THE UNIVERSITY OF GEORGIA
Center for Undergraduate Research Opportunities

CURO

2016 CURO SYMPOSIUM

PROGRAM & ABSTRACTS

CLASSIC CENTER | ATHENS, GEORGIA
APRIL 4 – 5

THE UNIVERSITY OF GEORGIA
CENTER FOR UNDERGRADUATE RESEARCH OPPORTUNITIES

2016

CURO

Symposium

Program and Abstracts

CURO Office
203 Moore College
The University of Georgia
Athens, GA 30602
(706) 542-5871

curo.uga.edu

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CURO

April 4, 2016

Dear Students, Faculty, and Guests,

Welcome to the 16th annual CURO Symposium, UGA's celebration of undergraduate research across the disciplines. Many individuals—administrators, faculty members, staff, graduate students, and, of course, undergraduate students—have collaborated to make the CURO Symposium the premier undergraduate academic event at UGA.

Each year, the Symposium has grown larger, and the 2016 Symposium is the largest to date with 408 undergraduate researchers communicating their substantial accomplishments to their peers, mentors, and the public at large.

From its inception, the CURO Symposium has showcased research and scholarship in all disciplines. The 2016 Symposium continues that commitment, featuring presenters pursuing 85 different majors from 14 schools and colleges who are conducting research with 248 faculty members from 69 departments. This two-day event displays UGA's broad and substantial support of research and the invaluable commitment of UGA's administration and faculty to providing exceptional learning opportunities for our undergraduates.

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

Sincerely,

Dr. David S. Williams, '79, '82
Associate Provost and Director

Dr. Martin P. Rogers, '01, '11
Associate Director

Acknowledgements

Special Assistance for 2016 CURO Symposium

Ms. Kate Belgum	Administrative Associate, External Affairs, Honors Program
Ms. Dorothé Otemann	Coordinator of External Affairs, Honors Program
Ms. Amanda Pruitt	Assistant to the Director, Honors Program
Ms. Karen Newcomb	IT Professional, Honors Program

Technology Equipment and Support for 2016 CURO Symposium

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

Reviewers for 2016 CURO Research Mentoring and Best Paper Awards

Dr. Martin Rogers	Associate Director of CURO & Honors
Dr. David S. Williams	Associate Provost and Director of Honors and CURO

Oral and Poster Session Conveners for 2016 CURO Symposium

Ms. Rachel Burns	Institute of Higher Education
Mr. Benjamin Campbell	Presidential Graduate Fellow, Department of Mathematics and Science Education
Ms. Rebecca Carter	Academic Advisor, Honors Program
Ms. Maria de Rocher	Assistant Director of Honors & Programming
Ms. Michelle Evans	Presidential Graduate Fellow, Odum School of Ecology
Ms. Heather Gallivan	Department of Anthropology
Ms. Cindy Ganas	Administrative Associate, Office of Recruitment, Honors Program
Ms. Jami Gilstrap	Program Coordinator, CURO
Ms. Steven Honea	Academic Advisor, Honors Program
Ms. Amber Kaufman	Department of Public Administration and Policy
Ms. Krysten Lewis	Academic Advisor, Honors Program
Ms. Emily L. Myers	Administrative Associate, Foundation Fellowship Office, Honors Program
Mr. Joshua Patterson	Institute of Higher Education
Ms. Ricky Roberts	Academic Advisor, Honors Program
Dr. Martin Rogers	Associate Director of CURO & Honors
Ms. Heather Smith	Academic Advisor, Honors Program
Ms. Petrina M. Watkins	Grady College of Journalism & Mass Communication

Schedule

Monday, April 4, 2016

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

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

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

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

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 5, 2016

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

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

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

Oral Session VIII **2:00-3:15 p.m.**
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

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.

2016

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

Dr. Richard Lewis, R.D., FACSM, Department of 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, Department of International Affairs, School of Public & International Affairs

2013

Master Level Faculty Award

Dr. Jennifer McDowell, Department of Psychology, Franklin College of Arts & Sciences

Early Career Faculty Award

Dr. Katalin Medvedev, Department of Textiles, Merchandising & Interiors, College of Family & Consumer Sciences

2012

Master Level Faculty Award

Dr. Lawrence Shimkets, Department of Microbiology, Franklin College of Arts & Sciences

Early Career Faculty Award

Dr. Michael Yabsley, Warnell School of Forestry & Natural Resources

2011

Master Level Faculty Award
Dr. Eric Stabb, Department of Microbiology
Early Career Faculty Award
Dr. John Drake, Odum School of Ecology

Program Award
Savannah River Ecology Laboratory
Dr. Kenneth McLeod, Interim Director

2010

Early Career Faculty Award
Dr. John C. Maerz, Warnell School of Forestry & Natural Resources

2009

Early Career Faculty Award
Dr. Brian S. Cummings, Department of Pharmaceutical & Biomedical Sciences
Dr. Anna C. Karls, Department of Microbiology
Dr. Dawn T. Robinson, Department of Sociology

2008

Master Level Faculty Award
Dr. John J. Maurer, College of Veterinary Medicine

Early Career Faculty Award
Dr. Walter K. Schmidt, Department of Biochemistry & Molecular Biology

Program Award
Biomedical and Health Sciences Institute
Dr. Harry S. Dailey, Director

2007

Master Level Faculty Award
Dr. Timothy Hoover, Department of Microbiology
Early Career Faculty Award
Dr. Steven Stice, Department of Animal & Dairy Science

2006

Master Level Faculty Award
Dr. Patricia Hunt-Hurst, Department of Textiles, Merchandising & Interiors
Early Career Faculty Award
Dr. Rodney Mauricio, Department of Genetics
Graduate Student Award
Christopher Anderson, PhD candidate in Ecology
Graduate Student Recognition
Dawn Holligan, PhD candidate in Plant Biology

CURO Research Mentoring Awards

2005

Faculty Award

Dr. Gary Barrett, Odum School of Ecology
Dr. Sidney Kushner, Department of Genetics

Department Award

Department of Cellular Biology

2004

Faculty Award

Dr. William S. Kisaalita, Department of Biological & Agricultural Engineering

2003

Faculty Award

Dr. Jody Clay-Warner, Department of Sociology

Department Award

Department of Microbiology
Dr. Duncan Krause, Department Head
Dr. Timothy Hoover, Undergraduate Coordinator

Program Award

The Pratt Laboratory of Plant Genomics and Bioinformatics
Dr. Lee H. Pratt, Department of Plant Biology
Dr. Marie-Michèle Cordonnier-Pratt, Department of Plant Biology

2002

Faculty Award

Professor William D. Paul, Jr., Lamar Dodd School of Art
Dr. Katherine Kipp, Department of Psychology

Faculty Recognition

Dr. Susan Sanchez, College of Veterinary Medicine

Department Award

Department of Biochemistry & Molecular Biology
Dr. J. David Puett, Department Head

Program Award

"Physics Beyond the Boundaries": National Science Foundation, REU Program
Dr. Loris Magnani, Principal Investigator, Department of Physics & Astronomy
Dr. Heinz-Bernd Schuttler, Department Head, Department of Physics & Astronomy
Dr. Jonathan Arnold, Department of Genetics
Dr. Susmita Datta, Georgia State University
Dr. David Logan, Clark Atlanta University
Dr. William Steffans, Clark Atlanta University

2001

Faculty Award

Dr. Marcus Fechheimer, Department of Cellular Biology

Faculty Recognition

Dr. David MacIntosh, Department of Environmental Health Sciences

Dr. Dean Rojek, Department of Sociology

Department Award

Department of Genetics
Dr. John MacDonald, Department Head

Program Award

Savannah River Ecology Laboratory
Dr. Paul Bertsch, Director

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.

Each recipient is recognized at the Symposium's Award and Keynote Session, and each award carries $100 in financial support, generously provided by the UGA Alumni Association. Winners from the 2016 CURO Symposium are listed below.

Arts, Humanities, and Media:

Katherine Opacity	Tolstoy's Second Epilogue: On Page and Screen

Life Sciences:

Michelle Sequeira	Susceptibility to Chronic Social Defeat Stress Increases Ethanol Consumption in Mice

Physical and Environmental Sciences:

Dessa Dun	Ecosystem Services and Restoration Efforts of Campus Forests: Tanyard Creek and Driftmier Woods

Public and International Affairs:

Emily Maloney	Reducing Teacher Turnover in Georgia Public Schools

Social Sciences:

Megan Murphy	White Matter Structure Differs Between Schizophrenia and Healthy Comparison Groups as a Function of Cognitive Control and Age

Business:

John-Jordan Nunnery	How the Market Responds to Changes in Firm Health Policy

Program: Monday, April 4, 2016

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

Room A	**Urmi Patel**	The Role of Dual Oxidase 1 in Tracheal Immunological Functions
	Madison Miracle	Investigating miRNA-195-Mediated Regulation of Cell Cycle Gene CHEK1 in Respiratory Syncytial Virus (RSV) Replication
	Chip Chambers	The Role of Cas4-2 in the CRISPR Adaptation Stage of *Pyroccocus furiosus*
Room B	**Joshua Willis**	Comparison of Oconee and Ocmulgee River Basins for Water Management Improvement
	Grace Power	Approaches to Reducing the Cost of Algal Biomass Production
	Lucas Montouchet	The Spatial Interaction between Cordgrass and Oysters across an Estuarine Gradient
Room C	**Emily Ivey, Olivia Carlson, Colleen Keeler**	The Influence of Psychosocial Functioning on Tic Severity in Children with Tourette Syndrome
	Kodiak Sauer	Cognitive Control as Assessed by Multiple Eye Tracking Paradigms
	Megan Murphy	White Matter Structure Differs between Schizophrenia and Healthy Comparison Groups as a Function of Cognitive Control and Age
Room D	**Catherine Braun**	The Hijab as a Feminist Tool of Agency
	Molly Mastin	Cooling Fabric: The Future of Keeping Cool
	Melissa Cousins	Optimizing Plique-à-Jour Enameling
Room G	**Ali Anderson**	Hookworm Egg Production in a Virulent Hookworm-Fur Seal System
	Caitlin Harris	*In-Vitro* and *In-Vivo* Assessment of a Yeast By-Product on the Inhibition of *Histomonas meleagridis*
	Mary Mehegan	Longitudinal Assessment of a Porcine Traumatic Brain Injury Model Utilizing Immunohistochemistry

Program: Monday, April 4, 2016

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

Room A	**Meili Swanson**	Issue Framing and Beliefs about the Importance of Climate Change Policy
	Ashka Patel	The Implications of International Intellectual Property Law on Global Access to Medicines
	Samuel Dickinson	The Influence of Social Conversation Case Study: Iran Nuclear Deal
Room B	**Mallika Madhusudan**	Eradicating Food Insecurity in Metro Atlanta
	Laura Pontari	Standardized Public Education Funding Formulas: A Best-Practice Evaluation
	Emily Maloney	Reducing Teacher Turnover in Georgia Public Schools
Room C	**Nivita Sharma**	Variation of Nanoparticle Surface Lipophilicity for Blood Brain Barrier Penetration
	Kodiak Sauer, Jacob Beckham	The Relationship between Central Nervous System Xanthophyll Status and Brain Activation in Healthy Older Adults
	Evan Knox	Effects of Cognitive Reserve and MPOD Levels on Personality in Older Adults
Room D	**Manisha Banga**	The Narrative Retelling of Marginalized Ancient Greek Mythological Characters by Contemporary Female Authors
	Sydney Wilson	Copy-Cats: Aphra Behn's *The History of the Nun* and Its Adaptations
	Joy Peltier	Functions of the Discourse Marker *"Bon"* in Spoken French
Room G	**Nikita Vantsev**	The Role of Cas1, Cas2, Csn2, and Cas9 in the Type II CRISPR-Cas Adaptation
	Bryan Grommersch	Metallothermic Reductions and Conductive Coatings for Lithium-Ion Battery Anode Materials
	Melissa Jennings	Regulation of Base J Synthesis in Trypanosomes
Room H	**David Reagan**	A Bright and Budding Future for Sunflowers: Understanding the Predictive Properties of *Helianthus annuus* Seedlings for Improving Adult-Stage Crop Yield

	Hayley Schroeder	The Effects of Migration and Infection on Resting and Flight Metabolism in Monarchs
	Jessica Story	Detritus Preferences in a Mangrove-Saltmarsh Ecotone

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

Room A	**Rebekah Worick**	Soldiers of Fortune: The Incidence of Mercenary Usage in Civil Conflict
	Sarah Sammons	How the Recruitment of Female Fighters for Islam Has Changed Transnational Terrorist Organizations and What the Long-Term Implications of This Trend Will Be for Interstate Conflicts
	Kimberlee John-Williams	The Effect of the Colonial Past on Women's Representation in the Caribbean
Room B	**Emily Maloney**	Correspondence between Family Needs and Family Goals: Implications for Early Childhood Interventions for Low-Income Families
	Hailey Clark	Addressing Teenage Pregnancy in Athens-Clarke County, Georgia
	Jenny Alpaugh	Examining Diversity in High School Publication Staffs
Room C	**Caroline Shearer**	Parasite Infection and Host Behavioral Complexity
	Martinique Edwards	Abundance of *Vibrio* Bacteria Associated with White Pox Disease in Elkhorn Corals
	Isabel Ott	Investigating a Potentially Novel Cache Valley Virus Variant in a Clinical Case in Missouri
Room D	**Insiyaa Ahmed**	Trait Variation in Sunflower Cultivars Grown Under Nutrient Stress Conditions
	Thomas Gottilla	Evolutionary Analysis of Mating-Type Genes in *Stagonosporopsis* Species Causing Gummy Stem Blight of Cucurbits
	Sabrina Park	Genetic Analysis of *Exobasidium maculosum* Using Microsatellites
Room G	**Patric Campbell**	Geographic Distribution of Adult Body Mass in Muridae

	Elizabeth Wilkes, Julia Connell	Fracking Governance and Resistance in Western North Carolina
	Shannon Burns	Spatial and Temporal Iron Isotope Fractionation in Hawaiian Soils
Room H	**Garrison West, Markus Cleveland, Alan Bosworth, Alexandria Lushaj**	Forensically Influential Beetle Fauna in the Spring
	John Roquet	Predictable Variation in Temporal Transmission Potential: West Nile Virus as a Case Study
	Onyinyechi Ochiobi	Investigations of How *Lysinibacillus sphaericus* Bin Toxin Kills a Cell Line Derived from the Malarial Mosquito *Anopheles gambiae*

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

Room A	**Joshua Reynolds**	Lutein and Zeaxanthin Are Unrelated to Performance on the Short Physical Performance Battery
	Morgan Gibbs	Methadone and Loperamide Interactions with the Multidrug Transporter P-Glycoprotein
	Caroline Langley	Examining the Antioxidant Properties of Hops
Room B	**Allison Fialkowski**	Best Practice for Informing Parents of their Newborn's Disability
	Vineet Raman	Eliminating Cultural and Linguistic Boundaries in Healthcare: Creating Standards and Funding for Medical Interpreters
	Sara Johnson	Parentification as a Predictor of Emotion Dysregulation in Young Adults
Room C	**Catriona Geddes**	Personality Judgment Accuracy: Personality and Social Context Influence the Way People See Each Other
	Benjamin Shepard	IO Variables in Gaming: When Work is Play
	Lauren Locklear, Ian Armstrong	Third Party Reactions to Mistreatment: A Meta-Analysis

Room D	**Marrissa Blackwell**	The Effect of Form and Source on Bioavailability of Vitamin E Supplementation in Mature Horses
	Adrea Mueller	Expression Analysis of Immune Genes in the Liver and Ceca of Blackhead Infected Turkeys
	Kathryn Sellman	Use of Social Recognition Test and Open Field Test to Assess Piglet Cognition
Room G	**Chelsea Thorpe**	Has *Laïcité* Transformed into a Law of Islamophobia?
	Taylor Martin, Rachael Andrews	A Policy Proposal for the Reduction of Violence in Georgia's State Prisons
	Hanna Han	Examination of Supply-Side Incentives and Motivations That Perpetuate the Skill Mismatch of Cambodian University Graduates
Room H	**Shannon Hochschild**	Dressing with a Disability
	Grace Donnelly	Seeing the Future: Interactive Data Visualization and Behavioral Intentions
	John-Jordan Nunnery	How the Market Responds to Changes in Firm Health Policy

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
2016 Symposium Best Paper Awards	Rahul Shrivastav, Vice President for Instruction
	Meredith Johnson, Executive Director of Alumni Association
UGA Libraries' Research Awards	Caroline Barratt, UGA Libraries

Program: Monday, April 4, 2016

Introduction of Keynote Speaker	Ms. Nivita Sharma, Class of 2018, Biochemistry & Molecular Biology
Keynote Address	Dr. Alan Darvill, Director of the Complex Carbohydrate Research Center (CCRC) and Regents Professor of Biochemistry & Molecular Biology, "Lessons Learned Studying Carbohydrates"
Closing Comments	David S. Williams

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

Poster # 1	**Emily Tyus**	The Use of Entertainment Education to Teach Nutrition Messages to Preschool Children: A Feasibility Study
Poster # 2	**Brittany Whitlock**	Implications of Inherited Microbial Profile in Long-Term Metabolic Health
Poster # 3	**Jenissa Gordon**	Neutrophil and Granulocyte Methylation in Normal Weight and Obese Individuals
Poster # 4	**Joann Yang**	Blood Folate and Whole Blood Global DNA Methylation Response to Folic Acid Supplementation Dose during Pregnancy
Poster # 5	**Fatima Kamal**	The Effects of Two Different High-Fat Diets on Appetite
Poster # 6	**Annie Ladisic**	Effect of Strategic Marketing on Healthier Vending Machine Sales
Poster # 7	**Kayla Patel**	Maternal Obesity and Trabecular Bone Microarchitecture in C57BL Mice
Poster # 8	**Emily Rollins**	Muscle Adiposity, Forearm Muscle Strength, and Radius Cortical Bone Geometry in Children
Poster # 9	**Erica Coe**	Natural Killer Cell Maturation is Controlled by Genetic Background in Aging Mice
Poster # 10	**Zixuan Jiang**	Circulating Concentrations of Growth Differentiation Factor 11 Are Heritable and Correlate with Life Span
Poster # 11	**Stephanie King**	Diet-Induced Obesity Differentially Regulates Glutathione Homeostasis in C57BL/6J, BALB/cByJ, and AKR/J Mice

Poster # 12	**Claire Yakaitis**	Heritability of Tissue Glutathione Levels and Redox Status in Aged Mice
Poster # 13	**Courtney Meyer**	A First Description of Nest Behavior in Red-and-Green Macaws
Poster # 14	**Rhianna Baldree, Emily Unholz, Margaret Bergmann**	Practice Makes Perfect: A Capuchin Monkey Becomes Skillful at Nut Cracking with an Unfamiliar Stone
Poster # 15	**Rachel Pack**	Wild Bearded Capuchins (*Sapajus libidinosus*) Use Tools in Fazenda Boa Vista, Brazil: Positioning the Nut Predicts Success
Poster # 16	**Lindsey Roles**	Who Is Better at Cracking Nuts: Humans or Monkeys?
Poster # 17	**Spencer Sheheane**	Using an Unconventional Tool: A Capuchin Monkey Becomes Skillful
Poster # 18	**Harrison Cloud**	The Effects of Lutein and Zeaxanthin Supplementation on Sensory Function in Healthy Adults
Poster # 19	**David Cromer, Eli Chlan**	The Effects of Serum Dietary Carotenoid Levels on Cognitive Function in Healthy Adults
Poster # 20	**Katelynn Porto**	Developmental Trends in Infant Temporal Processing Speed
Poster # 21	**Nicole Negri**	Cognitive-Behavioral Therapy for Adults with ADHD: A Meta-Analysis
Poster # 22	**Abigail Mistretta**	Differences in Brain Morphometry as a Predictor of Smoking Cessation Treatment Success in Nicotine-Dependent Smokers
Poster # 23	**Marie Rapoport**	Behavioral Economic Analysis of Relative Reinforcing Value as a Predictor of Smoking Cessation Treatment Outcomes
Poster # 24	**Ketki Desai, Luvika Gupta**	Influence of Intelligence on Correlation between Personality and Recreational Marijuana Use
Poster # 25	**Lauren Locklear**	The Effect of Gender Identification and Division of Labor on the Work and Family Experiences of Same Sex Couples
Poster # 26	**Selin Odman, Lindsey Murry**	The Effect of Corporate Wellness Program Benefits Over Time on End-Of-Workday Strain

Poster # 27	**Jacob Pendergraft, Parker Nayman, Fatima Koko, Christiana Agbonghae, Nikita Meka**	Words That Lead and Words That Follow: Lexical Indicators of Leadership
Poster # 28	**Benjamin Shepard, Julia Willis, Alex Moore, Holly Wright, Nick Sciales**	Personality Predictors of Team Work Relationships: Characteristics that Make Friends
Poster # 29	**Taylor Gutwillig**	Lunchroom Table Talkers Talk Students into Eating Fruits and Vegetables
Poster # 30	**Molly Minnen**	Friends and Coworkers
Poster # 31	**Jacob Young**	Cognition in the Crosshairs
Poster # 32	**Olivia Carlson, Emily Ivey, Colleen Keeler**	Pre-to-Post Transplantation Changes in Caregiver Emotional Functioning
Poster # 33	**Avery Campbell**	The Influence of Formal and Informal Sources of Support on Foster Parents' Couple and Co-parenting Relationship Quality
Poster # 34	**Megha Kalia**	Evidence-Based Interventions to Increase Wait Time and Decrease Problem Behaviors in Children with Autism
Poster # 35	**MacKenzie McGraw, Breanna Johnson, Sherry Sayavongsa, Alexis Pope, Meredith Towey, Hayley O'Hara, Sabrina Williams, Courtney Todd, Brianna Kelley, Anna Fink, Chase Kranzlein**	An Exploration of Communicative Intent and Its Relation to Early Vocalization Production in Two Young Children with Autism Spectrum Disorder
Poster # 36	**Breana Johnson, Alexis Pope, Mackenzie McGraw, Sherry Sayavongsa, Meredith Towey,**	The Role of Auditory Skill Development in the Advancement of Vocalization Development

	Hayley O'Hara, Courtney Todd, Anna Fink, Sabrina Williams, Chase Kranzlein, Brianna Kelley	
Poster # 37	**Margaret Naughton**	Examining the Relation between Stigma and Self-Esteem, Self-Efficacy, and Social Satisfaction in Young Adults with Autism Spectrum Disorder
Poster # 38	**Maria Ceron**	University Professors with Disabilities
Poster # 39	**Elliott Beale**	The Effect of Social Comparison on College Students' Attitudes toward Debt and Their Ability to Delay Gratification
Poster # 40	**Connor Gibbs**	A Faulty System: An Empirical Analysis on Student Loan Default
Poster # 41	**Theodore Gorman**	Credit Usage and Financial Literacy among University Students
Poster # 42	**Madison Nichols**	The True Cost of Medical Credit Cards on Patient Credit Scores
Poster # 43	**Benjamin Jacobs, Robin Haas**	Financial Literacy, Risk Tolerance, and Goals-Based Savings Behavior
Poster # 44	**Katie Cannon**	Corporate Social Responsibility and Stock Prices: The Environmental Responsibility of Shareholders
Poster # 45	**Mary Chastain**	Corporate Environmental Responsibility Recognition and Firm Value
Poster # 46	**Haris Vukotic**	Impact of Investment Bank Advisers on Merger Premiums and Merger Closing Times
Poster # 47	**Sona Rao**	A Review of the Use of Telemedicine in Nursing Homes
Poster # 48	**Thomas McBrearty**	Earning Disparity Among White and Black Women in South Africa
Poster # 49	**Michael Hutchison**	Legal Context to Violating Women
Poster # 50	**Rory Hibbler**	Ballot Initiatives and Voter Turnout
Poster # 51	**Shaunteri Skinner**	The Political Evolution of Malcolm X

Poster # 52	**Taylor Hill**	The *speAk* Movement: Social Media for Global Issues
Poster # 53	**Katherine McKeogh**	Understanding the Public's Relationships with ISIS and Counter-Terrorism Digital Media
Poster # 54	**Kari Saunders**	Off-Campus Housing and the Gentrification of Downtown Athens, GA
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Poster # 63	**Catherine Bernard**	Thinking Geographically in Regards to Power Dynamics of the Social Environment: Its Effect on Health
Poster # 64	**Joe Booth**	Mineralogy and Petrology of Huerfano Butte: A Tertiary Intrusion on the Great Plains, Colorado
Poster # 65	**Rachel Ehlinger**	Comparative Analysis of Soil Organic Matter Fractionation in Ultisols
Poster # 66	**Sarah Hickey**	Drift Between Two Specific Conductivity Probes
Poster # 67	**Morrison Nolan**	Re-evaluating Proposed Identities of *Brooksella alternata* of the Conasauga Shale of Georgia and Alabama
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		Dynamics? A Study of Hydrogen Sticking to Amorphous Water-Ice
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Poster # 71	**Patrick Mullen**	Charge Exchange: Atomic Data of Astronomical Significance
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Poster # 85	**Elena Morais**	Georgia SOL (Solar Optimization by Location)
Poster # 86	**Rashaan Fowles**	Design of Mass Concrete Specimens and Test Procedures

Poster # 87	**Maximillian Ovett**	To Close or Not to Close for Severe Winds: Two Cable-Stayed Bridges in the Georgia Coast Region
Poster # 88	**Nicholas Rorabaugh**	Evaluation of Georgia Bridges and Development of Large-Scale Bridge Testing Procedure
Poster # 89	**Sokngim Kim**	A Computer Program for Planar Truss Analysis
Poster # 90	**Katelyn Stallings**	Recycled Tire Chips for Use in Concrete Barrier Walls and Other Applications
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Poster # 95	**Morgan Najdowski**	The Determination of Sunflower Growth in Different Genetic Lines and under Various Nutrient Conditions
Poster # 96	**Kiara Shelby**	The Influence of Nutrient Stress on Mass Performance Rankings among Cultivated Sunflowers
Poster # 97	**Nicole de Leon Torralba**	Investigating the Phenotypic and Genetic Mechanisms of Root Architecture Traits in Cultivated Sunflower Seedlings under Drought Stress
Poster # 98	**Mary Lewis**	Far Red LEDs Effect on the Morphology and Flowering of Marigolds
Poster # 99	**Nicole Encardes**	Evaluation of Yield and Essential Oil Content of Holy Basil Varieties
Poster # 100	**Lindsey White**	Social Perceptions of the Impacts and Benefits of Non-Native Species in the Garden: The Case of Chinese Privet in the Southeastern U.S.
Poster # 101	**Elizabeth Hardister**	Hurricane Forecasting and Healthcare Facility Evacuations
Poster # 102	**Kaley Desher**	Addressing Severe Mental Illness of Atlanta's Chronically Homeless
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Poster # 104	**Mehabuba Rahman**	Mental and Sexual Health Post-War: Trauma, Depression, and Interpersonal Violence— Attitudes among Liberian Women
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Poster # 106	**Taylor Chishom**	Analysis of the Relationship between Patient Satisfaction Scores and Patient Health Outcomes
Poster # 107	**Morgan Green**	Effect of Multiple Ankle Sprains on Functional Performance Tests in Adolescents
Poster # 108	**Alyssa Varsalona**	Prevalence of Current Season Injuries in Collegiate Club Rugby Players with a Previous Injury History
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Poster # 114	**Payton Prins**	Evaluation of Recovery of Skeletal Muscle after Fatiguing Contractions
Poster # 115	**Joanna Szymonik, Kelly-Ann Peters**	The Effects of Iron Deficiency Anemia on Mitochondrial Capacity
Poster # 116	**Nathan Schlies**	The Effects of Lifetime Sports Participation and Sedentary Time on Muscle Capacity: Does More Activity Offset The Effects of Prolonged Sitting?
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Poster # 121	**Adrianne Smith**	Diazinon Promotes Adipogenesis in 3T3-L1 Preadipocytes
Poster # 122	**Jackson Rodgers**	Quantification of Contaminants of Emerging Concern in Fish and Shark Tissue from Sapelo Island, Georgia
Poster # 123	**Angela Lucero**	Modeling and Analysis of Virus-Bacteria Interactions in the Marine Environment
Poster # 124	**Guy Eroh**	Analysis of Hybridization in Chattahoochee Bass (*Micropterus chattahoochae*) Populations below Lake Lanier
Poster # 125	**Meghan Tait**	Influences of Predators on Parasite Prevalence in *Crassostrea virginica*
Poster # 126	**Usha Kaila**	How do Middle School Students Define Sustainability? A Preliminary Analysis of Focus Groups
Poster # 127	**Andrew Disharoon**	Engineering Soybean Mosaic Virus Resistance Utilizing tasiRNA
Poster # 128	**Tate Hutwagner**	Applying Computer Vision Analysis to Plant Phenotyping
Poster # 129	**Darcie Bruce**	Characterization of *Bacillus thuringiensis* Cry51Aa Toxicity to *Lygus*
Poster # 130	**Gillian Caudill**	Possibility of Attitude Change towards Edible Insects When Prepared by Top Chefs
Poster # 131	**Elijah Mehlferber**	Determining the Effect of Gut Microbes on *Drosophila suzukii* Gene Expression
Poster # 132	**Nicole Bisel**	The Role of Chondroitin Sulfate Glycosaminoglycans in Glioma Cell Progression
Poster # 133	**Tarun Daniel**	Neural Network Formation and Response to Pharmacological Stimulation
Poster # 134	**Caroline Coleman**	Use of a Spatial T-Maze Test and an Object Recognition Test to Assess Learning and Memory in a Piglet Model
Poster # 135	**Meagan Thomason**	Reactive Microglia as a Biomarker in a Piglet Model of

		Traumatic Brain Injury
Poster # 136	**Madelaine Wendzik**	Pathological Assessment of a Piglet Model of Traumatic Brain Injury Utilizing Non-Invasive Magnetic Resonance Imaging
Poster # 137	**Arjun Patel**	Cytotoxicity of Gold Nanoparticles with Feline Injection Site Sarcoma, *In Vitro*
Poster # 138	**Erika Evanoff**	MGMT Expression in Canine Glial Tumors
Poster # 139	**Susan Jones**	Quantitative PCR Detection of the SRY Gene of Male Dog Mesenchymal Stem Cells in Female Dog Brains with Experimentally Induced Ischemic Stroke
Poster # 140	**Kaitlyn Ruff**	Analysis of Forces Acting on the Equine Navicular Bone in Normal and Dorsiflexed Positions
Poster # 141	**Wendi Bao**	Comparing Meiotic Spindle Structure and Chromosome Attachment in Control and Pericentrin-Depleted Mouse Oocytes
Poster # 142	**Madison Canning**	Synthetic Estrogen Disrupts Spindle Organization and Meiotic Division in Oocytes
Poster # 143	**Annika Carter**	Effects of Maternal Immune Stimulation by a Viral Mimic on Autistic and Other Behaviors of Juvenile and Adult Mouse Offspring
Poster # 144	**Scott Chimberoff**	Yohimbine-Induced Reinstatement in Alcohol-Preferring and Wistar Rats
Poster # 145	**Michelle Sequeira**	Susceptibility to Chronic Social Defeat Stress Increases Ethanol Consumption in Mice
Poster # 146	**Brent Gawey**	Diet-Induced Obesity is Associated with a Change in Intestinal Innervation and Disruption of Gut-Brain Communication
Poster # 147	**Daye Park**	Effect of Different Concentrations of 25-Hydroxycholestrol on Osteogenic Differentiation of Mesenchymal Stem Cells (MSC) from Broiler Compact Bone
Poster # 148	**Camille Bauer**	Development of Immunologic Reagents for the Ferret Animal Model
Poster # 149	**Preston Samowitz**	Evaluation of Novel Antiviral Drug NS95397 for

		Treatment of Swine Influenza Infections in Pig Cells
Poster # 150	**Nicole Gilreath**	Serum Levels of Circulating and Exosomal MicroRNA Regulate Transformed Cell Growth
Poster # 151	**Christian Cullen**	The Role of Flagellar Motility in *Pseudomonas aeruginosa*-induced NET Formation
Poster # 152	**Nirali Patel**	Investigating the Antiparasitic Activity of Cry5B Protein against Fourth-Stage Nematode Parasites
Poster # 153	**Sahl Hakim**	Examining a Potential Role for *Mycobacterium tuberculosis* CtpB in Copper Transport
Poster # 154	**Ashitha Rajeurs**	Examining *Mycobacterium tuberculosis* Genes for Roles in B12 Synthesis
Poster # 155	**Kerryn Roome**	Malaria in the Late Stages of Pregnancy and the Significance of Tissue Factor
Poster # 156	**Ann Gore**	Improving Efficacy of HIV Vaccines for Immune-Suppressed Recipient
Poster # 157	**Hammad Khalid**	O-Linked Glycosylation Patterns of Cervical Mucins in HIV Infection
Poster # 158	**Elyssa Cohen**	Polysialic Acid Expression in AICAR Treated Mouse Neuroblastoma Cells
Poster # 159	**Lauren Dennison**	Extracellular Vesicle Dependent Transfer of a Virulence Factor Confers Human Infectivity to *Trypanosoma brucei brucei*
Poster # 160	**Jason Kwak**	The Impact of Blood Circulation on Cancer Metastasis Patterns
Poster # 161	**Anjali Kumar**	Analysis of Pancreatic Cancer Biomarkers
Poster # 162	**Sarah Hatton**	Identifying the Monoclonal Antibody Epitope Peptide Expressed on Pancreatic Adenocarcinoma
Poster # 163	**Christopher Whitlock**	How Does Mutagenesis of N-Linked Glycosylation Sites of C6f1 Fragment affect MAb109 Binding?
Poster # 164	**Juhi Varshney**	DARC Expression in Triple-Negative Breast Cancer
Poster # 165	**Kathryn Vollum**	Regulation of DARC Isoforms among Ancestry Groups and Associations with Aggressive Breast Cancer Subtypes

Poster # 166	**Andrea Brown**	Distinct Transcript Isoforms of the Atypical Chemokine Receptor 1 (ACKR1)/Duffy Antigen Receptor for Chemokines (DARC) Gene are Expressed in Lymphoblasts and Altered Isoform Levels are Associated with Genetic Ancestry and the Duffy-Null Allele
Poster # 167	**Isha Dabke**	Pharmacological Inhibitors of Epigenetic Mechanisms Alter Liposome Uptake
Poster # 168	**Thao Le**	Effects of Mitochondrial-Targeted (MitoQ) Antioxidants on the Lipidome of a Transgenic Mouse Model of Alzheimer's Disease
Poster # 169	**Marshall Kastens**	Age Related Metabolism of Pyrethroids in Rat Brain Microsomes
Poster # 170	**Paige Lane**	Efficient Cloning By Temperature Upshift
Poster # 171	**Kikachukwu Okolo**	Structural Characterization of an LTTR in *Acinetobacter baumannii*
Poster # 172	**Vincent Way**	Large-Scale Plasmid DNA Purification for Gene Therapy of Hemophilia B in Dogs
Poster # 173	**Julian Selano**	Development of a Non-Radioactive High Throughput Assay to Detect Thyroid Hormone Uptake in Cryopreserved Hepatocytes in Suspension
Poster # 174	**Kyle Brown**	Examining the Effects of Astrocytes on Chlorpyrifos Metabolism
Poster # 175	**Kyle Mott**	Trace Level Determination of Trichloroethylene in Plasma by Headspace Solid-Phase Microextraction Gas Chromatography/Negative Chemical Ionization Mass Spectrometry
Poster # 176	**Oluwasegun Olorunyolemi**	Sensitive Liquid Chromatography/Mass Spectrometry Method for the Determination of the Lipophilic Anticancer Drug in Rat Plasma
Poster # 177	**Kirsten Allen**	The Effects of Grape and Muscadine Juice on Protein Glycation
Poster # 178	**Kaylyn Bell**	Engineering the Active Site of Histone Acetyltransferase 1
Poster # 179	**John Lee**	Fractionation and Analysis of Wild Type and Galacturonosyltransferase 14 (GAUT14) Knockdown

