross sections are used to generate X-ray spectra for each of the processes. Results indicate that the inclusion of double electron capture events is important for some collision energies where they can redistribute the cross sections from the intermediate energy states towards both higher and lower energy states.

Studying Gene Flow in *Boechera stricta* to Understand the Impacts of Climate Change

Sunishka Thakur, CURO Research Assistant
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 *Boechera stricta* across elevational gradients, 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. To investigate the extent to which climate change will alter trait

evolution, we have transplanted individuals from across the range into five common gardens. During the growing seasons, we measure fitness and other life history traits and collect samples to quantify morphology. During the academic year, we measure phenotypes on these collections, such as leaf morphology and seed physiology. We then use molecular tools to understand the rate of gene flow across these populations. We will use genome-wide association studies to map QTL (quantitative trait loci) for traits. The question we seek to answer is whether gene flow will promote adaptive responses to climate change by moving alleles from drought-adapted populations from the lower elevations into the higher elevation populations. This is how higher elevation plants could possibly adapt to changes in climate that they will experience in the near future, i.e. a climate similar to the lower elevations. The ultimate goal is to understand whether these plants can keep up with climate change.

Effect of Various Threat Categories on the Spatial Clustering of Threatened Mammals

Sunishka Thakur, CURO Research Assistant
Dr. Patrick Stephens, Ecology, Odum School of Ecology

Studies have found that biodiversity hotspots often include only a small percentage of threatened animals, but a large percentage of all species in the class, for most classes of vertebrates. Further, it has been shown the that there is high congruence among classes of terrestrial vertebrates in terms of spatial distribution of all the species belonging to them, but poor congruence in the spatial distribution of only the threatened species in each class. Based on this observation, it has been hypothesized that a greater congruence among threatened species could be seen if they were grouped according to the major threats affecting them rather than taxonomy. We tested this hypothesis on endangered and critically endangered mammals. The major threat(s) affecting each of these species were identified using the data on the IUCN red list. According to these, the mammals were grouped by categories of "major threats" and by taxonomic group (i.e., orders). We gathered a matrix of pairwise distance between all the species in each category based on the geographic range midpoints reported in the PanTHERIA database. The average of the distances between the range midpoints was taken as a measure of how spatially clustered all the mammals in that category were, in comparison to other categories. The goal was to determine whether mammals showed greater spatial clustering when grouped by source of threat than by taxonomy. We found that there was no significant difference the average spatial clustering of endangered species when grouped via source of threat compared to species grouped by taxonomy. Among sources of threat, species threatened by human showed the greatest spatial clustering (i.e., lowest average distance between the range midpoints of species) indicating that targeted action and awareness at the local and regional level for this issue may yield results that benefit multiple species. Species threatened by habitat loss showed the lowest spatial clustering, suggesting that this is a conservation issue to be tackled more globally.

Discovering the Antimicrobial Effect of the Lactoperoxidase/Hydrogen Peroxide/Thiocyanate System against *Streptococcus pneumoniae*

Rachel Thomason, CURO Research Assistant
Dr. Balazs Rada, Infectious Diseases, College of Veterinary Medicine

We encounter a variety of pathogens each day, and the vast majority, if not all, of people encounter the bacterium *Streptococcus pneumoniae.* While colonization of the nasopharynx in humans is usually harmless, if the bacterium is able to spread to other areas of the respiratory tract a rapid inflammatory response ensues that results in disease. *S. pneumoniae* can result in a large spectrum of diseases such as pneumonia, bacteremia, meningitis and otitis media which collectively makes it one of the leading causes of infectious disease in people of all ages, but is particularly threatening to young children, the elderly, and immunocompromised individuals. Among the many defense systems of the airways, our tracheobronchial epithelial cells express two NADPH oxidases, Duox 1 and Duox 2, proteins that are abundantly expressed and produce extracellular H_2O_2 . Duox1 is part of a three-component system that utilizes lactoperoxidase (LPO) to oxidize thiocyanate (SCN^-) using

Duox1-derived hydrogen peroxide (H_2O_2) in order to produce the antimicrobial anion hypothiocyanite ($OSCN^-$). This system has been shown to inactivate influenza virus and certain bacteria, but no studies have been performed testing this system on *S. pneumoniae*. Our results show that incubating bacteria with the full Duox/H_20_2/LPO/SCN- system compared with bacteria alone demonstrated a strong killing effect. Our objective is to explore the effectiveness of hypothiocyanite produced by the lactoperoxidase/hydrogen peroxide/thiocyanate system in killing *S. pneumoniae*.

Charlie Hebdo: Moral Injury and the Display of Religion in Satirical Press

Chelsea Thorpe, CURO Research Assistant
Dr. David Williams, Religion, Franklin College of Arts and Sciences

On January 7, 2015, terrorists attacked Parisian satirical magazine *Charlie Hebdo*, spurring worldwide panic and curiosity. The shooters were of Muslim background and were affiliated with the Boko Haram terrorist organization. The incident once again brought attention to the manner in which Western minority religions, specifically Islam, are depicted in the satirical press. As stipulated by France's secularism law, displays of any religious symbol, including, among other things, prayer, headscarves, and niqabs, are strictly prohibited in the public sphere. This law forms the backbone to the French constitutional principle of *laïcité*, which describes the absence of religious involvement in government affairs. The 1905 law was originally designed as an attempt at societal integration. But signs of reverse integration materialize as *laïcité* is now viewed as a form of suppression of religious freedom, specifically among religious minorities. With the recent terrorist attacks and modifications to *laïcité*, Muslim communities, in particular, are further marginalized. This research discusses the display of religious symbols in the infamous satirical newspaper *Charlie Hebdo*. If the weekly journal was obligated to the strict principles of *laïcité*, then *Charlie Hebdo* would be banned from publishing any depictions of religion. To investigate further, qualitative analyses of its weekly caricatures and timely releases from European media question the presence of moral injury. Considerable attention is designated to individuals who are marginalized by French society, specifically Muslims, due to increasing legal bans on faith-based practices in the public sphere.

How Does Resource Availability Affect Non-State Armed Group Recruitment?

Chelsea Thorpe, CURO Research Assistant
Dr. K. Chad Clay, International Affairs, School of Public and International Affairs

Ranging from the arid deserts of Sirte to miniscule Polynesian islands, many civilizations, whether or not they reside in conflict zones, have become prone to extremist attacks and violent resource extortion. In order for a terrorist group to successfully expand as an entity that imposes fear, both trustworthy financial and human capital are required to ensure organizational communication and global attention. Similar to a business or large corporation, non-state armed groups must have adequate resources to acquire and maintain covert supply chains through commerce and perhaps financial extortion. When recruiting and gathering resources, however, it is necessary to understand why, unlike a firm, non-state armed groups often use violence as a means of extraction. This answer requires an analysis of the decision-making behind various recruitment methods based on the structure, size, and objectives of each organization. This research uses qualitative and quantitative methods to analyze how geographical location, political regime structure, and technological availability affect the expansion of global terrorist organizations.

Plasticization of Nanocellulose Gel

Taylor Beth Timmons
Dr. Suraj Sharma, Textiles and Merchandising, College of Family and Consumer Sciences

Deriving from wood and cotton, cellulose is the most abundant organic polymer on Earth that is renewable, non-toxic, and biodegradable. Urges to use natural and biodegradable products aren't just coming from innovation, but out of necessity. Looking for alternatives and new research in a wide range of products eliminates ongoing issues and opens the field for future research. Using a high-pressure homogenization process with wood pulp slurry, cellulose is converted from a wood powder into nano-molecular gel. Thus, the

microfibrillated nanocellulose is modified to have plasticizing effects with the addition of the natural plasticizer, glycerin. Based on performance, optimal percentages of glycerin ranged from 10, 20, and 30%. For each of the glycerin plasticizer percentages, the hydrogel material was spin coated onto polyurethane and silicon films. The outcomes were characterized through water contact angle testing, a Scanning Electron Microscope (SEM), and biomedical tests. By adding a plasticizer, this allows for the cellulose based nano-composites to be used as coatings on catheter tubing to reduce biofilm formation. These biofilms cause infections through a buildup of bacteria in the tubing. Applying a thin coating of nanocellulose and glycerin plasticizer onto a catheter lead to reductions in biofilm formation. The adaption of cellulose turned a waste product into a non-toxic, biodegradable nanomaterial with biomedical applications.

Mapping Diverse Bicycling Experiences in Athens, GA

Sam Tingle, Foundation Fellow, CURO Research Assistant
Stephen Jordan
Dr. Jerry Shannon, Geography, Franklin College of Arts and Sciences

This study maps areas of Athens-Clarke County (ACC) that need bike infrastructure improvements while also providing a representative account of the diverse biking experiences of Athens, Georgia residents. 20-30 semi-structured interviews and cognitive mapping exercises will be conducted with bicyclists throughout the community. Narrative and GIS analysis will then be used to digitize and georeference these cycling experiences to produce geospatially accurate maps displaying pertinent data. ACC is lacking the comprehensive and representative data necessary to develop an equitable bike master plan. This study will assimilate quantitative and qualitative data representative of Athens' diverse biker subsets to better inform the ACC Bike Master Plan Committee.