		Switchgrass Cell Walls to Determine the Structure Synthesized by GAUT14
Poster # 180	**Olivia Mendel**	Proteome and Glycome Profiling of Medaka Exposed to Chronic, Low Level Ionization Radiation
Poster # 181	**Jerin Varghese, Jason Moraczewski, Brittany Tummings**	Proteomic Profiling of a Model Species (Medaka Fish) to Study the Physiological Response to Chronic, Low Level Ionizing Radiation in the Environment
Poster # 182	**Kyle Bowler**	The Enzymatic Characterization of Three Nucleotide-Sugar Aminotransferases in Pathogenic *Bacillus*
Poster # 183	**Lauren Davis**	Regulatory Pathway of X-Polymer Formation in *Bacillus* Species
Poster # 184	**Michael Cheng**	Post Translational Modifications of CaaX-Box Proteins Are Dependent on Specific CaaX Motifs
Poster # 185	**Haeun Kim**	Investigating the Post Translational Modification of CaaX Proteins
Poster # 186	**Rohit Munagala**	Investigation and Structural Inhibition of Rce1 and Ste24 Activity in a Prokaryotic System
Poster # 187	**Justin Dumrongkulraksa**	Identification of CRISPR Adaptation Complexes and Associated Nucleic Acids in *Pyrococcus furiosus*
Poster # 188	**Jesse Hu**	Evaluation of Cas4 Function in CRISPR-Cas Adaptation
Poster # 189	**Jessica Dinsmore**	A Study of Transposon Movement in *C. bescii*
Poster # 190	**Cynthia Ponir**	Yield Improvement of *Pyrococcus furiosus* Soluble Hydrogenase I by Overexpression of Accessory Proteins
Poster # 191	**Monisha Narayanan**	Examining Intercellular Heme Transport via Freixenet Transgenic Zebrafish
Poster # 192	**Adam Aston**	Transcriptional Activity of MGA and Mutation in Zebrafish
Poster # 193	**Bryanna Thomas**	Biological Function of an AAK1-Like Protein Kinase in *Trypanosoma brucei*
Poster # 194	**Haley Vale**	Localization of Casein Kinase 1.2 in *Trypanosoma brucei*
Poster # 195	**James Kraus**	Identifying Genetic Suppressors of ZYG-11

Poster # 196	**Rachel Vaizer**	The Role of Intraflagellar Transport in Ciliary Gliding
Poster # 197	**Leanna Harbor**	*Agrobacterium tumefaciens* Mediated Transformation of *Mimulus nasutus* via the Floral Dip Method
Poster # 198	**David Cowan**	Heterologous Expression of Carbohydrate Utilization Genes from *Acidothermus cellulolyticus* in *Caldicellulosiruptor bescii*
Poster # 199	**Grace Johnson, Mary Abkemeier, Catherine Waldron, Daniel Blumenthal, Vivian Vu**	Knockdown of IFT Proteins Phenotypically Affects Primary Cilia
Poster # 200	**Thomas Layman**	Experimental Evolution and Sperm Precedence in *D. recens* and *D. subquinaria*
Poster # 201	**Dhairya Shukla**	Small Molecule Inhibition of CARM1 in Adipocytes to Control the Epigenome-Induced Risks of Obesity
Poster # 202	**Kitra Cates**	*In Vitro* DNA-Protein Interaction Analyses of *Zea mays* Transcription Factors
Poster # 203	**Madeline Steffensen**	Using Mutants to Understand Mechanisms of DNA Methylation in *Brachypodium distachyon*
Poster # 204	**Zehneel Jiwani**	Feeding Choice Characterization of *Euptoieta claudia* and Oviposition Choice Analyses of *Agraulis vanilla* in Relation to Cyanide Production of *Passiflora incarnata*
Poster # 205	**Atul Lodh**	Investigating the Role of Cyanogenic Glycosides in *Passiflora incarnata* (Maypop)
Poster # 206	**Michael Lopez**	Regulation of Intracellular Membrane Fusion by V-ATPase Subunits
Poster # 207	**Samuel Macfie**	Exploring Alternative Mechanisms of RidA-Independent 2AA Stress Relief
Poster # 208	**William Moxley**	Characterization of murI, racD and racR of *Acinetobacter baylyi*
Poster # 209	**Hirel Patel, Lucas Bougang, Rebecca Buchanan, John Buchanan**	Genetic and Metabolic Modeling the Methanogenic Archaeon *Methanococcus maripaludis*

Poster # 210	**Isabella Tondi Resta**	Determining Gene Products Interacting with RtcB of the rsr-rtcBA RNA Repair Operon via a Synthetic Lethal Screen
Poster # 211	**David Rink**	Synthesis and Surface Engineering of Fe5C2 Nanoparticles for Superior r2 Relaxivity in Liver-Specific MR Imaging
Poster # 212	**Sang Min Lee**	Investigations of Chromium Photocatalyzed Cycloadditions
Poster # 213	**Alexander Winkles**	Theoretical Investigation of the Combustion Chemistry of Acetaldehyde and Ethenol
Poster # 214	**Brett Askins**	Synthetic Iron Oxide Containing HDL Nanoparticles for Atherosclerosis
Poster # 215	**Noah Newman**	Alpha-Tocopheryl Succinate Encapsulated Nanoparticles for the Enhancement of Mitochondrial ATP Production

Program: Tuesday, April 5, 2016

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

Room A	**Kayla Alward**	Correlation between Teat End Scores and Presence of Mastitis in the UGA Dairy Herd
	Kendall Lee	The Effect of Supplemental Vitamin E Form on Blood Oxidative Stress Parameters Measured in Exercising Horses
	Joseph Elengickal	Deficiencies and Improvements to Mental Health Institutions in Georgia
	Kayla Hargrove	Assessment of Adult Pig Cognition Utilizing an Open Field and Object Recognition Test
Room B	**Andrew Jarnagin**	When Coca-Cola Grows Citrus on the Nile, Who Wins? Revisiting the Arab Boycott in Egypt
	Jazmine Griffin	Corporate Inversion: Companies Leaving the American Tax System
	Jennifer Hardister	Conference Calls and Tax Forecasting
	Melody Alam	Short Selling Pressure and the Information Disclosure of Corporate Innovation: Evidence from a Policy Experiment
Room C	**Camily Williams**	Love, Lust, and Loyalty: Female Sexuality in the Auchinleck Romances
	Leah Scott	"Brave Little Belgium": The British Home Front Response to Belgian Refugees, 1914-1918
	Aaron Conley	The Effect of Shield Laws on Journalists Acting as Investigators, Specifically at Public Universities
	Kinsey Brooke	The Mythical Realm of Faerie: Dragon-Lore Symbolism and the Literary Elements of Faerie
Room D	**Jackson Hopper**	Digitally Delicate Primes
	Lindsey Spreen	Acceleration of Human Transportation and Its Impacts on Energy Consumption
	George Barron	Quantum Fourier Transform in the Single-Excitation Subspace Method of Quantum Computation
	Joseph Skehan	Designing Chiral Metasurfaces and Understanding their

Optical Properties

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

Room A	**Johnathan Mayfield**	An Investigation into the Complex Viral Interactions between *Microplitis demolitor* Bracovirus and TnAV-2a, an Ascovirus
	Alyssa Wuellner	Severity of Cases Admitted into a Small Animal Hospital and the Phase of the Moon
	Kayla Hargrove	Effect of Preoperative Laboratory Testing on Anesthesia-Related Decision Making in Apparently Healthy Dogs
	Lauren Dempsey	A Systematic Review of Adverse Effects Resulting from Administration of Propofol in Domestic Dogs and Cats
Room B	**Xueying Li**	Conjugated Polymers
	Shreya Ganeshan	What Good is a Low-Carbon City if No One Can Afford to Live There?
	Megan Douglass	Caveolae in 3D Neuronal Cell Cultures
	Garrett Steck	An Environmental Engineering Challenge: Improving the Energy Balance of Global Food Production
Room C	**Casey Grippando**	Procedural Polarization: Examining Changes in the Roll Call Voting Record (1877-2012) and their Effects on Political Polarization
	Bryson Culver	Lesbian, Gay, and Bisexual Employment Protection: An LGB-Inclusive Argument for Title VII Sex Discrimination
	Robert Oldham	Coalitional Stability: Apportioning the Legislature at the U.S. Constitutional Convention
	Bert Thompson	The Doctrinal Development of Sea-Launched Nuclear Capabilities
Room D	**Brennan Ninesling**	Role of Human Intelectin-1 in the Innate Immune System
	Ashley Lall	Super-Resolution Microscopy vs. Epifluorescent Microscopy of Aurora Kinase C and SYCP3 Localization in Mouse Oocytes and Spermatocytes

	Tiffany Jenkinson	Expression of Inflammatory and Coagulation Factors in Syncytiotrophoblast BeWo Cells Exposed to *Plasmodium falciparum* Derived Hemozoin
	Andrew Webster	Regulation of Ovarian Cancer by RGS10 and BIN1

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

Room A	**Caroline Harvey**	Need of the "Other": Paradox in Gordon Parks' *Airline Terminal* and *American Gothic*
	Christian Lisa	A Romance: A Creative Writing Project
	Katherine Opacity	Tolstoy's Second Epilogue: On Page and Screen
	Jessie Blaeser	Literature and Art: How One Creates the Other
Room B	**Benjamin Leigh**	Foreign Aid: Helping or Hurting Democracy?
	Zoe Condon	The Gendered Risorgimento: How Wealthy British Ladies Ended Up Campaigning for Italian Unification
	William Robinson	Offensive Realism in a World of Hegemons
	Andrew Jarnagin	Understanding the Rise of the Sadrist Movement in Iraq
Room C	**Shannon Griffiths, Brittany Talkin**	Women, Welfare, and Borrowing
	Madison Turner	Blackout, the New Binge: A Case Study on Underage Drinking Patterns at the University of Georgia
	Ana Duron-Fleck	Financial Education in Georgia Public Schools and its Impact on Students' Financial Behaviors
	Duncan Lord	An Analysis of Trends in Difficulties Faced by Beginning Music Educators, with Discussion and Implementation of Effective Classroom Solutions
Room D	**Syed Tahmid**	Administration of Varying Carbon and Nitrogen Sources into a Defined Growth Media for Polysaccharide Secretion in *Bacillus cereus*
	Elizabeth Wilkins, Catherine Callaway	Optogenetic Control of a Neuromuscular Junction Model on a Chip
	Emily Myers	The Role of Trehalose-6-Phosphate Synthase in the

		Development and Transmission of *Cryptosporidium parvum* Oocysts
	Nikhil Gangasani	Enzymatically Preparing Carbohydrates for Development of an Effective Treatment against a Bacterial Pathogen
Room G	**Sarah Cunningham**	The Genetic Network of Circadian Rhythms in *Neurospora crassa*
	Alyssa Wuellner, Kayla Hargrove	Prevalence of Pain in Dogs with Cancer
	Caroline Langley	A Retrospective Study Analyzing the Relationship between Blood Coagulation and Liver Shunts

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

Room A	**Theresa Young**	Poverty and Shame: Implications for Social Work
	Laura Courchesne	Psycho-Social Impact of Drone Strikes on Non-Combatant Populations: The Cognitive Mechanism Underlying Pro-Group Endorsement of Extremist Violence
	Rachel Schwartz	Nazi vs. "Soup Nazi": The Double-Talk of Holocaust Rhetoric
	Chandler Johnston	Silencing in Chicana Literature: How Chicana Women Writers Navigate Marginalization in the Borderlands
Room B	**Kip Lacy**	Xenophobic Ants: Social Form Discrimination in the Tropical Fire Ant
	Katherine Russell	Investigating the Influence of Geospatial Attributes on Spider Species Richness and Diversity
	Jack Owen	Exploring Uncertainty in Models of Mosquito Vector-Borne Disease
	Caroline Spohn	Population Dynamics and the Ecology of the Common Bottlenose Dolphin of the Central Georgia Coast
Room C	**James Tyson**	Testing for a Correlation between History of Shoulder Injury and Functional Movement Screen Score
	Katherine Miller	Results of Gender and Personality Interactions on

		Mobility in a Sample of Older Adults
	Fatima Kamal	The Effects of Two Different High-Fat Diets on Appetite
	Emma Auger	The Effects of Predictable Targets on Saccade Behavior
Room D	**Allie Harbert**	Microwave Synthesis of MOF-5
	Erin Smith	Ecosystem Decomposition Using Fluxes
	Wesley Brown	An Improved Synthesis of a Fundamental MOF Precursor
	Emma Meehan, Doyle Wallace	Implementation of picoSpin(TM) NMRs into Organic Chemistry Teaching Laboratories through Spectral Analysis of Fischer Esterification Products
Room G	**Ruth Schade**	The Effect of Maternal Diet on Gastrointestinal Health of Offspring
	Zack Flagel	Injury Risk of Major League Foul Balls
	Kharine Jean	Education Level May Differentially Buffer Cognitive Decline in Older Adults Based on Race

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

Room A	**Laura Courchesne**	The Psychology of Nazism and Genocide: The Role of Religion and Symbolism
	Katherine Nichols	"I Just Wanted a Roof over My Head": Possible Housing Solutions for Asylum-Seekers in Germany
	Kelsey Lowrey	Motherhood, War and Ownership in Bertolt Brecht's "Mother Courage and Her Children" and "The Caucasian Chalk Circle"
	Iva Dimitrova	Oral Histories of the Vazov Machine Works
Room B	**Jordan Berne**	Short-Run Economic Mobility in the Wake of the Great Recession
	Meredith Paker	Psychiatric Drug Use and the Business Cycle
	Andrew Teal	Effects of Campaign Finance on Legislator Polarization
	Ian Van Giesen,	Green Power Solutions for Georgia

	Haidi Al-Shabrawey	
Room C	**Lawrence Towe**	Recycle or Landfill? Assessing the Efficacy of a Green-Themed Intervention
	Danei Ting	Financial Knowledge amongst College Freshmen
	Sarah Williams	New Challenges: ADHD Goes to College
	Rutvik Dmello	The Effects of Inclement Weather on Dining Hall Usage
Room D	**Ashley Biscan**	Androgynous Dress: A Sign of a New American Social Landscape
	Ayman Tartir	Code Switching in Tunisian Arabic
	Taylor Wright	Wedding Apparel: A New Definition
	Bleak Chandler	Can Virtual Reality Lead Us to Learn More about Empathy?
Room G	**Dessa Dunn**	Ecosystem Services and Restoration Efforts of Campus Forests: Tanyard Creek and Driftmier Woods
	James Workman	Divergent Selection in the Context of Source-Sink Dynamics
	Douglas Hart	Effects of Climatic Legacy on Southern Appalachian Plant Communities in Coweeta Basin
	Joseph Walker	Statistically Modelling the Determinants of Pathogen Transmissibility in Humans

Abstracts

Trait Variation in Sunflower Cultivars Grown Under Nutrient Stress Conditions
Insiyaa Ahmed
Dr. Lisa Donovan, Plant Biology, Franklin College of Arts & Sciences

A growing global population has put a strain on the limited arable land and natural resources available to meet crop demand. Starting in the early 1900s, high yield has been achieved through the use of inorganic fertilizers. This high input, high output system has led to environmental and soil degradation while providing no long-term solutions to increase production. Breeding more stress tolerant plants could be key to maintaining high yield while saving resources, preventing further ecological damage, and allowing farmers to use less fertile land for agriculture. This greenhouse study looks at variation in stress resistant traits in 12 sunflower cultivars grown at different nutrient treatments. Variation is necessary for breeding because it allows us to select for traits in the cultivars that coincide with increased tolerance. For the experiment, plants were grown to either the seedling or adult stage and traits relating to growth, physiology, and phenology were measured. Analysis of seedling data shows that there is indeed a high variation in response to different nutrient levels among the 12 lines. There was also variation in beneficial stress tolerant traits within the cultivars; for example, certain lines took fewer days to get to the harvest stage but also had lower whole plant leaf area. Adult plant data is currently being analyzed, but it is expected that there will be similar levels of variation in traits.

Short Selling Pressure and the Information Disclosure of Corporate Innovation: Evidence from a Policy Experiment
Melody Alam, CURO Research Assistant
Prof. Jie He, Banking & Finance, Terry College of Business

This study seeks to analyze shifts in information disclosure about a company's innovations when it is subjected to increased short selling pressure. Short selling is a technique that traders use to profit when they expect a company's share price to decrease. It is regulated in many countries. In 2004 a Securities and Exchange Commission policy experiment tested the effects of relaxing these regulations on 1,000 companies listed on the Russell 3000 index. This move increased short selling pressure on the affected 1,000 companies, which in turn incentivized managers to convince traders that future stock price would not decrease. One result of this policy change was an increase in the company's innovation as measured by the number and quality of patents it produced. I will collect data from the Factiva database on media coverage of the 3,000 companies on the Russell 3000 index for years 2001-2010. Then I will filter to find the proportion of those articles related to a company's innovation. This includes key words like patents, research and development, and intellectual property. We hypothesize that the proportion of articles related to innovation will increase for the affected 1,000 companies after the SEC policy experiment. Information dissemination is the basis of efficient markets—buyers and sellers need to know what a company is doing for its stock price to be accurate. In order for potential short sellers to be convinced of a company's long-term price growth, managers should theoretically ensure increased media coverage of their innovations.

The Effects of Grape and Muscadine Juice on Protein Glycation
Kirsten Allen, CURO Research Assistant
Dr. Phillip Greenspan, Pharmaceutical & Biomedical Sciences, College of Pharmacy

Protein glycation results in the production of advanced glycation end products that contribute to inflammation and have been

linked to diabetic complications and many other aging conditions like Alzheimer's disease. The experiment we conducted tested whether grape or muscadine juice inhibits protein glycation. The formation of glycated protein was performed in incubations containing 50 mg albumin/ml and 250 mM fructose in 200mM potassium phosphate buffer, pH 7.4. The formation of a glycation product, in the presence and absence of 2.5 μL/mL of grape (Welch's Red Grape) and muscadine (Paulk's Pride Muscadine) juices, was measured using a spectrofluorometer set at the wavelength pair, 370/440 nm. After three days of incubation at 37ºC, the samples containing only albumin and buffer averaged a fluorescence of 45 units, and this is considered background fluorescence. When fructose was added to the samples, fluorescence increased to a level of 180 units, an indication of the formation of a fluorescent glycation product. Both grape and muscadine juice inhibited fluorescence, with 2.5 uL juice/mL inhibiting glycation by 27% and 88%, respectively. Both juice samples did produce substantial diminishing of the fluorescence; however, muscadine juice was more effective in inhibiting protein glycation than grape juice. The presence of ellagic acid, a phenolic compound with antioxidant activity, in the muscadine juice is thought to be responsible for this difference.

Examining Diversity in High School Publication Staffs

Jenny Alpaugh, Ramsey Scholar, CURO Research Assistant
Prof. Joseph Dennis, Grady College of Journalism & Mass Communication

As the United States continues to deal with racial tensions, it is important that the media continues to increase diversity in order to properly cover these events from a variety of perspectives. However, diversity remains a problem in the media, with the American Society of News Editors reporting in their 2015 census that the percentage of minority journalists working in daily-newspaper newsrooms falls at 12.76 percent. When the demographics of a nation's journalists fail to represent the demographics of the nation, problems arise in obtaining fair and balanced coverage. This study aimed to discover if problems with minority representation were also present in high school publication staffs. Members of the Journalism Education Association were invited to participate in a 10-question survey which asked advisors to self-report both school and staff demographics. These demographics were then compared to determine if diversity in a school is represented in the school's publication staff with initial analysis suggesting that a school's diversity is not always represented within its publication staff. This lack of representation at the high school level illustrates a problem with diversity that exists in all levels of media.

Correlation between Teat End Scores and Presence of Mastitis in the UGA Dairy Herd

Kayla Alward
Dr. Stephen Nickerson, Animal & Dairy Science, College of Agricultural & Environmental Sciences

Mastitis is an inflammation of the mammary gland caused by bacteria that affects 1 in every 3 cows and costs the producer an average of $180/cow/year. Penetration of bacteria into the teat canal causing mastitic infections may be enhanced by hyperkeratosis, a thickening of the teat canal keratin, which provides a breeding ground for bacteria. The goal of this research project was to determine if a correlation existed between elevated teat end scores (degree of hyperkeratosis) and presence of mastitis and elevated somatic cell counts (SCC). For this study, 30 purebred Holstein cows in early lactation were sampled. Their teat ends were scored on a scale of 1 to 4 according to level of severity, and teat canal

swabs as well as milk samples were collected aseptically from each quarter for microbiological examination. Additionally, milk samples were evaluated for SCC using a DeLaval Cell Counter. The association of teat end score, infection status, and SCC was analyzed using the CORR procedure of SAS. Preliminary analysis of data suggested a relationship between mammary quarter infection status and teat score. Uninfected quarters exhibited an average score of 2.00, whereas the overall average score for infected quarters was 2.42. Among infected quarters, teat scores were CNS – 1.9, streptococcus – 2.0, prototheca – 2.0, *S. aureus* – 2.6, mold 3.0, and *E. coli* – 3.0. Results suggest that teat end hyperkeratosis is associated with the presence of mastitis, and that management practices should be in place to prevent this condition and to promote healthy teat ends.

Hookworm Egg Production in a Virulent Hookworm-Fur Seal System

Ali Anderson, CURO Honors Scholar
Dr. Nicole Gottdenker, Pathology, College of Veterinary Medicine

The South American Fur Seal (SAFS, *Arctocephalus australis*) is a marine mammal that inhabits the southern coasts of South America. While this species is one of the most widely distributed otariids in the world, the populations in the Pacific Ocean have experienced an alarming decline (57%) over the last 20 years. Although the cause of this decline is unknown, hookworm disease plays a significant role in the population dynamics of SAFS. Via necropsies conducted at Guafo Island, or Chilean Patagonia, hookworms were collected from SAFS pups with the aim of studying this host-parasite system, in which the parasite, the hookworm, causes significant damage to the host (high virulence). Since the virulence of this parasite is related to the extraction of host resources (blood), we hypothesize that high virulence correlates with a greater chance of transmission for the parasite. Additionally, we hypothesize that these populations will select for individuals with higher virulence over concurrent generations. In order to determine the effective transmission of this system, we measured the egg production of hookworm females collected from fur seal pups found dead due to trauma or hookworm disease. While results are pending, it is expected that there will be larger numbers of eggs in hookworm females collected from pups that died due to hookworm disease compared to hookworms collected from pups that died due to causes unrelated to hookworm infection (trauma).

Lung Abnormality Detection from Laser Projection Modeling

Sommer Anjum, CURO Research Assistant
Dr. Ramana Pidaparti, College of Engineering

Many respiratory diseases like asthma, chronic obstructive pulmonary disease (COPD), and pneumonia require the estimation of lung parameters that are very crucial in analyzing the health condition of a patient. Most of the available devices in the market perform these measurements invasively, and the non-invasive kinds like laser-based 3D monitoring of the chest wall are subject to issues involving maintenance, portability, and resolution. In addition, these instruments are not capable of performing localized measurements. We are in the process of developing a laser-based portable device capable of measuring respiration dynamics and heart rate non-invasively. The device primarily projects a laser grid onto an area of interest, and the displacement of the grid with time is monitored with an integrated CCD camera. These displacements can be measured precisely to a micrometer level and hence very minute changes in functional residual capacity of lungs can be monitored. Experiments were carried out to see how the respiratory rate can be predicted from well-defined surfaces

mimicking the patient chest. These results are presented in the poster.

Synthetic Iron Oxide Containing HDL Nanoparticles for Atherosclerosis
Brett Askins
Prof. Shanta Dhar, Chemistry, Franklin College of Arts & Sciences

Atherosclerosis is one of the world's most aggressive diseases, claiming over 17.5 million lives per year. This disease is often caused by high amounts of lipoproteins circulating in the blood stream, which leads to plaque formation. Ultimately these plaques can undergo thrombosis and cause heart damage. A major contributor to these vulnerable plaques is macrophage apoptosis. Development of subcellular vehicles that carry contrast and therapeutic agents to the mitochondria within these apoptotic macrophages is attractive for the treatment of atherosclerosis. Previously, our lab reported construction of a biodegradable, synthetic HDL nanoparticle (NP) system that is capable of detecting vulnerable plaques by mitochondrial membrane potential collapse, which occurs during apoptosis. This platform contains a core of poly(lactic-co-glycolic acid) and cholesteryl oleate, with similar hydrophobicity as found in natural HDL. Surrounding this core is a phospholipid layer comprised of 1,2-distearoyl-sn-glycero-3-phosphoethanolamine, along with stearyl-triphenylphosphonium (TPP) cations for detection of mitochondrial membrane potential collapse. On the surface of this lipid layer is an apoA-I mimetic 4F peptide capable of binding cholesterol and participating in reverse cholesterol transport (RCT). A Magnetic Resonance Imaging (MRI) iron oxide-based probe, mito-magneto, was encapsulated within the HDL NPs for potential use in therapeutic monitoring of atherosclerosis by MRI. This platform displays excellent composition, stability, and physiochemical properties required for encapsulation inside the core of the HDL-NPs. Characterization of the potential therapeutic and imaging abilities of these IONP-based HDL-NPs in atherosclerosis can be completed upon conduction of studies to further understand bioimaging, biocompatibility, toxicity, cholesterol efflux properties, and immunogenicity.

Transcriptional Activity of MGA and Mutation in Zebrafish
Adam Aston
Dr. Scott Dougan, Cellular Biology, Franklin College of Arts & Sciences

This study focuses on the normal function of MAX Gene Associated (MGA) transcription factor during zebrafish development as well as its involvement in tumorigenesis. The MGA gene is known to regulate the cell cycle and differentiation not only in zebrafish but also in mice and humans. In order to study the transcriptional activity of MGA in zebrafish, the CRISPR/Cas9 system is utilized to generate a targeted mutation in the T-Box DNA binding site. CRISPR/Cas9 is a genome editing method that utilizes the endonuclease activity of the Cas9 protein guided by the gRNA to cut at the target sequence of interest. Co-injection of the Cas9 mRNA and the T-Box gRNA in embryos can yield mutant phenotypes: a wide array of defects in the heart, tail, and eye development. The embryos are examined at both 24 hours and 48 hours post-fertilization; zebrafish exhibiting mutant phenotypes are documented and photographed. The gRNA injected F0 generation is raised to adulthood. The potential mutants are identified by outcrossing the F0 generation to wild-type zebrafish. DNA from the F1 larvae is extracted, PCR amplified, and T7E1 digested. Once the potential mutants are identified, their progeny are raised for further screening. Homozygous mutant MGA zebrafish are recovered by in-crossing two heterozygous F1. Crossing two homozygous

recessive F2 zebrafish will yield a maternal-zygotic mutant F3 generation. By analyzing the gene expression pattern and morphological defects of mutant fish, the results should allow for a better understanding of MGA regulation and involvement in embryonic development and human cancer.

The Effects of Predictable Targets on Saccade Behavior

Emma Auger
Dr. Jennifer McDowell, Psychology, Franklin College of Arts & Sciences

The ability to see patterns and alter behavior based on those patterns allows individuals to respond efficiently in predictable environments. Saccades, also known as rapid eye movements, are used when studying the influence of cognitive processes such as detection of timing patterns on sensory-motor function. This study investigated subjects' ability to adapt behavior to a predictable, patterned sequence of events by comparing saccade latency on a visually-guided pro-saccade task with random target locations to a predictive saccade task with alternating target locations. In the predictive task, subjects (n=40) performed blocks of trials with different rates of target alternation: 0.1, 0.2, 0.4, or 0.8 Hz. It was hypothesized that the faster the speed of the predictable targets the lower the latency would be, as subjects learned the timing pattern and generated anticipatory saccades. The preliminary analysis shows that at 0.1 Hz latency does not differ significantly compared to the visually-guided saccades. As the target movements get faster, however, the latency in the predictive task decreases. At 0.4 and 0.8 Hz subjects have faster latencies as the block progresses, ultimately having negative latencies as they learn to predict the target motion before it occurs. In conclusion, faster alternations in the predictive task allow subjects to construct internal representations of target timing patterns and to react more quickly to the change in target location than in a visually-guided pro-saccade task. This information supports the notion that cognition, in this case prediction of patterns, influences motor function and causes adaptive behavior.

Practice Makes Perfect: A Capuchin Monkey Becomes Skillful at Nut Cracking with an Unfamiliar Stone

Rhianna Baldree, Emily Unholz, Margaret Bergmann
Dr. Dorothy Fragaszy, Psychology, Franklin College of Arts & Sciences

Skill is defined as fluid and effective performance of a specific action, or set of actions, under varying circumstances. Wild bearded capuchin monkeys typically crack tough palm nuts by placing them on a log or stone anvil, and striking them with stone hammers that weigh a considerable portion of a monkey's body mass. To evaluate nut-cracking skill, we videotaped an adult male using an unfamiliar stone hammer of an average weight and size. We documented the monkey's behavior with the stone during nut cracking in slow-motion playback. We coded three exploratory actions with the stone (preparatory lifts, spins, and flips), the position of the monkey's hands on the stone each time it moved the stone, the angle of the strike, and outcome (stone dropped, nut cracked). We determined the frequency of actions and outcomes for the first 100 strikes of this monkey and reported that the monkey cracked 31 nuts in 100 strikes and produced between exploratory actions. Proportions of the three exploratory actions were also recorded, with .73 in spins per strike, .36 in flips per strike, and .38 in preparatory lifts per strike. The monkey rarely performed unskillful actions. As more strikes occurred, the number of exploratory actions decreased. We interpret the decrease in these actions across practice as an indication that the monkey became more familiar with the stone and therefore more skilled at using it,

increasing the efficiency. We also determined that exploratory actions may help with positioning the stone for an effective strike.

Quantifying Muscle Function in a Previously Fatigued Muscle

Rebecca Baltenberger
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A clinically relevant muscle endurance test using electrical twitch stimulation and accelerometry has been developed. Our aim was to characterize the endurance index (EI) of an endurance test in a previously fatigued muscle. We hypothesized that a supermaximal electrical current for muscle twitch accelerometry could be identified, and that maximal acceleration and the endurance of the muscle after a 5-minute test would be altered in a previously fatigued muscle. *Methods:* We tested males and females. Acceleration was measured using an accelerometer placed over the trapezius muscle. Supermaximal current was measured using electrical stimulation on the trapezius at 4Hz for 1-second intervals at progressively increasing current. Fatigue was produced with 5-minutes of 6Hz stimulation. EI was calculated as the difference between the start and the end values. Fatigue was induced using shoulder shrugs with weights to exhaustion. The EI was measured both after exercise and during a rested state and compared. *Results:* Acceleration leveled off with tolerable current levels. After shrugs, the initial acceleration at the start of the test was only 21% of the non-fatigued acceleration ($p < 0.05$). The EI was 39% +/- 17% in the rested and 190% +/- 154% in fatigued muscle ($p = 0.033$). *Conclusions:* We produced a supermaximal stimulus that may allow us to identify previously fatigued muscle. The decline in initial acceleration observed following exercise influenced the EI, which could potentially confound tests of clinical populations. Future studies need to address the impact of fatigue if we are to use the EI on clinical populations.

The Narrative Retelling of Marginalized Ancient Greek Mythological Characters by Contemporary Female Authors

Manisha Banga
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This research examines marginalized characters from ancient Greek mythology in the context of work by contemporary female authors. Specifically, it examines the phenomenon in which contemporary female authors retell the stories of ancient Greek characters who were sidelined in their myths—usually without agency and often without personality or complexity. When female authors reimagine these characters, they provide new character depth which the ancient mythology does not present. The texts examined will include Anne Carson's *Autobiography of Red*, Sarah Ruhl's *Eurydice*, and Cherríe Moraga's *The Hungry Woman: A Mexican Medea*. These texts reinvent the ancient characters of Geryon, Eurydice, and Medea by delving into their characters on a deeper narrative level by virtue of a defined three-part pattern in which modern authors villainize the ancient heroes, humanize marginalized characters, and finally reveal a corruption of the marginalized character by the hero. This research will employ classical, literary, and feminist analyses both on the ancient mythology and on contemporary work in order to understand the connection between the works in context of their relation to both time period and gender. The researcher argues that female authors retell stories of marginalized characters due to a sympathy derived from the general marginalization of female characters in contemporary art, literature, and culture.

Abstracts

Comparing Meiotic Spindle Structure and Chromosome Attachment in Control and Pericentrin-Depleted Mouse Oocytes

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

Errors in meiotic division in oocytes can lead to aneuploidy, a major cause of genetic disorders such as Down syndrome and pregnancy loss in women. While accurate chromosome segregation depends on stable spindle formation and correct chromosome-microtubule interactions, the regulation of these critical processes is not well defined. In previous studies, we identified an important role for pericentrin (Pcnt) in meiotic spindle stability and developed a unique transgenic mouse model in which *Pcnt* is knocked down exclusively in oocytes to test its function *in vivo*. Pericentrin is a key scaffolding protein that associates with microtubule organizing centers (MTOCs). The objective of this experiment was to compare the spindle structure and chromosome configurations between control and Pcnt-depleted ovulated (Metaphase II-stage) oocytes collected from control and transgenic (Tg) females. The oocytes were simultaneously immunostained with anti-pericentrin and anti-acetylated a-tubulin antibodies, then counterstained with DAPI to assess Pcnt expression as well as the spindle microtubules and chromosomes, respectively. Specific measurements of spindle pole diameter and inter-pole length revealed differences in the Pcnt-depleted group. Notably, the meiotic spindles in Pcnt-depleted oocytes were significantly shorter with relatively broader, less focused spindle poles. Spindle organization was also disrupted in a significant percentage of the oocytes. Moreover, Pcnt-depleted oocytes exhibited a high incidence of lagging chromosomes, indicative of chromosome-microtubule attachment defects. These meiotic errors can potentially lead to aneuploidy. Hence, our data support an important role for pericentrin in the regulation of stable spindle formation and chromosome attachment, necessary for accurate meiotic division.

Quantum Fourier Transform in the Single-Excitation Subspace Method of Quantum Computation

George Barron, CURO Research Assistant
Dr. Michael Geller, Physics & Astronomy, Franklin College of Arts & Sciences

The primary question of our research is "What does the Hamiltonian for the unitary operator associated with quantum Fourier transform look like?" The primary result of the paper is that we determined an analytical expression for the Hamiltonian and present possible applications, including applications to quantum chaos. To accomplish this, we apply results in linear algebra. The significance of this development is that it allows the quantum Fourier transform to be applied in one step in the single-excitation subspace method of quantum computation.

Development of Immunologic Reagents for the Ferret Animal Model

Camille Bauer
Prof. S. Mark Tompkins, Infectious Diseases, College of Veterinary Medicine

The study of influenza disease and immunity in humans is complicated by the multitude and variety of encounters during a lifetime. Accordingly, influenza researchers have developed animal models of influenza infection and immunity, including mice and ferrets. While the mouse model benefits from precise genetics and many immunological reagents, it is widely recognized that mice do not adequately model infection or transmission of influenza. The ferret is a superior model for transmission and pathogenicity and offers major advantages for understanding, preventing, and modulating the course of influenza. Despite the utility of

the ferret, it is underutilized. One recent review noted that "the major drawback to the more widespread use of the ferret as a model for influenza has been the lack of immunological reagents." The objective of this research is to develop validated reagents and protocols to study ferret cellular and immunological responses to influenza infection. Specifically, recombinant ferret proteins are being used to generate novel monoclonal antibody (mAb) reagents. Candidate mAbs will be tested for reactivity to recombinant ferret proteins expressed in the laboratory or provided by collaborators. Leading mAb candidates will be validated for reactivity using ferrets cells and tissues. We have generated plasmids encoding cDNAs for a panel of recombinant ferret proteins and included a 6x Histidine tag (6xHis), enabling detection and purification of the ferret proteins. The cDNAs have been confirmed by sequencing and we are now transfecting HEK293 cells for stable expression of the ferret proteins. Protein expression will be confirmed by multiple assays, including Western blot and immunohistochemistry (IHC), using 6xHis-specific antibodies, and then purified using the 6xHis tag, as well. These proteins and proteins from collaborators are being used to generate mAb, which will be screened for specificity using the recombinant proteins and validated using native antigens from ferret cells and tissues. The long-term goal is to develop ferret-specific mAbs for use in flow cytometry, ELISA, Western blot and other antibody-based assays, which in turn will be used for infectious disease and vaccine studies in the ferret model.

The Effect of Social Comparison on College Students' Attitudes toward Debt and Their Ability to Delay Gratification

Elliott Beale
Dr. Brenda Cude, Financial Planning, Housing & Consumer Economics, College of Family & Consumer Sciences

The research question I will answer is: "how does social comparison/peer pressure affect college students' attitudes toward debt and their ability to delay gratification?" I hypothesize that the students who compare themselves more to their peers and give in to peer pressure easily will be more accepting of debt and will not be able to delay gratification as well as students who do not compare themselves to others and do not give into peer pressure. I will research this question using data collected by Dr. Cude from college seniors in her classes since 2008. I will control for gender, financial knowledge, current financial situation, involvement of parents in financial education, confidence in financial knowledge, and previous financial education. I will use a scale used by Ray and Najman to measure delay of gratification, a scale used by Davies and Lea to measure attitudes toward debt, a scale used by Norvilitis and Maclean to measure parental involvement in financial education, a scale used by Norvilitis and Mao to measure confidence in financial knowledge, and a scale used by Gibbons and Buunk to measure social comparison. Financial knowledge and all other variables will be measured by student self-assessment and/or response to a survey question. By discovering the answer to this question, we will be better able to understand which college students are more at risk to make bad financial decisions.

Engineering the Active Site of Histone Acetyltransferase 1

Kaylyn Bell
Dr. Y. George Zheng, Pharmaceutical & Biomedical Sciences, College of Pharmacy

Histone acetyltransferase (HAT) enzymes regulate gene expression by transferring the acetyl group from acetyl-CoA to specific lysine residues of histones. However, recent studies provide evidence that HATs may provide for the intimate connection between epigenetics and metabolism, acting upon thousands of substrates exclusive of histones.

These proteins play key roles in posttranslational modification, cellular metabolism, and a multitude of other pathways in cell physiology, as well. My objective is to engineer the active site of histone acetyltransferase 1 (HAT1) via site-directed mutagenesis, in order to ultimately identify some of the enzyme's many substrates by conducting enzymatic activity assays. This will provide molecular insights into the biological functions of HAT enzymes and may lead to the development of novel bioorthogonal probes for further investigation.

Thinking Geographically in Regards to Power Dynamics of the Social Environment: Its Effect on Health

Catherine Bernard
Dr. Andy Herod, Geography, Franklin College of Arts & Sciences

Behavior, as it relates to health outcomes, is best predicted through socio-historical interactions, weighted by scale, which provide context to current interactions and seemingly intangible power dynamics that make up the social environment. Through a stance that is dialectical and non-judgmental, making use of critical reflection, successful and functional solutions that address the maladaptive appropriation of stimuli by the individual may be created. Health is correlative with the degrees of power of individuals. The nature of these power dynamics is that they are internalized and constantly re-established through habitual behaviors, reaffirming geographically contingent social constructions. Behavior is geographically contingent, meaning people at specific spaces and times have certain avenues and resources available to them for behavior to be enacted based on a myriad of environmental, socio-historical, and biological factors. This lens provides a more holistic approach to the understanding of behavior, particularly maladaptive behavior that can result in physical health problems. The purpose of this paper is to argue the interpretive value geographers provide in regards to behavior and health is both warranted and necessary in health studies and policies.

Short-Run Economic Mobility in the Wake of the Great Recession

Jordan Berne, CURO Research Assistant
Dr. Robert Nielsen, Financial Planning, Housing & Consumer Economics, College of Family & Consumer Sciences

The goal of this research is to identify short-run correlates of upward and downward wealth mobility in the aftermath of the Great Recession. The paper investigates individual components of wealth that are relevant to the causes and consequences of the recession (i.e. housing wealth and stock market holdings), along with a composite indicator of a household's net worth. Using panel data from the 2008 Survey of Income and Program Participation (SIPP), a series of two-period conditional logistic regressions is constructed to understand the correlates of household wealth mobility. This research fills a gap in the literature on wealth mobility since the recession and will inform the policy debate on how to increase upward mobility and decrease downward mobility. The results suggest that household upward mobility was greatest among those that weren't poor, lived in the South, lived in metropolitan areas, and were employed full time. Increasing educational attainment, improving outcomes for single-parent households, and helping households navigate housing markets may reduce downward mobility.

Androgynous Dress: A Sign of a New American Social Landscape

Ashley Biscan
Dr. Katalin Medvedev, Textiles, Merchandising & Interiors, College of Family & Consumer Sciences

Gender was at the forefront of discussion in 2015, both inside and outside of the fashion industry. Political, social, and retail actions have all been instrumental in breaking down the gender binary in the United States. Recently, fashion's culturally intuitive industry has turned androgynous dress into more than an avenue of personal expression; it created a national (and global) trend, affecting both the LGBT community and heterosexuals. To analyze this occurrence I studied a variety of sources. First, to examine the historical development of the rise of androgyny in today's culture I reviewed numerous academic texts. Next, I looked for proof for the expansion of the new trend in periodicals and by examining current designer collections. My aim was to curate evidence from a combination of sources to understand that the increasing mass acceptance of androgynous dress practices is reflective of dramatic social changes in the United States. I have grouped my findings into sections based on how they relate to fashion cycles, social reform, marketing, and celebrity endorsements. After analyzing my data, I arrived at the conclusion that the simultaneous progress of LGBT freedoms of the 21st century and the rise of androgynous dress as a style trend is more than coincidental. Together, they push and pull each other to help construct a more egalitarian culture. Today, androgyny is truly in fashion in America both literally and politically.

The Role of Chondroitin Sulfate Glycosaminoglycans in Glioma Cell Progression

Nicole Bisel, CURO Graduation Distinction, CURO Research Assistant
Dr. Lohitash Karumbaiah, Animal & Dairy Science, College of Agricultural & Environmental Sciences

Glioblastoma multiforme (GBM) is an aggressive, devastating type of brain tumor characterized by a highly invasive nature. Chondroitin sulfate proteoglycans (CSPGs) and their glycosaminoglycan (GAG) side chains are important elements in the brain extracellular matrix (ECM) and have been implicated in promoting tumor invasion. However, conclusive evidence to suggest CSPGs or the associated CS-GAGs induce brain tumor invasion is currently lacking. We aim to provide evidence suggesting that tumor cell invasion can be influenced by the level of sulfation of CS-GAGs in the tumor ECM. This was tested *in vitro* by encapsulating the glioblastoma cell line U87MG-EGFP into CS-A (4-sulfated), composite CS-A/E (4,6-sulfated), hyaluronic acid, and agarose hydrogels. We hypothesize that the sulfation of CS-GAGs influences tumor cell migration, potentially through a chemokine-mediated mechanism. Choice assays using microfluidics devices showed preferential cell migration into composite hydrogels ($p<0.05$). Immunohistochemistry for the cytoskeletal components FAK and vinculin demonstrated that cells encapsulated in CS-GAG gels show significantly more colocalization than control treatments ($p<0.05$). Chemotaxis assays with the chemokine SDF-1α suggest that, after three hours, GBM cells migrate further into composite gels containing SDF-1α than those without, displaying potential for chemokine-GAG affinity ($p<0.05$). Sandwich ELISA assays to determine SDF-1α binding affinity and qRT-PCR assays are ongoing to establish a molecular basis for SDF-1α mediated migration of U87MG cells in CS-GAG matrices. If glioma malignancy is influenced by the level of sulfation of CS-GAGs, this work could contribute to development of novel therapies for brain cancer and lead to improved patient prognoses in clinical medicine.

The Effect of Form and Source on Bioavailability of Vitamin E Supplementation in Mature Horses

Marrissa Blackwell

Dr. Kylee Duberstein, Animal & Dairy Science, College of Agricultural & Environmental Sciences

Vitamin E (alpha-tocopherol) is an essential nutrient for all horses that has an integral role in preventing excessive production of free radicals that can cause major damage to cell structures. Uncontrolled oxidative stress can inhibit the horse's ability to combat the imbalance between production and removal of free radicals, resulting in tissue damage and, most recently discovered, degenerative disease. Since alpha-tocopherol is not synthesized by the horse, it is a crucial nutrient for all types of equine diets. Vitamin E can be found in natural sources through green pastures, alfalfa, and other quality roughages, as well as in synthetic forms, such as liquid or powder supplementation. However, due to structural differences, absorption rates and effectiveness of alpha-tocopherol can vary. The objective of this study was to compare the bioavailability of natural and synthetic forms of Vitamin E. In this study, we utilized sixteen mature horses, previously housed on pasture. Horses were confined to stalls with minimal turnout to a dry lot (2-4 hrs/day) for a two-week washout period prior to the start of the trial. Horses were then randomly assigned to one of four treatment groups (Group 1 = synthetic acetate powder, Group 2 = natural acetate powder, Group 3 = Emcelle Powder, Group 4 = Emcelle Liquid), and then placed on a two-week feeding trial. Plasma was collected pre-feeding on days one, seven, and fourteen and four hours post-feeding on days one and fourteen to measure vitamin E levels.

Literature and Art: How One Creates the Other

Jessie Blaeser
Dr. Simon Gatrell, English, Franklin College of Arts & Sciences

For this research project, I will answer the following question: what relationships exist between painting and literature? Specifically, I am studying literature and art in England between 1820 and 1920 with works ranging from the paintings of J.M.W. Tuner to the Modernist movement. The purpose of this study includes three key elements: to develop a holistic understanding of literature that has been influenced by artistic movements, to discover how and why artistic movements influence literature, and to gain an understanding for how works of literature can influence and inspire works of art. Writing is meant to create images within a reader's mind's eye; therefore, I am investigating how literature is influenced by images themselves, and conversely, how images fuel pieces of literature. Although some research has been done on this topic, I will bring my own experience as a student of English and art to analyze individual paintings, novels, plays, and poems. My method of study will involve closely reading the poems, plays, and novels that have been tied to specific artists or artistic movements. Then, I will study the paintings that I believe have inspired or influenced these works of literature. After studying each, I will form my own conclusions on how one form of expression has influenced the other. For this presentation, I will be looking specifically at the paintings and poetry of William Blake and Dante Gabriel Rossetti.

Mineralogy and Petrology of Huerfano Butte: A Tertiary Intrusion on the Great Plains, Colorado

Joe Booth
Dr. Michael Roden, Geology, Franklin College of Arts & Sciences

Huerfano Butte, an alkali gabbro igneous intrusion located in the Great Plains of eastern Colorado, has been dated by K-Ar methods to be 25.2 million years old making this one of the most recent magmatic events in the Great Plains and placing it in the same

time frame as the famous dikes and plutons of Spanish Peaks, CO. Most likely, Huerfano Butte is a satellite intrusion of Spanish Peaks. It is composed of felsic and mafic rocks. The mafic rocks contain small felsic segregation veins representing the last portion of the melt to crystallize. Huerfano Butte likely formed by mantle melting related to the Rio Grande continental rift as recently inferred for some dikes in Spanish Peaks. The purpose of this study is to determine mineral compositions in both felsic and mafic rocks in order to understand crystallization history, and to place Huerfano Butte in the context of Tertiary magmatism in the western U.S.A. Compared to the dikes at Spanish Peaks, the rocks from Huerfano Butte are coarser-grained and fresh, allowing a more complete study of crystallization history. Samples were collected during the UGA/USC geology field school course in 2015 and analyzed using the JEOL electron microprobe housed in the Department of Geology at UGA. Olivine compositions range from Fo 71 to Fo 80 confirming a mantle origin, whereas other minerals track the evolution of the magma as it crystallized. Most intriguingly, apatite, amphibole, and mica contain significant H2O, indicating a hydrous magma consistent with a link to Spanish Peaks.

Assessing the Costs of Investments in Immunocompetence on the Fitness of *Hemigrapsus sanguineus*

Sydney Alyce Bourget, CURO Honors Scholar
Dr. Jeb Byers, Odum School of Ecology

Hemigrapsus sanguineus, commonly known as the Asian shore crab, is a highly invasive species that is native to the island of Japan and other coastlines in Asia. Found in Asian shore crabs' environment are rhizocephalan parasites, which often infect and castrate the crabs. This elicits an immune response in the crabs in which they attempt to phagocytize the foreign bodies through encapsulation. This study seeks to determine how infection impacts the fitness of the crab, specifically its metabolic rate. Crabs were infected with an immune response inducing bacteria for a span of 48 hours and then their metabolic rates were measured. The metabolic rates were measured before and after infection. The number of circulating blood cells and the effectiveness of the crabs' immune response were also measured after the infection process. Although data collection is still underway, increases in metabolic rates after infection are expected to be observed. Additionally, we also predict that there will be a positive correlation between the number of circulating bloods cells and the effectiveness of the immune response. This research is significant because the Asian shore crab's invasive range is the northeastern coast of the United States. These crabs are decreasing the biodiversity of these coastal ecosystems and are feeding upon commercially important species like the larvae of lobsters and blue shellfish. Thus, gaining a better understanding about this organism is extremely important in order to ultimately eradicate it from these areas.

The Enzymatic Characterization of Three Nucleotide-Sugar Aminotransferases in Pathogenic *Bacillus*

Kyle Bowler
Dr. Maor Bar-Peled, Biochemistry & Molecular Biology, Franklin College of Arts & Sciences

Sugar-conjugated macromolecules, or glycans, play significant roles in cell-to-cell recognition, binding to the extracellular matrix, and pathogenicity. Glycobiology has become an increasingly popular and medicinally relevant field of study, as there are more than 100 known human diseases related to glycan metabolism. Glycan synthesis requires the formation of diverse nucleotide-sugars. This work describes the formation of amino-nucleotide-sugars in the gram-positive

endospore forming bacterium *Bacillus cereus*. I have identified and characterized three NDP-4-keto-4-aminotransferases in *Bacillus* to gain insight on their levels of catalytic interplay and promiscuity. The aminotransferase genes, RBTH_04255, Bc5273, and Bc1944, were cloned into *E. coli*-compatible plasmids. Transformed *E. coli* were induced to express recombinant protein, which was harvested and purified. Assays were developed to characterize enzymatic activity in terms of substrate/cofactor specificity, buffer/pH specificity, optimal temperature, ideal nitrogen donor source, and ideal pyridoxal and redox groups. Enzymatic products were analyzed via liquid chromatography coupled to mass spectrometry and were confirmed by the fragmentation of nucleotide-mono-phosphate. Enzymatic "% Conversion" was calculated by dividing the integral of eluted product by the sum of the integral product and integral substrate. Bc5273 and Bc1944 were able to convert RBTH_04255's established substrate, UDP-4-keto-6-deoxy-L-AltNAc, to UDP-4-amino-6-deoxy-L-AltNAc at approximately 20% catalytic efficiency. Each aminotransferase was able to convert UDP-4-keto-6-deoxy-D-glucose to UDP-4-amino-6-deoxy-D-glucose. These results indicate an exciting amount of interplay in NDP-sugar metabolism *in vitro*, which demonstrates that proteins are capable of having broad and promiscuous catalytic activities. Future studies are required to better understand the regulation and biological role of these three aminotransferases in *Bacillus*.

Marijuana Use, Nutritional Behaviors, and Educational Attainment in U.S. School-Aged Youth

Ashley Bradford, CURO Research Assistant
Dr. Grace Bagwell Adams, Health Policy & Management, College of Public Health

Over the past decade as state laws regulating the sale and possession of marijuana have undergone significant changes, concern has increased over the impact of liberalization on youth marijuana use. Simultaneously, rates of youth obesity have increased substantially over time. Further, substance use, body image, and nutrition are individually known to be inputs into health and educational production functions for high school youth. However, relatively little is known about the interaction between these factors in health and educational achievement. In this paper we will use data from the Youth Risk Behavior Survey (YRBS) from 1995 to 2013 to study the interaction between marijuana use and nutritional inputs (including healthy eating and exercise) on BMI and on self-reported grade point averages. The underlying conceptual model assumes youth maximize utility across health (proxied by BMI) and school performance (proxied by GPA), where BMI and grades are the outputs of a household production function that has marijuana use, healthy foods, and exercise as inputs. The analysis data contains a representative sample of over 800,000 high school youth from 39 states over the 1995 to 2013 time period. Our models will control for potential endogeneity of the input demand decisions in the BMI and grade production functions using standard instrumental variables methods. Finally, we will discuss the potential policy interventions available to mitigate the adverse consequences of risky youth behaviors and nutritional deficits, and how those policies may differentially affect minority populations.

The Hijab as a Feminist Tool of Agency

Catherine Braun
Dr. Katalin Medvedev, Textiles, Merchandising & Interiors, College of Family & Consumer Sciences

The hijab and the practice of veiling within Islamic culture have been subject to ongoing negative criticism, shaped mostly by exclusionist Eurocentric viewpoints. In the wake of 9/11, many Americans began to view

the hijab as a symbol of an oppressive part of the world. Although the hijab is enforced by many fundamentalist regimes, it is forbidden and penalized by others. Whatever the case may be, wearing the hijab can be a highly personal choice for Muslim women, shaped by political ideology, cultural identity, and modesty. This paper identifies the shifting global trends of hijab wearers and discusses disparate meanings of this dress item for different wearers. In Turkey, for example, Muslim women have often covered themselves to distinguish themselves from the ideological viewpoints of different family members. To better understand the hijab as a tool of empowerment, I have reviewed academic articles and memoirs of hijab wearers. My objective was to identify the positive aspects of veiling. Although it is difficult to measure the exact potential of the hijab as a feminist tool, attempts for the normalization of veiling practices can be detected in social media platforms among millennials and Generation Z members. While women will likely continue to be judged for their appearance, alternative social media representations of veiled women appear to have the potential to jumpstart a dialogue in which such a controversial sartorial phenomenon may find new interpretations.

The Mythical Realm of Faerie: Dragon-Lore Symbolism and the Literary Elements of Faerie

Kinsey Brooke
Dr. Jonathan Evans, English, Franklin College of Arts & Sciences

Characters of the dragon and the dragon-slayer are important symbols in popular themes found in medieval myths and fantasy literature. This project purposes to answer the question, "What are the literary elements of Faerie, and how do they relate to the evolution of dragon-lore and J.R.R. Tolkien's adaptation of these themes?" An inquiry reveals Tolkien's interpretation of what constitutes a fairy story and what defines the broader realm of Faerie. It further contributes to the body of research investigating the symbolic importance of the dragon and dragon-slayer legends and the fantasy worlds in which those tales take place. The focus of the research includes exploration of dragon myths, the historical influences of medieval social customs, the adaptation of dragons in fantasy literature, and the expansion of their portrayals in the works of Tolkien. Additionally, it elaborates on the attributes of dragons from their first conception. I examined the way in which Tolkien used these subjects and adapted them into his stories through survey of his essay "On Fairy Stories" and other literary works. Scholarly articles from other sources were also consulted. In conclusion, the features of dragons are not static but have morphed over time, varying depending on the author's imagination, and the realm of Faerie is given very few literary limits thus adding to the author's flexibility when composing a fairy story.

Distinct Transcript Isoforms of the Atypical Chemokine Receptor 1 (ACKR1)/Duffy Antigen Receptor for Chemokines (DARC) Gene are Expressed in Lymphoblasts and Altered Isoform Levels are Associated with Genetic Ancestry and the Duffy-Null Allele

Andrea Brown
Dr. Melissa Davis, Genetics, Franklin College of Arts & Sciences

The Atypical ChemoKine Receptor 1 (ACKR1) gene, better known as Duffy Antigen Receptor for Chemokines (DARC or Duffy), is responsible for the Duffy Blood Group and plays a major role in regulating the circulating homeostatic levels of pro-inflammatory chemokines. Previous studies have shown that one common variant, the Duffy Null (Fy-) allele that is specific to African Ancestry groups, completely removes expression of the gene on erythrocytes;

however, these individuals retain endothelial expression. Additional alleles are associated with a myriad of clinical outcomes related to immune responses and inflammation. In addition to allele variants, there are two distinct transcript isoforms of DARC which are expressed from separate promoters, and very little is known about the distinct transcriptional regulation or the distinct functionality of these protein isoforms. Our objective was to determine if the African specific Fy- allele alters the expression pattern of DARC isoforms and therefore could potentially result in a unique signature of the gene products, commonly referred to as antigens. Our work is the first to establish that there is expression of DARC on lymphoblasts. Our data indicates that people of African ancestry have distinct relative levels of DARC isoforms expressed in these cells. We conclude that the expression of both isoforms in combination with alternate alleles yields multiple Duffy antigens in ancestry groups, depending upon the haplotypes across the gene. Importantly, we hypothesize that DARC isoform expression patterns will translate into ancestry-specific inflammatory responses that are correlated with the axis of pro-inflammatory chemokine levels and distinct isoform-specific interactions with these chemokines. Ultimately, this work will increase knowledge of biological mechanisms underlying disparate clinical outcomes of inflammatory-related diseases among ethnic and geographic ancestry groups.

Examining the Effects of Astrocytes on Chlorpyrifos Metabolism

Kyle Brown, CURO Research Assistant
Dr. Michael Bartlett, Pharmaceutical & Biomedical Sciences, College of Pharmacy

Chlorpyrifos (O,O-diethyl O-[3,5,6,-trichloro-2-pyridyl] phosphorothionate, CPF) is a widely used organophosphate insecticide. CPF is utilized as an insecticide, and its activity and toxicity is due to the irreversible inhibition of acetylcholinesterase. Chlorpyrifos is metabolized by Cytochrome P-450 (CYP) into chlorpyrifos-oxon (O,Odiethyl-O[3,5,6,trichloro-2-pyridinly]phosphate, CPO) and 3,5,6,-trichloro-2-pyrinidol (TCP). CPO is approximately 3,000 times more potent than CPF and leads to neurotoxicity. TCP is nontoxic and is eliminated in the kidneys. Methods have been developed to quantify chlorpyrifos and its two metabolites by column liquid chromatography/electrospray ionization tandem mass spectrometry (LC/ESI-MS/MS). Preliminary data showed the detoxification of CPF into TCP in the presence of astrocytes. An increase in TCP levels was observed in cell culture medium in the presence of astrocytes, but was inhibited in the presence of CYP inhibitor SKF525A. This suggested that astrocytes have the ability to metabolize and detoxify chlorpyrifos, and the metabolism could be inhibited by the CYP inhibitor. This poster will discuss quantitative data obtained from the co-culturing of neurons with astrocytes in the presence of CPF and how astrocytes affect the metabolism of CPF into CPO and TCP.

An Improved Synthesis of a Fundamental MOF Precursor

Wesley Brown, CURO Research Assistant
Dr. Douglas Jackson, Chemistry, Franklin College of Arts & Sciences

As the first step in a multi-step synthetic project, the synthesis of methyl 10-nitro-9-anthracenecarboxylate is critical to the foundation of the organic linker needed to complete the construction of a hybrid molecular switch to metal-organic framework, or MOF. To synthesize this methyl ester, esterification of 9-anthracene carboxylic acid was implemented in methanol and sulfuric acid, and the reactions completed to various yields. However, rather than pursuing conventional synthetic routes for this reaction, such as oil-bath reflux, microwave irradiation was implemented to greatly reduce

the time table of this reaction. A more successful esterification was achieved by first converting 9-anthracene carboxylic acid to the acyl chloride, and then immediately converted to the desired methyl 9-antrhacenecarboxylate with the addition of methanol in acidic conditions. Following the successful esterification, methyl 9-anthracenecarboxylate was nitrated to methyl 10-nitro-9-anthracenecarboxylate by way of the creation of the nitronium ion in sulfuric acid and an acetic acid/acetic anhydride solution. Current methods improve upon the literature in terms of reduced reaction time, improved yield, and purity.

Characterization of *Bacillus thuringiensis* Cry51Aa Toxicity to *Lygus*

Darcie Bruce, CURO Summer Fellow, CURO Research Assistant
Prof. Michael Adang, Entomology, College of Agricultural & Environmental Sciences

Tarnished Plant Bugs, *Lygus lineolaris*, have emerged as major global crop pests. This group of bugs in the Order Hemiptera has piercing-sucking mouth parts, stylets that puncture plant cells and remove cellular contents. These species are cosmopolitan pests of high value crops. During the early bud and bloom stage, feeding by these insects causes bud and flower loss, reducing yield on stone fruits such as peaches, and a number of agricultural row crops including cotton. Recently, the structure of Cry51Aa was solved by collaboration with the Adang laboratory. Based on the discovery by Baum et al. (2012) that a Cry51A-typetoxin has toxicity to *Lygus*, I tested Cry51Aa for *Lygus* activity in the 2015 Summer and Fall semesters. This involved developing an effective bioassay method and then using bioassays to determine Cry51Aa toxicity to *L. lineolaris*. My goals for this semester are: 1) determine the Lethal Concentration50 (LC50) value for Cry51Aa against *Lygus*, 2) conduct a *Lygus* bioassay with activated Cry51Aa toxin, 3) using fluorescently labeled Cry51Aa toxin, image toxin binding and damage to gut tissue in *Lygus* nymphs by confocal microscopy. The data will provide basic information on toxin interaction with the *Lygus* gut, and will guide the optimization of Bt Cry51Aa toxin for enhanced activity against *Lygus* and other hemipteran pests.

Diabetes Self-Education App

Ben Burgh
Dr. Kyle Johnsen, College of Engineering

Diabetes mellitus is a metabolic disorder affecting almost 400 million people worldwide. In order to help these people understand how their actions (i.e. adhering to their medication, diet, and exercise regimes) can affect their health, we constructed a mobile application to promote patient knowledge and keep track of their well-being. The primary means of accomplishing this is a "What If" simulation which visually demonstrates to users how different behaviors would hypothetically improve or degrade their health. Users would be encouraged, both by the application and their doctors, to live a healthier lifestyle. Our question is, are patients willing, or even able, to educate themselves through this application?

Spatial and Temporal Iron Isotope Fractionation in Hawaiian Soils

Shannon Burns, CURO Graduation Distinction, CURO Research Assistant
Dr. Aaron Thompson, Crop & Soil Sciences, College of Agricultural & Environmental Sciences

In the future, iron isotope fractionation patterns can serve as tracers for redox conditions in past climates, particularly when coupled with fractionation patterns for other metal isotopes. Given that microbes play a role in iron reduction, these redox conditions might elucidate microbial composition in ancient soils. Hawaiian soils have undergone

controlled soil formation, or pedogenesis, as a result of their formation from volcanic hot spot activity. We sought to determine differences in the iron (Fe) isotopic ratio of 56Fe/54Fe in soils of varying age and climate from Hawaii. Our sampling sites varied in mean annual precipitation. We hypothesize that elevated weathering from increased precipitation and/or age of soils will yield a greater 56Fe/54Fe ratio. Samples were digested for Fe isotope analysis. For Fe purification, a double-spike of 58Fe-54Fe was added to each purified sample to account for mass bias in Inductively Coupled Plasma Mass Spectrometry (ICP-MS) measurements of 56Fe and 54Fe. Isotopic compositions will be compared across soils with temporal and spatial climate variation to elucidate redox patterns in the soils.

The Influence of Formal and Informal Sources of Support on Foster Parents' Couple and Co-parenting Relationship Quality

Avery Campbell, CURO Research Assistant
Dr. Ted Futris, Child & Family Development, College of Family & Consumer Sciences

Nearly 7,500 of Georgia's children are placed in foster care each year. Having had experience with maltreatment, poor parenting, and high-conflict homes, foster children benefit the most from foster homes that include both high-quality parenting and healthy couple relationships. However, foster parents experience many unique stressors (e.g., traumatic experiences of foster youth, challenges with both foster and birth children, financial strain, legal processes, increase on time demands, lack of permanency) that increase their risk of experiencing marital and co-parenting challenges, which may jeopardize placement quality and stability. Couples who have meaningful social connections they can turn to during challenging times typically do better managing their concerns. The current study examines the influence of formal and informal sources of support on married foster parents' couple and co-parenting relationship quality. From an initial pool of 4,346 active foster parents in Georgia shared by the Division of Family and Children Services, 2,465 were identified as married (62.4% Caucasian) and 300 couples were randomly selected and mailed a survey (50% Caucasian). A total of 100 foster parents responded (69.0% Caucasian; 59.0% female), representing a total of 60 married couples (63.3% with data from both partners). Preliminary results show that foster parents identified support from friends, their family or child's doctor, and other foster parents as most helpful. Additionally, foster parent support was associated with greater commitment to the couple relationship and higher relationship quality. This presentation will share the results of this study and implications for enhancing support services for foster parents across Georgia.

Geographic Distribution of Adult Body Mass in Muridae

Patric Campbell
Dr. John Gittleman, Odum School of Ecology

Geographic range size and body mass have been well studied in mammalian species. However, the studies overlook the fact that geographic distribution may correlate with body mass. We used various museum rodent specimens to estimate body mass using an allometric relationship between adult body mass and skull length. The reason we are using rodent specimens is that we have a lot of information on many rodent species; yet, we are still missing data from a few rodent species. In order to find out more information on their geographic distribution, we can use patterns of information that is analyzed to provide correlations to the data we are missing for the few rodent species. Using the location data for where each museum specimen was collected, we will analyze global

patterns of body mass across a map of biogeographic realms. The main goal in mind is to predict patterns of geographic distribution in rodent species to help aid with conservation measures, due to the fact that environmental changes are expected to alter geographic distribution and can put many of these species at risk for extinction.

Synthetic Estrogen Disrupts Spindle Organization and Meiotic Division in Oocytes

Madison Canning, CURO Research Assistant
Dr. Maria Viveiros, Physiology & Pharmacology, College of Veterinary Medicine

Aneuploidy, the presence of an abnormal chromosome number, in embryos is a leading cause of birth defects such as Down syndrome and pregnancy loss. This condition is primarily attributed to meiotic division errors in female oocytes before fertilization. Studies indicate that environmental toxins, such as estrogenic compounds, can disrupt oocyte development and meiosis. This investigation tested the effect of short-term exposure to the synthetic estrogen, Diethylstilbestrol (DES), on mouse oocytes in culture. To determine whether DES impairs the resumption and progression of meiotic division, GV-stage oocytes with surrounding granulosa cells were collected from pre-ovulatory follicles and cultured with increasing concentrations of DES (0, 5, 15 and 30 uM) for 17 h. Additionally, we tested whether a brief 4h exposure to DES disrupts mature MII oocytes post-ovulation. Following culture, the oocytes were fixed for immunofluorescence analysis of chromosome and meiotic spindle configurations. The distribution of key MTOC associated proteins, pericentrin and g-tubulin, was also analyzed. DES exposure during 17h culture disrupted the progression of meiosis, with higher concentrations of DES leading to MI-arrest. The oocytes showed significant chromosome-microtubule attachment errors as well as disrupted meiotic spindle organization. In addition, both pericentrin and g-tubulin showed atypical distribution in numerous smaller foci throughout the cytoplasm. Interestingly, similar errors were observed in ovulated MII eggs following short exposure to DES. These data indicate that DES exposure significantly disrupts oocyte microtubule organization, causing meiotic spindle structure defects and chromosome attachments errors. These deformities can result in aneuploidy, which adversely effects embryonic development post fertilization.

Corporate Social Responsibility and Stock Prices: The Environmental Responsibility of Shareholders

Katie Cannon, CURO Research Assistant
Dr. Christopher Pope, Banking & Finance, Terry College of Business

Over the past few decades, the American population has taken an increased interest in the environmental and social problems that directly result from corporate decisions. Multiple studies have found that consumers, investors, and financing organizations have become sensitive to corporate environmental responsibility, and especially their irresponsibility. Decision makers need dependable information to help them balance their responsibilities to the shareholders and to show the company as environmentally responsible. The objective of this study is to measure the impact that eco-friendly and eco-harmful events have on stock prices, as a measure of corporate performance. To examine the impact that sustainable initiatives (or lack thereof) have on stock prices in modern times, a series of event studies was performed. Relevant events between 2010 and 2015 were identified using Wall Street Journal articles, found through Factiva. Focusing on the environmental responsibility portion of CSR, appropriate events were determined using applicable

keywords. Each event was then categorized into one of two groupings: eco-friendly or eco-harmful. A three-day event window [-1,1] was used to observe any abnormal returns surrounding the events. Based on previous research, it is likely that this study will find a causative relationship between eco-harmful and eco-friendly events and a change in the company's stock price. Specifically, past studies have indicated that stock prices will rise after the announcement of an eco-friendly event, while stock prices will fall after the announcement of an eco-harmful event. The results of this study should give decision makers a clearer path to follow.

Investigating the Plasmonic Property of Ag-Cu Alloy Nanostructures

Daniel Carlson
Dr. Yiping Zhao, Physics & Astronomy, Franklin College of Arts & Sciences

When a photon hits the interface between a noble metal and a dielectric (such as air), it causes electrons to oscillate at that interface. When the size of the metal becomes much smaller than the wavelength of the incident light, at certain frequencies photons will excite a strongest oscillation, which is known as surface plasmon resonance (SPR). At the SPR frequency, the electric field around the metal surface will be greatly enhanced, which can be used in a wealth of applications such as food safety, medical diagnostics, microscopy beyond the diffraction limit, or even disease treatment. For different applications, it is very important to tune the SPR frequency. This project focuses on manipulating the SPR frequency using the silver-copper composite nanostructures. The Ag-Cu composite nanostructures are fabricated using shadow nanosphere lithography with a two-source electron beam deposition system. Glass substrates are coated with a hexagonal close-packed colloid monolayer of polystyrene beads (500 nm and 750 nm in diameter) and act as a mask during physical vapor deposition. By controlling the deposition rate of the two metals, their relative composition can be tuned. The resulting materials are characterized by UV-Vis spectrometer, scanning electron microscopy, transmission electron microscopy, atomic force microscopy, and energy dispersive x-ray spectroscopy. We find that the SPR frequency decreases with the Cu composition, which is consistent with the theoretical prediction. We will establish the relationship between the optical properties and the morphology and composition of the Ag-Cu nanostructures.

Pre-to-Post Transplantation Changes in Caregiver Emotional Functioning

Olivia Carlson
Emily Ivey, Colleen Keeler
Dr. Ronald Blount, Psychology, Franklin College of Arts & Sciences

Objective: Caregivers and families of children awaiting solid organ transplantation often experience significant stress. Less research has examined how caregiver and family distress changes from before to after transplantation. This study investigated how caregiver and family psychosocial functioning changed from before (T1) to 6 months after transplantation (T2). It was hypothesized that caregiver and family distress would decrease from T1 to T2. *Methods*: The sample included 46 caregivers of pediatric transplant recipients (T1 *M* child age = 8.08 years; T2 *M* child age = 9.11 years). T1 data was collected at the pre-transplant evaluation and T2 data was collected 6 months post-transplantation. Caregivers completed questionnaires of their own emotional functioning and the impact of the child's illness on the family. *Results*: From T1 to T2 (*M* time passed = 11.92 months), caregivers demonstrated significant decreases in somatization symptoms ($d = .31$, $p = .04$), overall emotional distress ($d = .40$, $p = .02$), and post-traumatic stress symptoms ($d = .45$, $p = .01$). There were no differences from T1 to T2 for caregiver depression, anxiety, or the

impact of the child's illness on the family. *Conclusions*: Symptoms likely decreased in response to having the burden of awaiting transplantation removed. Anxiety and depression symptoms and the impact of the child's illness on the family may require intervention to decrease post-transplant. Providers may inform caregivers that aspects of emotional distress will likely decrease post-transplantation, and provide support for current symptoms. *Significance*: Results inform evidence-based practices for the content of psychoeducation provided to families before transplantation.

Effects of Maternal Immune Stimulation by a Viral Mimic on Autistic and Other Behaviors of Juvenile and Adult Mouse Offspring

Annika Carter, CURO Summer Fellow
Dr. Nick Filipov, Physiology & Pharmacology, College of Veterinary Medicine

In line with epidemiological data, maternal immune stimulation of mice leads to neurobehavioral deficits of autistic nature in the offspring. While other studies focused on the effects of maternal immune activation (MIA) early in development predominantly on male offspring, this study investigated the degree and nature of behavioral deficits caused by MIA in juvenile (postnatal day [PND] 35) and adult (PND70) offspring of both sexes. A viral mimic, Poly I:C, was administered at mid-gestation to dams. Offspring were left unperturbed until behavioral testing. Male and female offspring were subjected to behavioral tests at PND35 or PND 70 designed to detect motor, emotional and cognitive behavioral deficits, including some of autistic nature. From data analyzed thus far, sex differences are apparent: the juvenile females swam longer and climbed more in the forced swim test, and both juvenile and adult females had decreased grip strength compared to age-matched males in a grip strength test. In the marble-burying test, a measure of anxiety, there was a trend for increased marble burying by juvenile male offspring of dams treated with Poly I:C; this trend was significant at PND70. These results indicate that male and female mice, while performing differently in tests for depression and muscle strength, are not affected by MIA in these two domains. Alternatively, male mice born to MIA dams exhibit increased anxiety, which is more pronounced in adult offspring. These data suggest that key autistic behaviors in offspring of MIA dams are maintained in adulthood and have a male bias, similar to children with autism.

***In Vitro* DNA-Protein Interaction Analyses of *Zea mays* Transcription Factors**

Kitra Cates, CURO Research Assistant
Dr. Robert Schmitz, Genetics, Franklin College of Arts & Sciences

Corn (*Zea mays*) serves as an integral world crop used for oil production, livestock feed, and nutrient sources in the human diet. Corn is a cereal crop grown for the palatable grains it produces, which are primarily composed of endosperm. Research concerning regulatory pathways associated with transcription in endosperm is necessary to study the factors involved in early seed development and the regulatory influences on hypomethylation observed in corn endosperm. In addition, this study serves to develop a novel *in vitro* DNA-protein interaction protocol. Transcription factors PBF-1, Opaque2, abi3/ZmAFL4, OHP1, and OHP2 were chosen due to their activity during endosperm development. Each transcription factor gene was artificially synthesized in a Gateway entry vector plasmid and transformed into *Escherichia coli*. Sequential cloning into the destination vector pIX-HALO added a HALO motif sequence to the gene sequences and placed the genes under an inducible promoter. Cloned genes were expressed and translated using an

established *in vitro* protocol. HALO hybrid proteins were utilized to isolate DNA targets of our transcription factors. Purification with an anti-HALO antibody coupled with high throughput sequencing identified the targets of our transcription factors, providing novel data on the role of these transcription factors in regulation of endosperm development**.** The protocol parallels the widely used, but extremely costly, chromatin immunoprecipitation sequencing protocol. It provides an efficient, scalable production of transcription factors and the potential to manipulate regulatory networks of interest.