The Effects of Type 1 Diabetes on Skeletal Muscle Endurance

Bethany Toney, CURO Research Assistant
Riley Jenkins
Dr. Kevin McCully, Kinesiology, College of Education

Type 1 diabetes (T1D) is an autoimmune disease affecting carbohydrate metabolism, which may alter muscle endurance. The effect of T1D on skeletal muscle endurance is currently unknown. The aim of this study was to measure muscle endurance in participants with a diagnosis of T1D and controls. The wrist-flexor muscles of participants with T1D (n=12) and controls (n=12) were electrically stimulated at frequencies of 2, 4, and 6 Hz for 3 minutes at each frequency. Muscle movement was measured with an accelerometer and analyzed with a custom MATLAB routine. Overall health of participants was assessed using an HbA1c test, casual glucose test, and adiposity measurements. T1D participants with an HbA1c of 7.3$\pm$0.8% were 20.8$\pm$2.2 years and had a BMI of 25.9$\pm$3.1. Controls with HbA1c of 5.2$\pm$0.4% were 20.8$\pm$0.4 years and had a BMI of 23.3$\pm$3.3. Adipose tissue measurements were 0.58$\pm$0.19 cm for T1D participants and 0.43$\pm$0.08 cm for controls. The endurance indexes were not different between T1D and controls ($P>0.05$ for all comparisons). Endurance indexes at 2, 4, and 6 Hz were 94.4$\pm$4%, 83$\pm$7.8%, and 69.5$\pm$14.8% for T1D and 95$\pm$3.9%, 87.6$\pm$6.2%, and 68.6$\pm$14.9% for controls. The hypothesis was not accepted that young people with well-controlled T1D had reduced muscle endurance compared to similar controls. Future studies could be performed on TID participants with moderate to poor control to determine the effect of blood glucose control on muscle endurance.

Emotional Modulation of the Late Positive Potential

Rebekah Trotti
Dr. Brett Clementz, Psychology, Franklin College of Arts and Sciences

The late positive potential (LPP) is an enhanced positive component of an event-related potential (ERP) elicited by emotional stimuli after 300ms. The LPP is sustained over the entire stimulus viewing window and continues after stimulus offset. This increased positivity reflects the allocation of neural resources to appetitive and defensive motivational stimuli. For this study, researchers used electroencephalography to record

ERPs while participants viewed unpleasant, pleasant, and neutral pictures from the International Affective Picture System. ERPs were elevated for unpleasant and pleasant stimuli from 500ms after stimulus onset to 250ms after stimulus offset at frontocentral and centroparietal scalp locations, indicating that the brain responds preferentially to emotional stimuli. Unpleasant and pleasant ERPs did not significantly differ, suggesting that the LPP is not valence-specific, but indicates processing of motivational picture content. Overall, these data demonstrate motivated attention in the brain.

Effects of Gender and Race on Speed and Accuracy of Facial Recognition

Skyler Tuholski, CURO Research Assistant
Samrina Jamal, Katie Lee, Nidhi Thiruppathi, Abby Thomas
Dr. Janet Frick, Psychology, Franklin College of Arts and Sciences

Gender and race of both viewer and target have been explored in the context of facial recognition accuracy, but factors predicting individual variability have not been as well investigated. Overall, women perform better than men in face recognition in terms of both accuracy and reaction time; women also display an own-sex advantage for recognition of female faces. In terms of race, it has been shown repeatedly that both males and females are better able to recognize faces of their own race when living in an area with a strong racial majority. In this study, we analyzed patterns of short term visual memory for both adult male and female Caucasian and Asian faces among male and female college-aged participants, using both accuracy and reaction time as measures of performance. We created a standardized experiment that contained a reaction time task and a short-term memory task, which consisted of blocks of white female, white male, Asian female, and Asian male faces presented in a random order. Preliminary data suggests that accuracy of both male and female participants is lessened, and reaction time is increased, when analyzing faces of another race. Additionally, our initial data supports our hypothesis that females show greater accuracy in recognizing female faces in either race condition, whereas males do not exhibit an own-sex advantage. These findings may have implications for understanding individual differences in factors underlying facial recognition and discrimination.

The Price We Pay: Analyzing the Over-Incarceration of Low-Level Juvenile Offenders in Georgia

Hannah Turner
Dr. Georgia B Calhoun, Counseling and Human Development Services, College of Education

This research explores the high rate of incarceration among low-level juvenile offenders in Georgia. Primarily, this work aims to answer what policy solution would effectively reduce incarceration rates while also befitting the juvenile offender and the public in general. Low-level offenders are youth who have committed minor crimes, yet face substantial damage to their future educational, employment, and mental health outcomes as a result of the time they are forced to spend in detention facilities. In addition, continuing to incarcerate children who arguably pose no threat to public safety costs taxpayers hundreds of thousands of dollars each year. A review of the literature revealed that many of these children are detained because there are few community-based sentencing options across the state that could mitigate the root causes of delinquency while keeping youth at home. To address this issue, I propose three different policy alternatives that each focus on increasing access to sentencing options within the community. The first would establish a state-wide grant program to fund mental health care for juvenile offenders, the second involves creating nonprofit networks to better serve youth doing community service, and the third requires each county in Georgia to adopt two community-based sentencing options. After considering the efficacy, feasibility, and cost-effectiveness of each alternative, the creation of nonprofit networks emerged as the best policy to reduce the number of low-level juvenile offenders currently incarcerated in Georgia.

Shedding Light: A Study of Light Pollution on the UGA Campus

Narissa Turner, CURO Research Assistant
Dr. Puneet Dwivedi, Forestry, Warnell School of Forestry and Natural Resources

Light pollution is the fastest growing pollution worldwide; however, many people are not aware of the adverse impacts of light pollution. Therefore, in this study I wish to identify the awareness level of UGA students about light pollution and attempt to determine the consequences of light pollution on the health of UGA students. I will also explore ways to reduce waste related to light pollution on the UGA campus. The data needed to successfully complete the first two objectives of the project will be collected using two different surveys. In the first survey, I will randomly survey 120 students in the Tate student plaza to determine their awareness level about light pollution. In the second survey, I will survey an additional 50 students living in UGA Housing to determine any adverse health impacts of light pollution. For the third objective, I will use the database maintained by UGA's Architect Office to define waste related to light pollution on the UGA campus. I hypothesize that the awareness level of students about light pollution will be low as the topic is very novel in nature. I also hypothesize that students living on campus may self-report several health-related issues which could be easily attributed to light pollution. Ultimately my goal for this project is to increase awareness about light pollution and to create opportunities for UGA to reduce waste related to light pollution.

Applicatives in Southern English

Nicholas Twiner, CURO Research Assistant
Dr. Vera Lee-Schoenfeld, Germanic and Slavic Studies, Franklin College of Arts and Sciences

This paper looks at three sentence types: Double Object Constructions (DOCs); Benefactive Constructions; and Subject Co-Referential (SCR) applicatives, demonstrated as follows: John gave Mary the book; John baked Mary the cake; and John caught him a fish. DOCs must have two objects following the verb. Benefactives and SCRs have optional objects (John baked a cake) which are introduced to sentences by silent components which compound with the verb. I seek to clarify the case assignments in these sentences. Every noun needs case; otherwise, the sentence will not satisfy the requirements for an acceptable sentence. There are two types of case: structural and nonstructural. Structural case is assigned to the subject, nominative, and to one object, accusative. Another silent verbal component called Active Voice assigns accusative. Accusative is not assigned in passive sentences because it lacks Active Voice. This diagnostic shows if cases are structural. Nonstructural cases are assigned via unique verbs or because of objects' roles in the sentence. The questions then remain: what assigns case to the direct object in the three sentences; and, for verbs like bake, which do not need an indirect object, what accounts for the alternation in case? Sometimes the direct object is structurally marked (The cake was baked), but sometimes the indirect object is structurally marked (Mary was baked a cake). I argue these constructions rely on nonstructural case. For DOCs, case is assigned by DOC verbs. For benefactives and SCRs, the functional component provides this case.

An Investigation of RIN4 Phosphorylation in Plant Immunity

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

RPM-Interacting Protein 4 (RIN4) is an essential regulator of plant defense in the model *Arabidopsis* - *Pseudomonas* pathosystem. This protein performs its role by activating both effector- and pathogen-associated molecular patterns (PAMP)-triggered immunity (ETI and PTI) by being phosphorylated. Current work in our lab has identified two kinases that interact with RIN4. The research being conducted seeks to understand the mechanisms behind the interaction of each kinase with RIN4 by examining if phosphorylation will occur at specific residues on the protein. It was hypothesized that elimination of RIN4 phosphorylation will inactivate its immune signaling function, rendering plants susceptible to pathogen infection. The research will be conducted by first performing an in-vitro kinase assay. Then, to elucidate the role of RIN4 phosphorylation, we will assess the presence of the hypersensitive response (HR) by co-infiltrating a bacterial effector and RIN4 phosphomimetic proteins into the plant *Nicotiana benthamiana*. The results of the experiment will allow us to understand how these two kinases interact with RIN4 to elicit the plant's defensive functions against an infection. With the knowledge from the results, the mechanism behind RIN4's plant

immune regulation and the protein's significance during the regulation will be determined.