Possibility of Attitude Change towards Edible Insects When Prepared by Top Chefs

Gillian Caudill
Dr. Marianne Shockley, Entomology, College of Agricultural & Environmental Sciences

In 2012, a previous student studied attitudes and behaviors of individuals before and after eating an insect infused product. The student wanted to determine if choice was based upon attitudes towards their health. Since their findings showed that focusing on health has little impact on changing attitudes, it would be beneficial to study a change in attitude based on appearance of the food. Instead of promoting insects as a healthy choice, we chose to promote insects as an exotic and aesthetic food chefs can prepare at an event this past September of 2015 at the Science Cafe Bug Banquet. This event featured renowned chefs from various restaurants in Athens, GA. We predicted that there will be a more dramatic change in attitudes based upon appealing to people's desire to eat a food that is exotic, mostly unavailable in the States, and that is made by acclaimed chefs.

University Professors with Disabilities

Maria Ceron, CURO Honors Scholar
Dr. Edward Delgado-Romero, Counseling & Human Development Services, College of Education

This project presents preliminary results on the first phase of a qualitative study focused on exploring and comprehending the concept of "inclusive" higher education. The analyzed sample consists of six university professors of education from Bogota, Colombia who have lived almost their entire lives experiencing some form of disability. These professors have lived with a disability during the vital period of adolescence, professional training and development, and today serve as trainers in higher education in various subject areas. This project takes into account the fact that people with disabilities are increasingly able to participate in social processes, and are therefore able to contribute to the construction of an inclusive society for all. The study was conducted in three phases. First, each professor's teaching style was illustrated through video recordings of his/her class. The videos were then analyzed according to an established protocol. Then, instrument inventories were utilized to analyze the effectiveness of each professor's teaching style. Finally, in-depth interviews were conducted, transcribed verbatim, and analyzed in order to understand participants' construction of meaning in terms of the relationship between disability, experience, and teaching. Ultimately, the purpose of this study is to determine the effects in which people with disabilities in professional positions influence society. As professors, they hold positions of influence over students in education who will be responsible for implementing the concept of inclusivity into their own classrooms in the future, thereby aiding to the construction of an inclusive society for all.

Novel Nitric Oxide Releasing Materials for Prevention of Infection in Vascular Catheters

Sarah Chaji
Dr. Hitesh Handa, College of Engineering

Clotting and infection are two common problems associated with vascular catheters. Catheters are used in hospitals in thousands of patients every day and are highly prone to infection. The proteins in blood plasma such a fibrinogen and albumin attach to the catheters allowing bacteria to bind to the catheter surface leading to biofilm formation and infection. Frequent use of antibiotics has shown to create resistant strains of bacteria, increasing the risk of infection, thus making them an expensive approach for hospitals due to longer duration of infection recovery time. Nitric oxide (NO) is known to be a potent antibacterial and anti-thrombotic agent. Endothelial cells that line the inner walls of all blood vessels exhibit a NO flux of 0.5–4 × 10−10 mol cm−2 min−1 that helps prevent thrombosis. This research examines the potential of incorporating NO donor, SNAP (*S*-nitroso-*N*-acetylpenicillamine) within Elast-eon E2As catheters (medical grade polymer). This research study consists of a bacterial adhesion assay on protein-exposed catheters made of SNAP and E2As against gram positive and negative bacteria. The results suggest that the SNAP/E2As catheters have the potential to improve the bactericidal activity of intravascular catheters, as well as other blood-contacting medical devices (e.g., vascular grafts, stents).

The Role of Cas4-2 in the CRISPR Adaptation Stage of *Pyroccocus furiosus*

Chip Chambers, CURO Honors Scholar
Dr. Michael Terns, Biochemistry & Molecular Biology, Franklin College of Arts & Sciences

CRISPR (Clustered Regularly Interspaced Short Palindromic Repeats) Cas (CRISPR-Associated) proteins are revolutionizing the field of modern biology, research, and medicine. With most research occuring within the last 5-10 years, CRISPR is rapidly becoming one of the most hot-button issues in biology, prompting coverage from the New York Times, Wall Street Journal, and NPR. CRISPR-Cas is an adaptive immune system in prokaryotic systems made up of several "Cas" (CRISPR-Associated) proteins. My research focuses on evaluating the role of one protein, Cas 4-2, in the CRISPR system of *Pyroccocus furiosus*. This protein has been implicated in the adaptation stage of CRISPR, possibly associating with Cas 1 and Cas 2, which are known to form complexes in the adaptation phase of the process. This presentation will appeal to a broad audience with an introduction to CRISPR while simultaneously conveying the technical aspects of the research.

Can Virtual Reality Lead Us to Learn More about Empathy?

Bleak Chandler, CURO Research Assistant
Dr. Sun Joo Ahn, Grady College of Journalism & Mass Communication

Can virtual reality lead us to learn more about empathy? The dark triad is a group composed of three personality traits: psychopathy, Machiavellianism, and narcissism. With the use of Samsung Gear VR virtual reality, we want to discover whether or not we can discover a link between the dark triad and an individual's empathic response. Each study will involve two individuals who will enter a room. Before entering, Individual A will take a test that determines their "dark triad" personality. Individual A will then enter the room and be set up with a virtual reality headset. Individual B, a confederate, will be set up with a device that can "measure" their heart palpitations. Individual A will read a prompt from a script to individual B that will "trigger" their heart rate. Individual A will then, using the virtual headset, "walk" inside a 3D virtual representation of individual B's heart and experience their heartbeat and palpitations; this heartbeat is simulated. A test will be given after to Individual A to help

determine a link between the dark triad and empathy. Through this test, we want to discover whether or not Individual A's responses and reactions to Individual B's simulated heartbeat are connected to their dark triad.

Corporate Environmental Responsibility Recognition and Firm Value

Mary Chastain
Dr. Christopher Pope, Banking & Finance, Terry College of Business

This paper investigates the relationship between corporate environmental responsibility recognition and firm value. The purpose of the paper is to answer the following question: does external acknowledgement of a firm's sustainability position affect firm value? Answering this question could provide empirical data encouraging companies to adopt sustainable initiatives. The Corporate Knights' "Global 100 Most Sustainable Corporations" is the acknowledgement considered in this study. A firm's placement on, removal from, or new ranking are evaluated to capture any impact of recognition on firm value. The study might be limited by the importance in which the accolade holds. Results pending.

Post Translational Modifications of CaaX-Box Proteins Are Dependent on Specific CaaX Motifs

Michael Cheng, CURO Graduation Distinction
Dr. Walter Schmidt, Biochemistry & Molecular Biology, Franklin College of Arts & Sciences

The modifications occurring to *CaaX* proteins have largely been established using few reporter molecules (e.g. Ras, the yeast a-factor mating pheromone). These proteins undergo three coordinated COOH-terminal modifications: isoprenylation of the motif's cysteine, proteolysis to remove the *aaX* portion, and carboxylmethylation of the COOH-terminus. Here, we investigated the coupling of all three modifications in the context of the yeast Ydj1p Hsp40 chaperone. We provide genetic, biochemical, and biophysical evidence that the Ydj1p *CaaX* motif is isoprenylated but not cleaved and carboxylmethylated. Moreover, we demonstrate that Ydj1p-dependent phenotypes and Ydj1p localization are altered when *CaaX* motifs from yeast Ste18p or a-factor are transplanted onto Ydj1p. The abnormal phenotypes and localization patterns revert to normal when post-isoprenylation events are genetically interrupted. Our findings promote a general model in which proper Ydj1p function and localization require an isoprenylatable *CaaX* motif that is resistant to post-isoprenylation events. These results expand on the complexity of protein isoprenylation and revise the impact of post-isoprenylation events in regulating the function of Ydj1p and perhaps other *CaaX* proteins.

Yohimbine-Induced Reinstatement in Alcohol-Preferring and Wistar Rats

Scott Chimberoff, CURO Research Assistant
Dr. Jesse Schank, Physiology & Pharmacology, College of Veterinary Medicine

Animal models are frequently utilized to develop treatments for a variety of human medical disorders and have been developed to assess critical adaptations within the brain involved in the development of tolerance to, and physical dependence on, alcohol. To better understand the 50% genetic component to the risk for developing alcoholism, alcohol-preferring (P) rats have been selected for high alcohol preference and bidirectionally bred from outbred Wistar rats. Many studies have shown that P rats will self-administer more alcohol than Wistar rats; however, few have studied relapse-like behavior using the reinstatement model. One study demonstrated

that P rats will reinstate, or relapse, to alcohol-seeking behavior after being injected with the pharmacological stressor yohimbine. However, the P rat's sensitivity to yohimbine was not measured using a dose-response analysis. In this study, we explored yohimbine-induced alcohol seeking using the reinstatement model and neuronal activation in the nucleus accumbens shell, a region involved in drug-reward and positive reinforcement, using immunohistochemistry between P and Wistar rats. Neuronal activation was investigated by staining for the Fos protein, whose presence is indicative of neuronal activation. Consistent with previous studies, we found P rats will self-administer more alcohol than Wistar rats. We also found P rats to have greater sensitivity to the reinstatement effects of yohimbine and show greater neuronal activation in the nucleus accumbens shell. This study is one of few addressing relapse-like behavior using the reinstatement model, and possibly the first to compare the reinstatement effects of different doses of yohimbine between P and Wistar rats.

Analysis of the Relationship between Patient Satisfaction Scores and Patient Health Outcomes

Taylor Chishom, CURO Honors Scholar, CURO Graduation Distinction, CURO Research Assistant
Dr. Amanda Abraham, Health Policy & Management, College of Public Health

The Centers for Medicaid and Medicare Services (CMS) now requires hospitals to report and submit their patient satisfaction ratings, which are known as Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) scores. These patient satisfaction scores are tied to a portion of the hospital's reimbursement as a part of CMS's new value-based purchasing initiative. The scores are also published on CMS's hospital compare website, and consumers are able to compare hospitals based on the hospital's HCAHPS scores. Consumers can also compare hospitals based on outcomes such as value of care, timeliness of care, and readmission rates. The purpose of CMS's hospital compare website and value-based purchasing initiative are to incentivize hospital providers to increase the quality of their services while also reducing costs. The purpose of this analysis is to determine if CMS's use of HCAHPS scores in determining a portion of the hospital's reimbursement is tied to better healthcare service quality and better patient health outcomes, or if hospitals are simply investing in processes and environments that result in better HCAHPS scores but not necessarily better healthcare service quality or better patient health outcomes. The hospitals being studied in this analysis are Athens Regional Medical Center and St. Mary's Hospital, which are located in Athens, Georgia. Using these hospitals' patient satisfaction scores, general patient readmission rates, and hospital deaths among patients with treatable complications, a determination will be made as to whether higher HCAHPS scores are linked to better patient outcomes and improved healthcare quality.

Addressing Teenage Pregnancy in Athens-Clarke County, Georgia

Hailey Clark
Dr. W. David Bradford, Public Administration & Policy, School of Public & International Affairs

Since reaching an all-time high in 1990, the teenage pregnancy rate in the United States has steadily decreased. This is in large part due to public health programs designed to increase access to preventative care and to decrease risky sexual behavior. Nevertheless, Athens-Clarke County has a teenage pregnancy rate of 59 pregnancies per 1,000 teenage females, which is higher relative to Georgia (41.3) and the United States (34).

Teen pregnancy has consequences for both teenage parents and the children of teenage parents in terms of educational, employment, and financial outcomes. These consequences are passed on to all citizens in the forms of decreased social well-being and fiscal costs to fund support programs. A systematic review of three policy alternatives and the status quo was conducted on the basis of economic viability, medical effectiveness, and political feasibility. Based on the results of a policy matrix, Athens-Clarke County officials should implement an educational program in the local high schools that promotes youth development in addition to providing sexual education, rather than accept such consequences and allow the teenage birth rate to decrease gradually. Increased connection to one's community and preparation for future aspirations lessens the incidence of risky sexual behavior and resulting pregnancy. Further investigation into the public sentiment of Athens-Clarke County citizens and the Clarke County School District's ability to administer the program is necessary going forward.

Effects of Fire in a Riparian Zone on Aquatic Fungi

Sarah Clement, CURO Research Assistant
Dr. Amy Rosemond, Odum School of Ecology

Fires are an important structuring element of forest ecosystems, both 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, both in terrestrial and aquatic ecosystems. Stream nutrient enrichment studies have been shown to cause an increase in aquatic fungal reproductive output, in the form of conidia production, as well as an increase in aquatic fungal abundance and species richness. There are 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. By comparing a severe burn and a mild burn, this study will provide evidence as to how these effects could change with global climate change, as severity and prevalence of fires increases. I predict that increased nutrients will cause an increase in fungal biomass, production, and conidia production. I predict the increase in conidia production to be more drastic than the increase in biomass, as more production will be devoted to reproduction. I predict there will be a shift in fungal species richness and relative species abundance. I predict the magnitude of these changes to be greater for the severe burn. I will measure fungal biomass via ergosterol extraction, and conidia will be stained in water samples, counted, and identified. Biomass versus reproductive output will be compared pre-burn and post-burn.

The Effects of Lutein and Zeaxanthin Supplementation on Sensory Function in Healthy Adults

Harrison Cloud
Dr. Lisa Renzi, Psychology, Franklin College of Arts & Sciences

Xanthophyll catotenoids lutein (L) and zeaxanthin (Z) are the only carotenoids found in the neural retina and are the dominant caotenoids in the brain. Previous research has shown that supplementation with L+Z can improve visual function under conditions that cause light stress. These effects are largely optical in nature, but additional past research has shown that L+Z may also improve visual function via improving processing speed of visual stimuli in younger adults. The purpose of this study was to determine whether or not supplementation can improve visual processing in older adults. A total of 51 adults over the age of 65 (M = 73.74 +/- 8.2 years) completed a one-year randomized, double-masked, placebo controlled L+Z supplementation study. In addition to a

number of basic cognitive measures, temporal visual processing speeds, visual reaction time and coincidence anticipation ability were tested at baseline, 4-month, 8-month and 12-month time points. Temporal visual processing speed was measured via a custom-built desktop optical device, and visual reaction time was measured using a wall-mounted, custom-built Beyseian timer. In addition to visual function testing, other markers of visual health, such as incidence of age-related cataract, smoking status, and dietary intakes, were collected. Preliminary analyses suggest that nutritional supplementation with L+Z improved visual reaction time in older adults. Analyses are ongoing, but preliminary results suggest that L+Z can improve visual function via both optical (as shown previously) and neural mechanisms.

Natural Killer Cell Maturation is Controlled by Genetic Background in Aging Mice

Erica Coe
Dr. Robert Pazdro, Foods & Nutrition, College of Family & Consumer Sciences

Natural killer (NK) cells are a key component of innate immune responses. Using granules containing perforin and granzymes, NK cells destroy cancerous and virus-infected cells within the body. Recent studies show that as organisms age, NK cell maturation becomes dysfunctional. NK cells increasingly arrest in the early stages of development and fail to become fully mature. These defects ultimately increase susceptibility to cancer and viral infections later in life. We predicted that age-associated declines in mature NK cells are heritable. To test our hypothesis, we assessed the development of splenic NK cells isolated from old mice representing 19 genetically-diverse inbred strains. We measured the number of NK cells as a percent of total splenocytes, and we quantified the percentage of NK cells in each of the following stages: mature, transitional, immature, and double negative. Our results show that NK cell maturity is highly heritable in old mice. Our future studies will identify novel genes and pathways that drive NK maturation during aging, and we predict that these pathways will serve as targets for innovative cancer therapies.

Polysialic Acid Expression in AICAR Treated Mouse Neuroblastoma Cells

Elyssa Cohen
Dr. Michael Tiemeyer, Biochemistry & Molecular Biology, Franklin College of Arts & Sciences

Polysialic acid (PSA) is an N-linked glycan decoration found on the Neural Cell Adhesion Molecule (NCAM), which is expressed in Neuro-2A cells, a mouse neuroblastoma cell line. AICAR is a pharmacological activator of AMP-activated protein kinase (AMPK) - mammamlian target of rapamycin (mTOR) signal transduction pathway. AICAR activates AMPK, leading to increased phosphorylation of TSC2, which produces GDP-bound Rheb. GDP-Rheb inhibits mTORC1 activity, and mTORC1 inhibition causes tumor suppression. Therefore, mTORC1 inhibition is currently of great interest as a clinical approach for cancer treatment. Insight into how AICAR might affect glycosylation could lead to an understanding of the roles that specific glycans, such as PSA, might play in the AMPK-mTORC1 pathway. In the Neuro-2A cell line, I hypothesized that treatment with AICAR would increase PSA expression, thereby implicating a novel role for mTOR signaling in the regulation of glycoprotein glycosylation. My experimental results demonstrate that treatment of Neuro-2A cells with 500μM AICAR for twenty-four hours induces cells to increase PSA expression. Western blot analysis demonstrates that the amount of NCAM protein does not change in treated Neuro-2As. Rather, AICAR affects the

glycosylation of NCAM. Furthermore, by lectin blot analysis, AICAR does not appear to impact the ability of Neuro-2A cells to glycosylate proteins; the expression of high-mannose glycans indicates that core N-glycosylation levels are not altered. Thus, alterations of AMPK-mTORC1 signaling affects processing of glycoproteins in neuronal tumor cell lines, suggesting dynamic modulatory mechanisms for regulating cell-surface glycan expression.

Use of a Spatial T-Maze Test and an Object Recognition Test to Assess Learning and Memory in a Piglet Model

Caroline Coleman, Foundation Fellow
Dr. Franklin West, Animal & Dairy Science, College of Agricultural & Environmental Sciences

Due to similarities between piglet and human toddler brains in structure, composition, and development, piglets have become increasingly relevant subjects in varying aspects of cognition in a piglet model. The spatial T-maze test assesses learning and spatial memories, and the object recognition test assesses object memory. In the spatial T-maze test, piglets will learn to locate a milk reward within a plus-shaped maze. This will test allocentric memory as piglets will have to use extra-visual cues to locate the milk reward, despite starting at alternating north and south start arms. We will measure latency to choice and proportion of trials correct. We expect that piglets will acquire the ability to use extra-visual cues to locate the milk reward, demonstrated by decreased latency to choice and increased proportion trials correct. In the object recognition test, piglets will be exposed to two similar objects, wait for a ten-minute interphase interval, and then be exposed to one familiar and one novel object. Time spent interacting with each of the objects will be measured, and memory involved in distinguishing between familiar and novel objects will be tested. We expect that piglets will spend more time with the novel object over the familiar object. Together with the social recognition test and the open field test, these two behavioral tests will contribute to further understanding piglet learning, memory, and overall cognitive abilities.

The Gendered Risorgimento: How Wealthy British Ladies Ended Up Campaigning for Italian Unification

Zoe Condon
Prof. Steven Soper, History, Franklin College of Arts & Sciences

This project analyzes the varied political involvement of aristocratic British women in Italian unification efforts during the Victorian reformist era. The goal is to show that women did not simply hold back from the political arena, but they were, for the most part, not on the front line of debate either. Instead, women had a variety of political experiences in their efforts with the Italian campaign, spanning from pamphlet writing and public speaking endeavors to more traditional concepts of female political participation like hosting charitable events. The research was done by examining and analyzing letters and correspondence between wealthy women and members of liberal pro-unification entities, which demonstrate women played a major role in publicizing and contributing to the British efforts in the Risorgimento. This paper argues that British women played a critical role in political reform campaigns.

The Effect of Shield Laws on Journalists Acting as Investigators, Specifically at Public Universities

Aaron Conley, CURO Honors Scholar, CURO Summer Fellow
Dr. Barry Hollander, Grady College of Journalism & Mass Communication

In recent years, there has been much debate about the right of journalists to refuse to testify as to the identity of confidential

sources or confidential information collected in the process of newsgathering. Recently, this protection has been brought into the attention of the general public as the result of the case surrounding James Holmes, the now-convicted shooter from the movie theatre in Aurora, Colorado. In the course of the investigation and trial, a copy of Holmes' diary was leaked to Fox News reporter Jana Winter, who published its contents. The State of Colorado attempted to force Winter to reveal the source who leaked the diary, but the courts ruled that Winter was protected by New York's state shield law. One major question that has been prevalent in the debate over shield laws centers on who specifically is protected by these statutes, especially in the case of student journalists. While the United States Supreme Court addressed many questions about the rights of high school student journalists in its decision for *Hazelwood School District v. Kuhlmeier*, there has been no effort to address the rights and protections that should be afforded to journalists at public universities. By examining the various state shield statutes that have already been established, the proposed Free Flow of Information Act of 2013, as well as other academic sources and court precedents, it can be seen that in many cases collegiate journalists are not afforded the protection under the law that they should rightfully receive.

Fracking Governance and Resistance in Western North Carolina

Julia Connell, CURO Research Assistant
Elizabeth Wilkes
Dr. Jennifer Rice, Geography, Franklin College of Arts & Sciences

Hydraulic fracturing (fracking) is largely unregulated at the federal level and is exempt from nearly all federal environmental laws, leaving individual states and localities to regulate the industry. This fragmented landscape of regulatory responsibility has resulted in limited spaces to contest whether or not fracking should be permitted. Our research attempts to determine the spaces and practices of opposition that are possible under neoliberal forms of fracking governance. Using theoretical insights on the nature of democracy, we examine an anti-fracking movement in western North Carolina, one of the only such movements in the United States to coalesce before drilling had started. We argue that contemporary forms of democracy under neoliberalism limit resistance and activism to what we call "micro sites" of contestation. These include: letters to the editors in local newspapers; landowner rights workshops on fracking; local government resolutions against fracking; and the Mining and Energy Commission (MEC) hearing on the rules that permit hydraulic fracturing. This research contributes literature on state theory and environmental governance by showing the ways in which resistance is focused into narrow spaces of dissent under neoliberal governance.

Psycho-Social Impact of Drone Strikes on Non-Combatant Populations: The Cognitive Mechanism Underlying Pro-Group Endorsement of Extremist Violence

Laura Courchesne, Foundation Fellow
Dr. Jeff Berejikian, International Affairs, School of Public & International Affairs

This research examines the impact of drone strikes in influencing the perceptions and decision-making processes of civilian populations. It presents a critique of the traditional view that drones help protect soldiers by reducing the need for on-the-ground action in a conflict. By contrast, it contends that drones help produce a communal identity as well as a preference towards group ideology and extremism among previously non-militant actors. This argument relies on a neurological, psychological, and anthropological understanding of trauma and

anxiety, modeled around the theory of modes of religiosity, to illustrate the potential harm drone strikes can have in aiding militant recruitment efforts. As a result of the trauma they create, drone strikes are able to alter the behavior of population members, who might not normally endorse or join a violent organization, towards pro-group behavior. This can take the form of a shift in moral values and/or the promotion of extreme actions in protection of the group. The emotional response drones elicit and the subsequent psychological changes which occur lead to improved recruitment and support of militant efforts. To support this causal relationship, the paper will present a cognitive mechanism, based on the trauma's successive influence on mental functioning, sense of group identity, and capacity for moral decision-making. This research utilizes case studies on collective experiences of violence and trauma, including disasters, terrorist attacks, religious rituals, and gang initiations, to illustrate the explanatory power of this mechanism.

The Psychology of Nazism and Genocide: The Role of Religion and Symbolism
Laura Courchesne, Foundation Fellow
Dr. David Williams, Religion, Franklin College of Arts & Sciences

The Holocaust is a widely studied historical example of the consequences of uninhibited intergroup aggression and explicit targeting of a particular community on the basis of a shared characteristic. This research provides a review of relevant literature examining the Holocaust as a case study in understanding the psychological, economic, cultural, and religious factors which contribute to group aggression. It places particular emphasis on what leads an individual to accept the violent and discriminatory ideologies of a group, with an interest in applying a psychological understanding of in-group/out-group biases as well as investigating the role of religion and ideology in fostering pro-group sentiments. It offers an understanding of the factors which instigate intergroup violence and genocide as well as the psychology of individuals involved in genocides. This research explicitly focuses on how religion and cultural mythology within German society acted as a structure which inspired the promotional and ideological tactics of the Nazi party in promoting antisemitism. It provides an overview of the theoretical basis of ethnic conflict and genocide while highlighting the importance of evoking certain emotions in a populace through the use of symbolism, mythos, and religion.

Optimizing Plique-à-Jour Enameling
Melissa Cousins, Ramsey Scholar, CURO Summer Fellow
Prof. Mary Pearse, Lamar Dodd School of Art

My research examines the current methods of plique-à-jour enameling and looks at what is actually beneficial to the final piece of enamel. The modern techniques for many styles of enameling are counterintuitive and contradictory, and the long-winded process and delicacy required by these methods tends to turn people away from this style of enamel. I am looking at each step of the process and determining which are helpful, which do nothing, and which are detrimental. My hopes are to come up with a more streamlined method of plique-à-jour to make it more accessible and less difficult to produce. The methods I am using include visual comparisons between samples made using washed, sifted, washed and sifted, and unwashed and unsifted enamels; experimenting with different firing temperatures, firing times, and framework constructions; trying out mosaic work, mica inclusions, and painting for creating shading or pattern; testing if wet firing produces subpar results in comparison to dry firing; and figuring out the maximum size of a cell when using the surface-tension technique for

making a piece of plique-à-jour. All tests are done with unleaded enamels and do not necessarily reflect the properties of leaded enamel. My results have shown that unwashed, sifted enamel works best; a gradual increase in firing times will produce good results without harming a soldered framework; wet firing works just as well as dry and saves time. Tests on pattern making and cell size are still being conducted.

Heterologous Expression of Carbohydrate Utilization Genes from *Acidothermus cellulolyticus* in *Caldicellulosiruptor bescii*

David Cowan, CURO Graduation Distinction
Dr. Janet Westpheling, Genetics, Franklin College of Arts & Sciences

Current energy sources are unsustainable in the long term as well as being very detrimental to the environment; therefore, our future energy production will need to be both sustainable for the long term as well as being environmentally friendly. Lignocellulosic biomass including corn stover, sugar cane, wood, straw, and waste residues from agriculture and forestry is a promising resource for producing fuels and chemicals. Dr. Jan Westpheling's lab has introduced two xylanases (Acel_0180 and Acel_0372) from *Acidothermus cellulolyticus* into *Caldicellulosiruptor bescii*'s secretome in order to increase the species' ability to degrade plant biomass, particularly xylan. The effects of these introductions were determined by comparing growth on cellobiose and xylan substrates, and conducting xylanase activity assay. The results from these experiments showed a modest increase in the activity of the secretome but a dramatic increase in growth on xylan. The most striking result was the viable cell numbers obtained when growing cells on complex xylan substrates. *C. bescii* strains overexpressing Acel_0180 or Acel_0372 xylanases were viable after 36 h cultivation on oat spelts xylan, while neither control strain could. In addition, both strains with xylanase exhibited 32.7 and 15.5 folds higher viable cell numbers on birchwood xylan than that of the control strain. These results show an important step in biofuel research, as cells from the end of one batch are used as inoculum for the next batch to reduce cost and also xylose is one of the most abundant sugars in lignocellulosic biomass.

The Effects of Serum Dietary Carotenoid Levels on Cognitive Function in Healthy Adults

David Cromer, CURO Research Assistant
Eli Chlan
Dr. Lisa Renzi, Psychology, Franklin College of Arts & Sciences

Past research suggests that dietary carotenoids such as lutein (L) and its isomer zeaxanthin (Z) are capable of improving cognitive function in a wide variety of participants across the lifespan (e.g. Renzi et al, 2013). L and Z are known antioxidants that have been cited previously for their ability to reduce risk for central nervous system (CNS) degenerative diseases such as age-related macular degeneration (e.g. AREDS-2 Research Group, 2013), which has been linked to other CNS diseases, such as Alzheimer's disease (e.g., Sivak, 2013). These carotenoids are not the only carotenoids that cross the blood-brain barrier, nor are they the only antioxidants frequently consumed in the human diet. Whether or not these other carotenoids are as impactful as L and Z in cognitive function is currently unknown. The purpose of this thesis is to relate serum concentrations of alpha-tocopherol, retinol, beta-cryptoxanthin, and alpha-carotene to cognitive function in adults between ages of 18-90 years. Cognitive function was measured through a computerized cognitive inventory that includes measures such as processing speed, cognitive flexibilty, and other related factors. In order to measure serum carotenoids, 5 mm of whole blood was collected via venipuncture. Serum was

separated via centrifugation and was frozen at -80-deg C until it could be analzed via high-performance liquid chromatography (HPLC). Analysis is currently ongoing, and final results will be presented at the symposium.

The Role of Flagellar Motility in *Pseudomonas aeruginosa*-induced NET Formation

Christian Cullen
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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. *Pseudomonas aeruginosa* is the main CF respiratory pathogen responsible for large-scale neutrophil recruitment in the airways. Neutrophils fail to clear *P. aeruginosa*. Instead, they release granule cargo and DNA into the airway lumen causing tissue damage. The mechanism of neutrophil dysfunction in CF airways is unknown and of high clinical relevance. Neutrophil extracellular traps (NETs) represent a novel antibacterial mechanism of neutrophils when they release DNA associated with histones and granule components. *P. aeruginosa*-induced NET formation occurs in CF airways and offers a likely mechanism for neutrophil-mediated lung damage. Therefore, understanding its details is of potential clinical relevance for CF. Previously we had shown that bacterial flagellum is essential to induce maximal NET release in neutrophils. Recently, we found that bacteria with motile flagellum trigger significantly more NET release than *P. aeruginosa* with immotile flagella. To reveal the mechanism of this unexpected finding, we measured *P. aeruginosa* phagocytosis by neutrophils and found that immotile bacteria are not getting phagocytosed as efficiently as their motile counterparts. 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 from the presence of flagellin protein, and proposes to target proteins driving flagellar motility as CF therapeutics.

Lesbian, Gay, and Bisexual Employment Protection: An LGB-Inclusive Argument for Title VII Sex Discrimination

Bryson Culver, CURO Honors Scholar
Prof. Alex Reed, Insurance, Legal Studies, and Real Estate, Terry College of Business

The 1964 Civil Rights Act provided various protections for millions of Americans based on their race, color, national origin, religion, and sex. In Title VII of the act, this action takes the form of employment protection. While the language of the legislation is very short and simple, the application of the law has grown to cover a wide range of sex-related aspects. As our understanding of sex and gender grow, so does the protection provided to it. Since 1989, this law has been interpreted to include protection against the many aspects of sex beyond a simple gender difference. Initially, the Supreme Court decision Price Waterhouse v. Hopkins added protection against the stereotypes employers may have about sex. A decade later, another Supreme Court decision protected against sexual harassment from someone of the same gender. These two ideas laid a foundation so that other atypical gender expressions could be protected. Transgenders, lesbians, gays, and bisexuals have had success in Federal Appellate and District courts by claiming their non-conforming sexual orientation should be protected under Title VII. In 2015, the Equal Employment Opportunity Commission endorsed these expanded uses of Title VII in its investigations into employment conduct.

Abstracts

The Genetic Network of Circadian Rhythms in *Neurospora crassa*

Sarah Cunningham, CURO Graduation Distinction
Dr. Jonathan Arnold, Genetics, Franklin College of Arts & Sciences

Many genes of *Neurospora crassa* are under the control of the biological clock in the cell. The clock consists of a closed network loop of the genes, *white collar-1 (wc-1)*, *white collar-2 (wc-2)*, *frequency (frq)*, and *clock controlled genes (ccg)* and their RNA and protein products. A model has been proposed for the network regulating these interactions that improves upon published models by differentiating between reactions in the cytoplasm and nucleus of the cell. Markov Chain Monte Carlo runs were used to test theseis models with published RNA and protein accumulation data and refine the model's parameters. The model ensemble created was found to fit experimental data collected from *Neurospora* statistically similarly to previously published models. This model was also expanded upon to include genes regulating the clock's ability to entrain to light and tested against other light entrainment models. A better model could improve research done on all areas of the clock and further our understanding of circadian rhythms in *Neurospora* and all other organisms with a circadian clock.

Pharmacological Inhibitors of Epigenetic Mechanisms Alter Liposome Uptake

Isha Dabke, CURO Research Assistant
Dr. Brian Cummings, Pharmaceutical & Biomedical Sciences, College of Pharmacy

In recent years, there have been rapid advances in the understanding of epigenetic mechanisms, which include histone modifications and DNA methylation. These mechanisms, in addition to other transcriptional regulatory events, ultimately affect gene activity and phenotypic expression without physically altering the nucleotide sequence of the DNA itself. Similarly, the potential of liposomes as drug deliverer devices has also gained significant attention in the scientific sphere. Liposomes are amphipathic molecules and have proven to show an improvement in the therapeutic index of new or established drugs by modifying drug absorption, reducing metabolism, prolonging their own biological half-life, and reducing unwanted side-toxicity. The goal of this study is to determine the effects of epigenetic drugs (DNA methylation inhibitor *5-aza-2'-deoxycitidine* and histone deacetylation inhibitor *Trichostatin A*) on liposome uptake in an *in-vitro* cell culture. The hypothesis of this project is that reversing epigenetic changes in cancer cells will enhance the drug-encapsulated liposome uptake in prostate cancer cells. The first step of this two-part liposomal drug delivery project is presented here: cell culture techniques, selection of the drugs used, and MTT analysis of the treated cells at 24-hour and 48-hour time periods. After quantification of cells and compilation of the data from the trials presented in this paper, it was determined that higher concentrations of the selected drugs show a decrease in cell proliferation at the given time periods. Consequently, the experiments presented here in Part I will be built upon next semester in Part II—the actual formulation and encapsulation of the liposomes.

Neural Network Formation and Response to Pharmacological Stimulation

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

Recently, efficient testing platforms for developmental neurotoxicant (DNT) screenings have been increasingly achieved through the use of the micro-electrode array (MEA) system, which is a tool that allows researchers to monitor complex spatial and

temporal patterns of neural network firing. Electrophysiological monitoring with the MEA provides the opportunity to observe the organization and response of an entire neural network to pharmacological reagents or neurotoxicants. MEAs provide a cost and time-efficient alternative to *in vivo* DNT testing. The electrophysiological activity recorded can be used to monitor the changes caused by dosage of pharmacological reagents, as different pharmacological reagents will produce a characteristic effect on the pattern of activity such as changes in mean firing rate and other burst parameters. This work will examine the response of stem cell derived mouse motor neurons to bicuculline and lindane, providing a foundation for future testing of many different reagents and solidifying a new model for DNT screenings.

Regulatory Pathway of X-Polymer Formation in *Bacillus* Species

Lauren Davis
Dr. Maor Bar-Peled, Biochemistry & Molecular Biology, Franklin College of Arts & Sciences

We recently identified a polysaccharide, named X-polymer that is made when certain *Bacillus* species are grown in a defined medium. While clarification of the chemical structure of the glyco-polymer is ongoing, I am investigating potential genes that are involved in the regulation and production of X-polymer in my research. To do this, I am examining wild type and mutant strains of *Bacillus* species known to produce this polysaccharide that are impaired in signaling, phosphorylation, or stress responses. The detection of the polysaccharide in these strains is carried out in several steps. First, the crude X-polymer is isolated from the cells and hydrolyzed to monosaccharides. Then, the sugars are reduced and alditol-acetate derivatized to volatile compounds. These sugar-derived compounds are separated by gas-chromatography and analyzed by mass spectrometry (GC-MS). This method allows us to quantify the relative amount of sugars that are composed of the X-polymer and determine if none, normal, or higher amount of the X-polymer is made in the various mutant lines. In my poster I will provide examples of genes involved in the regulation of this metabolic pathway.

A Systematic Review of Adverse Effects Resulting from Administration of Propofol in Domestic Dogs and Cats

Lauren Dempsey, CURO Research Assistant
Dr. Erik Hofmeister, Small Animal Medicine & Surgery, College of Veterinary Medicine

Propofol, a sedative-hypnotic akyl phenol, is widely used in both induction and maintenance of veterinary anesthesia. It is known for being helpful for its ability to produce unconsciousness in a patient within as little as 30 seconds while also decreasing incidence of postoperative nausea and vomiting when administered with any anesthetic drug. However, when used for induction and administration, anesthetic-related adverse effects can appear. The objective of this systematic review was to identify the most common adverse effects when propofol was administered and the amount of propofol administered, compare the adverse effects with other factors regarding the anesthetic procedure such as its rate and if it was co-induced with another agent, and observe the difference in the occurrence of specific adverse effects between dogs and cats. This study can be used by anesthesiologists as a reference for the potential adverse effects that could occur with the administration of propofol. A comprehensive search of research literature was performed using Pubmed, CAB Abstracts, and the University of Georgia's library system from September 2015 to December 2015. The most common adverse effect observed with the administration of propofol was apnea. Other fairly common

adverse effects observed were bradycardia, hypotension, pain on injection, tachycardia, and increased motor activity. It is anticipated that there is a correlation between the administration of propofol in cats and dogs and the number of adverse effects that occur.

Extracellular Vesicle Dependent Transfer of a Virulence Factor Confers Human Infectivity to *Trypanosoma brucei brucei*

Lauren Dennison, Foundation Fellow, CURO Research Assistant
Dr. Stephen Hajduk, Biochemistry & Molecular Biology, Franklin College of Arts & Sciences

Trypanosoma brucei rhodesiense is the causative agent of human African sleeping sickness. The related subspecies *Trypanosoma brucei brucei* is able to establish infection in cattle, but is highly susceptible to lysis by a subclass of human high-density lipoproteins called trypanosome lytic factor (TLF) and therefore unable to cause human African trypanosomiasis. *T. b. rhodesiense* is resistant to TLF due to the serum resistance-associated (SRA) protein, a virulence factor localized to the parasite endosome that binds and inhibits TLF following endocytosis. Recently our lab has shown that African trypanosomes produce nanotubes that arise from initial budding of the flagellar membrane and vesicularize into heterologous 80 nm extracellular vesicles (EVs). Mass spectrometry analysis showed these EVs are enriched in flagellar proteins that contribute to virulence, and western blot analysis showed that *T. b. rhodesiense* EVs contain SRA protein necessary for human infectivity. Additionally, co-cultivation of *T. b. brucei* and SRA expressing *T. b. rhodesiense* in a trans-well chamber which blocked direct cell-cell contact but allowed EV diffusion conferred TLF resistance to *T. b. brucei* suggesting EVs play a role in disease pathology. In an effort to understand the function of EV mediated secretion during host infection, we show that upon incubating SRA expressing cells with TLF, EVs purified from the cells now contain TLF proteins. The detection of TLF proteins in EVs is cell dependent, as TLF could not be detected in EVs incubated with TLF alone. This suggests vesicle mediated secretion provides a mechanism of protein efflux, which may play an important role in trypanosome survival in the host.

Influence of Intelligence on Correlation between Personality and Recreational Marijuana Use

Ketki Desai, Luvika Gupta
Dr. Lawrence Sweet, Psychology, Franklin College of Arts & Sciences

Recreational marijuana use prevention and cessation programs emphasize identification of personality traits and cognitive factors that increase the individual's risk for use. Previous research indicates that initiation and frequency of marijuana use are associated with specific personality traits and intelligence. A better understanding of how these risk factors influence use behavior would enhance personalized treatments. The aim of this study is to examine the premise that certain personality traits correlate with marijuana use while controlling nicotine dependence severity, and to determine if intelligence moderates this relationship. Data was collected from 90 rural nicotine dependent cigarette smokers who completed personality and intelligence assessments. Personality traits of interest include neuroticism, conscientiousness, and openness from the Neuroticism-Extraversion-Openness Five-Factor Inventory (NEO-FFI). The Wechsler Test of Adult Reading (WTAR) was utilized to assess intelligence. Self-report measures were administered to assess recreational marijuana use frequency and nicotine dependence severity. Based on prior literature, it is predicted that high frequency of marijuana use will correlate with high neuroticism, low conscientiousness, and high

openness. It is further predicted that intelligence will moderate these relationships. The results are expected to increase understanding of the psychological processes involved in marijuana use initiation and maintenance, which may allow prevention and cessation programs to tailor interventions based on a patient's individual personality and cognitive function.

Addressing Severe Mental Illness of Atlanta's Chronically Homeless
Kaley Desher, CURO Research Assistant
Dr. Nathan Hansen, Health Promotion & Behavior, College of Public Health

The widespread prevalence of severe mental illness among the chronically homeless in Atlanta, Georgia is high; there are 1,322 individuals suffering from chronic homeless as of 2014. An expected 60% of these people are predicted to have a severe accompanying mental illness such as schizophrenia, depressive disorder, bipolar disorder, and/or post-traumatic stress disorder. Most of these individuals are not receiving any treatment. The social and economic consequences of this problem are dire. The debilitating symptoms associated with these disorders drastically diminish these individuals' quality of life and potential to contribute to society. Furthermore, the government incurs significant costs by the overuse of services, such as emergency room visits, hospitalizations, shelter stays, and incarcerations that is characteristic of this demographic. In order to mitigate these negative effects, the City of Atlanta should form a contract with a coalition of local nonprofit organizations working on mental illness and chronic homelessness in the city in an attempt to maximize their impact.

The Influence of Social Conversation Case Study: Iran Nuclear Deal
Samuel Dickinson
Dr. Itai Himelboim, Grady College of Journalism & Mass Communication

When it comes to international public opinion, influence takes the form of a trifecta: governments and non-governmental organizations, traditional media coverage, and grassroots activity. Social media, a relative newcomer, has only recently enjoyed the power to influence public opinion as a result of the widespread and strategic social network involvement of all three actors. The increasing relevance of this new media warrants a case study analysis measuring the scope of its sway and the interplay among key stakeholders. The Iran Nuclear Deal, a highly visible and politically-charged agreement, is proposed here as a case study, examining the role of each trifecta segment in sparking and sustaining conversation using Crimson Hexagon—a social listening tool. In doing so, we will outline the relationship between social media commentary and more cemented information outlets, providing an outline of observed trends that will serve as a comparison for future research.

Oral Histories of the Vazov Machine Works
Iva Dimitrova, CURO Summer Fellow
Prof. Callie Holmes, Richard B. Russell Library for Political Research and Studies

I researched the history of the Vazov Machine Works (VMZ, in Bulgarian) in the city of Sopot, Bulgaria using oral history methodology. I conducted a series of interviews with previous workers to better understand the defense plant's social and economic role in varying scopes, extending from the local to the regional and national. Interviews were recorded using a Zoom H5 recorder and were structured as one-on-one conversations where I acted as the interviewer. Questions pertained to the participants' early life, their work at the plant, and other personal experiences and

reflections. While the workers described the plant through their personal experiences, their work life was directly affected by the larger trends of the economy and the government of Bulgaria, especially after the democratic transition starting in 1990. By comparing responses across interviews, I was thus able to draw larger conclusions about the effect of notable events, trends, and perceptions on local history, as experienced by individual people. While these interviews highlighted VMZ's historical significance, they also raised the concern of anonymity. As a response to this concern, the original scope of my project changed to exclude the photographic and visual materials I had initially recorded, and only include audio interviews, edited to remove personally-identifying information. In addition, I have worked to transcribe the transcripts into Bulgarian and translate them into English to be accessible to multiple audiences.

A Study of Transposon Movement in *C. bescii*

Jessica Dinsmore, CURO Graduation Distinction
Dr. Mike Adams, Biochemistry & Molecular Biology, Franklin College of Arts & Sciences

As our oil reserves are depleting, scientists are searching for alternative fuel sources. A promising renewable fuel source is cellulosic biofuels. Consolidated bioprocessing (CBP) is a potential strategy of generating these biofuels in an economically feasible way. CBP involves using genetically engineered organisms to convert biomass into ethanol in a single step. *Caldicellulosiruptor bescii* is an excellent candidate for CBP as it is the most thermophilic cellulolytic microbe known. While *C. bescii* does not natively produce ethanol, previous studies have demonstrated that *C. bescii* can be engineered for ethanol production. As with any organism used for industrial purposes, *C. bescii* must have a stable phenotype. Recently, transposon activity has been observed within strains of *C. bescii*. Because these transpositions could compromise the integrity of the desired phenotype, we are interested in determining whether this high rate of transposon activity is a native phenomenon in *C. bescii* or whether it has arisen due to the procedures used to isolate certain strains. The purpose of this study is to monitor the activity of transposons within *C. bescii* as well as to determine the parent strain responsible for this high rate of transposon activity. We will use southern blots to observe and compare the locations of the transposons within various strains, including those with documented transposon movement, wild type *C. bescii*, and strains isolated in a different manner. We will also grow wild type *C. bescii* under a variety of stressors to determine if high transposon movement is native to *C. bescii*.

Engineering Soybean Mosaic Virus Resistance Utilizing tasiRNA

Andrew Disharoon, CURO Research Assistant
Dr. Wayne Parrott, Crop & Soil Sciences, College of Agricultural & Environmental Sciences

Soybeans, as one of the largest crops in cultivation, are constantly under attack by diseases. One of the most common diseases affecting soybeans internationally is the soybean mosaic virus. Food supply safety is a growing concern that must be addressed through new solutions as old techniques falter in the face of evolving diseases and increasing demand. Gene silencing is a powerful tool that many plants use to regulate their own gene expression. In this case, if gene-silencing could turn off the genes of the invading virus, the plant would be resistant. Even before the causal mechanism was known, genetic engineers have used gene silencing to combat viral disease. With a greater understanding of these silencing mechanisms, genetic engineers can create more efficient ways to induce gene

silencing. One such method is using a specific type of miRNA pathway known as tasiRNA, which is found within crop plants, and using it to induce the desired silencing. By placing a tasiRNA 22 DNA recognition site in the front part of the viral DNA, resistance to soybean mosaic virus should be achievable. Accordingly, vectors for silencing the positive sense, negative sense, and a combination of the two strands of the virus were constructed. These events were introduced into Jack soybean tissue to generate transgenic lines for each vector. Events will be phenotyped for disease resistance upon reaching 20 cm in height. It is expected that not only can this approach impart viral resistance to soybean mosaic virus, but also to all other related viruses.

Creating a Pseudo-Random Number Generator Using the Spectral Analysis Test and Genetic Algorithms

Steve Dixon, CURO Honors Scholar, CURO Research Assistant
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Pseudo-random number generators use pre-calculated mathematical formulas to produce sequences of numbers that appear random. The need for pseudo-random numbers arises for many purposes. The two most important are data security such as ATM cards, computer passwords, and electronic commerce, and the other is modeling and simulation applications such as the programs that predicate the path of cataclysmic weather events. A genetic algorithm is a problem-solving formula that mimics the process of natural selection. Our genetic algorithm generates each individual with its own "genetic makeup". "Chromosomes" are swapped through crossover and/or mutated to breed a new generation of individuals. Individuals with a higher fitness level will "breed" more often. For our experiment, we used the spectral test as fitness criteria. The spectral test returns a number called a P-value between zero and one, with zero being completely non-random and one being completely random. The spectral test works by finding patterns. The harder it is to find the pattern, the more random the sequence is and the higher its p-value. We use this value as the fitness criteria for the genetic algorithm. The purpose of this experiment is to determine if this combination of algorithms would produce a statistically superior psuedo-random number generator.

The Effects of Inclement Weather on Dining Hall Usage

Rutvik Dmello
Dr. Nikhil Srinivasan, Management Information Systems, Terry College of Business

One of the most important things in running any business smoothly is being able to predict the volume with which customers arrive. This is even truer in the service industry, where staffing and resource allocation directly respond to how busy the business expects to be. For the University of Georgia, this problem is best recognized in the dining hall facilities. While there are many factors that obviously impact dining hall usage, one potentially important variable is the weather. Using regression analysis, my research aims to analyze the impact of precipitation on dining hall attendance. The weather information was attained through the website of the Weather Channel. I gathered contemporary dining hall capacity data through a Java program that I created especially for parsing usage information. Historical data were available through the Information Technology Auxiliary Services. After cleaning the collected data through Microsoft Excel, I utilized the R programming language in order to perform regression analyses. In addition to using simple ordinary least squares regressions, I applied the statistical approach of indicator variables. Both of these methods aim to

elucidate the relationship between precipitation and the utilization of dining hall facilities. Beyond analyzing usage in the aggregate, I was able to stratify the data into the individual attendances of the food service locations. I believe after robust statistical scrutiny, my results could be of significant value to the Department of Food Services. This benefit extends additionally to understanding the mechanics behind service industry utilization.

Seeing the Future: Interactive Data Visualization and Behavioral Intentions
Grace Donnelly
Dr. Bartosz Wojdynski, Grady College of Journalism & Mass Communication

This research project seeks to contribute knowledge to our understanding of how design decisions related to the graphical depiction of data and deployment of interactivity influence news consumers' ability to accurately understand health information and make decisions about their behavior. Specifically, a 2 (data presentation: text-only, text and graphics) x 2 (future self-reference: yes/no) between subject experiment was designed to test the effects of using an interactive online life-expectancy calculator on recall, perceived risks, and behavioral intent. An online calculator page was built and developed for this project that allowed users to input their age, gender, and race and receive average life expectancy information based on U.S. data. Participants were then allowed to input indicators of their exercise per week and smoking behavior to gauge the impact of their actions on their future selves. Conditions varied in how participants' life expectancy was communicated to them, and the degree to which the effects of their present-day choices on future outcomes were made explicit. In the experiment, participants (N =100) were randomly assigned to one of four conditions and asked to use an online life expectancy calculator and then answer a series of dependent measures, including recall of information presented, perceived risk perceptions, and behavior intent measures. Data collection is planned for March 2016. The results of the study have implications for best practices in visually communicating quantitative information to audiences in a way that has both affective and cognitive impact.

Caveolae in 3D Neuronal Cell Cultures
Megan Douglass, CURO Research Assistant
Dr. William Kisaalita, College of Engineering

Traditionally, 2D cell-based assays have shown to be unreliable for drug discovery, as they are not predictive of the *in vivo* response. Therefore, significant importance is being given to providing the cells with a 3D microenvironment that more closely mimics *in vivo* conditions. Cells grown in a 3D microenvironment (microtissue) can be characterized by structural and functional biomarkers that are different from their 2D counterparts. The presence of caveolae, which are 60 – 80 nm, cup-shaped invaginations in the plasma membrane, has been well established in many cell types but has not yet been confirmed in cells of neuronal origin. In this study, the presence and functionality of caveolae in neuroblastoma (SH-SY5Y) cells were examined. Transmission Electron Microscopy (TEM) imaging confirmed the presence of invaginated structures in the cells, closely resembling the physical descriptions of caveolae. Subsequently, the functionality of the caveolae was examined by measuring calcium oscillation frequency, which was found to be similar to *in vivo*, in 3D compared to 2D. These findings present a structural and functional biomarker that may be used to confirm the 3D characteristics of neuronal cells and subsequently establish more predictive 3D cell-based assays for drug discovery.

Abstracts

Identification of CRISPR Adaptation Complexes and Associated Nucleic Acids in *Pyrococcus furiosus*

Justin Dumrongkulraksa, CURO Honors Scholar, CURO Summer Fellow
Dr. Michael Terns, Biochemistry & Molecular Biology, Franklin College of Arts & Sciences

CRISPR (Clustered, Regularly Interspaced, Short Palindromic Repeats) loci and their associated genes (Cas) comprise an adaptive defense system in bacteria and archaea. This immune system protects the organism against phages and other foreign genetic elements. Immunity is conferred via the acquisition and incorporation of invader DNA into the CRISPR locus. The locus is then transcribed to produce an RNA complement (crRNA), which guides Cas nucleases in targeted invader DNA or RNA destruction. In the archaeon *Pyrococcus furiosus*, our lab has recently obtained genetic evidence linking four Cas proteins (Cas 1, Cas 2, and Cas4-1 and 4-2) to the function of integration of new invader sequences in a process called CRISPR adaptation. However, the individual roles of each protein in the process are unknown and will be an area of exploration in my research. To examine how each of these proteins functions in the cell, a number of experiments will be performed in order to test whether or not each protein is a member of a larger functional complex. Additionally, the ability of each protein to bind, recognize, or capture CRISPR and invader DNA will be tested. A CRISPR locus sequence called the leader is required for adaptation. As Cas 1, Cas 2, Cas 4-1, and Cas 4-2 are believed to have some role in adaptation, the leader along with invader DNA is expected to be found when these proteins are immunoprecipitated. This finding would provide substantial insight into this relatively new system.

Ecosystem Services and Restoration Efforts of Campus Forests: Tanyard Creek and Driftmier Woods

Dessa Dunn
Dr. Elizabeth King, Odum School of Ecology

Driftmier Woods is a small forest on UGA's campus overgrown with invasive plant species. There are plans to use prescribed grazing by the Chew Crew goats to reduce invasive plants, but they may affect other parts of the ecosystem. The Chew Crew project can therefore provide a living laboratory to study the interactions between land management and ecosystem services, which are benefits provided by the forest. I first compiled a portfolio of potential ecosystem services and hypothesized goat impacts. Then I focused on ecological roles of leaf litter and English ivy, an invasive plant that covers the ground in parts of Driftmier Woods. While goats consume English ivy, their hooves can disturb soil and leaf litter, lowering soil stability and risking water erosion. To study goat impacts on leaf litter, I first studied the Chew Crew's current site, Tanyard Creek, by comparing quantity and size distribution of leaf litter particles inside and outside goat exclosures. I then assessed potential impacts of goats versus hand removal of ivy at Driftmier Woods. In a non-grazing area, I set up plots in which I removed ivy manually, simulated goat browsing by plucking leaves, or left the ivy as a control. I measured litter, soil moisture, and litter decomposition rates in each plot. Goat impacts on leaf litter at Tanyard Creek proved statistically insignificant, and results from Driftmier Woods are forthcoming. Combined, these studies help assess the Chew Crew's impacts and provide a base for future students to study forest ecosystem services on campus.

What is a Sticking Event in Classical Molecular Dynamics? A Study of Hydrogen Sticking to Amorphous Water-Ice

John Dupuy
Dr. Phillip Stancil, Physics & Astronomy, Franklin College of Arts & Sciences

Gas-grain and gas-phase reactions dominate the formation of molecules in the interstellar medium (ISM). Gas-grain reactions require a substrate on which the reaction is able to occur. The formation of molecular hydrogen in the ISM is a prime example of a gas-grain reaction. In these reactions, an atom of hydrogen will strike a surface, stick to the surface, interact with the molecular structure of the substrate (in this case water), find another H atom, form molecular hydrogen, and then be ejected from the surface. We perform classical molecular dynamics (MD) simulations of hydrogen atoms sticking to an amorphous water-ice surface. This study examines the first step in the process, the sticking of the hydrogen atom to the substrate. We present here possible criteria for sticking and detail on how we arrived at those criteria.

Financial Education in Georgia Public Schools and its Impact on Students' Financial Behaviors

Ana Duron-Fleck, CURO Honors Scholar
Dr. Brenda Cude, Financial Planning, Housing & Consumer Economics, College of Family & 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. In this project we are focusing on whether or not the class taken in high school had any significant impact on the students' financial behaviors. Two data sets are used in this study. The surveys were conducted online and consisted of 463 students, 111 of which were seniors and 352 of which were freshman. Questions were asked about their financial education in high school and whether or not they benefited from the experience. In addition, the surveys were intended to gather information about the students' current financial behaviors. An example of this is whether or not the student owns a credit card they are responsible for or if they are responsible for any loans. It will be interesting to see whether or not the students' experiences in the high school course have a significant impact on students' monetary habits and whether or not they even recall the information they learned while taking the course. We hope to see that the course has had an impact in students' financial lives. However, in the senior data set, we expect to see that the students no longer recall the content learned in their personal finance course.

Abundance of *Vibrio* Bacteria Associated with White Pox Disease in Elkhorn Corals

Martinique Edwards, CURO Research Assistant
Dr. Erin Lipp, ENVIRONMENTAL HLTH SCI -- Public Health

Caribbean coral reefs have declined by 80% over the past decade in part due to the spread of marine diseases. Corals host a mutualistic bacterial community in their surface mucus that serves as protection against pathogenic microbes. This bacterial community may be altered in favor of pathogens when the coral becomes stressed, for example by elevated temperature. Of particular interest are the *Vibrio* bacteria, which are ubiquitous in coastal waters and are implicated in six of twenty coral diseases described. We are studying the critically threatened Caribbean elkhorn coral, *Acropora palmata*, the only species known to succumb to white pox disease. We hypothesize that there is an increased relative abundance of *Vibrio* bacteria on disease lesions compared to the surface mucus of healthy corals. To investigate, we extracted the total bacterial DNA from 4-ml samples (n=5-6) of coral mucus and surrounding water. We then performed quantitative PCR (qPCR) on the bacterial DNA with *Vibrio*-specific primers and non-specific bacterial primers to enumerate both the *Vibrio* population and the entire bacterial community throughout all samples. We will calculate the

ratio of *Vibrio* cells to the total number of bacterial cells and expect a higher ratio of *Vibrio* to total bacteria in samples taken from disease lesions. Researching the population dynamics of *Vibrio* on diseased corals will help elucidate the driving force behind coral disease and decline. If diseased corals are found to be a reservoir for *Vibrio* bacteria, then the biochemical interactions between *Vibrio* cells and coral mucus should be investigated.

Comparative Analysis of Soil Organic Matter Fractionation in Ultisols

Rachel Ehlinger
Dr. Alexander Cherkinsky, Geology, Franklin College of Arts & Sciences

Soil organic matter is one of the largest reservoirs of carbon on earth, containing more carbon than the atmosphere itself. Fractionation and accelerator mass spectrometry are used to study the turnover of soil organic matter carbon from its initial state in the biosphere to its decay in the atmosphere. In this study, we separated microaggregates from Ultisol soils collected in the Calhoun Critical Zone of South Carolina. These microaggregates were separated into heavy and light fractions through physical fractionation methods. The heavy fraction is depleted of organics, while the light fraction is enriched with organics. We then took these samples for AMS radiocarbon dating in order to analyze the turnover rate of each fraction. With this analysis, we are able to interpret the turnover rate of carbon for each fraction. Our results allow us to conclude that the heavier organically depleted fraction has a slower turnover rate and is therefore better preserved in the environment.

Deficiencies and Improvements to Mental Health Institutions in Georgia

Joseph Elengickal
Dr. Leonard Martin, Psychology, Franklin College of Arts & Sciences

A major issue with inpatient mental health institutions is that patient visits can be traumatic. This is because mental health institutions do well at their intended function, keeping suicidal patients alive until their doctors find a sustainable medication type and dose, but inpatient programs do very little past that. Many inpatient programs do not have legitimate methods for coping therapy and rely solely on preliminary therapy. In addition, the relationship between nurses and patients is tense due to the hierarchal structure of the hospital as well as the lack of oversight. While inpatient programs fulfill the status quo, policy change is necessary because many patients do not attend other therapy programs after their inpatient stay, thus making their limited time valuable. In order to examine this situation, the laws related to mental health institutions on the local, state, and national level will be analyzed. Furthermore, research into how other states and countries run their mental health institutions may lead to useful insight into how to improve Georgia's institutions. Also, data collected from past patient visits will reveal trends that may lead to viable solutions to the problem. This research hopes to attain multiple policy solutions that strive to solve problems related to mental health institutions.

Evaluation of Yield and Essential Oil Content of Holy Basil Varieties

Nicole Encardes, CURO Research Assistant
Prof. David Berle, Horticulture, College of Agricultural & Environmental Sciences

Holy basil (*Ocimum tenuiflorum*) is an important medicinal plant that has been associated with decrease in stress, regulation of metabolism, and reduction of inflammation. In many cultures it is used as a tea. The study evaluated yield and essential oil content of *O. tenuiflorum* varieties to determine the best for commercial production. Plants from 14 holy basil varieties were selected from commercial catalogs and the USDA Germplasm systems. Plants were

grown in the field, harvested, and biomass recorded before and after drying. Essential oils were extracted from each sample by hydrodistillation. Varieties were ranked using an index score that was a combination of yield and essential oil content per plant. The top five yielders included both USDA and commercial varieties, including PI288779, Amrita, PI652059, PI652057, and Kapoor. Results indicate an inverse relationship between biomass yield and essential oil content, suggesting that growers should not use biomass as the sole characteristic for variety selection.

Analysis of Hybridization in Chattahoochee Bass (*Micropterus chattahoochae*) Populations below Lake Lanier

Guy Eroh, Foundation Fellow
Dr. Byron Freeman, Odum School of Ecology

Maintenance of fish species diversity is intrinsically and ecologically valuable, but challenging in areas where cross-stocking of ecologically similar species occurs. The Chattahoochee bass (*Micropterus chattahoochae*) is a cryptic species that is difficult to distinguish visually from other closely related species of the genus *Micropterus* (black basses). *M chattahoochae* is endemic to the Chattahoochee watershed in Northwest Georgia where several other black bass species have been stocked. These introduced species pose threats to the Chattahoochee bass through competition and interbreeding. In order to determine if pure populations of *M. chattahoochae* remain in tributaries of the Chatahoochee River below Buford Dam, this study analyzed the genetic identities of several populations of bass below Lake Lanier. Bass samples were taken by electrofishing or rod and reel angling from the Chattahoochee River and tributaries including Hillabahatchee, Snake, and Whooping Creeks. Specimens were also collected from the Maricao River in Puerto Rico, where a population has been established. DNA was extracted from fin tissue and amplified using polymerase chain reaction. To evaluate hybridization in the *M. chattahoochae* populations, a nuclear (ITS2) and a mitochondrial (CO1) gene were sequenced and compared to known *Micropterus* species sequences. Additionally, six microsatellite loci (known to cross amplify and discriminate between related species) were amplified and analyzed. Analysis of microsatellites and nuclear and mitochondrial DNA will identify fish hybridization and backcrossing in these Chattahoochee bass populations.

MGMT Expression in Canine Glial Tumors

Erika Evanoff, CURO Research Assistant
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This study is being conducted in order to investigate whether or not canine glial tumors express the MGMT protein and if these tumors have hypermethylation within their MGMT promoter region, as these may be indicators of a positive response to cancer treatment with temozolomide. Formalin fixed paraffin embedded tissue from canine glial tumor tissues (oligodendrogliomas and astrocytomas) submitted to the College of Veterinary Medicine Department of Pathology and Athens Veterinary Diagnostic Laboratory from 2005-present were evaluated. Twenty-two glial tumor tissues were tested for MGMT protein expression by immunohistochemistry (IHC). In order to prepare for the methylation-specific PCR portion of this study (to be performed in Spring 2016), genomic DNA from the tissues was isolated and bisulfite conversion of the DNA was performed. Findings from IHC reveal that high-grade glial tumors had the greatest amount of MGMT protein expression with 5 out of 11 (45.5%) having positive staining. In contrast, low- grade oligodendrogliomas and astrocytomas all had

negative staining results. In Spring 2016, methylation-specific PCR will be performed in order to determine if there is a correlation between MGMT protein expression and MGMT promoter region methylation.

Best Practice for Informing Parents of their Newborn's Disability

Allison Fialkowski, CURO Honors Scholar, CURO Summer Fellow
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Bad news is news that "drastically and negatively" changes a person's perception of his or her future providing "a feeling of no hope... a risk of upsetting an established lifestyle" (Buckman, 1992; Bor, Miller, Goldman, & Scher, 1993, p.70). This research studies the disclosure of what most families perceive to be devastating news - a disability of their newborn. Because physicians are the primary messengers of this challenging news, medical schools and continuing education services must train physicians in the central considerations that lead to the most positive disclosure process when informing parents of their newborn's disability (Harnett, 2007, p.92). After reading literature concerning best practice for informing individuals, analyzing a physician's training, and understanding the specific concerns and circumstances of families with a newborn with a congenital disability, I identified the central considerations that physicians must make throughout this disclosure process. By addressing these concerns, physicians can ensure a positive experience that prevents parents' distress and anxiety, fosters a strong relationship between the parents and professionals, and assists in attachment between the parents and child.

Characterization of a Muconic Acid Biosensor-Reporter System in *E. coli*

Tyler Fischer, CURO Research Assistant
Dr. Yajun Yan, College of Engineering

Over the past decades, metabolic engineering has proven its superiority on the microbial production of valuable chemicals such as biofuels, pharmaceuticals, nutraceuticals, and materials. To build microbial cell factories that efficiently convert a feedstock into a desired product, metabolic engineers have developed several strategies to direct the intracellular metabolites into the exogenously introduced pathways, including overexpressing rate-limiting enzymes, blocking competing pathways, and bypassing native regulations. However, the directed metabolite fluxes generally resulted in metabolism imbalance which would inhibit cell growth and decrease production in heterologous pathways when the engineered enzymes or intermediates accumulated toxic levels. To monitor the metabolic status of the engineered pathway in real time, Dr. Yajun Yan's laboratory is focusing on creating a transcription factor-based biosensor to alleviate the imbalance metabolism. Transcriptional factors (TFs) are natural sensory proteins that regulate gene expression in response to environmental changes or key intracellular signals which need tight control. They bind to specific DNA sequences in a promoter region to either activate or repress transcription. The DNA-binding activity of TFs can be affected by binding to metabolites. Recently, Dr. Yan's group is exploiting an exogenous TF to monitor the product of muconic acid (a renewable precursor to polyethylene terephthalate and nylon with global sales of $51 billion) in *Escherichia. coli*. However, native TFs always suffer from poor orthogonality and background noise due to uncharacterized interactions between candidate TFs and operator sites in native promoters. Thus, Dr. Yajun Yan's group is focusing on designing hybrid promoters to improve the specificity and sensitivity of TF-based biosensors in response to the concentration of muconic acid. To simplify the screening process, a sensor-reporter system is designed to evaluate the strength of hybrid promoters by monitoring the fluorescence intensity of green

fluorescence protein. In this project, I deeply understand the mechanism of the muconic acid sensor-reporter system and have received systematical training on the basic experimental skills of molecular biology and the design of biochemical experiments. During this process, my critical thinking abilities have greatly enhanced by discussing the experiment with the graduate students.

Optimization of Biogas to Electricity Plant

Carter Fitzgerald, CURO Research Assistant
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Recently, much has been made of the increase in the price and reduction of quantity of fossil fuels such as oil, coal, and natural gas. It is widely accepted that biogas, which is a mixture of carbon dioxide and methane, can be produced via anaerobic digestion. Anaerobic digestion is the series of biological processes where organic material is broken down by microorganisms, particularly methanogenic bacteria, in the absence of oxygen. This biogas can be burned to produce electricity, compressed to make compressed natural gas, or compressed even further to form liquid natural gas. The leftover organic material can be used as compost bedding or as fertilizer. The starting organic material that is fed into the anaerobic digestion process can range from cellulose to municipal solid wastes. This versatility is a huge reason for the advantages of biogas, because while it may not be as energy dense as its fossil fuel counterpart, it has other advantages: the source of the energy is renewable and, in the case of cellulose, the net carbon production is zero. After biogas is produced in the digestion tank or chamber it is a mixture of about 60% methane and 40% carbon dioxide. The gas is then scrubbed to increase the purity of the gas to 98% methane which is then sent to be compressed. The hot, high-pressure gas leaves the burner and enters an expansion turbine which turns a generator and produces electricity. Using process modeling software, multiple process variables can be manipulated in order to find the optimal composition, flowrate, and process unit sizes based on economic feasibility. The purpose of this research is to optimize the production of electricity from biogas and run cost analysis on the entire process to find a range of biogas prices where production is profitable.

Injury Risk of Major League Foul Balls

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

Currently, Major League Baseball does not have a standardized policy that requires stadiums to have netting to protect fans from foul balls and broken bats flying into the stands. In other words, fans sitting above the dugouts or down the foul lines often do not have such protection and are at risk to injury. This research paper attempts to ascertain the extent to which fans attending Major League Baseball games are at risk of being injured by foul balls leaving the field of play. Specifically, this paper attempts to quantify the extent to which injury risk and injury severity have increased over time. It identifies several factors that increase spectator risk. Perhaps most notably, new major league ballparks that have opened over the last few decades have been designed with smaller areas of foul territory, thus putting fans closer to the field. Moreover, average pitch velocity has steadily increased over the last decade, helping to cause balls hit off the bat to travel even faster. These prominent factors, along with a multitude of other distractions, have caused the fans' reaction time to decrease. Through statistical analysis documenting the actual changes of stadiums' foul territories and pitchers' pitch velocities, this paper concludes that the injury risk for fans sitting in unprotected seats close to the field of play has increased significantly in the last few decades.

Design of Mass Concrete Specimens and Test Procedures

Rashaan Fowles
Dr. Mi Geum Chorzepa, College of Engineering

The goal of this research is to design specimens to quantify temperature loss and gain in mass concrete structures and develop test procedures for mass concrete specimens for a Georgia Department of Transportation project. There are two important parameters that need to be quantified in mass concrete specimens: (1) maximum internal temperature; and (2) gradient temperature. Current GDOT specification for mass concrete (special provision to the Section 500) includes the maximum allowable internal temperature of 158 °F and temperature differential of 35 °F between interior and exterior portions of the designated mass concrete element. The need to quantify and understand these two parameters and structural behavior is pertinent. This research will focus on understanding the underlying thermal behavior of mass concrete structures through the review of available literature on the subject of mass concrete mix designs and crack width measurement. As it is essential to study temperatures and temperature differences in several common types of mass concrete elements or placement configurations, simple thermal analysis models will be created to validate test procedures and specimens configurations developed during this study.

What Good is a Low-Carbon City if No One Can Afford to Live There?

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Cities increasingly embrace "climate friendly" policies that encourage alternative forms of transportation, incentivize green building and urban infill, and provide environmental services to residents, such as recycling and composting. Meanwhile, corporate investment attracts skilled labor into the technology spheres and specialized industries and significant capital inflows into these cities. Tensions between population growth and "green innovation" pull urban landscapes in opposite directions. The "Emerald City" of Seattle, WA is lauded for its high percentages of walking and biking work commuters and pristine air quality. Census and municipal survey data, however, reveal a different narrative. Median housing values in Seattle have surpassed the $500,000 mark for the first time ever. Energy efficient skyscrapers and "apodment"-style housing have become the built environment norm. In a pattern of carbon gentrification, an influx of high-earning individuals, who can afford to live in the city center and utilize the low-carbon modes of work commute, has crowded out lower-income families. As a result, Seattle faces a new political challenge: providing affordable housing and low carbon lifestyles simultaneously. We argue that conventional production-based representations of urban greenhouse gas (GHG) inventory data fail to display individual consumer contributions to emissions, which hinders the development of targeted public policies. This research disaggregates road passenger transport emissions to provide insight into individual responsibilities for emissions. We identify a need for policy that not only attempts to curb GHG output from transportation, the highest emitting civilian activity, but also the social and economic changes to urban design and governance.

Enzymatically Preparing Carbohydrates for Development of an Effective Treatment against a Bacterial Pathogen

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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 the World Health Organization. In particular, *S. pneumoniae serotype III* (Pn3) has increasingly victimized children under the age of five, who represent more than 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 covalently 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 the Pn3 CPS into fragments of suitable size and composition provides a carbohydrate source for creating a glycoconjugate vaccine against the Pn3 bacterium. In 1931, another bacterium called *Bacillus circulans* was found to secrete an enzyme that degrades the CPS of Pn3. Through a series of experiments, the *B. Circulans* enzyme has been purified and its size has been determined. Furthermore, the interactions between the enzyme and the Pn3 CPS have been studied and the means of CPS degradation are now understood. Ideal conditions for the enzymatic degradation of the Pn3 CPS have been established, and the size of the main degradation products themselves have been determined. Utilizing what is now known about the Pn3 CPS and the *B. Circulans* enzyme that degrades it, future research efforts will work towards creating an effective treatment against the harmful Pn3 bacterial pathogen.

Diet-Induced Obesity is Associated with a Change in Intestinal Innervation and Disruption of Gut-Brain Communication

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Obesity has become an important topic in modern healthcare, as obesity rates continue to rise at an alarming rate. In the past thirty years, obesity rates have nearly doubled, with adolescent obesity rates reaching levels almost quadruple their previous levels thirty years ago (Ogden 2014). As obesity becomes more widespread, efforts to understand the consequences of an unhealthy diet and the effects of being overweight are of utmost importance as obesity-related health problems rack up a total of $190.2 billion dollars annually (Teuner 2013). Current studies focus their investigations on body weight in regards to obesity; however, body weight is not an accurate measure of adiposity. In our study, we wanted to understand if caloric value of the diet was the only factor inducing obesity. To test our question, we obtained a sample of twelve rats and randomly assigned rats in groups of four to three different diet groups (low fat, high fat, regular diet). The rats were maintained on a regular diet for nine days and then were fed their designated diet for twenty-eight days. Over the course of the experiment, we measured each rat's body composition using a Minispec LF110. The Minispec LF110 is a machine that uses TD-NMR to measure body composition (fat, lean, free and total body water). This machine allowed us to analyze the living rats without having to use anesthesia to prevent animal movement, as the TD-NMR technology allows for accurate measurements even with little movements from the animal during analysis. Following euthanasia on the twenty-ninth day of the experiment, we measured the liver fat percentage using the Minispec LF110. Additionally, we used neuroanatomical methods and immunohistochemical techniques to measure inflammation in the hindbrain by staining microglia with IBA1 and to check for neural reorganization in the hindbrain by staining non-myelinated fibers with IB4. We found that rats maintained on low fat and high fat diets had body fat compositions that were significantly greater than the regular diet. We did not find any

significant changes in microglia activation (inflammation) in the hindbrain at the given fat levels of the diets. However, we did find neural reorganization of the hindbrain in both the high fat and low fat diets. Our results suggest that a balanced diet of macronutrients is key for optimal health. Consuming high-fat, greasy foods or low-fat diet products can both lead to interrupted satiety signaling between the gut and the brain. Therefore, in effective diet strategies, the caloric density should not be the main focus, but rather a focus on consuming a balanced diet of macronutrients, avoiding any high or low extremes of any given nutrient.