The Ciliary Gliding Motility in Eukaryotes

Rachel Vaizer
Dr. Mark Farmer, Cellular Biology, Franklin College of Arts and Sciences

The ability of cells to move through their environment is one of the most ancient attributes of living cells. One way in which cells can move is through ciliary gliding, which is thought to be both ancient and highly conserved, even among human cells. Developing an understanding of the mechanism of ciliary gliding in Euglenid flagellates may help us understand this basic mechanism in other cells. This study is designed to determine the relative positions of two ciliary structures, the paraxial rod (PAR) and axoneme, relative to a substrate. The Euglenid cilium has an asymmetrical formation of the paraxial rod, a lattice-like fiber that extends the length of the cilium, and the axoneme, which has a 9+2 arrangement of microtubules. This unique formation allows us to study the potential orientation of the cilium relative to a substrate while an organism is gliding. To find which axonemal microtubular doublets are associated with the motive force responsible for pushing and pulling the cell, specimens will be prepared for and examined using transmission electron microscopy. This will enable us to determine the relative positions of ciliary structures relative to a substrate.

Understanding the Role of Social Determinants in Drug Overdose Deaths in Georgia

Christina Valentini
Dr. Jayani Jayawardhana, Clinical and Administrative Pharmacy, College of Pharmacy

Georgia has experienced an exponential increase in drug overdose deaths. Specifically, the number of deaths due to opioids and heroin has increased dramatically in Georgia within the last decade. However, the impact of social determinants on disparities in drug overdose deaths is not clear. Certain demographic groups could be adversely affected by this public health epidemic. While many studies have explored national trends of drug overdoses, few have specifically considered the epidemic in Georgia. This research examines the impact of social determinants on drug overdose deaths in Georgia. We use county-level drug overdose death data from the Georgia Department of Public Health's Online Analytical Statistical Information System (OASIS) for the analysis. Additional data on population demographics, poverty level, median household income, and geographical variation (rural/non-rural) are gathered from the US Census Bureau. Analysis data sample includes 2,703 observations from all 159 counties in Georgia from 1999-2015. Both descriptive analyses and regression analyses will be conducted to determine the role of social factors on drug overdose deaths in Georgia due to all drugs, opioids, and heroin. The results of this study will highlight the variations in drug overdose deaths across multiple social determinants in the state. The findings will help identify public health policy interventions that address the social determinants that are contributing to this public health priority in Georgia.

Investigating the Grindability of Woodchips at Varying Torrefaction Temperatures

Ian E Van Giesen, CURO Research Assistant
Dr. Sudhagar Mani, Chemical, Materials, and Biomedical Engineering, College of Engineering

Torrefied woody biomass, a promising alternative to coal, has great potential to be used in co-firing coal applications, however, a rigorous analysis of the energy required to grind the torrefied material is needed determine the economic feasibility of the alternative fuel. This study investigated the grindability of woodchips torrefied at four different torrefaction temperatures. Higher torrefaction temperatures increased heating values, but decreased the woodchips' durability. Lower durability woodchips require less energy to be ground, but are susceptible to deterioration and subsequent loss of material during transportation. The obtained results will be beneficial for producing a fuel whose characteristics are most similar to coal.

Adapting a CRISPR-Cas System into a Novel Gene Knockdown Platform

Nikita Vantsev, CURO Honors Scholar, CURO

Research Assistant, CURO Summer Fellow
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 an integration of spacers into the CRISPR array of the host genome to generate a heritable record of the invasion. 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 focuses on utilizing the invader silencing complex of Type III-A CRISPR-Cas systems to design efficient gene expression suppression tools. In vivo expression experiments of the full and reduced complexes in *E. coli* bacteria coupled with Northern Blot analysis demonstrated that Type III-A CRISPR-Cas complex was capable of efficient RNA cleavage.

Association between Ankle Sprain History and Current Ankle Sprains in Collegiate Club Sports Players

Alyssa Varsalona
Dr. Cathleen Brown Crowell, Kinesiology, College of Education

Research suggests that ankle sprains are the most common sports-related injury, and players with a history of ankle sprains are likely to sustain recurrent ankle injuries. The purpose of this study was to determine if an association between previous ankle sprain history and current ankle sprains exists among a population of collegiate club rugby and ultimate Frisbee players. Participants self-reported previous injury history prior to the competitive season and submitted weekly surveys to document practice time and injuries that occurred during the previous week. University of Georgia's club rugby and ultimate frisbee players who had sustained any injury during the 2015-2016 school year were included in the analysis (n=30; 15 male, 15 female; age=20.6±1.7yrs, height=172.5±9.0cm, weight=75.0±17.4kg). Association between ankle sprain history and current season ankle sprain was computed using a Phi coefficient. Of the 30 participants, 12 (40%) reported having sustained an ankle sprain in the past, while 8 (26.7%) reported a current season ankle sprain. A statistically significant weak-to-moderate positive association was observed between ankle sprain history and current season ankle sprains (Φ=0.59, p=0.001). The strength of the association was likely a result of the small sample size. Confounding variables may exist, although they were not accounted for in this analysis. Based on the data obtained, we can conclude a weak-to-moderate positive association between the two variables is present, but cannot determine causality of the recurrent ankle sprains. Further research is necessary to conclude ankle sprain history is directly predicative of recurrent ankle sprains.

Structural Insights into the Role of [2Fe-2S] Clusters in Bacterial Ferrochelatases

Sheena Vasquez, CURO Research Assistant
Dr. Harry Dailey, Microbiology, Franklin College of Arts and Sciences

Heme is an essential cofactor of various enzymes in organisms. It is a key compound for several biological functions such as drug and hormone metabolism and oxygen transport throughout the cell. When the biosynthesis of heme is disrupted, the buildup of its precursors has been shown to cause genetic diseases known as porphyrias. Ferrochelatase is the terminal enzyme in the heme biosynthetic pathway that inserts ferrous iron into the porphyrin ring to make the complete protoheme compound. Human ferrochelatases are known to contain an [2Fe-2S] cluster; however recent studies have shown that bacterial ferrochelatases contain this cluster, as well. In addition, there are at least three different motifs hypothesized to coordinate the iron-sulfur cluster in these enzymes. The reason for mammalian and bacterial ferrochelatases containing this cluster is unknown. Therefore, the goal of this project is to provide structural evidence for how the [2Fe-2S] clusters are coordinated by the various motifs in these enzymes. Ferrochelatases from *Ruegeria pomeroyi*, *Myxococcus xanthus*, and *Caulobacter crescentus* were used for investigations.

Furthermore, techniques such as protein purification and crystallography were used. Initial crystal conditions were obtained for the ferrochelatases, and optimization experiments under these conditions are being actively conducted to produce high quality crystals for X-ray diffraction. These findings will provide insight into the coordination and purpose of the [2Fe-2S] clusters in bacterial ferrochelatases.

The Effect of Insulin Dysregulation and Breed on HPA Axis Function and Plasma Cortisol Binding Dynamics in Ponies and Horses

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

Mechanisms resulting in breed predispositions to insulin dysregulation (ID) and endocrinopathic laminitis are poorly characterized. The adrenal steroid cortisol antagonizes insulin, and free, biologically active cortisol can be increased in ID. Breed-related differences in serum free cortisol fraction (FCF) could contribute to ID in pre-disposed breeds such as ponies, but FCF has not been quantified in ID-predisposed-breeds. The objective of this study was to compare FCF between horses and ponies during health and ID. We hypothesized that: in health, FCF is higher in ponies than horses; and FCF is further increased in ponies with ID. Serum total cortisol (TC), ACTH, FCF and insulin were measured in 36 horses (age 1-24 years) and 31 mixed-breed ponies (age 4-27 years). Animals were sampled before morning feeding in their normal routine, and ID was defined as fasted insulin > 20 μIU/ml or non-fasted insulin > 60 μIU/ml when sampled on pasture. Data were compared with Mann-Whitney tests and Spearman correlation analysis ($P<0.05$). TC and FCF were comparable in healthy horses and ponies, but ACTH and insulin concentrations were 1.3-1.6-fold higher in ponies ($P=0.001$-0.041). In animals with ID, TC was similar but FCF and insulin were increased 1.6-fold and 3.2-fold respectively in ponies ($n=9$) compared to horses ($n=11$, $P=0.01$-0.049), and FCF and insulin were positively correlated ($P=0.04$, $r=0.45$, 95%C.I=0.014-0.746). These data demonstrate differences in hypothalamic-pituitary-adrenal axis function during health and ID between ponies and horses. Further study is needed to determine if and how such alterations impact insulin regulation and, ultimately, laminitis risk.