Personality Judgment Accuracy: Personality and Social Context Influence the Way People See Each Other

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Effective social interactions often depend on people making quick judgments about one another. The purpose of the study is to investigate how people differ in their ability to determine other people's personality traits and how social context affects the accuracy of personality judgments. In the current study, we characterized individual differences in personality recognition at two time points: during first impressions and following an interpersonal task. In addition, we tested whether social context—interpersonal closeness, competition, or cooperation—had an impact on personality judgment accuracy. We hypothesize that people who score higher in extraversion will be more accurate in reading their partner's traits and those who participate in the interpersonal closeness condition, compared to the other conditions, will be more accurate in reading the personality traits of others. The participants first come in individually and complete a personality inventory (NEO) and a ten-item personality inventory (TIPI). Then as a pair, participants complete a three-minute arbitrary question session, allowing for superficial interaction, and then a forty-five minute activity of one of the interpersonal conditions. The participants complete a TIPI survey for their partners after both activities, allowing us to characterize how well the participants read their partners' traits based on first impression and again after more time. We can then test for an association between a person's personality traits and judgment accuracy. This study holds the potential to identify traits that render a person to be a good judge of character.

Functions of HAN in *Arabidopsis* Embryo Development

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The GATA transcription factor HANABA TARANU (HAN) regulates embryonic patterning in *Arabidopsis thaliana*. We have previously shown that two closely related GATA factors, HAN LIKE 1 (HANL1) and HAN LIKE 2 (HANL2), can substitute for HAN function when expressed with the HAN promoter in mutant embryos. HAN, HANL1, and HANL2 share two recognizable structural motifs: a central B-class GATA zinc-finger domain shared with seven other *Arabidopsis* genes; and a short, N-terminal sequence specific to the HAN clade and called HAN domain. The HAN domain is required for HAN function and deeply conserved in HAN orthologs of all flowering plants, but its molecular function has not been uncovered. My research aims at investigating the function of the two structural motifs of HAN genes by systematic gene and motif swapping experiments. I have expressed the remaining seven members of the B-type GATA factors of *Arabidopsis* under the control of the HAN promoter in mutant embryos and found that only one of them, GATA29, can substitute for HAN. GATA29 lacks a HAN domain;

however, a closer inspection of the GATA29 protein sequence revealed the presence of an N-terminal EAR motif. EAR motifs have been shown to promote transcriptional repression by binding co-repressors of the TOPLESS family. I have hypothesized that the HAN domain may serve a similar function and also constitute a transcriptional repressor domain. Consistent with this view, the EAR motif of GATA29 can be replaced with a HAN motif, and the HAN motif with the well-studied EAR motif of the *Arabidopsis* IAA17 protein. In addition, adding either an IAA17 EAR motif or a HAN domain to the N-terminus of GATA16, which contains a B-class zinc finger but fails to rescue mutant embryos in swap experiments, creates a mosaic protein with HAN function. I conclude that the HAN domain is a repressor domain and biochemically equivalent to an EAR motif. In addition, I have replaced the B-class zinc finger of HAN with A-, C-, and D-class zinc fingers. While mosaic proteins with an A- or D-class zinc finger are inactive, HAN variants with a C-type zinc finger, surprisingly, can complement mutant embryos. This result would suggest that B-class and C-class zinc fingers have similar properties. I am now examining T-DNA constructs in which the three C-class zinc finger genes of *Arabidopsis* are expressed with the HAN promoter, to explore possible functional redundancies.

Passive Drug Delivery for Intraocular Applications

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The current treatments available for patients who suffer from ocular diseases such as glaucoma, diabetic retinopathy, and age-related macular degeneration include daily eye drops and monthly intraocular injections. In order to avoid blindness, treatment for these diseases must be administered on a regular basis, with some treatments requiring lifelong administration. This work studies a refillable, implantable ocular drug delivery device as a long-term solution to patients who undergo the inconvenience and discomfort of frequent doctor visits and monthly injections. In this study, three different micro-channel designs, along with the modification of the channel surfaces, are tested for the diffusion of various dyes as a model for drug delivery. A refillable device with a three-year time span reduces the number of required doctor visits and prevents frequent replacements of the device, greatly improving patient life.

A Faulty System: An Empirical Analysis on Student Loan Default

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This study expands student loan policy literature, focusing on shifting from a grant and merit-based financial aid system to one based on repayable student loans. While this policy change provides educational opportunities to individuals who otherwise could not go to college, it also had led to an increase in the student loan default rate. Given associated negative macroeconomic outcomes such as postponed household formation, decreased homeownership, and decreased consumption, this study attempts to empirically evaluate default through a multiple regression model to predict one's own probability of default. This methodology was driven by evidence that for-profit institutions may enroll non-traditional students who qualify for federal student loans but inadequately prepare them for the workforce. The model utilizes four predictor variables: institution type, degree completion status, salary after completion of school, and time after school completion to employment. The results could inform policymakers' choice to lobby for more federal oversight of for-profit universities or even adjusting state funding

formulas to make public universities more attractive for nontraditional students. The research could assist policymakers as they sort an array of policy solutions to lower the growing default rate, improve the welfare of student borrowers, and mitigate the negative economic outcomes of default.

Methadone and Loperamide Interactions with the Multidrug Transporter P-Glycoprotein

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The multidrug transporter P-glycoprotein (Pgp) serves as gatekeeper of the blood brain barrier by effluxing toxins away from the brain, but in doing so, it also prevents the entry of beneficial drugs. Despite similarities in their molecular structures, the opioid agonist loperamide has essentially no brain penetration compared with the opioid agonist methadone. This is because loperamide is effluxed at 4 times the rate of methadone by Pgp. Despite several studies with these drugs and Pgp, the molecular reason for these differences is not well understood. To unravel the molecular basis of loperamide and methadone transport by Pgp, these drugs were investigated using ATP hydrolysis assays, fluorescence and NMR. Pgp-mediated ATP hydrolysis with methadone and loperamide suggests that they have one and two binding sites, respectively, and that methadone competes with one of the loperamide binding sites on Pgp. The interactions of loperamide and methadone with Pgp were also investigated by NMR and found to be consistent with the Pgp-mediated ATP hydrolysis results. These drugs also showed large differences in their ability to induce global conformational changes of Pgp by fluorescence spectroscopy. From these results, a conformationally gated model of opioid agonist transport is proposed to explain the molecular basis of their transport.

Serum Levels of Circulating and Exosomal MicroRNA Regulate Transformed Cell Growth

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Serum is an essential component of cell culture media and provides the necessary growth factors and biomolecules for efficient cell growth. Fetal bovine serum (FBS) is the most common source of serum, but has several drawbacks including cost, lot to lot variation, and ethical concerns related to its procurement. Various types of chemically defined media are also available but often are more expensive, and in some cases unable to support cell growth as efficiently as FBS. This study examines if variations in pattern or type of serum microRNA expression influence the growth rate of Madine-Darby Canine Kidney (MDCK) cells. We hypothesized that FBS samples contain specific exosome-associated microRNA(s) that impact cell growth parameters. Serum samples from several commercial sources were evaluated for miRNAs from exosomes and within the serum. RT-qPCR was used to identify specific serum microRNAs, and the serum samples were assessed for their ability to support the growth rate of MDCK cells using both manual and automated cell counting methods. Several miRNAs were found to be highly upregulated in serum samples that yielded higher MDCK cell growth rates. The miRNAs that yielded higher growth yields will be validated by testing miRNA mimics and inhibitors for their potential to alter cellular and viral growth kinetics.

Measuring Muscle Fatigue in Men vs Women Using Mechanomyography

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Previous studies have suggested that women have greater skeletal muscle endurance than men. The purpose of this study was to test this hypothesis using mechanomyography to measure the endurance of the forearm muscles in men and women. Twitch electrical stimulation was used to produce muscle contractions in the forearm muscle of subjects at frequencies of 2, 4, and 6 Hz while a tri-axial accelerometer measured the acceleration of each contraction. Fatigue was estimated with an endurance index (EI), which was final acceleration divided by initial acceleration. Peak acceleration was greater in men than that of women (PA=3.3G +/- 0.9 and 2.2G +/- 0.2 respectively). Women had a greater average endurance index than men (EI=84.1% +/- 3.7% and 77.4% +/- 2.1% respectively). A T-test between the two groups for endurance yielded a P value of 0.11. The study results are underpowered, and additional participants will be tested. However, the magnitude of different between men and women are consistent with previous studies. The mechanism explaining differences between men and women in muscle fatigue needs to be evaluated in future studies.

Neutrophil and Granulocyte Methylation in Normal Weight and Obese Individuals

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Folate acts as a one-carbon methyl donor, modulating epigenetic activity. Blood contains mixed populations of white blood cells of varying DNA methylation status, and may be responsible for inconclusive reports of variable DNA methylation responses to folic acid (FA) supplementation. A single cell type may serve as a more reliable epigenetic reporter to determine DNA methylation changes due to FA supplementation. Obesity influences folate status and increases risk for neural tube defects, but the impact of obesity on epigenetic responses following FA supplementation has not been investigated. FA was provided (800 μg/d) to normal weight (NW; BMI 21.6+ 1.4 kg/m2; n=12) and obese (OB; BMI 37.5+ 2.3 kg/m2; n=6) women of childbearing age for 8 weeks. Genome-wide DNA methylation changes in CD4+ T cells (CD4) and CD16+ neutrophils (CD16) were determined using Infinium HumanMethylation 450BeadChips. Increased folate status was observed, but OB women at baseline had lower serum folate concentration than NW women; this trend was maintained after supplementation. Methylation changes in response to supplementation were more abundant in CD4 than CD16 in both OB (12.4% vs. 3.1%) and NW (4.6% vs. 1.7%) women. A small number of CpG sites responded in both cell types (0.1% and 0.6% of total CpG sites in NW and OB, respectively). Our results indicate that DNA methylation response following FA supplementation is distinctive in each cell type and obesity affects the epigenetic regulation in response to folate status. Findings provide preliminary evidence to develop cell-type specific biomarkers of folate status unique to obesity.

Improving Efficacy of HIV Vaccines for Immune-Suppressed Recipient

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HIV affects millions worldwide, and vaccines have not previously been effective. The Harn lab developed VacSIM, a novel vaccine delivery method in which a liquid forms a gel matrix upon entry into the recipient. Previous studies have proved this delivery method more efficacious than CpG, alum, and Fruend's adjuvant. The delivery method has been tested in the flu vaccine model as well and found it to work well for viral clearance in mice. We decided to then test the efficacy of VacSIM in an Envelope-based HIV vaccine.

To do this, we combined an HIV Envelope protein and VacSIM and administered it to mice via subcutaneous vaccination. We then used ELISAs to determine endpoint titers of HIV-specific antibodies in the blood of vaccinated animals. This experiment showed that VacSIM was by far the best for humoral response, with or without CpG adjuvant. This semester, we are continuing the experiment to study the efficacy of VacSIM-delivered HIV vaccines in mice chronically infected with *Schistosoma mansoin,* which causes immunosuppression. We will vaccinate either infected or uninfected mice with the HIV proteins Envelope and Gag in VacSIM and test humoral responses to Envelope via ELISAs and cellular responses to Gag via ELISpots.

Credit Usage and Financial Literacy among University Students

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We know the general criteria for good credit use. We know what distinguishes a solid credit score from a weak one, and we know which actions can lead to a particular score. But in all this research, information about a crucial demographic is left largely unexplored: college students, and in particular those who are working to improve their ability to manage their own finances. With a data set compiling information from almost a thousand UGA students' credit reports, we can look more closely at the foundations of strong credit use among students, as well as examine instances where problems arose. Given the continual rise of both college tuition and competition in the US job market, college students have to be thriftier than ever, and having a good credit history has never mattered more. Our data show the effects of authorized versus individual user account ownership, and we can now compare the credit standing of students who have had help from their parents and those who have not. With all this in mind, we've worked to organize and analyze this data set with the intention of producing a provable hypothesis in the form of a research paper.

Evolutionary Analysis of Mating-Type Genes in *Stagonosporopsis* Species Causing Gummy Stem Blight of Cucurbits

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Gummy stem blight of cucurbits has recently been discovered to be caused by three genetically distinct but morphologically indistinguishable fungal species: *Stagonosporopsis cucurbitacearum*, *Stagonosporopsis citrulli*, and *Stagonosporopsis caricae*. A key biological difference among these species may be their mating systems, and specifically the presence and structure of the *MAT1-1-1* and *MAT1-2-1* genes, which together compose the *MAT1* locus. Genes associated with reproduction tend to diverge rapidly, so our objectives were to identify the genes and determine if the genes are rapidly evolving. This would include analyses for both positive and purifying selection. Genomes of the three species were searched for homologs, and tests for positive and purifying selection were conducted primarily in the form of dn/ds analyses. The results of these analyses show that the dn/ds ratio for the three species is less than one, suggesting that the three fungal species are undergoing purifying selection. However, the evolutionary constraints on the three species were significantly different than those affecting the outgroups; although both ratios were less than one, the two ratios were significantly different. Concrete evidence of positive selection in mating-type genes may provide evidence that distinct speciation among *S. caricae, S. citrulli*, and *S. cucurbitacearum* is occurring. Because the

MAT1-1-1 and *MAT1-2-1* genes contained in the mating-type locus are associated with several functions ranging from host recognition to the formation of reproductive structures, understanding the evolutionary factors acting on the *MAT1* locus could be critical in understanding the emergence of new fungal species.

Effect of Multiple Ankle Sprains on Functional Performance Tests in Adolescents

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Ankle sprains are the most common sports injury among athletes and the initial sprain often occurs during adolescence. Functional performance tests are commonly used in injury screens, but it is unclear if adolescents with a history of sprain demonstrate deficits. The purpose of this study was to determine if a significant difference in functional performance ability was present between adolescent athletes with a history of a single ankle sprain versus multiple sprains in the star excursion balance test (SEBT) and single leg hop test (SLHT). We hypothesized the athletes with a history of multiple ankle sprains would perform significantly worse on a SEBT and SLHT than the single ankle sprain athletes. Adolescent soccer players (8 male, 13 female, 15.6±1.3 yrs.) completed surveys to report the number of previous ankle sprains. Each participant performed three trials of the SEBT and two trials of the SLHT to measure functional performance of the ankle. Overall, the subjects with a history of multiple ankle sprains performed significantly worse on the SEBT (69.1±9.3, $p < .001$) and SLHT (18.0±4.1, $p < .001$) than the single ankle sprain athletes (SEBT-99.8±4.9, SLHT-7.2±.7). A history of multiple ankle sprains negatively affects ankle joint function in an adolescent population. Future research may include prospectively tracking ankle sprains over a competitive season to determine the clinical utility of specific cut-off scores for determining those at risk for ankle sprain.

Corporate Inversion: Companies Leaving the American Tax System

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The current Pfizer-Allergan merger is an example of a particular trend in United States mergers and acquisitions, corporate inversions. In corporate inversion, an American corporation may merge with another foreign corporation and move to overseas headquarters. This allows the originally American corporation to escape taxes on income earned abroad. In the case of Pfizer, one of the largest pharmaceutical companies in the United States, merging with Allergan will allow them to move their headquarters to Ireland. Many companies seek tax havens, countries with less stringent tax laws and lower rates, to escape foreign income tax in America. Currently, America taxes foreign income at 35% upon returning to U.S. soil. This tax falls on top of the income taxes corporations already pay in the location income is earned. To avoid the tax burden American companies keep approximately 2.6 trillion abroad. The president, congress, and even some politicians are trying to find solutions to this problem. In the following presentation, we will discover the strategies companies use to avoid U.S. foreign taxation, and the potential income America is losing. To examine the mechanics of corporate inversion we will analyze current corporate inversion deals including, Pfizer-Allergan, Tyco-Johnson, and Applied Materials. From there, we will discuss the pros and cons in America's tax systems and the strategies politicians and congress have devised to keep U.S. corporations from exiting.

Abstracts

Women, Welfare, and Borrowing
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Brittany Talkin
Dr. Mary Caplan, School of Social Work

The U.S. credit market is awash in credit products for all economic strata of society, and many are marketed toward credit-constrained people. 62% of low-income families have a credit card, and 32% of people who qualify for the Supplemental Nutrition Program (SNAP) have consumer debt. At the same time, approximately 34% of Americans receive some form of means-tested social assistance. The purpose of this study is to examine how and to what extent welfare recipients utilize these consumer borrowing opportunities. This study employs grounded theory design using semi-structured interviews with women over the age of 18 currently receiving means-tested social assistance and using some sort of borrowing, like payday loans, pawn shop loans, revolving credit cards, title loans, and other informal loans. The social process of borrowing is examined using Charmez's constructivist grounded theory approach, including systematic coding, memo writing, and theory development. The research team has conceptualized the study, created and refined interview questions, recruited informants, conducted participant and non-participant observations, conducted interviews, and analyzed data. Informants were recruited through professional networks as well as posting flyers throughout the community, and snowball sampling was used. The main research question is, "What are the borrowing attitudes and behavior of women who receive public means-tested social assistance?" The nascent framework contains three interconnected concepts: 1) complicated methods of borrowing affects and is affected by complex life circumstances; 2) access to credit provides hope, but increases economic vulnerability and self-doubt; and 3) balance between personal responsibility and social pressures.

Procedural Polarization: Examining Changes in the Roll Call Voting Record (1877-2012) and their Effects on Political Polarization
Casey Grippando, CURO Summer Fellow
Dr. Anthony Madonna, Political Science, School of Public & International Affairs

Recently, much attention has been given to the role of partisan politics within the American Congress; namely, how the polarization of American political parties appears more pronounced than ever. The question to be answered then is why modern times have produced the appearance of a polarized political system and whether this problem is as extreme as it appears. We believe that an increase in requests for roll call votes has contributed to this polarized image of Congress. Using the *Congressional Record*, roll call voting data on amendments from 1877 – 2012 was coded in Microsoft Excel and amassed with existing research on previous sessions of Congress to statistically uncover partisan voting and procedural patterns. Variables coded included various Congressional procedural tactics, member party, and type of vote, amongst others. Votes on measures of little importance (more specifically, votes on measures not considered "landmark legislation") were largely ignored. The results so far are as expected: amending activity on legislation has largely increased within both parties, and more amendments have received roll call votes. This in turn creates more party line votes and thus the polarized image of Congress we see today. Given the large range and depth of data, we believe the results are extremely important and applicable when judging the polarization of the current and future Congresses. It is also important in demonstrating that a volume of votes rather than a pure shift in ideology could be at fault for increased polarization.

Metallothermic Reductions and Conductive Coatings for Lithium-Ion Battery Anode Materials

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The chemical technology inherent in lithium-ion batteries has not kept pace with the portable electronics and automobiles that depend on them. Fossilized silica (SiO2) frustules, or shells, of the fresh-water diatom *Aulacoseira* feature intricate pores and shapes which make them a promising template for a lithium battery anode. It is believed that retaining these intricacies after a magnesiothermic reduction to Mg2Si and silicon will yield batteries of superior capacity and cyclability. Subsequently coating these microparticles with a conductive polymer promises to improve their electrochemical properties even further. Metallothermic reductions of Al2O3 and GeO2 were also explored in this project, as was the creation of silicon microparticles via an alternative SiCl4 synthesis.

Lunchroom Table Talkers Talk Students into Eating Fruits and Vegetables

Taylor Gutwillig
Dr. Michelle vanDellen, Psychology, Franklin College of Arts & Sciences

Changes to the National School Lunch Program require schools to provide students receiving a school lunch with two fruit and vegetable servings, but this change has produced high plate waste. In the present study, we draw on principles of behavioral economics to try to nudge students to choose and consume more fruits and vegetables. We developed a low cost intervention using brightly colored, age appropriate table talkers to introduce students to eight fruits and vegetables. Each side of the table talker shows a fun fact rather than health information, as previous research has shown highlighting health related information can decrease consumption. A baseline data collection of fruit and vegetable waste was performed in each school through observing students (kindergarten to fifth grade) in the lunchroom. During an intervention period, half of the schools (chosen by random assignment) received table talkers to place on lunchroom tables. Preliminary results showed that in the control schools, which were not exposed to the table talkers, fruit and vegetable consumption decreased. However, fruit and vegetable consumption remained the same in intervention schools (i.e., did not decrease). An explanation of these findings and their implications for understanding the decisions made by students in the lunchroom and how school programs can promote healthy eating while decreasing the waste and increasing the consumption of fruit and vegetables will be discussed.

Examining a Potential Role for *Mycobacterium tuberculosis* CtpB in Copper Transport

Sahl Hakim
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Mycobacterium tuberculosis is the cause of human tuberculosis, a chronic and sometimes fatal respiratory infection. The *ctpB* gene in *M. tuberculosis* is annotated to encode Cation Transport Protein B (CtpB) predicted to function as a copper-transporting ATPase. Copper is an essential mineral for many biological processes, but when present in excess can be toxic. The overall goal of this project is to examine the function of *ctpB* when expressed in nonpathogenic *Mycobacterium smegmatis*. The *ctpB* gene will be cloned with a c-myc tag into a mycobacterial expression vector downstream from a tetracycline-inducible promoter. The plasmid will be introduced into *M. smegmatis*. The transformed cells will be induced with varying tetracycline concentrations alone and in the

presence of copper ions. If CtpB is a copper efflux pump, then the expression of the gene is predicted to render the bacteria more resistant to the excess copper compared to the wildtype bacteria. If the CtpB is a copper influx pump, then the expression of the gene is expected to render the bacteria more sensitive to elevated levels of copper. To determine if the protein is made, western blotting will be performed to detect the presence of the myc-tagged CtpB protein. Results of this project will be presented.

Examination of Supply-Side Incentives and Motivations That Perpetuate the Skill Mismatch of Cambodian University Graduates

Hanna Han
Dr. Audrey Haynes, Political Science, School of Public & International Affairs

In Cambodia, the increased enrollment in higher education has not significantly led to a more robust economy as many university graduates remain un- or underemployed. This unusual phenomenon can be ascribed to the graduates' skill mismatch, or the disparity between the labor supply of universities and the labor demand of employers. This study attempts to understand the supply-side incentives and motivations that contribute to the skills mismatch. In short, why university students decide upon the majors and career paths they do. The study makes use of six hour-long semi-structured focus groups with current Cambodian university students stratified according to major and university type (public or private). Coding analysis of qualitative data reveals the major supply-side problem to be the lack of accurate career information and exposure to a diversity of career options, misguided conclusions about labor demand based on economic observations, and societal and familial pressures. This study is significant in that it will inform Cambodian educators, employers, and policymakers about the incentives and motivations encouraging the current skill mismatch, which will then allow them to craft policy solutions to alter incentives. The study also will inform USAID, the World Bank, and other international organizations that implement education development programs within Cambodia about the skill mismatch, which will allow them to alter existing programs or create new ones in order to address the issue and prevent its exacerbation.

Microwave Synthesis of MOF-5

Allie Harbert, CURO Research Assistant
Dr. Douglas Jackson, Chemistry, Franklin College of Arts & Sciences

Metal organic frameworks are an area of research of increasing interest. Organic linkers of various complexities and potentials for activity can be linked together with metal centers to form a porous crystal. Their porous nature combined with their very large surface area allows for MOFs to be ideal substances to store gases as well as capture them. These crystals have great potential for application in different areas including gas storage and capture for environmental and energy uses as well as for delivering drugs, since essentially any linker with at least two reactive sites can be used. This experiment focused on simplifying the process of forming a known MOF, MOF-5, which is formed using Zinc Nitrate and Terephthalic Acid, and has been previously formed using reflux over a period of 48 hours. MOF 5 has previously been analyzed using x-ray powder diffraction. The goal of this experiment was to devise a new reaction scheme to cut down reaction time and maximize yield in order to expand upon the new methodology to more efficiently synthesize more complex MOFs that have applications of interest. This reaction time has been successfully cut down to 50 minutes using microwave chemistry and DMF as the solvent. The MOF was able to be crystallized out and analyzed using X-ray crystallography.

Abstracts

Agrobacterium tumefaciens Mediated Transformation of *Mimulus nasutus* via the Floral Dip Method

Leanna Harbor
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Agrobacterium tumefaciens mediated transformation is a powerful genetic tool and both floral dip and vacuum infiltration methods have been incredibly successful in the model plant *Arabidopsis thaliana*. *Mimulus* is an emerging model plant genus studied by ecologists and evolutionary geneticists. The study of *Mimulus* species would greatly benefit from genetic transformation and, in fact, the floral dip vacuum infiltration method has been previously successful in transforming the self-pollinating *Mimulus nasutus* species. Stable germ-line transformation was confirmed in the T3 generation through BASTA resistance screening and PCR analysis conducted on the surviving T3 seedlings. However, successful transformation has not been repeatable, highlighting the need for an optimized protocol. In this study, the goal was to optimize *Agrobacterium* mediated transformation of *Mimulus nasutus* by testing a variety of controlled conditions to determine which treatment yields successful transformation. The conditions tested were varying concentrations of Silwet L-77, inoculation technique of either floral dip or floral dip and vacuum infiltration, and repetition of the inoculation treatment. Mature seeds from the inoculated plants were collected and planted to undergo BASTA resistance screening. The number of seeds produced by plants in each condition group greatly differed between the treatment conditions, with some conditions resulting in the production of much fewer seeds. The BASTA resistance screening is ongoing, but available results of plants that have completed resistance screening show no successful transformation events. The transformation process will be repeated on additional *Mimulus nasutus* plants, with altered treatment conditions in addition to a greatly increased sample size.

Hurricane Forecasting and Healthcare Facility Evacuations

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Hurricanes have the potential to produce mega mass casualty and mass fatality events in addition to catastrophic structural damage. The state of Georgia is located in an area vulnerable to hurricanes originating in both the Atlantic Ocean and the Gulf of Mexico; however, Georgia's response to a major hurricane has not yet been tested. While forecasting and emergency planning have greatly improved over the past few decades, recent history demonstrates that hurricanes still have the potential to result in catastrophic loss of life. The successful evacuation of coastal healthcare facilities in response to an impending hurricane requires advanced notice, timely decision making, and an unprecedented coordination effort between coastal and inland facilities. However, government planning assumptions do not accommodate the additional challenges faced by coastal healthcare facilities during severe weather evacuations, specifically, the advanced timelines needed, and the limitations of early hurricane forecasting models.

Conference Calls and Tax Forecasting

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Conference calls are one medium from which analysts obtain financial information from company management. Companies typically divide these calls into scripted and discussion sections. In the scripted portion, company managers present analysts with information

about the financial performance of the firm. During the following discussion portion, analysts are able to question managers. Financial analysts then use information gathered from these calls to prepare estimates of financial measures such as net income. This paper analyzes mentions of tax in quarterly conference calls of public companies and their relation to changes in analysts' forecast properties. This analysis provides evidence of the utility of these calls for analyst tax forecasting. Preliminary results suggest management mention of taxes in the scripted portion correlate with improved analyst forecasts.

Effect of Preoperative Laboratory Testing on Anesthesia-Related Decision Making in Apparently Healthy Dogs

Kayla Hargrove
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The objective of this retrospective study was to determine if the results of pre-operative laboratory testing in otherwise healthy dogs influence anesthesia-related decision making. These decisions include additional non-diagnostic procedures, cancellation/postponement of surgery, intravenous fluid rates, repetition of laboratory tests, monitoring and management techniques, further tests conducted, change in ASA risk status, changes to client communication, and avoidance of NSAIDs. It was hypothesized that few surgeries would be cancelled, but that other anesthetic decisions would be altered on the basis of laboratory results. One hundred dogs that underwent elective orthopedic surgeries and had a complete blood cell count, serum chemistry, and urinalysis performed were selected. All cases were reviewed by 5 veterinary anesthesiologists. Out of 100 dogs, 0% would have additional surgeries or procedures, 6% would have their procedure cancelled or postponed, 38% would have fluid therapy altered, 32% would have laboratory tests repeated, 9% would have changes made to monitoring while anesthetized, 15% would have management techniques altered, 12% would have further tests conducted, 13% would have their risk status changed, 20% would have changes in client communication, and 59% would have NSAIDs eliminated from treatment. It is recommended that routine pre-operative laboratory testing be conducted in healthy dogs presenting for elective orthopedic procedures.

Assessment of Adult Pig Cognition Utilizing an Open Field and Object Recognition Test

Kayla Hargrove
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Behavioral testing allows for the evaluation of learning and memory, and is an integral component for assessing functional deficits in current models of neural injury and disease. Pigs have become a model of interest for neurobehavioral research based on morphologic similarities to the human brain. Studies assessing neurodevelopment in pigs have revealed that they possess sophisticated cognitive abilities; however, further optimization to assess learning and memory capabilities are needed. The present study utilized object recognition testing and open field testing as a means of assessing spontaneous trial-unique memory, and normal/abnormal behaviors, respectively. We hypothesized that object recognition testing would reveal more time spent investigating novel objects than familiar ones, and that when placed in an open field, pigs would demonstrate exploratory behavior. Four male pigs, approximately 5-6 months of age were used. For the open field test, pigs were placed in the arena for 10 minutes and their behavior recorded. At the start of the object recognition test, two similar objects were

fixed to opposite corners in the arena, and the pigs were allowed to investigate them for 10 minutes, followed by a 10 minute inter-phase interval, and a 10 minute test trial in which one of the previous objects was replaced with a novel object. All open field and object recognition trials were recorded via overhead camera and analyzed with Ethovision software. These tests provide valuable insight on pig cognition, and will allow efficacy assessments for treatments targeting the improvement of learning, memory, and behavior.

In-Vitro and *In-Vivo* Assessment of a Yeast By-Product on the Inhibition of *Histomonas meleagridis*

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Histomonas meleagridis is an anaerobic protozoan and the causative agent of Blackhead disease. This disease can cause up to 100% mortality in turkeys because the innate immune is not able to identify the parasite as foreign. The objective was to determine if a yeast by-product known to upregulate the innate immune system could inhibit *H. meleagridis in-vitro* and *in-vivo*. For the *in-vitro* trial, *H. meleagridis* cells were incubated in Dwyer's media for 24h at 42oC then flasks containing fresh media were inoculated with 100,000 cells per flask. Cells were treated with several concentrations of yeast by-product and counts were performed after 8 and 48 h. For the direct and indirect *in-vivo* trials, 1 day old poults were obtained and had *ad libitum* access to treatment diets and water. Treatments consisted of varying yeast by-product concentrations. At 18 days old, poults were challenged with *H. meleagridis* cells. For the direct trial, all poults were challenged, and for the indirect trial, 5 out of the 30 poults per treatment were challenged. Mortalities were necropsied for liver and cecal lesions. The direct trial was terminated at 10 days post-infection and the indirect trial was terminated when 80% of the inoculated control birds exhibited Blackhead signs. The results of the *in-vitro* trial determined that the treatments did not inhibit *H. meleagridis* cell growth ($P<0.05$). There were also no significant differences between treatments for the direct trial ($P<0.05$). Lastly, the indirect trial determined that the treatments did not inhibit lateral transmission of Blackhead ($P<0.05$).

Effects of Climatic Legacy on Southern Appalachian Plant Communities in Coweeta Basin

Douglas Hart
Dr. Jeff Hepinstall-Cymerman, Warnell School of Forestry & Natural Resources

In recent decades, the eastern United States has experienced increased precipitation rates, along with a greater frequency of extreme wet and dry years. These trends, along with an absence of occasional fire disturbances, have been hypothesized to allow for "mesophication" to occur within eastern plant communities. Mesophication is a term recent studies have used to describe the recruitment of mesophytic (wet-adapted, drought-intolerant) plants within xeric (dry-adapted, drought-tolerant) plant communities typically dominated by oaks *(Quercus*). As moisture availability increases within these communities, mesophytic species such as maples (*Acer*), tulip poplar (*Liriodendron tulipifera*), and birch (*Betula*) begin to dominate the understory and, if disturbances permit an opening, the canopy. This study examines if mesophication is occurring across a 30-year precipitation gradient in the Coweeta Basin located in Macon County, North Carolina in the southern Appalachian Mountains. Vegetation surveys were conducted in the summer of 2015 across a precipitation gradient in the basin, with sampling locations representing a variety of slope aspects. Differences in the vegetation community are

being explored using multivariate community analysis tools, and are expected to show distinct differences in mesophytic and xeric species composition between communities. Understanding the phenomenon of mesophication is important when considering the future of plant communities under a changing climate. The widespread replacement of oaks and other xeric species with mesophytic species could result in forests with less valuable habitat and food availability for some species, along with less valuable timber for harvesting.

Need of the "Other": Paradox in Gordon Parks' *Airline Terminal* and *American Gothic*

Caroline Harvey
Dr. Janice Simon, Lamar Dodd School of Art

Through an analysis of two photographs produced by Gordon Parks in the mid-20th century, this paper seeks to highlight the paradoxical nature of race relations during the era of Jim Crow and segregation. Rather obviously, whites clung to the comforting idea of segregation as it raised them into the upper echelons of political and economic welfare while it simultaneously disenfranchised America's black population. Because the goal was to keep the races separated, it became less apparent that black and whites were mixing in a crucial setting—employment. Blacks were so economically cast down that they often needed employment from whites, a need that was met by the white's "need" of poor blacks to help with childcare, housekeeping and other menial, sometimes degrading, tasks. Parks noticed this problem, and saw in it the strange need of the "other" between the races. His documentation of this paradox is best seen in two works, *Airline Terminal* (1956) and *American Gothic* (1942), both of which were produced during his role as photojournalist for *Life* and the Farm Security Administration, respectively. Through complex visual analysis influenced by Roland Barthes' *Camera Lucida* (1980) and Connie Choi's contributions to *Witness: Art and Civil Rights in the Sixties* (2014), this paper examines Parks' photographic indictment of the American institution of segregation and Jim Crow law. Furthermore, this argument is additionally influenced by Parks' own memoirs, which bring further clarity to Parks' personal motivation behind his production of *Airline Terminal* and *American Gothic*.

Identifying the Monoclonal Antibody Epitope Peptide Expressed on Pancreatic Adenocarcinoma

Sarah Hatton, CURO Research Assistant
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Pancreatic ductal adenocarcinoma (PDAC) is one of the most deadly cancers with one-year and five-year survival rates of only 24% and 5%, respectively. Physicians currently lack useful biomarkers in the screening, diagnosis, and treatment of PDAC which unfortunately leads to the majority of patients being diagnosed in incurable, progressive stages. A mouse monoclonal IgG antibody, known as MAb109, has been developed, isolated, and shown to preferentially react with cancerous pancreatic tissues over non-diseased normal tissue in a disease progressive manner. This antibody binds an N-glycan containing epitope expressed on two specific glycoproteins, CEACAM 5 and CEACAM 6. Isolation of the MAb109-reactive glycopeptides followed by mass spectrometry analysis has identified a single glycopeptide that contains a N-linked glycan. My research focuses primarily on identifying this peptide sequence in model organisms such as the fruitfly (*Drosophila melanogaster*) and zebrafish (*Danio rerio*). A MAb-109 reactive band was detected in *Drosophila* pupae lysate after immunoblotting, and a peptide sequence was found within the fruit fly genome using bioinformatics that denotes a likely candidate

protein. By performing a similar experiment with zebrafish lysate, I hope to identify for the same or related peptide that reacts with the antibody. Future experiments will test the function of the protein containing this peptide during zebrafish organ development. An additional study will be to determine if quantifying the MAb109 epitope in human blood is useful for detecting and monitoring pancreatic cancer. The epitope expressed on cancer cell surfaces may also serve as a potential therapeutic target.

Ballot Initiatives and Voter Turnout
Rory Hibbler, CURO Research Assistant
Dr. Anthony Madonna, Political Science, School of Public & International Affairs

This research analyzes the potential effects of ballot initiatives on voter turnout in national presidential and congressional midterm elections. This research is significant in the political science field because while there has been significant research on ballot initiatives and voter turnout, nothing has been published on these topics since the 1990s to early 2000s. There is a desperate need for an update in this topic, especially since there's a historically low voter turnout rate in recent elections (36.4% in 2014 midterms). I plan on testing this by comparing the turnout of voters in states that utilized ballot initiatives and the turnout in states that did not utilize ballot initiatives throughout a series of presidential elections and midterm elections. No results are available yet.

Drift Between Two Specific Conductivity Probes
Sarah Hickey, CURO Research Assistant
Dr. John Dowd, Geology, Franklin College of Arts & Sciences

As a part of a larger study of the Lake Herrick Watershed, we will be measuring the time it takes for a specific conductance probe constantly taking measurements while submerged in a tributary stream of Lake Herrick to drift from a specific conductance probe calibrated before each measurement in the same stream. This work is significant because it will help us determine how long we can leave the probe in the water before collected data becomes inaccurate. I expect that the probe left in the stream will drift from the probe that will be calibrated before each measurement and will need to be re-calibrated once every four weeks. This study is important because there is limited research published on the amount of drift in the specific probes we are using. Results and conclusions from this research can help improve the data collected for the Lake Herrick Watershed Study and help identify the pollution sources for the lake.

The *speAk* Movement: Social Media for Global Issues
Taylor Hill, CURO Honors Scholar
Prof. Jennifer Smith, Grady College of Journalism & Mass Communication

The *speAk* campaign seeks to answer two questions: first, "What makes a social media campaign successful, reach audiences, or 'go viral'?" The second is "Can social media be used to successfully inform the public of global issues in a more approachable manner and lead to involvement?" In this case, the issue is ocean health and exploitation, which encompasses ecotourism, shark finning, and marine mammal captivity. The research will be broken up into three phases. The first phase involves shooting video shorts that convey these issues in a comical, rather than chastising, fashion. After the videos have been filmed, they will be shown to focus groups in order to gauge audience reaction in terms of their ability to convey these issues in a more informative, approachable, and engaging manner. Post-focus groups, the video shorts will be released through social media outlets such as Twitter, Facebook, and Instagram in order to see if these social media campaigns

are able to gain web traffic to an informative website that will serve as a platform for individuals to engage with organizations supporting these environmental issues. Studying social media and how it can be used as a platform for change is relevant in this digital age where the internet serves as a primary source of information and communication. It is valuable to study whether or not this new media can be used to connect larger audiences to reliable sources of information and involvement in global issues.

Dressing with a Disability
Shannon Hochschild
Dr. Katalin Medvedev, Textiles, Merchandising & Interiors, College of Family & Consumer Sciences

Cerebral palsy (CP) is a contracted disease impairing standard motor functions controlled by the cerebrum and cerebellum. Damage to one or both of these regions obstructs the body's physical mechanisms and intellectual development. Today, comprehending the complexity of CP relies exclusively on information produced by the field of medicine and science. Therefore, there is a need for extensive cultural and social research to solidify the CP population's position and wellbeing in mainstream society. Identification of those moderately and severely afflicted by CP is primarily dependent on dress. The physical abnormalities caused by CP require assistance through dress items such as braces and custom footwear, which indicate to society that a condition exists. Based on experiments regarding postural control and equilibrium in children with CP, continual backwards-walking training exhibited improvements in overall posture and coordination. These findings highlight an opportunity for potential modifications and innovations in dress that would aid the afflicted CP body. The neglect to study CP holistically hinders society's understanding of this medical condition and feasible improvements in the lives of people living with CP. Therefore, conducting future research of CP in the interrelated fields of dress, society, and culture will directly influence beneficial dress modifications and innovations for this population.

Digitally Delicate Primes
Jackson Hopper, CURO Summer Fellow, CURO Research Assistant
Dr. Paul Pollack, MATHEMATICS -- Arts & Sciences

Terence Tao has shown that in any fixed base, a positive proportion of prime numbers cannot have any digit changed and remain prime. In other words, infinitely many primes are "digitally delicate." Tao's work uses sieve methods, a departure from previous work by Cohen, Selfridge, and Sun on the topic using covering systems of the integers. We strengthen this result in a manner suggested by Tao: a positive proportion of primes become composite under any change of a single digit and any insertion a fixed number of arbitrary digits at the beginning or end.

Microplastic Sampling in the Atlantic Ocean
Adam Howington, CURO Research Assistant
Dr. Jenna Jambeck, College of Engineering

Based upon our work of annual mass flows of plastic into our ocean compared with what has been found in the ocean, there are millions of tonnes of plastic in unknown locations. In order to understand potential impacts, it is important to try to determine the location and form of this plastic. In our environment, plastic physically degrades into smaller fragments and pieces, called microplastic, that can both transport organisms (including invasive species) and host their own microbial communities. Plastics also absorb persistent organic pollutants. Plastic debris continues to be found all over the world, and the average size

of plastic particles in the ocean appears to be decreasing, but open ocean sampling published in the literature has consisted primarily of trawl collection of plastic samples 330 um and above. We analyzed open ocean water samples collected through filtration and fractionation on a path from the Canary Islands to Martinique, across the Atlantic. The samples were filtered in the lab and we counted suspected plastic particles in the size range of 20 um to 333 um. Plastic particles will be reported in number per liter of seawater collected.

Evaluation of Cas4 Function in CRISPR-Cas Adaptation

Jesse Hu
Dr. Michael Terns, Biochemistry & Molecular Biology, Franklin College of Arts & Sciences

Given that viruses are the most abundant biological entities on the planet, prokaryotes 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 prokaryotes. This system is composed of a CRISPR array and Cas proteins. The CRISPR array affords memory of past infections and contains identical repeats separated by sequences known as spacers, which are derived from foreign nucleic acids. CRISPR functions in three stages: adaptation, CRISPR RNA (crRNA) biogenesis, and crRNA guided interference. My research focuses on adaptation, in which Cas proteins capture spacers and incorporate them into the CRISPR array through a process called integration. In *E. coli*, Cas1 and Cas2 form a complex essential for spacer integration, with Cas1 contributing to integrase activity and Cas2 appearing to play a non-enzymatic role. However, the functions of other Cas proteins, such as Cas4, are poorly understood. I aim to elucidate the role that Cas4 proteins in *Pyrococcus furiosus (Pfu)* and *Thermococcus kodakarenesis (Tko)* play in CRISPR-Cas adaptation. Supported by previous *Pfu in vivo* data, I predict that Cas4 plays a critical role in the capture of foreign DNA into CRISPR loci. Therefore, I will evaluate the effect that different Cas4 proteins have on previously developed *in vitro* integration reactions. Further understanding of the roles of distinct Cas4 proteins in adaptation will clarify our understanding of a crucial step in prokaryotic adaptive immunity.

Legal Context to Violating Women

Michael Hutchison
Dr. K. Chad Clay, International Affairs, School of Public & International Affairs

This paper focuses on the role of legal systems on gender equality and human rights advocacy. Common law, Islamic law, Civil law, and Mixed law systems will be measured against physical human rights violations to determine which system performs best in context to religious influence on each legal system; in addition, this paper will discuss discriminatory law absent of religion, law influenced by religion, and the presence of religious extremist groups and how their interaction with a given state and population will affect human rights support and violations. Such a study has not yet been conducted, and results of this paper will illuminate the field of human rights pertaining specifically to women and the causes of violence against this sex in context to the law. This paper intends to discover the importance of religion's role in influencing the performance of legal systems pertaining to women's human rights support and violations.

Applying Computer Vision Analysis to Plant Phenotyping

Tate Hutwagner

Dr. Wayne Parrott, Crop & Soil Sciences, College of Agricultural & Environmental Sciences

Plant phenotyping lags behind in the plant breeding field because of advances in molecular biology making high-throughput genotyping easier. However, plant breeders need to asses plant phenotypes to interpret the genotypic data. Breeders still need to develop methodologies that affordably and efficiently categorize phenotypes. High throughput phenotyping would be useful to evaluate insect resistance in plants. For example, soybeans that resist damage from insects are desirable, as more than 20% defoliation leads to a significant yield and economic loss. Current methodology requires destructive sampling, as leaves must be detached from a plant before damage is measured. One current methodology under review for phenotyping is computer vision; computer vision visually assesses and scores images for characterizing crop traits. However, computer vision has been difficult to use to measure caterpillar damage. Thus, attempts are underway to adapt computer vision to measure insect-caused leaf damage. The first step has been to devise a way to get images of a whole plant—given the 3-dimensional aspects of a plant, imaging from several angles is needed. Next, Open CV, software written in Python and C++, was used to code a program to measure the amount of damage incurred by the plant. Photos of the plant are extracted from the background image utilizing the program. After, the program evaluates holes in the leaves caused by a caterpillar and calculates the percent defoliation. The ability to conduct these measurements in intact plants overcomes the traditional phenotyping bottleneck by utilizing high-throughput methods facilitated by computer vision.

The Influence of Psychosocial Functioning on Tic Severity in Children with Tourette Syndrome

Emily Ivey, Olivia Carlson, Colleen Keeler
Dr. Ronald Blount, Psychology, Franklin College of Arts & Sciences

Objective: Prior research has demonstrated relationships between comorbid psychological disorders, social problems, and increased tic severity in children with Tourette Syndrome (TS). There is also evidence that social problems positively correlate with tic severity. Less research has examined if and how psychological and social problems jointly predict tic severity. This study investigated how social impairment and symptoms of psychological comorbidities in children with TS relate to tic severity. *Methods:* The sample included 46 caregivers of children with TS (M age= 12.80, SD = 2.32). Caregivers reported on children's psychological functioning, social impairment, and tic severity. *Results:* Separation anxiety symptoms, OCD symptoms, and social impairment were significantly correlated with tic severity (rs = .31 to .40, $p < .05$). OCD symptoms were the only significant predictor of tic severity (β = .32, p = .04; $R2$ = .18, p = .01). Social impairment accounted for significant additional variance when added at Step 2 ($\Delta R2$ = .08, p = .04) and was a significant predictor of tic severity (β = .30, p = .04). OCD symptoms remained a significant predictor of tic severity at Step 2. The overall model accounted for 26.4% of the variance (p = .005). *Conclusion:* More prevalent symptoms of OCD predict greater levels of tic severity. Social impairment also relates to greater tic severity, beyond the contribution of OCD symptoms. Treating comorbid psychological disorders and social skills impairments may reduce tic symptom severity. *Significance:* These findings may guide the development of novel evidence-based treatments for children with TS.

Abstracts

Financial Literacy, Risk Tolerance, and Goals-Based Savings Behavior

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Robin Haas
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This study uses a national dataset to examine the association among risk tolerance, financial literacy, and goals-based savings behavior of households. The results indicate that three out of five households do not have any emergency funds set aside, and about two out of three households have not calculated how much money they will need for retirement. However, financial literacy is positively associated with risk tolerance; separately, both financial literacy and risk tolerance are associated with goals-based savings behavior, such as saving for emergencies, saving for children's education, and planning for retirement, among households. We also find that the likelihood of goals-based savings behavior of moderately risk seeking households is positively associated with financial literacy. Although risk tolerance appears to be an important factor in the savings and investment decisions of households, the findings of this study provide further evidence regarding the role of financial literacy in improving household financial capability. Implications for policy makers, scholars, and researchers in the area of behavioral economics and household finance are included.

When Coca-Cola Grows Citrus on the Nile, Who Wins? Revisiting the Arab Boycott in Egypt

Andrew Jarnagin, CURO Summer Fellow
Dr. Shane Hamilton, History, Franklin College of Arts & Sciences

The Coca-Cola Company was barred from the Egyptian market in 1966 under the Arab boycott of Israel and firms conducting business with Israel. The company responded by mobilizing its influence in the American government to assist in negotiations. It succeeded in inking a deal in 1977, two years before Egypt officially ended its participation in the boycott altogether, whereby Coca-Cola agreed to invest $10 million ($39 million in today's dollars) in agriculture and factory infrastructure, insured by the U.S. government. However, in secret talks in 1975 with the U.S., Egypt had already agreed to end the boycott (thus allowing Coca-Cola to return) as a part of the peace deal with Israel. When Egypt allowed Coca-Cola to re-enter the country, it was facing a foreign exchange crisis as a part of larger economic woes. In the first decision to ban Coca-Cola and the second allowing it to return, economic circumstances rather than anti-imperialist ideology dictated Egypt's negotiating position, and it extracted a desperately needed inflow of foreign investment from Coca-Cola in exchange for a right to sell that it had already secretly negotiated away as part of an American-backed peace deal with Israel. These findings are based on analysis of internal Coca-Cola documents and U.S. State Department cables.

Understanding the Rise of the Sadrist Movement in Iraq

Andrew Jarnagin, CURO Summer Fellow
Dr. Kevin Jones, History, Franklin College of Arts & Sciences

When the Ba'th Party came to power in Iraq in 1968, Saddam Hussein spelled out the party's opposition to "sectarian, racism, and tribalism." By the mid-1990s, however, the Ba'th regime was itself a proponent of those three –isms, whether openly or indirectly. This study demonstrates that government policies promoting sectarianism, racism, and tribalism contributed to the rise of a populist social movement led by Muhammad Sadiq al-Sadr which endured past his assassination by the regime in 1999. Sadr took advantage of

Iraqi Shias' growing feelings of alienation due to state oppression to create a public space for expressing Shia religious identity; used Saddam's long-held desire to see an Arab cleric rather than one with "Persian" links leading the Shia religious establishment to quickly grow in influence, initially with government consent; and appropriated the regime's revival of tribal identity to build a parallel network of tribal support across central and southern Iraq. Analysis of internal Ba'th Party documents shows that the despite the image of Ba'thist Iraq as an all-powerful totalitarian state, the government felt unable to control the growth of Sadr's influence. While the regime assassinated Sadr after he began to publicly challenge government oppression, it was unable or unwilling to dismantle the movement's entire network, and Sadr's representatives remained active after his death. This study contributes to scholarship debating the totalitarian nature of Saddam's Iraq and also helps explain the rise of Muqtada al-Sadr, son of Muhammad Sadiq al-Sadr, as a major political and militia leader in Iraq today.

Education Level May Differentially Buffer Cognitive Decline in Older Adults Based on Race

Kharine Jean
Dr. Lloyd Stephen Miller, Psychology, Franklin College of Arts & Sciences

Although race and educational attainment have both been related to cognitive functioning in late life, the interaction of these two factors is surprisingly understudied. The aim of this study was to examine whether education level differentially buffers cognitive decline in Caucasian and African American older adults. Given that African Americans are at increased risk for cognitive decline due to a variety of socioeconomic and lifestyle factors, it was hypothesized that education level would confer greater advantage to African Americans relative to Caucasians during the cognitive aging process. A 2×3 analysis of variance was conducted on a sample of 580 older adults (mean age =69.9, 62.2% Caucasian) participating in the Family Relationships in Late Life Study with race (Caucasian and African American) and education (< high school, high school, and higher education and above) as the between-subjects factors. Cognition, as measured by the Repeatable Battery for the Assessment of Neuropsychological Status global score, served as the dependent variable. Consistent with previous findings, significant main effects indicated that African Americans [$F(1, 574)=49.09$, $p=<.001$] and individuals with less education [$F(2, 574)=78.74$, $p=<.001$] evidenced lower cognitive functioning. As expected, the interaction term reached statistical significance [$F(2, 574)=5.724$, $p=.003$]. Upon further analyses, the effect size of education on RBANS score for African Americans was .33 and .14 for Caucasians. Our findings suggest that African Americans gain greater benefits from educational attainment; and that education may have greater clinical significance among African Americans in preventing dementia, given lower overall levels of cognitive functioning in late life.

Expression of Inflammatory and Coagulation Factors in Syncytiotrophoblast BeWo Cells Exposed to *Plasmodium falciparum* Derived Hemozoin

Tiffany Jenkinson, CURO Graduation Distinction, CURO Research Assistant
Dr. Julie Moore, Infectious Diseases, College of Veterinary Medicine

Malaria is often considered a disease of the developing world, affecting more than 97 countries and an estimated 207 million people annually. Furthermore, children and pregnant women are a more susceptible population. High rates of maternal morbidity, as well as low birth weight and fetal loss, are attributed

to placental malaria (PM), a disease characterized by the accumulation of malaria infected erythrocytes in the intervillous space of the placenta, the invasion of inflammatory cells, and the release of pro-inflammatory mediators. While the specific immunologic mechanisms underlying the pathogenesis of PM are not fully understood, it is established that excessive fibrin deposition and an over-activation of inflammatory mediators are key components of the body's response to malarial infection. This study aims to investigate the progression of placental coagulopathy in a trophoblast choriocarcinoma cell line, known as BeWo. In order to mimic the pathological model of PM infection, BeWo cells were stimulated with stimulants such as lipopolysaccharide (LPS) and the *Plasmodium falciparum* by-product, hemozoin. Cellular mRNA levels were analyzed by quantitative PCR for possible upregulation of pro-coagulant factors, pro-inflammatory cytokines, anti-fibrinolytic factors, anti-coagulants, and pro-angiogenic factors. The underlying interrelation and corroboration of coagulation and inflammation is still not well understood. By gaining a deeper understanding of the role of coagulation and its relationship with inflammation in PM, we hope to provide insight into possible mechanisms of treatment or prevention.

Regulation of Base J Synthesis in Trypanosomes

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Leishmania tarentolae (*L. tarentolae*) is a protozoan parasite that causes leishmaniasis, which affects people in parts of Africa, Asia, South America, and Central America. The Leishmania protozoa are part of a larger class called kinetoplastids which are responsible for deadly human diseases such African sleeping sickness in Africa and Chagas disease in South America. Research in the Sabatini lab is focused on a novel modified DNA base, called base J, that regulates RNA polymerase II transcription and gene expression in kinetoplastids. By understanding base J synthesis and function, researchers may one day be able to develop a specific treatment that will manipulate base J and kill these human pathogens. The initial step of J synthesis is catalyzed by two thymidine hydroxylases, JBP1 and JBP2, that somehow recognize specific regions of the parasite genome and modify a thymine base. Understanding the mechanisms involved in regulating the specificity of J synthesis in the kinetoplastid genome is essential to understanding epigenetic regulation of gene expression in the parasite lifecycle. Our hypothesis is that additional proteins are associated with JBP that direct the specificity of thymine modification genome-wide. My project has been to identify JBP associated proteins using tandem affinity purification of JBP1 and JBP2 in *L. tarentolae* followed by mass spectrometry. Utilizing this technique I have recently identified several potential JBP1 associated proteins. Characterization of these proteins is underway to determine their role in regulating JBP1 activity on chromatin in vivo and thus directing the modification of specific thymines in the genome.

Circulating Concentrations of Growth Differentiation Factor 11 Are Heritable and Correlate with Life Span

Zixuan Jiang
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Growth differentiation factor 11 (GDF11) is member of the transforming growth factor β (TGF-β) superfamily of proteins. Circulating GDF11 concentrations appear to decline with age, and its depletion is associated with cardiac hypertrophy and other morbidities. Knowledge of GDF11 regulation is limited,

and the effects of natural genetic variation on GDF11 levels are currently undefined. We tested whether genetic background determines serum GDF11 concentrations using two classical inbred mouse strains: C57BL/6J (B6) and BALB/cByJ (BALB). B6 mice exhibited significantly higher GDF11 levels than BALB mice, and these strain differences were consistent throughout the life span. Overall, interactions between age and genetic background determined GDF11 concentrations, which were unaffected by sex. We then surveyed a panel of 22 genetically diverse inbred mouse strains and discovered a sixfold range in GDF11 levels at middle age. We estimated that 74.52% of phenotypic variation in GDF11 levels was attributable to genetic background. We used the Mouse Phenome Database to screen for phenotypes that correlate with GDF11. Interestingly, GDF11 levels predicted median strain life spans. This study revealed high heritability of GDF11 levels. Furthermore, our correlative data suggest that GDF11 may serve as a novel predictor of mammalian life span. (Zhou, Y., et al. J Gerontol A Biol Sci Med Sci. In Press. doi:10.1093/gerona/glv308)

Feeding Choice Characterization of *Euptoieta claudia* and Oviposition Choice Analyses of *Agraulis vanilla* in Relation to Cyanide Production of *Passiflora incarnata*

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Cyanogenesis is the release of hydrogen cyanide stored in forms such as cyanogenic glycosides and cyanogenic lipids within the tissue of certain plants. This release of HCN is used as a defense mechanism by certain plant species in order to deter or poison herbivores from consuming the plant. Some herbivores, however, have adapted in such a way as to not only withstand the effects of HCN release but rather seek out plants based on the production of cyanogenic glycoside for the purposes such as feeding and survival. Experiments were conducted in order to evaluate the strength of the defensive mechanism of cyanogenic glycoside production in the Purple Passionflower (*Passiflora incarnata*) against herbivory of a generalist herbivore, the Variegated Fritillary (*Euptoieta claudia*). Further analyses of the relationship between cyanogenic glycoside production by the Passionflower and herbivores was evaluated by an experiment examining the oviposition preference of a specialist herbivore, the Gulf Fritillary (*Agraulis vanilla*), on varying genotypes of Passionflower.

The Effect of the Colonial Past on Women's Representation in the Caribbean

Kimberlee John-Williams
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This paper focuses on the Caribbean region and the effect that the colonial past has on women's representation today. This paper analyzes the influence of colonial history on women's representation by comparing Ibero and Anglo Caribbean countries. The Anglo Caribbean had a relatively peaceful transition from colonialism to independence and it was expected that this would translate into higher women's representation in legislature than the Ibero Caribbean. However, the data demonstrated that Ibero Caribbean countries elect women at a slightly larger margin than Anglo Caribbean countries. This paper presents a novel explanation for why this occurs, based on women's participation in nationalist revolutionary movements.

The Role of Auditory Skill Development in the Advancement of Vocalization Development

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Fink, Sabrina Williams, Chase Kranzlein, Brianna Kelley
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Research supports the effectiveness of early intervention in lessening the impact of hearing impairment on speech and language development. Recent advances in hearing aid and cochlear implant technology make an audible speech signal possible. Audibility of the speech signal is critical for the development of speech and language and is a primary goal of assistive technology. The relationship between early speech development and auditory skill development needs to be defined in clinically useful ways if such information is going to meaningfully contribute to the treatment decision making process. The purpose of the current study is to investigate if there is a minimum amount of auditory skill development necessary for the emergence of canonical babbling. Canonical babble is a milestone in vocalization development and is an indication of emerging first word production. The current study is a retrospective analysis of data from 7 children with normal hearing with an average age of 14.25 months (range 5-25.67 months). Auditory milestone behaviors were collected using the IT-MAIS (adapted) parent questionnaire. The early vocalization data were collected using the LENA device. The LENA is a small digital language processor worn by the child throughout the day to record up to a 16 hour language sample in a naturalistic environment. The data will be segmented and analyzed to determine degree of canonical babble emergence. The results will be combined with the results from a previous investigation of children with hearing impairment to better understand the relationship of auditory and early vocalization milestones.

Knockdown of IFT Proteins Phenotypically Affects Primary Cilia

Grace Johnson, CURO Graduation Distinction
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Dr. Jonathan Eggenschwiler, Genetics, Franklin College of Arts & Sciences

The purpose of this project is to investigate ciliogenesis of the primary cilia. On a broad scale, these cilia have large implications in the fields of human disease and developmental biology. There is a wide spectrum of diseases called ciliopathies that are caused by problems with ciliary processes. The ciliary proteins we are investigating include intraflagellar transport (IFT) proteins, motors, and regulatory proteins that play a role in regulating the primary cilia. To investigate these proteins, we employed the CRISPR/Cas genome editing system and a loxP flanked transcriptional stop cassette to induce reversible mutations in target genes. The specific genes that we investigated were Atat1, Kif7, CCRK, IFT122, and Bbs8. Atat1 is α-tubulin acetyltransferase and a knockout is expected to result in slower intraflagellar transport by assembly proteins and a lack of alpha-tubulin. IFT122 is transport protein whose knockdown results in an accumulation of transcriptional mediators at cilia tips. Kif7 is a protein that regulates cilia length and structure. A knock out of Kif7 results in phenotypically longer cilia. Our research attempted to couple a Kif7 null with a CCRK null, whose phenotypic effects are unknown. Bbs8 encodes for Barbet Biedle syndrome protein 8. A mutation should result in improper cilia movement. These phenotypes are observations that have been made and reported in the literature. Our goal is to explain these phenotypes at the mechanistic level by observing the effects on the overall structure of cilia, the rate of transport, and the ability to transport cargo within the cilia.

Abstracts

Parentification as a Predictor of Emotion Dysregulation in Young Adults

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Parentification is a form of role-reversal within a parent-child dyad in which the parent looks to the child to act as his or her caregiver (Jurkovic, 1997); this disturbance of typical family-relationship boundaries is problematic when the demands placed on a child by the parent exceed developmental ability (Kerig, 2005; Sroufe & Fleeson, 1988). Parentification has been linked to poor social competence in childhood and worse college adjustment (Johnston, 1990; Hetherington, 1999). Peer attachment also predicts psychological well-being among adolescents; secure peer attachment is associated with increased well-being (Laible, Carlo, & Raffaelli, 2000). Based on this literature, we hypothesized that peer attachment would mediate the relations between childhood parentification and emotion dysregulation, given that disrupted parent-child relationships may impact the formation of healthy peer relationships, furthering the likelihood of dysregulated emotions in young adulthood. This study utilized data collected from a sample of 1654 undergraduate students (*M* age = 19.47; 71.4% female) through online surveys. Measures included a retrospective questionnaire of childhood parentification (PBS-III), current peer attachment, including subscales of trust, communication, and alienation (IPPA), and current emotion dysregulation problems (DERS). Consistent with hypotheses, peer trust and alienation were both significant mediators of the relations between childhood parentification and current emotion dysregulation (see Figure 1). These findings highlight the degree to which young adults are impacted by their relationships with the most important people in their lives: both parents and peers. Future research should explore the importance of peer attachment in associations between other childhood experiences and later psychosocial functioning.

Silencing in Chicana Literature: How Chicana Women Writers Navigate Marginalization in the Borderlands

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"*En boca cerrada no entran moscas*" is a well known Spanish saying, meaning "Flies don't enter a closed mouth." As Mexican Americans living in a hegemonic mainstream United States culture, Chicana women must navigate silencing in order to overcome marginalization and find agency and power. Silencing for Chicana women can occur through language, marginalization in the borderlands (living within the hybrid context of U.S., Mexican, and Mexican-American cultures and spaces), and the struggles of multiple "*mestiza*" consciousnesses. Ultimately, Chicana women often break through this silencing during coming-of-age narratives or use silence to their advantage as a form of agency. Using Gloria Anzaldúa's foundational Chicana text *Borderlands/La Frontera* as a theoretical framework, I investigate representations of silencing in more recent contemporary Chicana literature. Analyzing these narratives through a feminist lens, I argue that Chicana women use language, literary style, and strategic silence to find a voice amid the oppressive powers of both Mexican-American and U.S. cultures. Whether through more active or subdued feminist performance, Chicana women, facing issues of their intersectional identities that affect them through ethnicity, race, gender, class, and nationality, must struggle and survive through repressive settings. My paper studies these oppressions and reveals how current Chicana women writers represent how to

endure and thrive through outside silencing forces.

Quantitative PCR Detection of the SRY Gene of Male Dog Mesenchymal Stem Cells in Female Dog Brains with Experimentally Induced Ischemic Stroke
Susan Jones, Foundation Fellow
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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 quantitative PCR. To detect the MSCs, a primer set was designed to amplify the SRY gene on the Y chromosome by qPCR. This technique was tested and optimized using male dog bone marrow. The qPCR technique was 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. This technique was effective at detecting the Y chromosome in the brain samples and is suitable for tracking male-derived MSCs in this dog model of stroke.

How do Middle School Students Define Sustainability? A Preliminary Analysis of Focus Groups
Usha Kaila
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This project aims to characterize how middle school students understand the concept of "sustainability." We highlight what domains of knowledge and experience students draw on to develop definitions of sustainability, and how they negotiate these definitions in a group setting. In order to impact students' attitudes and behavior around sustainability, it is essential to understand how they think about this issue. As part of a larger research project studying the impact of integrated sustainability programming at a local middle school, we have conducted focus groups with 6th graders (2 groups, with 4-6 students each). We are in the process of analyzing this data and will be conducting a second round of focus groups this spring. Preliminary analysis indicates that students' definitions are influenced by their experiences at home and at school, and focus on students' collective responsibility to make resources last.

Evidence-Based Interventions to Increase Wait Time and Decrease Problem Behaviors in Children with Autism
Megha Kalia, CURO Honors Scholar, CURO Summer Fellow, CURO Research Assistant
Dr. Kevin Ayres, Communication Sciences & Special Education, College of Education

Participants in this study include two children with autism who display varying degrees of aggression, non-compliance, or self-injurious behavior (SIB) when waiting to request for items. The purpose of this research is to decrease the quantity of their problem behaviors and to increase the children's waiting time when waiting to request for items. A picture exchange system will be used within a changing criterion design to systematically increase wait time before the item is available. The function of a picture exchange system is to provide children with

communication deficits with another mode of communication using photographs.

The Effects of Two Different High-Fat Diets on Appetite

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Studies show that eating a single meal rich in poly-unsaturated fats (PUFAs) results in greater fullness compared to a meal rich in mono-unsaturated fats (MUFAs). Purpose: Determine the effect of a high-fat diet rich in either MUFAs or PUFAs on feelings of hunger and fullness. The study used a randomized, cross-over design consisting of 2 trials that were each 10 days. Seven adult males (age 18-45) were recruited. Each 10d trial consisted of a 3d lead-in diet, two 9h testing visits, and a 5d intervention diet. During the 5d 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 9h testing visit, subjects received a breakfast and lunch meal, high in the fat designated for that trial. Subjects completed Visual Analogue Scale (VAS) questionnaires to rate feelings of hunger and fullness before and every 30-min following the two meals. There was no difference in fasting hunger or fullness VAS scores from pre to post PUFA or MUFA diets. Postprandial area under the curve was not different from pre- to post-diet for hunger in MUFA (pre:314.1±41.7, post:308.4±35.3, p=0.9) or PUFA (pre:351.4±61.1, post:326. 9±43.1, p= 0.7). Fullness was also not different pre- to post-diet in MUFA (pre:414.7±62.6, post:399.1±64.8, p=0.8) or PUFA (pre: 412.8± 64.2, post:391. 9±67. 9, p= 0.8). High fat diets rich in either MUFA or PUFA did not have an effect on feelings of hunger or fullness in adult men.

Finding Optimal Designs Using Genetic Algorithms

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In order to extract meaningful information from experimental data, the experiment needs to be designed carefully. Practitioners often use statistically optimal designs for conducting such experiments. With the advent of modern technology, sometimes the experiments have different constraints and it may be difficult or impossible to obtain such designs theoretically. We propose using numerical algorithms for obtaining such designs. Genetic algorithms, which find optima using search algorithms based on natural gene transmission, mutation, and fitness, have been applied successfully to various fields requiring numerical solutions. We examine their effectiveness in finding optimal experimental designs under different situations and demonstrate that they find good designs successfully based on various optimality criteria.

Age Related Metabolism of Pyrethroids in Rat Brain Microsomes

Marshall Kastens
Dr. Catherine White, Pharmaceutical & Biomedical Sciences, College of Pharmacy

Pyrthroids are commonly used insecticides and insect repellants that are known to exert neurotoxicity. The objective of this project is to determine if the toxicity is age-dependent since children (1-3 yrs) have higher exposure risks than adults. Preliminary studies have shown that 15- and 21-day-old rats have higher brain levels than adults; however, while adult brain concentrations remain high, the levels in younger rats decrease at a faster rate. To understand these dispositional differences in brain the role of brain metabolism must be examined. Pyrethroids are metabolized by carboxylesterases and cytochrome P450 which

are both found in brain tissue. However, very little information is available regarding age-related maturation of these enzyme systems in the brain. Brain homogenates and microsomes will be used to explore the possible age-dependent metabolism of pyrethroids. Brains will be harvested from day 10, 15, 21, 30, 40 and 90 day-old rats and pooled. Tissues will be homogenized and microsomes made using standard methods. Deltamethrin, cis-permetrhin, trans-permethrin and cis/trans permethrin will be incubated at 37C with brain homogenates (carbocylesterase + Cytochrome P-450) and microsomes (cytochrome P-450) and loss of parent compound will be monitored by HPLC or GC/MS. Data will be analyzed with WinNonlin/Prism. The results of these studies will determine if there is an age-related difference in the metabolic capacity and/or binding affinity with pyrethroids and cytochrome P-450/carboxyesterase enzymes.

O-Linked Glycosylation Patterns of Cervical Mucins in HIV Infection

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Mucosal surfaces, well known for their role in sensing their environment (nose, mouth), nutrient absorption (gut), gas exchange (lungs), and reproduction (vagina and uterus), also function as a complex immunological barrier at these common sites of entry for pathogens and viruses. However, surprisingly little is known about the complex post-translational modifications of the mucin proteins expressed at these surfaces and about how these modifications provide protection. This project focuses on an in-depth characterization and comparison of the glycans found on cervical mucins from HIV and non-HIV patients aimed at identifying unique modifications that may play a role in mucosal immunity. Samples were collected and prepared to analyze by direct injection nanospray ionization mass spectrometry (NSI-MS). Glycan structures were probed using collision induced disassociation (CID) and assigned using software developed in-house for high-throughput analysis. Experimental data obtained suggests a decrease in sialylated and fucosylated structures and a decrease in sulfated O-linked glycan structures in HIV patients indicating a possible defect in terminal glycan processing. Additionally, data from lectin blots indicate a decrease in the abundance of anti-inflammatory mucins in non-HIV patients. By understanding the fine structural features of the mucosal interface, new approaches for eliciting mucus-tethering antibodies can be considered. Additionally, this research has the potential to develop a more efficient, standardized platform for evaluating the mucus barrier, which could enhance future research on natural and vaccine-induced defenses against other sexually transmitted infections.

Investigating the Post Translational Modification of CaaX Proteins

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Many neurodegenerative diseases are associated with aggregation of proteins into amyloid plaques due to defects in protein modification. Examples of such diseases include Alzheimer's and progeria. Hsp70 and DnaJ/Hsp40 are co-chaperones that serve to facilitate protein translation, modification, translocation, and destruction. More specifically, within the family of DnaJ/Hsp40 proteins lies a group of CaaX proteins that are characterized by their highly conserved four-amino acid sequence at the carboxyl-terminus. A recent observation by the Schmidt lab directly contradicts what was previously understood in

literature regarding Caax proteins. It was previously understood that all proteins with the CaaX motif follow a strict 3 step model of post-translational modification. It is now known, through the experimental investigation using genetic and microbiological approaches involving the yeast system, that the Ydj1p CaaX protein does not follow this traditional scheme. Ydj1 is a DnaJ family protein that is hypothesized to only go through the first step of the modification pathway rather than all three. This study further investigates the possible cause for the difference in post-translational modification associated with Ydj1p by using S. cerevisiae. Approaches to study this phenomenon involve mutations of the CaaX motif and genetic assessment of a Ydj1p-dependent thermotolerance phenotype.

A Computer Program for Planar Truss Analysis

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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. This project discusses the development of a computer program for analyzing planar trusses. The inputs for this program are loads, sizes of members, material properties, and truss geometry. The outputs are support reactions, member forces, deflections, and the deformed shape of the truss. This program can be used to analyze trusses of varied geometry quickly and allows the user to choose the most optimal truss design manually. Further development of this program will support the automatic determination of optimality.

Diet-Induced Obesity Differentially Regulates Glutathione Homeostasis in C57BL/6J, BALB/cByJ, and AKR/J Mice

Stephanie King, CURO Graduation Distinction
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Cellular metabolism generates free radicals and other reactive oxygen species (ROS), and accumulation of these molecules disrupts homeostasis and drives oxidative damage. The endogenous antioxidant defense system detoxifies ROS and confers cellular protection against stress, and the ubiquitous tripeptide glutathione (GSH) coordinates many diverse mechanisms within this system. Higher GSH concentrations and redox status (GSH/GSSG) are therefore associated with augmented cellular defenses and stress resistance, while lower levels reflect oxidative stress and disease. Tissue GSH concentrations and GSH/GSSG are highly heritable in humans and mice, and interactions between genetics and diet appear to regulate these traits in model organisms. Currently, the dietary components that intersect with genetic background to regulate GSH homeostasis are not completely defined. In this project, we tested the hypothesis that dietary fat regulates tissue GSH homeostasis in a manner dependent on genetic background. To characterize these effects, GSH levels and GSH/GSSG were quantified in tissues from C57BL/6J (B6), DBA/2J (D2), and AKR/J (AKR) mice fed a control or high-fat diet for 12 weeks. Diet-induced obesity caused an increase in renal GSH/GSSG in B6 mice only. D2 mice fed a high-fat diet exhibited an increase in hepatic GSSG concentrations and a decrease in GSH/GSSG, while the livers from other strains were unaffected. Diet-induced obesity did not alter the GSH system of AKR mice in either tissue. In all, these data indicate that high dietary fat and subsequent diet-induced obesity regulate GSH homeostasis in a strain-dependent manner. Future studies will clarify the mechanisms by which genotype and diet-

induced obesity interact to control the cellular antioxidant system.