Computational Investigations of He-HD Collisions in the Interstellar Medium

Clark Goodman Veazey, CURO Research Assistant
Dr. Phillip C Stancil, Physics and Astronomy, Franklin College of Arts and Sciences

When conducting an examination of distant astronomical objects, scientists rely on measurements derived from astronomical observations of these objects, primarily using spectroscopy. The most obviously available data is in the form of radiation being transmitted to us from the source at the speed of light. Ideally we can interpret these incoming photons, which are emitted by charged molecules interacting throughout the interstellar medium, to generate accurate data detailing the way that these molecules are behaving, giving astronomers insight into the temperature and therein the energy of the source object. Seeing as most of the observable infrared radiation in the universe is emitted by molecules excited by collisional processes in the interstellar gas, generating accurate data on the rate of molecular collisions is of salient interest to astronomical endeavors. The collisional system we will be focusing on here is He-HD, an atom-diatom system in which He (Helium) collides with HD (Deuterium-Hydride). We are primarily interested in the cooling capabilities of this system, as these species are predicted to have played an important role in the formation of primordial stars, which emerged from a background composed solely of Hydrogen, Helium, and their compounds. Using an adaption of a public-domain scattering package known as molscat, cross-sectional areas of He-HD collisions are computed for a swathe of rotational and vibrational states across a range of relevant kinetic energies, then integrated to produce rate coefficients. In this research, the resources being utilized are the UGA GACRC z-cluster, and the Cray-XC/40a 30 peta-flop machine at NERSC.

Reducing and Preventing Sexual Assaults on Georgia College Campuses

Eashaa Velamuri

Dr. Chris Linder, Counseling and Human Development Services, College of Education

This policy research looks at the prevalence of sexual assault on college campuses within the University System of Georgia. It questions what is being done to combat sexual assault on these campuses and what could be done. This research goes on to develop policies to reduce and prevent the number of incidences of sexual assault at these Georgia schools. Through a literature review, some common themes were found as to why sexual assault occurs on college campuses and the effects of these sexual assaults on the victims of the attacks. Specifically, past research has shown that much of the problem stems from a lack of transparency within sexual misconduct policies and sexual health and violence prevention education. In addition, the short history of sexual assault policy and long history of "rape culture" on college campuses allows for more sexual violence perpetration. To address these issues, I created three policy alternatives, which include: amendments to the Sexual Misconduct Policy developed by the Board of Regents, introduction of a course on sexual violence prevention in 8th and/or 9th grade, and the creation of more consistency within the Clery Act. After comparing the different policy alternatives against the status quo and measuring the effectiveness, cost and benefits, and feasibility of each, I determined that the best policy alternative is to amend the current Sexual Misconduct Policy as it directly affects how sexual misconduct cases on college campuses are dealt with and thus would have the most immediate impact on victims of sexual assault.

Influence of Air Pollution and Socioeconomic Factors on Chronic Obstructive Pulmonary Disease (COPD)

Siva Venkatachalam, CURO Research Assistant
Dr. John L Gittleman, Ecology, Odum School of Ecology

The World Health Organization predicts COPD to be third leading cause of death worldwide by 2030. Therefore, it is important to find out the factors affecting the spread of COPD. This project focuses on how complex patterns of air pollution, disease mortality of COPD, and socioeconomic factors (GDP per capita/number of physicians) are related to one another. Using statistical analysis, I have depicted the correlation between each variable from the database and identified potential factors underlying their relationship. I used a statistical software (.JMP, regression, and PATH analysis), WorldBank data, and predictions from literature to identify if pollution levels correlate to a higher COPD mortality rate while socioeconomic factors make a negative impact on the spread of COPD. There was a significant, positive correlation between pollution levels (CO_2 emission) and COPD mortality rates. There was an even stronger positive correlation between GDP per capita and the rise in pollution. A potential explanation for this is that mainly urban cities with high GDP and population density often have higher pollutant levels (ex: Beijing, Mumbai, NYC) causing a positive relationship between pollution and per capita. Interestingly, there was even a stronger negative correlation between COPD mortality rates and GDP. Countries with higher GDP levels have a better quality of healthcare (higher number of physicians) which allow for less mortality rates in COPD. In conclusion, the medical community should target different types of air pollutants to prevent the spread of COPD and study COPD causes on a local level.

Visualization of Lung Inflammation

Mayank Verma, CURO Research Assistant
Dr. Ramana Pidaparti, Environmental, Civil, Agricultural, and Mechanical Engineering, College of Engineering

The stochastic nature of cells makes it difficult to understand how certain pulmonary diseases such as asthma cause inflammation within the bronchial tubes. Since in vivo analysis is a challenging task, simulation-based modeling is fruitful in many cases in understanding the processes occurring at the cellular level. Cellular Automata (CA) based simulations offer a powerful solution to this problem by giving mathematical identities in the form of rules to these complex biological systems. These rules provide a medium to better understand how certain parameters such as; normalized thickness, normalized air pressure, Young's Modulus, and frequency of the breathing cycle affect the rate of inflammation on the lung tissue. In this study, we will develop rules and simulation frameworks in Java with a touch of

virtual reality to visualize the inflammation process and to acquire its corresponding metrics. Our preliminary sample tests suggest that varying the parameters plays a critical role on inflammation. We plan to extend this work toward a more robust CA simulation framework for various other diseases and inflammation simulations.

An Insight into Organizational Use of Business Process Management Tools and Technologies: An Exploratory Examination

Will Russell Vineyard, CURO Research Assistant
Dr. Dave Chatterjee, Management Information Systems, Terry College of Business

Business Process Management (BPM) is an interdisciplinary systematic approach to creating more effective and efficient workflows to support and empower operational and decision making activities. By employing various tools, techniques, and methodologies, BPM practitioners enable organizational decision makers to see past irrelevant complexities inherent to organizational clutter. This not only allows management to make decisions in a timely and well-reasoned manner, but provides them with a clear and direct way to communicate these decisions to their underlings. BPM practices are universally highly regarded and employed by large corporate firms, but they should not stop there. Through interviewing subject matter experts and reviewing a wide-variety of BPM literature and research, I have come across ways in which organizations in which BPM is not traditionally used stand to reap great benefits if they start engaging in BPM activities. My exploratory findings suggest that organizations of all sizes and purposes stand to benefit from integrating some degree of BPM to their operations, be they a Fortune 500 company or a ten-person non-profit. By doing so, not only will these organizations discover ways in which they can operate more efficiently and effectively, but they also might even provide new insights for BPM in the corporate world.

A Phylogenetic Analysis of *Pyractomena* Fireflies

Garrett Vollino
Dr. Kathrin F Stanger-Hall, Plant Biology, Franklin College of Arts and Sciences

Firefly species around the globe are known for emitting a wide variety of light colors; however the North American genus of *Pyractomena* displays the largest variation ranging from green to orange. In addition, very little is known about their evolutionary history or what factors determine the different distributions of the 16 *Pyractomena* species across North America. Using DNA extracted from 1-3 legs of individual firefly specimen this research study will generate the first *Pyractomena* phylogeny for 10 species with DNA grade specimen (based on three separate protein coding genes: mitochondrial COI and two nuclear genes WG and CAD). This phylogeny will be utilized with biogeographical data for a phylogeny-based analysis of biodiversity and for testing of evolutionary hypotheses on signal evolution in *Pyractomena* fireflies.

Exploiting CRISPR/Cas Genome Editing System in Ciliogenesis

Catherine Waldron, CURO Research Assistant
Dr. Jonathan Eggenschwiler, Genetics, Franklin College of Arts and Sciences

Dysfunction in ciliary processes can lead to a wide range of ciliopathies, which can be further studied and corrected for medical purposes. The overall goal is to study the regulation of ciliogenesis through investigation of proteins that are known to have a role that is not yet understood. The ciliary proteins we are investigating include intraflagellar transport (IFT) proteins, motors, and regulatory proteins that play a part in regulating the primary cilia. The specific genes of interest are Atat1, Kif7, CCRK, IFT122, and Bbs8. To investigate the roles of these genes, we used the CRISPR/Cas genome editing system and a Cre-LoxStopLox (LSL) transcriptional cassette to induce reversible mutations in the target genes. Generation and insertion of the LSL/Homology cassette into the mIMCD IFT88YFP cell line was successful. This will lead to further phenotypic analysis at the mechanistic level by observing the effects on the ability and rate of intraflagellar transport within the overall structure of the cilia.

Mapping and Modeling Hotspots of Schistosomiasis

Joseph Walker
Dr. John M Drake, Ecology, Odum School of Ecology

Schistosomiasis is a water-borne parasitic disease caused by flatworms of the genus *Schistosoma*. These parasites infect over 200 million people each year, mostly children living in rural Africa. Although Schistosomiasis is usually not lethal, chronic infection can stunt physical and cognitive development and hinder productivity at school and work. In 2010, the Schistosomiasis Consortium for Operational Research and Evaluation (SCORE) began conducting longitudinal studies in Tanzania, Niger, Kenya and Mozambique on the efficacy of Mass Drug Administration (MDA) for controlling the parasite. Investigators observed that some "responder" villages were able to significantly reduce the prevalence of Schistosomiasis by the end of the study period, while other "hotspot" villages experienced comparatively little change in prevalence. The goal of our work was to identify which factors influence the change in Schistosomiasis prevalence among Mozambique study villages. To accomplish this, we trained boosted regression trees on environmental and survey data associated with 120 of the 150 SCORE study villages in Mozambique. We then applied the resulting model to the remaining 30 villages in order to evaluate our prediction ability. Although our model was relatively successful at explaining the change in prevalence for the training villages (Pearson R^2 of 0.69), we were unable to make accurate predictions on the withheld test villages (Pearson R^2 of 0.03). In addition to our modeling work, we have created maps of all SCORE study villages in Tanzania, Kenya, Niger, Mozambique and Côte d'Ivoire.

Comparison of Female and Male Lone Star Tick Microbiomes in Watkinsville, Georgia

Lily Victoria Lee Wang
Dr. Travis Glenn, Environmental Health Science, College of Public Health

Ticks are vectors of many different diseases; however, we currently lack details of where, when, and how these diseases are distributed among ticks. By studying the population structure of tick microbial communities, we may be able to track the spread of pathogens by ticks and have a better idea of which pathogenic bacteria are able to co-infect ticks and at what proportions. I characterized the microbiomes of three sets of female and three sets of male lone star ticks collected on different dates from the same location near Athens, Georgia. I extracted DNA from 70 ticks, amplified 16S rDNA, which is specific to bacteria, and obtained an average of 12550 sequences per tick. I then searched for matching 16S sequences from a database of most known 16S sequences and putatively detected *Coxiella*, *Rickettsia*, and *Ehrlichia*. I tested for differences in the prevalence of these pathogens among each set of ticks. The results show that female lone star ticks had a significantly higher proportion of *Coxiella* in their microbial community than male lone star ticks ($p < 0.01$), leading us to conclude that female lone star tick microbiomes are significantly different from those of their male counterparts. Although additional studies characterizing more ticks are necessary to confirm my findings, this study provides a foundation for future studies relating to the population structure of pathogens in lone star ticks.

Identification of Vaccine Misinformation Online

Jonathan Waring, CURO Research Assistant
Prof. Shannon Quinn, Computer Science, Franklin College of Arts and Sciences

Vaccination provides the most effective method of preventing infectious diseases. While vaccine safety and efficacy has been widely studied and verified, there is still opposition from the anti-vaccine movement. It has led to vaccine hesitancy, which is defined as a delay in acceptance or a refusal of vaccine services. It is an ever-growing and constantly changing problem that needs constant surveillance. The internet plays a large role in disseminating vaccine misinformation to a large number of people, which contributes to the vaccine hesitancy problem. In order to combat the spread of misinformation online, it is important to first recognize true facts from false ones. We attempt to develop a machine learning strategy using natural language processing (NLP) that allows one to identify misinformation in vaccine-

related webpages. This will be accomplished through the use of the low-dimensional document embedding algorithm, Doc2Vec. Through the use of semi-supervised learning, we take a small sample of manually labeled vaccine webpages and a large amount of unlabeled vaccine webpages, and attempt to classify misinformed webpages from accurate ones. Doc2Vec also provides methods for determining how semantically similar two documents may be, which can be used to determine what makes a vaccine webpage misinformed. The results of this study could enable both public health practitioners and the general public to monitor vaccine misinformation online in order to reduce vaccine hesitancy and identify strategies to improve vaccine education.

The Expression of the Duffy Antigen Receptor for Chemokines in the Triple Negative Breast Cancer Cell Line, HHC1806

Lauren Taylor Wassel
Dr. Melissa B Davis, Genetics, Franklin College of Arts and Sciences

The Duffy Antigen Receptor for Chemokines (DARC), also known as Duffy or ACKR1, is a seven transmembrane atypical chemokine receptor present on a variety of cell types in the human body. DARC is considered an atypical receptor for two reasons. First, rather than being a signaling receptor, DARC acts as a chemokine sink to reduce the concentration of chemokines in circulation, indirectly influencing the migration of immune cells. Second, DARC is able to bind more than twenty different chemokines in two distinct structural classes, CC- and CXC-, which allows for its description as a promiscuous chemokine receptor. DARC has two distinct protein isoforms that are expressed differentially. This study follows isoform B, which differs from isoform A in the first 7 amino acids at the N-terminus of the protein, making up part of the extracellular binding region. Isoform B was overexpressed through transient transfection in the triple negative breast cancer (TNBC) cell line, HCC1806, to detect differential chemokine binding between the two structural classes. Overexpression was quantified using qPCR, and co-localization with chemokines from the two classes was completed with immunofluorescence imaging of DARC with CCL2 or CXCL8, two known ligands. Future studies will look at the binding affinities of these two chemokines to the different isoforms of DARC, in addition to investigating these interactions in cell lines representing other molecular subtypes of breast cancer.

Derivation of Aerosol Optical Depth and Total Column Ozone via DOBSUN Instrument

Nicholas D Weinand, CURO Research Assistant
Dr. Geoffrey D Smith, Chemistry, Franklin College of Arts and Sciences

Currently, most atmospheric components are measured using expensive, stationary or satellite-based instruments, limiting when and where valuable measurements, potentially elucidating changing climate conditions, can be made. Utilizing an Arduino microprocessor, an RGB color sensor, two UV analog sensors, and various pairs of UV-range band-pass filters, the DOBSUN instrument was designed to easily and inexpensively calculate aerosol optical depth (AOD) over three wavelengths of light, and derive total column ozone (TCO), both important measures of differing atmospheric components. Calculated AOD values were compared to NASA AERONET calculations, with previous measurements producing an average difference of 28% for the red wavelength (612nm), 34% for green (542nm), and 28% for blue (468nm). The DOBSUN calculated TCO values, derived from measuring the differing intensity of UV radiation at two different wavelengths, were compared to NOAA Brewer instruments, and differed on average by roughly 300%. Current efforts are being made to design an instrument case that would allow for a more standardized data retrieval method, theoretically increasing the accuracy of extrapolated factors used to calculate AOD and TCO. For additional comparison with theoretically accurate instruments, DOBSUN AOD measurements are being compared to those made by the Sun and Sky Monitoring Station, an established, inexpensive, sun photometer. Further development of the DOBSUN instrument could allow for its introduction into nearby middle or high school classrooms, as a means of introducing atmospheric science to younger students, while

producing accurate and valuable atmospheric data at a variety of locations.

Needs Assessment to Assess the Use of a Mobile Food Pantry in the Child Care Setting

Camaria Moné Welch, CURO Research Assistant
Dr. Caree Jackson Cotwright, Foods and Nutrition, College of Family and Consumer Sciences

Childhood obesity is a major public health concern. The objective of this study is to conduct a needs assessment to determine if a mobile food pantry and nutrition education intervention will increase fruit and vegetable (FV) consumption and self-efficacy to cook healthy meals. The target audience is early care and education (ECE) stakeholders, parents, and teachers serving low-income children in Northeast Georgia. The needs assessment methodology will include quantitative baseline data collection via surveys related to cooking self-efficacy and attitudes, FV consumption, and an inventory of FV served in the home. Barriers and facilitators to the use of mobile food pantry will be collected using qualitative methods including, key informant interviews, focus groups, and Photovoice. Surveys will be administered to participants in an existing mobile school food pantry with the Food Bank of Northeast Georgia and local ECE stakeholders. Focus groups and interviews will be conducted with ECE center directors, Food Bank managers, ECE teachers, and parents. Photovoice, an approach that combines photography and social action, will be implemented by families to assess their nutrition knowledge, food environment, and overall perception of the use of a mobile food pantry. It is expected that the target audience will have low baseline self-efficacy for consuming and preparing FV. We also expect to gain salient data on planning an intervention to increase knowledge and self-efficacy using a mobile food pantry. 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.

The Sapelo Island Coloring Book

Abigail Elizabeth West, Foundation Fellow
Dr. Chris Joseph, Anthropology, Franklin College of Arts and Sciences

Sapelo Island is home to the only remaining intact Geechee community in Georgia. They are the direct descendants of slaves who bought and settled the land after the Civil War, and while they have managed to maintain much of their cultural heritage, the Hog Hammock community is threatened by loss of land, lack of employment, and an aging population. This research addresses the question: can art be used as a way to draw attention to their struggle to maintain a community on Sapelo? *The Sapelo Island Coloring Book* documents this unique island as it exists today, as seen through the eyes of the artist. While many artists have drawn and painted Sapelo's natural beauty, this book takes a more holistic perspective of what forms a place's identity, depicting places of cultural, historical, and environmental significance. Anyone who colors these pictures is encouraged to think about their narratives and to learn more about Sapelo and the Hog Hammock community. The artist used research methods including spending time exploring the island, observational drawing, renting a room and being immersed in Hog Hammock, chatting with locals, and reading. The coloring books have been well-received by both members of the Hog Hammock community and the public: as of February 2017, over 200 books had been sold. They are being sold in stores on and near Sapelo, in Athens, and online. All proceeds are being sent to the Sapelo Island Cultural and Revitalization Society, whose mission is to preserve and revitalize the Hog Hammock community.

Utilization of Organic Synthesis to Investigate Molecular Organic Frameworks

Aubrey Wheeler, CURO Research Assistant
Dr. Douglas M Jackson, Chemistry, Franklin College of Arts and Sciences

Metal Organic Frameworks, or MOFs, are hybrid 3-dimensional structures consisting of transition metal atoms linked via organic ligands. These compounds are porous and have applications in catalysis, molecular recognition, and separation. This work seeks to develop a metal-organic

framework in an array biocompatible zinc atoms that would connect a set of switchable organic linkers. Molecular switches are molecules which respond to an external stimulus by changing reactivity or configuration. The target molecular switch will be altered by changes in pH and/or ultraviolet light. Synthetic targets for this MOF will require a functional aromatic macrocycle that moves back and forth in a mechanical movement in response to an external stimulus thus altering the function of the structure. Potential applications include drug delivery, for example a drug may be encased in the overall structure, which could then be released only in certain target tissues without harming normal somatic cells. Current work for development of this molecular machine includes a novel synthesis of a mechanically interlocked macrocycle, rod-shaped backbone, and an endcap or stopper for containment along the backbone.

Effects of Pre-Transition Warnings and Contingency Statements on Compliance to Pre-Transition Demands and Problem Behavior

Allison N White, CURO Research Assistant
Dr. Kevin M Ayres, Communication Sciences and Special Education, College of Education

Research suggests that pre-transition verbal warnings alone are not a sufficient intervention in order to decrease latency to comply with transition demand and decrease problem behavior associated with transitions. The current study used an alternating treatment design embedded in a multiple baseline across types of transitions to evaluate effects of different verbal warnings and contingency statements on the latency to comply with demands and problem behavior during transitions. The researchers examined the effects of intervention on 4 elementary-aged students in their self-contained special education classrooms. Researchers collected data on students' latency to comply with transition demands and student-specific problem behavior. The anticipated effects of intervention are a decrease in latency to comply with transition demands and a decrease in problem behavior associated with transitions. The current study provides an evaluation of an easy to use but understudied pre-intervention study.

Hydroxyl Tracing in Diffuse Molecular Clouds

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

In an attempt to determine the extent of "dark molecular gas" in the Galaxy, we have conducted a survey of hydroxyl (OH) in a region containing a low-density molecular cloud. Dark molecular gas is a term given to regions which contain H_2, but may not be detectable with radio spectroscopic tracers. We also seek to determine the overall efficacy of hydroxyl as an indicator of the presence of molecular hydrogen. We observed spectral lines of OH at multiple locations (491 individual pointings in 44 locations) on a grid in a region of the sky where molecular hydrogen had previously been detected. Our data were taken with the 305-m Arecibo radio telescope in Puerto Rico. The spectra were then each analyzed for the presence of OH emission lines. The results of this study should determine the extent of "dark molecular gas" in this region and perhaps be applicable to other regions with low-density molecular clouds. We also aim to determine conclusively whether OH is a better tracer of dark gas than the most common molecular tracer, carbon dioxide.

Two Dimensional Visualization of Higher-Order Relations in Biological Graphs

Matthew Wicker, CURO Research Assistant
Dr. Liming Cai, Computer Science, Franklin College of Arts and Sciences

Data visualization is a powerful tool in scientific investigations. It makes it possible to perceive significance and identify correlations or causalities across a complex system under investigation. While often such relations of data are modeled with graphs, it is quite challenging for a visualization tool to faithfully visualize the higher-order, crossing relations in a graph on a two dimensional medium. In particular, recent research at the UGA RNA Informatics lab has developed a graph model (k-tree) for RNA secondary and tertiary structure, enabling computational prediction of sophisticated nucleotide interactions. The work motivated our research to seek a visual abstraction method for the k-tree that captures

nucleotide interactions in order to evaluate and improve RNA nucleotide interaction prediction before rendering a 3D structure. The objective of our visualization research is to display the data such that we achieve: even distribution in the drawing space, minimal edge crossing, and preservation of any symmetry that exist in the data. After observing the effects of different graphing schemes on k-trees, we have found that force directed algorithms produce the most meaningful abstractions. Initial results in this direction have been encouraging. The use of a constrained Kamada-Kawai algorithm on known RNA tertiary structure allows an accurately represent biological structures. Further constraining this model and expanding into three dimensions should allow abstraction of significant information about RNA molecules based on the k-tree.

Online Activism: The Movement to Combat Honor-Based Violence

Ashley Willard, Foundation Fellow
Dr. Mark Cooney, Sociology, Franklin College of Arts and Sciences

Honor-based violence (HBV), a form of communal sanctioning used to restore familial honor following a perceived transgression, has existed in various male-dominated societies over the course of human history. In 2000, the United Nations estimated the prevalence of honor killings, the most extreme form of HBV, to be 5,000 deaths per year. This number is widely considered to underestimate the true prevalence, as the collective nature of the phenomenon facilitates the concealment of murders as suicides or natural deaths. The regions most affected by HBV are Southeastern Asia and the Middle East. Relatively recently, these practices have spread to the English-speaking world through immigration. A social movement has arisen in response. My research focuses on the development of this movement in the Western world. In a bid to assess the status of the Western anti-HBV movement, I conducted a search of organizations with an English language online presence (n=30, to date). I gathered and coded information on their missions, particularly the division into groups providing direct services to victims and those focusing on disseminating information, their social network involvement, their regional distribution, and the timeline and evolution of the social movement more generally. This research contributes to the sociology of social movements by consolidating fragmented resources and thereby providing an overview of concurrent cross-national activism in response to HBV.

Small Structures in the Magellanic Stream: Cloud-Cloud Interactions

Elliott Williams, CURO Research Assistant
Dr. Robin Shelton, Physics and Astronomy, Franklin College of Arts and Sciences

Our Solar System lies in one galaxy, the Milky Way (MW), 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 and trails behind. The Magellanic Stream (MS) is a structure of mostly neutral and ionized hydrogen gas pulled from the LMC and SMC. It stretches ~100° along the southern polar axis relative to the MW. It is estimated to contribute ~0.4 solar masses of material to the MW per year via diffuse warm gas raining on the halo that has been decelerated enough to fall in. This study investigates the mechanics of small structures in the MS, specifically in dual cloud scenarios, through hydrodynamical simulations. Our simulations look at two clouds at varying distances, one directly downstream from the other, as well as a single cloud simulation, to understand how cloud-cloud interactions affect different processes such as gas infall rate and cloud survival. We will present the physical state of the gas from the clouds including its density and temperature in regions of cloud-cloud interactions. Using results from this study, we hope to aid observations by providing certain identifying characteristics of processes in the MS to better understand the evolution and future of the MS.

Investigating the Function of GABAergic Signaling during Neural Development of Zebrafish

Sydney Williams

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

Γ-Aminobutyric Acid (GABA) is known to be the primary inhibitory neurotransmitter in the adult vertebrate central nervous system. An imbalance of excitatory and inhibitory neurotransmitters can lead to seizure activity in the brain. Glutamate is converted to GABA via the Gad enzyme. The two isoforms of this enzyme are Gad67 and Gad65, encoded by the gad1 and gad2 genes respectively. Like mammals, zebrafish have both known gad genes; however, our lab has recently found evidence for a gad1 paralog in zebrafish. Using the zebrafish model to study these three gad isoforms and the role of GABA signaling is ideal because the animal is transparent and develops ex utero. To further investigate the function of the gad genes and to elucidate the role of GABA signaling during development, we are using CRISPR/Cas9 for targeted mutagenesis. A gad1b -/- mutant has been created in our lab already and we continue working towards making additional novel alleles for the gad genes in the zebrafish through this process. By performing gel electrophoresis and sequencing, we can assay for CRISPR/Cas9 success in inducing mutations in these alleles. Electrophysiological recordings have shown that our homozygous mutant has shown increased and abnormal brain activity as compared to wild-type animals. These experiments can be utilized to address the question of how genetic manipulations in GABAergic signaling affect neural development and neurological activity.

The Effectiveness of US Congressional Committees

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

Committees are known as where bills go to die, but which committee kills the most bills and are there institutional differences between committees? More research in this specific area of study would lead to a better understanding of the most prominent institution in Congress. Through data collection going back to 1999, this study aimed to operationalize each committee by the percentage of bills it was responsible for killing. I gathered data on every bill that was submitted in each congress and tracked which committee it was assigned to. From there, I noted where the bill ended in the legislative process: in committee, in another area (on the floor, Presidential veto, conference committee), or was enacted into law. I compiled the data and broke it down by committee, congress, which party controlled which chamber, and whether or not there was a unified government. A byproduct of this research was the ability to contrast the internal atmosphere of the Senate and House through the comparison between committees with analogous jurisdictions. Thanks to texts such as Fenno's *Congressmen in Committee*, I was able to analyze the results in the larger context of the parent chamber as a whole. I found that the committees dealing with tax policy often killed the most bills while both Appropriations Committees had the best chance of dying in other areas or signed into law. This data can be used to better understand the inner workings of Congress as well as measure the probability of success for future legislation.

Habitat Provision Associated with Environmental Flows

Joshua R Willis, CURO Research Assistant
Dr. Bill Tollner, Environmental, Civil, Agricultural, and Mechanical Engineering, College of Engineering

A comprehensive analysis of environmental flow schemes represents a key step in ensuring adequate water availability to meet increasing human needs while minimizing adverse impacts on aquatic ecosystems. This study investigates how several environmental flow methods affect habitat provision in the Middle Oconee River near Athens, Georgia. Historical discharge data are coupled with water withdrawal simulations for three common environmental flow types to examine trade-offs between ecological and social outcomes (i.e., habitat provision and water withdrawal, respectively). Hydraulic models are applied to translate hydrologic simulations into habitat suitability for three generic habitat types: shallow-fast, deep-fast, and shallow-slow. The availability and distribution of habitats are then analyzed with respect to increasing water withdrawal rates. Finally, we compare the utility of deterministic modeling approaches based on long-term average conditions relative to stochastic modeling approaches using frequency-weighted

outcomes. Our initial results for the Middle Oconee River show that percent-of-flow regimes are most conducive to providing deep-fast habitat while results are mixed for shallow-fast and shallow-slow habitat. Furthermore, our findings indicate that models based on average, annual discharge consistently overestimate total habitat. The analytical methodology and approach set forth in this paper is significant in that it may be easily adapted to inform environmental flow analyses at other study sites.

Environmental Conditions That Activate the *E. coli* RNA Repair Operon

Andrew Charles Wise, CURO Research Assistant
Dr. Anna Karls, Microbiology, Franklin College of Arts and Sciences

Escherichia coli contains within its genome a putative RNA repair operon consisting of two genes, *rtcBA*; RtcB is an RNA ligase, while RtcA is a nucleotide phosphate cyclase. The operon is tightly regulated under the control of a σ^{54}-dependent promoter that requires activation of RtcR, a bacterial enhancer binding protein, in order to initiate transcription; the specific signal that activates transcription is as of yet unknown. The purpose of this research is to determine environmental conditions under which the operon is expressed. This will be accomplished by creating a reporter strain using λ-Red recombination to replace *rtcB* with a *xylE*-Kan^R reporter fusion, which will allow us to distinguish when the operon is being transcribed. Using the reporter strain, we will test different conditions to determine which stressor(s) initiate expression of the operon, including those that are known to cause nucleotide damage or affect the ability of ribosomes to carry out translation. Determining which conditions activate the operon will provide vital information toward elucidating the specific molecular signal that activates RtcR. Additionally, the results in *E. coli* will be compared to those in *Salmonella* Typhimurium, which contains additional genes within the operon (*rsr-yrlBA-rtcBA*). Preliminary research suggests that, despite significant homology between the two species, the operon is activated under entirely different conditions. Overall, this project will further our understanding of the physiological roles for RNA repair in bacteria.

The Ugly Duckling Narrative: Identity Development in Multiracial Individuals

Taylor Withrow, CURO Honors Scholar, CURO Research Assistant
Dr. Valerie Babb, English, Franklin College of Arts and Sciences

Race has been a central factor in the development of society for hundreds of years, particularly 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. Several different forms of identity development were isolated, indicating there is not one single process for identity growth but various processes all dependent on the individual's characteristics, experiences, and environments. Recently, there has been a shift toward 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; therefore, understanding multiracial identity struggle and growth is key to understanding the evolving state of race perception and race relations in society today.

Effect of the Female Frequency on the Pollen Dispersal Distance in Natural Populations of the Wild Geranium, *Geranium maculatum*

Ariane Wong, CURO Research Assistant
Dr. Shu-Mei Chang, Plant Biology, Franklin College of Arts and Sciences

When a male-sterile mutation occurs in a hermaphroditic population, it can turn the population into one that is composed of both female (or male-sterile) and hermaphroditic genotypes, named a gynodioecious population. An increase of females in a gynodioecious population can subsequently select for an increase of male function in the hermaphroditic individuals, which can increase in the likelihood of a female-sterile (male) mutation occurring in a population, and eventually resulting in the evolution towards a dioecious system that contains separate male and female individuals. To test this theory, studies have been done that observe male function in hermaphrodites with increasing population female frequency. However, female frequency calculated at the entire population level may not be the best predictor for the pattern of selection in nature. This is because gynodioecious populations show spatially structuring of the sexes where females are often clustered in one portion of the population and pollen dispersal is often limited in distance in natural populations. In other words, female frequency in a population as a whole may not be a good representation of mating potentials since hermaphrodites that are surrounded by a cluster of females may experience different effects of mating behavior than those farther away from females. Instead, female frequency at the subpopulation-level, defined by the distance of pollen dispersal, could be a more accurate measure of mating potential for a given plant within the subpopulation. This study aims to test this hypothesis by estimating the distance of pollen dispersal by comparing the shared paternity between seeds of paired maternal individuals. I used DNA extraction, PCR amplification, and genotyping to obtain genetic data for seeds collected from maternal plants whose locations were mapped in 4 populations of *geranium maculatm*. Results from a preliminary study completed in the fall 2016 showed that populations with females have a lower average pollen dispersal distance than those that contain only hermaphroditic individuals. Continuing research will work to test male fitness as a result of female frequency in subpopulations defined by pollen travel distance.

Developing a Sub-Viral Particle Dengue Vaccine Using Computationally Optimized Broadly Reactive Antigen (COBRA) Technology

Dianna Wong, CURO Research Assistant
Dr. Ted M Ross, Infectious Diseases, College of Veterinary Medicine

Dengue is a mosquito-borne *Flavivirus* that causes dengue fever, which predominantly causes mild symptoms but can progress in severity and ultimately develop to lethal dengue hemorrhagic fever. The endemic is worldwide with less than half of the world's population susceptible to infection with limited treatment available. The virus has four serotypes and is sensitive to variability proving it difficult to develop a tetravalent vaccine. Computationally optimized broadly reactive antigen or "COBRA" technology addresses the antigenic diversity of each serotype by using global surveillance efforts to generate a consensus of sequence of the surface. Sequences to make chimeric E proteins can be generated by switching regions that elicit neutralizing antibodies representing different serotypes. The regions DIII and Hinge were chosen to make DENV1-DENV3 and DENV2-DENV4 sequenced chimeras. Recombinant sequences of the E protein are used to make subviral particles for the serological detection of antibodies in mice. This study describes how chimeric sequences using COBRA methodology are implemented through bacteria in a DNA purification system for subsequent use for harvesting subviral particles.

Indecent: The Show That Shut Down on Opening Night

Lukas Woodyard
Dr. Frances N Teague, Theatre and Film Studies, Franklin College of Arts and Sciences

This paper considers the reception of a lesbian kiss on stage, and what that reception tells us about American attitudes toward gender and sexuality in popular culture. In 1923, *God of Vengeance* by Sholem Asch was shut down due to indecency on their opening night when the American public first viewed the lesbian kiss. The second production was far more successful. The Jewish Repertory Theatre revived the show in 1992 and did better than the original production probably due to the loss of the shock value of the show. Most recently, Asch's play was revived by La Mama E.T.C. at the end of 2016. This

production precedes another work: the Pulitzer-Prize-winning Paula Vogel, a queer feminist playwright is premiering her new work *Indecent*, a play about the first production of Asch's *God of Vengeance*. Since the play will not open until April on Broadway and not be published until August, this study will focus on the reception of the three productions of Asch's play and the reception of earlier productions of Indecent (at Yale Repertory Theatre and at Vineyard Theatre).

Hydrophilic Top Coat on Nitric Oxide-Releasing Surfaces for Enhanced Antibacterial and Antifouling Properties

Christina Workman, CURO Research Assistant
Dr. Hitesh Handa, Chemical, Materials, and Biomedical Engineering, College of Engineering

Healthcare-associated infections have resulted in rising numbers of deaths and medical costs in the United States. A majority of these infections stemmed from opportunities provided by medical implants and surgical wounds. Implanted medical devices provide surfaces for proteins from body fluids to bind, leading to bacteria aggregation and platelet activation. Biomedical grade polymers that involve the incorporation of nitric oxide (NO), an antimicrobial agent, are being investigated to reduce the risk of infection. While the results have been widely successful in reducing the incidence of infection it has been discovered that NO-releasing surfaces consequently increase protein absorption to these surfaces. This research worked to prevent protein absorption on these surfaces by incorporating hydrophilic polymers as a topcoat to NO-releasing surfaces. Four different polymers, three thermoplastic polyurethanes and a silicone elastomer were evaluated for their surface characteristics, affinity towards protein and viable bacteria absorption. These traits were measured using methods such as spectroscopic ellipsometry, chemiluminescence NO analyzer and atomic force microscopy (AFM) to identify which polymer exhibited the most hydrophilic properties. Highly hydrophilic polymers, such as SP60D60, form hydration layers on their surface, protecting the surface from protein adhesion. The formation of a hydration layer can be attributed to low surface roughness, as identified with AFM scans. The antifouling property of SP60D60, top coated on a NO-releasing film provided a synergistic effect of reducing viable bacteria by 95.83% compared to the control and protein adhesion was minimal, as measured by change in thickness of the SP60D60 films (2.24±0.68 nm).

Studying the Effects of Valsartan on *Daphnia magna*

Alyson Ming Wright, CURO Research Assistant
Dr. Ford Ballantyne, Ecology, Odum School of Ecology

As pharmaceuticals constantly enter the environment, aquatic organisms are chronically exposed to these potentially harmful compounds. A small aquatic invertebrate, *Daphnia magna* play a key role in the freshwater ecosystem as important herbivores that help determine water quality and serve as crucial sources of food for many fish. Studying the effects of pharmaceuticals on *D. magna* is critical to gain an understanding of how they disrupt development and life history characteristics and to preserve the dynamics of freshwater ecosystems. Valsartan, a drug typically used to treat high blood pressure in humans, was found in the highest concentrations around United States water treatment facilities and its affects on daphnia are unknown. In this study, *Daphnia* were exposed to various concentrations of valsartan that reflect concentrations found in the environment. Development and life history traits of *Daphnia* were analyzed to see the effects. It is expected to find physical deformities, a reduced rate of fecundity, and a slower maturation rate across all treatment levels compared to the control.

Investigation of the Effectiveness of Geosynthetics in North Georgia Soils

Jason Christopher Wright, CURO Research Assistant
Dr. S. Sonny Kim, Environmental, Civil, Agricultural, and Mechanical Engineering, College of Engineering

This study will a large specimen, 6' x 6' accelerated model, in conjunction with numerical modeling in order to determine the effectiveness of geosynthetics as a reinforcing material in the between the base course of pavement and the subgrade using different soil types of Georgia. There have been several studies investigating this but very few investigate the relationship of full

scale testing data with numerical finite element modeling. For this study, finite element analyses will be conducted using ansys. The model will include both the graded aggregate base (GAB) and subgrade soils to determine the vertical stress and horizontal strain numerically. There will be several different subgrade soils tested from varying parts of the state of Georgia in order to determine the effects of the base layer, subgrade layer and geosynthetic. In conjunction with the numeric modeling, a large scale test will be performed with each of the different subgrade soils with different geosynthetic reinforcements. From the accelerated lab testing the experimental vertical stress and horizontal strain will be extracted. This data will then be compared with the FEM data in order to produce a more accurate and reputable relationship between the two to provide recommendations to the Georgia Department of Transportation (GDOT) for the six different subgrade soils. The results of the numerical modeling and large scale test will be used to develop a Mechanistic-Empirical Pavement Design for the use of geosynthetics in North Georgia soils by GDOT. It is expected that the soil used in conjunction with the geosynthetic will perform better than the test specimen with no geosynthetic.

Educational Disparities between Rural and Urban Schools in the State of Georgia

Victoria Ayse Yonter, Foundation Fellow
Dr. Josh Kinsler, Economics, Terry College of Business

Disparities between K-12 education in metro and non-metro counties were found in the state of Georgia. Linear regression analysis was used to measure the differences in outcomes, with test scores as the measureable outcomes. Demographic controls including income, race, and education levels of the counties were used as controls and tested as explanatory variables. Determining the causes of the achievement gap among rural schools will help policies be crafted that can effectively alleviate these gaps. The effectiveness of the federal Rural Education Achievement Program was tested using difference-in-differences model. Testing the effectiveness of existing programs is important to improve these programs and encourage more successful future initiates. This paper hopes to address and describe the differences in rural and urban education, using Georgia as evidence, and test current efforts aimed at lessening these differences.

The Role of Chondrogenic Growth Factors in the Pathogenesis of Equine DSLD

Madeline Young, CURO Research Assistant
Dr. Jaroslava Halper, Pathology, College of Veterinary Medicine

Equine Degenerative Suspensory Ligament Desmitis (DSLD) is a disease afflicting a wide range of horse breeds that often results in mortality. Little is known about the pathogenesis of the disease making diagnosis and treatment of the affected horses difficult. Our lab has shown that the key histopathological sign of DSLD is an abnormal buildup of proteoglycans within connective tissue throughout the body with Safranin O staining which indicates the proteoglycan's sulfation. Additionally, at least one of the tendon proteoglycans, decorin, is abnormal in horses with DSLD, with chondroitin sulfate replacing the normal dermatan sulfate. The purpose of our current research has been to explain the abnormal levels of the proteoglycans by investigating the levels of the chondrogenic growth factors Bone Morphogenetic Protein 2 (BMP-2) and Transforming Growth Factor β1 (TGFβ). These growth factors regulate the production of proteoglycans by binding to the dermatan sulfate in decorin to suppress further production of the proteoglycans. When the dermatan sulfate is replaced with the chondroitin sulfate we believe the growth factors are unable to bind to the decorin which stimulates further production of proteoglycans by the tendon cells. Through immunohistochemistry staining, abnormally high levels of BMP-2 were found to be correlated with the overproduction of the proteoglycans and cellular activity. Interestingly, the levels of TGFβ were found to be low. Finding higher levels of the BMP-2 correlated with abnormally high levels of proteoglycans supports our hypothesis that growth factors are unable to bind to the altered decorin and could be leading to the progression of DSLD.

Pedagogical Methods for Developing Empathy in Engineering Students

Kathryn Marie Youngblood, CURO Research Assistant
Dr. Jo Walther, Environmental, Civil, Agricultural, and Mechanical Engineering, College of Engineering

Among the variety of design talents and technical expertise expected of engineers, recent critiques of engineering work have challenged problem-solvers to more closely examine the social contexts and consequences of their work. This challenge demands that engineers of the future be trained to empathetically interact with a diversity of stakeholders. The socially-situated and interdisciplinary nature of the grand challenges of the modern world necessitates a socially conscious engineer and one who integrates empathy into their professional way of being. There has, however, been little exploration of methods by which to cultivate empathy as part of the professional development of engineering students. Based on previous work establishing the utility and application of empathy, this research entails the development of a pedagogical intervention for fostering empathy in an engineering setting through skill building exercises and role play. Qualitative analysis of student reflections on these experiences reveals a wide range of understandings of empathy as it applies to professional practice and as a way of being, in addition to illuminating elements of engineering culture that may be detrimental to the empathetic development.

Long-Term Population Dynamics Pre-Die Off of the Vermetid Gastropod, *Ceraesignum maximum*, in Mo'orea, French Polynesia

Margaret Zacharias
Dr. Craig W Osenberg, Ecology, Odum School of Ecology

Coral reefs form some of the world's most productive ecosystems, but corals are currently threatened by physical and biological stressors. One of these stressors, *Ceraesignum maximum*, is a vermetid snail, which can densely populate coral reefs and are known to decrease coral survival, growth, and photosynthetic yield. Although these snails are a known stressor, not much is known about the ecology and biology of these snails. In 2015-2016, vermetid populations experienced an unforeseen, massive die-off throughout French Polynesia. To better understand vermetid population dynamics and recognize if there were warning signals for the die-off, we analyzed an 11-year time series (2006-2016) of photographs from Mo'orea, French Polynesia to quantify snail density and size structure as well as live coral cover. Photographs were taken annually at 6 different sites around the island, with 100 photographs per site. Results indicate that vermetid populations increased at an average rate of 0.29% $year^{-1}$ from 2006-2015, and areas with higher vermetid densities have lower coral cover. There appeared no warning of a population crash. While other factors may have led to the coral decline, we predict that the vermetid population crash will lead to increases in live coral cover. Future work will examine the correlation between different coral species and vermetid densities, as well as how size structure of the populations has changed over time. These data will help us to better understand dynamics of populations before massive die off events.

Exploring Grief: Accompanying End of Life Support with Palliative and Bereavement Care

Amy Zhan, CURO Research Assistant
Dr. Toni Miles, Epidemiology and Biostatistics, College of Public Health

With a cohort of nearly 50 million, Boomers quickly approaching their older years, aging is one of the most significant public health trends to monitor in coming years, along with the growing realization that our current models of end-of-life-care and bereavement management have major shortcomings. Death and dying will be experienced by millions of families across the United States, with few mechanisms in place to address the needs of those left behind. This research seeks to find effective means of supporting resilience and restructuring policies to renovate hospice care in order to restore good health for surviving family members and loved ones. Can we create policies to restore health following bereavement? A lack of clear evidence regarding the effects and nature of bereavement results in an inability to guide the development and allocation of bereavement programs, and the findings will have the potential to inform the

capacity and effectiveness of services and community organizations that are able to care for individuals who are bereaved, according to their needs. Palliative care is incomplete without bereavement training, and our work seeks to incorporate these aspects of care to create more efficient patient-centered care in nursing homes and hospice settings. We will be conducting interviews with health care providers and hospice residents, and compiling quantitative and qualitative data to support our findings. Such studies are essential for achieving equitable resource allocations within our health system and providing cost-effective measures with beneficial health outcomes for all.

Olympic Performance and Propensity for Interstate Conflict

Jonathan Zot Sr.
Dr. Andrew Owsiak, International Affairs, School of Public and International Affairs

Does a negative performance at the Olympic Games affect the aggressiveness of states that invest heavily in the international competition? Considering the sizable financial inputs of states, the widespread viewership of the events, and the opportunity for international leveraging, it is rational to assume that state governments are aware of the spectacle's political salience. With such high stakes, a significantly poor performance would be dissatisfying to both a government and its citizens. This paper explores aggressive foreign policy adoption in response to pervasive public discontent following Olympic underperformance, employing Diversionary War Theory as the state government's motivating factor. I observe the relationship between the two relevant aspects that encompass a state's overall experience: outcome and investment. Outcome was the difference between the final medal count and a count predicted by leading experts. To establish a baseline for Olympic potential, I developed a novel approach that uses each state's GDP per capita share to determine an unbiased medal count. This count was contrasted to the leading prediction to estimate investment. From these variables, I isolated a group of underperformers with high investments. In the period immediately following the Olympics, the states investing more in the games initiated a greater average number of Militarized Interstate Disputes than their low-investing counterparts when faced with Olympic underperformance. To further establish a link between Olympic performance and interstate aggressiveness, I plan to incorporate data from other Olympic years. This will offer empirical research supporting the political relevance of the event.

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