Effects of Cognitive Reserve and MPOD Levels on Personality in Older Adults

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Previous research has established both cognitive reserve and the five-factor traits of personality as impacting cognitive impairment in older adults. The early determinations of cognitive reserve and theories as to cognitive reserve's physical meaningfulness both support a potential relationship between cognitive reserve and the five-factor personality traits. This relationship may be altered by levels of lutein in the brain over a long period of time. The results of any such analysis could provide insight into the physical manifestations of cognitive reserve, and also establish how cognitive reserve's effects on aging and cognitive impairment are mediated by personality. The authors performed a regression analysis between 2 proxy measures of cognitive reserve and the gender-accounted NEO-FFI scores for a sample of older adults (n=58, ages 64-92). Several multiple regression and moderation analyses were performed using cognitive reserve proxies and several macular pigment optical density (MPOD) readings (460 nm, 490 nm, and average) in a smaller sample (n=40, ages 64-92). Both proxy measures were found to be significantly positively related to openness (p=.002, p<.001) alone. For the average MPOD levels, both proxies demonstrated significant positive moderation effects with conscientiousness (p=.017, p=.005). While the lack of a cognitive reserve – neuroticism relationship is unexpected, the cognitive reserve – openness relationship confirms our expectations. The relationship between MPOD, cognitive reserve, and conscientiousness presents new information that must be further examined for replicability, but could provide new insights into the physical meaning of cognitive reserve.

Response of *Helianthus annuus* Biomass to Nutrient Stress

Ellen Krall, CURO Research Assistant
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The cultivated sunflower (*Helianthus annuus)* is an important oil and food seed crop throughout the world. Both intensive cultivation of sunflowers in developed countries and low-input methods of cultivation in developing countries would benefit from nutrient stress resistant cultivars of sunflower that perform optimally under low nutrients. The ultimate goal of this experiment is to identify which of twelve previously identified genotypically diverse strains of *Helianthus annuus* L. perform similarly under low nutrient stress as they do in an optimized nutrient setting, and determine what characteristics could have contributed to their improved response. Three replicates of each strain (total n = 153 plants) were grown in four levels of nutrients and harvested at the seedling stage while three additional replicates (total n = 308) were grown in eight levels of nutrients and harvested at the budding stage. Evaluation of data from seedling harvest suggests that lines PPN027 and PPN240's pronounced allocation of biomass to roots at low nutrients may contribute to their more uniform growth across nutrient levels. Data are currently being collected and analyzed for sunflowers harvested at the budding stage, but it is reasonable to assume the same patterns, perhaps more defined, in terms of biomass allocation will be observed and data may also unveil other strains that perform well over a longer period of time.

Identifying Genetic Suppressors of ZYG-11

James Kraus, CURO Graduation Distinction, CURO Research Assistant
Dr. Edward Kipreos, Cellular Biology, Franklin College of Arts & Sciences

The ubiquitin-proteasome pathway is a process for targeted protein degradation. The protein substrates include cell cycle-related proteins that need to be degraded in a timely manner to allow proper cell cycle progression. In this pathway, the protein targets are marked for degradation by addition of a poly-ubiquitin chain, which acts as a signal for the proteasome. Cullin-RING ligases (CRLs) are a class of protein complexes that target proteins for poly-ubiquitination. The different substrate recognition subunits (SRSs) provide the specificity for the protein substrates of the CRLs. CRL2/ZYG-11 is a CRL complex that uses ZYG-11 as the SRS. Our lab has showed that CRL2/ZYG-11 is required for the meiotic metaphase II to anaphase II transition in *C. elegans*. There are many *zyg-11* mutant phenotypes including defects in chromosome condensation, polarity and cytoplasmic organization. The goal of my research is to further understand the role of CRL2/ZYG-11 in these cellular processes by identifying its substrates. Currently we are identifying *zyg-11*(ts) suppressor mutations by positional cloning of mutants, whole genome sequencing, and RNA interference of candidate suppressor genes.

Analysis of Pancreatic Cancer Biomarkers

Anjali Kumar, CURO Honors Scholar
Dr. Lance Wells, Biochemistry & Molecular Biology, Franklin College of Arts & Sciences

Of all cancers, pancreatic cancer has the lowest survival rate. The high mortality rate, due to lack of diagnostic tests, has created an important role for pancreatic cancer researchers to change these statistics through discovering more efficient methods for detecting pancreatic cancer. We study pancreatic ductile fluid and patient serum samples which contain proteins and sugars that aid in finding early diagnostic biomarkers. Pancreatic ductile fluid contains pancreatic cancer biomarkers that can be detected by glycoproteomic approaches. Due to the invasiveness of drawing pancreatic ductile fluid from patients, we are studying patient serum as a means to identify proteins. Immunoblotting analysis is used on serum samples from pancreatic cancer and pancreatitis patients to compare the conditions of serum, using pancreatitis as a control condition. Prior to conducting immunoblotting techniques, serum samples are normalized through a cleanup of albumin and IgG. Western blotting techniques are used to identify the level of protein changes present between the two conditions as well as to observe potential shifts in bands due to glycosylation. Target proteins for western blot analysis include pancreatic amylase, pancreatic lipase related protein 2, phospholipase A2, REG family proteins, Elastase 3B, and GP2-1. We are currently undergoing procedures in analysis of the proteins of interest; evaluation of the results will provide insight into the strength and correlation of biomarkers with either condition. The findings may be used to develop an early detection, non-invasive assay to identify biomarkers for pancreatic cancer more efficiently and increase the survival rate of pancreatic cancer patients.

The Impact of Blood Circulation on Cancer Metastasis Patterns

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Cancer metastasis is a process of cancer cells spreading throughout the body, and building new colonies in organs that are distant from the original location of the primary tumor. The tumor microenvironment is defined by the interaction between molecules around a tumor and the normal cells, and its study is significant in understanding the process of

tumor progression, and the mechanism behind metastasis. Noting that cancer metastasis occurs in the venous system, in our research, we are interested in how the blood circulation system has an impact on the metastatic patterns of primary cancer. Therefore, we studied the correlation between blood circulation rate and metastatic distribution of different primary cancers by using Spearman's rank correlation. 4012 autopsies of 40 primary cancers and 30 metastatic sites from five medical centers were used, and the blood circulation data for 14 normal organs were obtained from literatures. Our study has shown that the lungs had the highest Spearman's correlation value of 0.6073 between the rate of metastasis to each distant organs and the organs' blood circulation amount, and the p-value of 0.01 was highly significant to state that lung cancer evidently preferred to metastasize to sites with abundant blood circulation. On the contrary, some cancer type such as retro-peritoneum showed a significant negative correlation. These suggest different primary cancer type expresses different preference towards sites with abundant blood circulation, and further studies are needed to improve our understanding of the role that blood circulation rate poses in cancer metastasis.

Xenophobic Ants: Social Form Discrimination in the Tropical Fire Ant

Kip Lacy, CURO Summer Fellow
Dr. Ken Ross, Entomology, College of Agricultural & Environmental Sciences

Elucidating the genetic components of animal social behavior continues to be a biological holy grail. Fire ants have become a model system in which to explore the intricacies of social behavior. They exhibit the highest level of animal sociality—eusociality—and are often socially polymorphic within species. This is the case with the Tropical Fire Ant, *Solenopsis geminata*, in which there are two social forms: monogyne (single queen colonies) and polygyne (multiple queen colonies). The factors that maintain these two social forms sympatrically are unknown, however. In this study I investigated the interaction between workers and queens across different social forms and sites of origin by conducting behavioral choice assays for queen acceptance or rejection. I found that polygyne workers rejected all queens not from their site of origin, regardless of social form. Since ants presumably recognize each other on the basis of genetically determined pheromones, this inability to recognize such closely related conspecifics as kin may indicate unusual reproductive modes in the polygyne social form.

Effect of Strategic Marketing on Healthier Vending Machine Sales

Annie Ladisic
Dr. Leann Birch, Foods & Nutrition, College of Family & Consumer Sciences

Rationale: Regardless of the overwhelming evidence that consuming excess calories can contribute to obesity and chronic diseases, low-calorie snack options are not prevalent in most college campus vending machines. Even when offered, these items are frequently out-purchased by consumers in favor of higher calorie snack options. The use of strategic marketing to effect change in purchasing, encouraging consumption of lower calorie snacks, could help reduce the overall caloric intake of vending machine consumers. *Objective:* This study examines the effects of implementing a message spotlighting the "healthy" vs. "unhealthy" rows of products in a Dawson Hall vending machine. *Methods:* Rows 1 and 2 were stocked with "unhealthy" products that contained between ~250-500 kcal/package. The third row was stocked with "healthy" products, all ≤ 200 kcal. Sale data was collected over 12 weeks. A nutrition intervention sticker was installed on the machine during weeks 5–9, emphasizing high calorie (Rows 1 and 2) vs. low calorie (Row 3)

options. Three weeks of post-intervention data was collected to reveal whether the presence of the sticker had enduring effects on sales. *Results:* Using baseline data gathered in the initial 5 weeks of the study, I will compare the purchase choices of consumers prior to the intervention stage to those during, as well as after the intervention. I anticipate that during the intervention weeks, the product sales for Rows 1 and 2 will decrease, while sales of Row 3 items will increase. Following the intervention phase, I expect for sales to return to slightly below pre-intervention counts.

Super-Resolution Microscopy vs. Epifluorescent Microscopy of Aurora Kinase C and SYCP3 Localization in Mouse Oocytes and Spermatocytes

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

Being able to more closely examine cells on the molecular level is becoming increasingly important to researchers in order to understand the complex pathways and interactions that occur during meiosis. Unveiling information about these interactions is extremely critical in order to understand problems that occur during pregnancy and reproduction which will hopefully remedy long-lasting issues that often result in pregnancy loss and genetic mutations in surviving embryos. The purpose of this experiment is to analyze two chromatin remodeling proteins that are essential for proper chromosomal division to occur during meiosis. Aurora Kinase C is primarily localized at the centromeres of mouse oocytes, and Synaptonemal Complex Protein 3 (SYCP3) is localized along the cohesions between homologous chromosomes in the lateral position of each chromosome. This experiment will specifically be studying lymphoid specific helicase wild type mouse oocytes and Trichostatin A-treated mouse spermatocytes. Epifluorescent microscopy, a common method of imaging chromosomes, is used in this report. However, advances in technology have allowed super-resolution microscopy to yield higher-resolution imaging of chromosomes. Super-resolution microscopy will allow the observation of Aurora Kinase C and SYCP3 on a molecular level in the mouse germ cells with hopes of uncovering more information about the roles of both Aurora Kinase C and SYCP3 during meiosis. The primary goal of this report is to compare and contrast the two microscopy methods, epifluorescent microscopy and super-resolution microscopy, and discuss the relative strengths and weaknesses of using each microscopy method.

Efficient Cloning by Temperature Upshift

Paige Lane
Dr. Cory Momany, Pharmaceutical & Biomedical Sciences, College of Pharmacy

Traditional cloning methods use restriction endonucleases, which are enzymes able to recognize and cleave specific DNA sequences within a plasmid. Ligases are then used to glue the cleaved products together in a second step. In routine cloning, purification of the insert and plasmid and then a selection or screening process (*e.g.* blue-white screening) is necessary for identifying appropriate clones. This complicated process is due to inefficiencies in the overall cloning reactions that result in vectors that lack inserts and low transformation numbers. A streamlined cloning method (Galloway *et al.*, 2013) utilizes only one restriction enzyme, an enzyme that cuts outside its recognition site, and concurrent ligation at room temperature. Introduction of a temperature upshift (from room temperature to 50°C) appears to be very effective in reducing the background of incorrect products. The ligase is inactivated at 50°C, while the restriction endonuclease cuts empty vector. Most restriction endonucleases

are used at 37 °C, a temperature in which the ligase is still active. The goal of this project is to identify restriction enzymes that are compatible with temperature upshift (e.g., are stable at 50°C in the time frame of the upshift). Endonucleases will be evaluated for their cutting efficiency at 50°C. The use of a blunt-end cutter with ligase and a temperature upshift results in very efficient cloning that does not require significant screening of clones. The results of this project have wide application to the standard genetic engineering methods used in research laboratories.

Examining the Antioxidant Properties of Hops

Caroline Langley
Dr. Erik Hofmeister, Small Animal Medicine & Surgery, College of Veterinary Medicine

Hops, used most commonly in brewing beer, contain the powerful flavonoid Xanthohumol. The only way to access this compound is through the consumption of beers. Though this compound has been proven as a potential longevity-increasing compound, there is little known about it. Xanthohumol inhibits the metabolic activation of harmful carcinogens, and can help eliminate free radicals in the human body that have been shown to cause cancer. The purpose of this study is to determine if hops teas can compete against commonly consumed teas in terms of antioxidant content. The hypothesis of this study is that a hops strain with a high alpha acid content will have an equal or greater phenolic content than most herbal teas. To do this, 20 strains of Hops with different alpha acid contents will be analyzed for antioxidant content via Total Phenolic Content and Ferric Reducing Ability of Plasma (FRAP) tests. Different times will be applied to each strain, consistent with beer brewing times. The FRAPS and phenolics values obtained in the lab will be compared to those of other commonly consumed teas, such as chamomile and green. With these values, we will be able to compare how Hops tea may affect oxidation as compared to other herbal remedies.

A Retrospective Study Analyzing the Relationship between Blood Coagulation and Liver Shunts

Caroline Langley
Dr. Erik Hofmeister, Small Animal Medicine & Surgery, College of Veterinary Medicine

In veterinary medicine, when canine patients are diagnosed with liver shunts, they are often given blood coagulation tests. The correlation between the two may not be as strong as believed. The purpose of this study is to determine if running blood coagulation tests on patients with post systemic shunts is a worthwhile endeavor both financially and medically. The hypothesis is that in most cases it is not beneficial to run blood coagulation tests. The results were obtained by cross analyzing medical cases and comparing recovery rate. Abnormalities in the coagulation tests were gathered in patients with liver shunts, with fewer the abnormalities corresponding to a decreasing need to run the tests. This study used cases from the past five years.

Experimental Evolution and Sperm Precedence in *D. recens* and *D. subquinaria*

Thomas Layman, CURO Graduation Distinction, CURO Research Assistant
Dr. Kelly Dyer, Genetics, Franklin College of Arts & Sciences

This study investigates the dynamics of speciation between two closely related fruit fly species. *Drosophila recens* and *Drosophila subquinaria* are found across northeastern N. America and northwestern N. America respectively. Their ranges overlap in the Canadian Rockies. Female *D. subquinaria* from populations that overlap with *D. recens*

discriminate against mating with *D. recens* males, whereas *D. recens* females from this region do not discriminate strongly against mating with *D. subquinaria* males. This presentation will discuss the results from two experiments. First, we will discuss an experimental evolution study that aimed to test whether a population of *D. recens* females subject to very strong selection against hybridization will acquire the ability to discriminate against mating with *D. subquinaria*. Second, we will discuss an experiment that tests for post-mating selection against *D. subquinaria* sperm in the female *D. recens* reproductive tract.

Effects of Mitochondrial-Targeted (MitoQ) Antioxidants on the Lipidome of a Transgenic Mouse Model of Alzheimer's Disease

Thao Le
Dr. Brian Cummings, Pharmaceutical & Biomedical Sciences, College of Pharmacy

Alzheimer's disease (AD) is a neurodegenerative disorder that causes deterioration in memory and thinking skills. It is the sixth leading cause of death in America, and experts estimate that there are over 5 million Americans with AD. Given the considerable evidence implicating the role of oxidative stress and mitochondrial dysfunction in AD, antioxidant compounds have been targeted as therapeutics. MitoQ (mitoquinone mesylate), is a drug candidate that easily crosses the blood-brain barrier to reach the site of formation of most reactive species, the mitochondria. In this study, we used lipidomics to assess the effect of MitoQ on the blood and brain lipid profiles of AD-transgenic mice. Phospholipids were extracted using the Bligh-Dyer method from whole blood and hippocampi of 13-month old and 18-month old 3xTg female mice treated with 100mM MitoQ via drinking water for 5 months prior to blood collection. Lipid phosphorus content was quantified using the Bartlett inorganic phosphorus assay. The samples were analyzed using electrospray ionization-mass spectrometry (ESI-MS), and principal component analysis (PCA) was performed. PCA analysis demonstrated distinct differences in lipid profiles across 13- and 18-month old mice based on age as well as MitoQ treatment. The lipidome of both age groups demonstrated alterations in glycerolipids, and the majority of changes were detected in 18-month old mice treated with MitoQ. Diacylglycerol and triacylglycerol lipid species decreased along with several phospholipid classes such as phosphatidylcholine and phosphatidylserine. These data indicate a potential effect of age as well as MitoQ on the lipidome within an AD mouse model.

Fractionation and Analysis of Wild Type and Galacturonosyltransferase 14 (GAUT14) Knockdown Switchgrass Cell Walls to Determine the Structure Synthesized by GAUT14

John Lee
Dr. Debra Mohnen, Biochemistry & Molecular Biology, Franklin College of Arts & Sciences

Researchers have made progress in understanding plant cell wall structure and function. However, much remains to be learned about wall biosynthesis and fine-scale wall structure. Pectin is a major cell wall polysaccharide that provides structural support to the plant, is important in cell signaling, and binds adjacent cell walls together. Galacturonosyltransferases (GAUTs) are enzymes that synthesize the cell wall glycan pectin. In the model plant *Arabidopsis thaliana*, there are 15 GAUT genes which have either proven or putative pectin biosynthetic activity. Switchgrass is a biofeedstock crop being studied as a source of biomass for biofuel production. Modification of the expression of GAUT14 in switchgrass can potentially increase the quality of this

feedstock for biofuel production. The goal of this study was to determine the structural differences between cell walls from six GAUT14-knockdown (KD) lines compared to WT switchgrass. Cell walls from wild-type and the KD lines were extracted using solvents of increasing severity. The yield differences between the extracts from wild type and the knockdown lines were measured and will be discussed in regards to GAUT14 function. Such data also provide base-line data regarding possible ultrastructural changes in the cell walls of GAUT14-KD plants compared to the wild type. The cell wall fractions from the KD and WT lines are also being analyzed by glycome profiling, monosaccharide composition analysis, and linkage analysis. The goal is to identify which wall polymer(s) GAUT14 synthesizes and to determine which ones are modified in the GAUT14-KD switchgrass lines.

The Effect of Supplemental Vitamin E Form on Blood Oxidative Stress Parameters Measured in Exercising Horses

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

Vitamin E is a component of the antioxidant system of the horse and is commonly included in commercial horse feeds in the form of synthetic alpha-tocopherol acetate. The purpose of the research was to test the effect of supplemental vitamin E form on blood oxidative parameters in exercising horses. The project utilized 16 horses previously housed on pasture. Horses were kept in stall confinement for the duration of the study with 2–4 hours of dry-lot turnout per day. The horses underwent a two week "wash-out" period in which horses were fed a low vitamin E diet with no supplemental vitamin E. Following the wash out period, horses began a two week feeding trial where they were fed the same diet plus 4,000 IU/day of supplemental vitamin E. Horses were randomly assigned to one of the following supplementation groups: synthetic acetate powder, natural acetate powder, micellized d-alpha-tocopherol (liquid), and micellized d-alpha-tocopherol (powder). At the completion of the feeding trial, horses began a two day standard exercise regime. Whole blood and serum were collected four hours post supplementation prior to exercise on the first day and four hours following completion of the standardized exercise test (SET) on the last day. SET protocol was conducted by free lunging in an enclosed round pen at controlled and incrementally increasing speeds. Pre and post exercise serum was analyzed for alpha-tocopherol. Whole blood was analyzed for reduced, total, and oxidized glutathione to assess exercise induced oxidative stress.

Investigations of Chromium Photocatalyzed Cycloadditions

Sang Min Lee, CURO Research Assistant
Prof. Eric Ferreira, Chemistry, Franklin College of Arts & Sciences

Photocatalysis is an emerging area in modern organic synthesis which allows previously inaccessible transformations to be achieved using readily available visible light as an energy source. As of now, Cr photocatalysts have been employed in the radical cation Diels-Alder reaction of electron-rich dienophiles. In this transformation, 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 are not strong enough to oxidize the electron-poor alkene, current research in the lab promotes the idea that it reacts with the diene through a different pathway. Experimental evidence suggests a light-mediated [2+2]-cycloaddition, followed by a

Cr-catalyzed vinylcyclobutane rearrangement. Importantly, this rearrangement yields the net [4+2] product with reversed Diels-Alder regioselectivity. Although a powerful transformation, a limitation of this reaction was that the electron-poor alkene had to be substituted with an electron-rich arene in order for the vinylcyclobutane rearrangement to occur. The possibility of a substrate where the dienophile was tethered by an additional alkene would also undergo the cycloadditions was considered as the proposed products would allow for further structural modification. Two variations of the tethered alkene dienophile substrates with electron-withdrawing substitutes were studied. Neither variation yielded the expected net [4+2] addition product, showing further limited restriction of the Cr catalyst transformation. The research suggests that the cycloaddition with the inclusion of this additional alkene section is not possible with solely the Cr catalyst.

Foreign Aid: Helping or Hurting Democracy?

Benjamin Leigh, CURO Graduation Distinction, CURO Research Assistant
Dr. Andrew Owsiak, International Affairs, School of Public & International Affairs

Does foreign aid foster democratization—either globally or specifically within Africa? There are conflicting arguments and evidence over the answer to this question. Some scholars maintain that foreign aid hinders development by encouraging corruption and propping up ineffective leaders. They note that although aid can promote democratization in democracies, it often does the opposite in autocracies. In contrast, others find evidence that aid can support and encourage viable opposition parties, improve the strength of an independent media and civil society, and elevate quality of life for citizens. Finally, some scholars strike a middle ground, stating that the attachment of conditions—such as permitting opposition parties or funding specific development projects—to foreign aid can help encourage the development of democracy. What many researchers overlook, however, is the role of intervening factors that may influence the foreign aid- democracy relationship by altering state and leader preferences. This paper therefore re-examines the relationship between foreign aid and democracy, with particular attention to the factors that may impact the effectiveness of foreign aid in encouraging democratization. In the end, I find that there is no cut and dry verdict on aid's efficacy. Instead, a combination of factors, including natural resource wealth, opposition party strength, and respect for human rights unite to impact if and how foreign aid engenders democratization.

Analysis of Surfactant Patterns Induced by Carbon Nanotube Arrays

Christopher Lenear, CURO Research Assistant
Dr. Xianqiao Wang, College of Engineering

As the interest in nanofluidic and nanostructural devices grows, there is an increasing need for nanoscale fabrication techniques that are both accurate and reliable. One novel strategy includes the patterning of block copolymers that can be degraded under ultraviolet radiation, resulting in channels or cracks on surfaces. In this project, we aim to study how carbon nanotubes can be strategically located on surfaces to generate a desired self-assembled pattern of surfactants using coarse-grained molecular dynamic simulations. This may provide a robust design strategy for many devices used for biosensing, electronics, purification techniques, and chemical separations for technology such as lab-on-a-chip and nanocapillary array membranes. By designing a variety of carbon nanotube patterns and studying the effects they have on the organizations of surfactant solutions, we can propose an algorithm to

produce many desired nanostructures. This study will offer an affordable method for creating unique self-assembled surface patterns from surfactant and thereby aid in the progression of many biological and electrical applications.

Far Red LEDs Effect on the Morphology and Flowering of Marigolds
Mary Lewis, CURO Research Assistant
Dr. Marc van Iersel, Horticulture, College of Agricultural & Environmental Sciences

Better control over the growth and development of greenhouse crops can help growers increase profits. Control over when plants flower is especially important. Far-red light is known to be important in triggering flowering responses of many plants. Our objective was to determine whether far-red light from LEDs can make marigolds flower faster. Marigolds (*Tagetes erecta*) typically flower fastest when exposed to long nights. We also wanted to determine whether far-red light affects plant morphology, including height and leaf size. Each day, marigolds were exposed to 16 hours of light and 8 hours of dark, simulating summer time. At the start of the dark period, plants received 0, 15, 30, or 60 minutes of far red light. All other growing conditions were kept as similar as possible. Plants that did not receive far-red light flowered later (~104 days) than those in any of the other treatments (~76 days). Plants that did not receive far-red light were 30 cm tall compared to a height of 87 cm for those exposed to far-red light. Plants grown without far-red also had smaller leaves than those in far-red treatments. Our results show that growers can speed up flowering of marigolds with far-red LEDs, while also producing larger plants. The amount of far-red light required is very low, which makes practical applications easy and cheap.

Conjugated Polymers
Xueying Li, CURO Research Assistant
Dr. Jason Locklin, Chemistry, Franklin College of Arts & Sciences

Organic photovoltaic devices have been made, but the thickness is hard to control. In our lab, we are synthesizing different conjugated polymers and grafting them onto various substrate surfaces to form polymer brushes using SI-KCTP (surface initiated Kumada catalyst-transfer polycondensation). This way, the thickness of the polymer layer of organic photovoltaic devices can be controlled. Ni(0) catalyst is used to make reactive initiator monolayers followed by ligand exchange and then growing polymer brushes from these reactive initiator monolayers. Organic photovoltaic devices have the advantages of covering large areas and flexible surfaces of solar panels over inorganic photovoltaic devices. The controlled thickness polymer coating provides more control on the energy harvest process.

Lung Cancer Cell Enrichment with Buffer Stream via Biocompatible Ferrofluid and Microfluidic Device
So Hyun Lim, CURO Research Assistant
Dr. Leidong Mao, College of Engineering

Metastasis due to circulating tumor cells (CTCs) is the major cause of cancer related deaths. The difficulty in metastasis prevention is due to rarity of CTCs in the bloodstream which is estimated to be one CTC per billions of blood cells. Existing methods to separate cancer cells from whole blood pose three problems: expensive cost, long duration for procedure and physical and chemical damage on CTCs which reduces cell viability, hindering further analysis with separated cells. In this study, lung cancer cell enrichment from buffer stream via microfluidic device with biocompatible ferrofluid, in laminar flow with whole blood sample, provides low cost, short duration lung cancer cell separation with minimized damage on the cell. Lung cancer cell is separated from whole blood based on

the difference in cell sizes. Biocompatible ferrofluid is used to allow transitioning of lung cancer cell from the whole blood to a buffer stream, which minimizes the contact time between lung cancer cell and ferrofluid, allowing least amount of physical and chemical damage done to the cell by biocompatible ferrofluid, as well as increased cell viability. Furthermore, buffer stream was collected to enrich lung cancer cells, allowing not only medical analysis such as diagnosis, prognostic monitoring and treatment plans, but also laboratory analysis including but not limited to therapeutic efficiency, physical and chemical studies of cells as well as genetic studies.

A Romance: A Creative Writing Project
Christian Lisa, CURO Graduation Distinction, CURO Research Assistant
Prof. LeAnne Howe, English, Franklin College of Arts & Sciences

A Romance is an episodic novella about student-athletes. The work follows the parallel storylines of Sarah Jenson, a cross country runner at The University of Vermont, and Darius Williams, a highly-recruited linebacker at Notre Dame. The work is a coming-of-age story that covers themes of social isolation, ambition, drug use, and depression—all through the lens of collegiate athletics. While working on the project, I was interested in an avant-garde, maximalist style. The work employs humor, colloquial language, pop-culture references, footnotes, and social media posts as found objects to convey a substantial amount of detail and achieve intimacy with the reader. The work is written from the shifting perspectives of several different characters—jumping between scenes and people, the story presents reality in a fractured non-diachronic way. Complicated but never confusing, *A Romance* follows characters that are united by their relentless ambition and escapist tendencies. It is an examination of physical achievement and the American dream, and the larger cultural implications of a society-wide obsession with sports.

The Effect of Gender Identification and Division of Labor on the Work and Family Experiences of Same Sex Couples
Lauren Locklear, CURO Research Assistant
Dr. Malissa Clark, Psychology, Franklin College of Arts & Sciences

Although work-family conflict has been thoroughly researched for heterosexual couples (e.g., Byron, 2005; Michel, Kotrba, Mitchelson, Clark, & Baltes, 2011), minimal research exists about the work and family experiences of same-sex couples. With the recent ban on same-sex marriage lifted, it is more critical than ever to understand the work and family experiences of same-sex couples. In heterosexual couples, traditional gender role expectations suggest that men tend to contribute more financially while women place greater focus on home and family responsibilities (Blair-Loy, 2001). The small amount of research on gender identification and division of labor for same-sex couples is inconclusive. Therefore, this study explores gender-identification and division of labor in both gay and lesbian couples, and how this affects levels of work-family conflict. Participants will be recruited through advertisements posted on Facebook. To be eligible for the study, couples must be currently in a long-term same-sex relationship, cohabitating with their partner, and employed full-time. During the first phase of the study, each partner completes a questionnaire that assesses their gender role identification (Bem, 1974), division of labor in the household (custom measure), partner support (Shakespeare-Finch & Obst, 2011), and job demands (van Veldhoven & Meijman, 1994). Two weeks following completion of phase one of the study, each partner completes a questionnaire that assesses work-family conflict (Carlson, Kacmar, & Williams, 2000). Multiple regression analysis will test the

relationship between division of labor and work-family conflict, as well as the moderating role of gender role identity, job demands, and partner support.

Third Party Reactions to Mistreatment: A Meta-Analysis

Lauren Locklear, CURO Research Assistant
Ian Armstrong
Dr. Marie Mitchell, Management, Terry College of Business

Mistreatment in the workplace is commonplace, and may involve supervisors, peers, and even organizational outsiders such as customers. This mistreatment manifests in many forms such as abusive supervision (Tepper, 2000), social undermining (Duffy, Ganster, & Pagon, 2002), incivility (Andersson & Pearson, 1999), bullying (Einarsen & Skogstad, 1996), exclusion or ostracism (Ferris, Brown, Berry, & Lian, 2008; Hitlan & Noel, 2009), deviance or counterproductive behavior (Robinson & Bennett, 1995), and sexual harassment (Lim & Cortina, 2005). Previous research focused on the employer-employee relationship, particularly the reaction of the employee (the victim) to mistreatment by his or her employer (Skarliki & Kulik, 2005). However, recent research has moved beyond the victims of mistreatment to examine the reactions of third parties who witness abuse events. A third party witness is as an individual who forms impressions of organizational justice based upon direct, indirect, or vicarious experience of an organization. At present, this research stream has reached a critical mass, making it necessary to analyze the empirical findings to reveal the direction third party abuse research should take moving forward. Using the meta-analytic techniques outlined by Schmidt & Hunter, (2014) we will examine the effects of mistreatment episodes on third parties. We propose that witnesses will have cognitions (i.e., thoughts of revenge) and emotions (i.e., feelings of anger) following the abuse event which will lead to changes in behavior, well-being, and job attitudes. This meta-analysis aims to determine which of the previously explored relationships in the existing empirical research have the strongest support. Findings will provide a model for researchers to use moving forward in third party research.

Investigating the Role of Cyanogenic Glycosides in *Passiflora incarnata* (Maypop)

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

Plants produce the largest variety of metabolites of any organism on the planet. However, the evolutionary forces that generate this diversity are still unresolved. A leading hypothesis is that these metabolites serve as defenses against insect herbivores that utilize plants for food. Defensive metabolites produced can alter a plant's fitness and the fitness of the herbivore that feeds on it, resulting in a co-evolutionary relationship between the two. One putatively defensive metabolite is cyanogenic glycoside. Hydrolysis of this compound leads to the production of hydrogen cyanide, a toxic compound that interferes with cellular respiration. A plant species that produces cyanogenic glycoside is *Passiflora incarnata*, a plant species native to Athens, Georgia. 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 over the summer of 2015 using the plant species *P. incarnata*. A split-plot design was used where clonal replicates of genotypes were exposed to herbivores or protected from them using a pesticide. If herbivores are selecting for cyanogenic glycoside production, then plants that produce the most cyanogenic glycosides should have the highest fitness (measured by looking at fruit production)

when exposed to herbivores. Furthermore, when plants are protected from herbivores, there should be relaxed selection on cyanogenic glycoside production. This work provides further insight into the importance of metabolites in mediating plant-herbivore co-evolutionary interactions.

Regulation of Intracellular Membrane Fusion by V-ATPase Subunits

Michael Lopez, CURO Research Assistant
Dr. Vincent Starai, Microbiology, Franklin College of Arts & Sciences

Eukaryotic organisms must properly package, sort, and deliver proteins and membranes to a number of essential intracellular organelles during normal cell growth, which usually demands the fusion of transport vesicles with their target membranes. For these membrane fusion events to occur, a conserved "core" protein machinery consisting of SNARE proteins, Rab-family small GTPases, and multisubunit tethering factors must be present on both membranes. While much of the fundamental mechanistic information regarding the activity of this core machinery during fusion is known, additional factors which precisely regulate the SNAREs/Rabs/tethering factors during fusion remain to be characterized. It is now thought that a number of accessory proteins and lipids help catalyze specific fusion events by directly regulating the activities of these "core" proteins. Previous research has potentially identified one such accessory protein, the membrane-bound multisubunit subdomain of the eukaryotic V-ATPase (Vo). In the budding yeast, *Saccharomyces cerevisiae*, vacuolar (lysosomal) membranes lacking the Vo subdomain fail to homotypically fuse *in vitro*, and it has therefore been proposed that Vo serves a structural role in regulating endolysosmal SNARE-dependent fusion events. To test the hypothesis that the Vo domain plays some role in vacuolar fusion, modified yeast strains lacking both subunit "a" isoforms (Vph1p and Stv1p) of the V-ATPase Vo domain will be modified to express TgVha1, the Vph1p/Stv1p ortholog originating from the apicomplexan parasite, *Toxoplasma gondii*. Yeast strains expressing TgVha1 in place of Vph1p/Stv1p displayed a fragmented vacuolar morphology similar to yeast strains unable to properly fuse their vacuoles *in vivo*. Furthermore, these strains were able to grow in the presence of zinc and caffeine, suggesting that the V-ATPase formed with TgVha1 was functional for vacuolar acidification. These results suggest that this biochemically active V-ATPase was unable to properly regulate yeast endolysosomal fusion events, thus providing evidence that subunit "a" may play a physical role in regulating membrane fusion. Further characterization of this activity will require the isolation of intact vacuoles from yeast strains expressing TgVha1 and measuring V-ATPase activity *in vitro*, and the direct measurement of homotypic fusion of TgVha1-containing vacuoles. These results will help elucidate the role of the V-ATPase "a" subunit in endolysosomal fusion events.

An Analysis of Trends in Difficulties Faced by Beginning Music Educators, with Discussion and Implementation of Effective Classroom Solutions

Duncan Lord
Dr. Joshua Bynum, Hugh Hodgson School of Music

This project will provide a meaningful look at the challenges of beginning a career in education, with the goal of addressing a common problem among early educators: a perceived lack of sufficient experience to handle situations faced early on. This research will conduct a cross-sectional survey of primary and secondary music educators, with the intent to locate trending difficulties observed by the sample group within the first five years of teaching. An analysis of these trends will be presented, looking at why

certain experiences and difficulties were specific to a specialization, while others were shared across the entire field. Discussion of effective solutions suggested by the subjects will be presented along with recommendations for application in the classroom. By providing application and implementation strategies, this project will be a resource for pre-service and beginning music educators.

Motherhood, War and Ownership in Bertolt Brecht's "Mother Courage and Her Children" and "The Caucasian Chalk Circle"

Kelsey Lowrey, Foundation Fellow
Dr. Martin Kagel, Germanic & Slavic Studies, Franklin College of Arts & Sciences

I studied the presentation and implications of motherhood in two famous epic theatre plays by the German author Bertolt Brecht: Mother Courage and Her Children / Mutter Courage und ihre Kinder and The Caucasian Chalk Circle / Der kaukasische Kreidekreis. The concept of motherhood was examined first through the lens of war and peace, the main characters of these plays are women displaced by various historical wars; the fruitfulness of their motherhood was found to be closely related to the justness of different violent conflicts. As the women all lived in exile, their motherhood was also examined through its relation to the home and homemaking, as well as the historical context of real-world mothers in exile and in the home, and Nazi propaganda of the era dealing with racial and land-based ideals of motherhood. An in-depth look was taken at the character Kattrin from Mother Courage and her status as a role accessible to female and otherwise oppressed audience members, as well as her complicated relation to performative gender, female sexuality, and sexual violence. Ultimately, the findings deal with motherhood and female disenfranchisement on one end, and motherhood as an allegory for the Marxist concept of "ownership" on the other, and its aptness as such.

Modeling and Analysis of Virus-Bacteria Interactions in the Marine Environment

Angela Lucero
Dr. Adrian Burd, Lamar Dodd School of Art

Viral infections in the ocean are a major source of mortality in marine bacteria, thereby influencing the composition of bacterial communities. The purpose of this study is to investigate the interactions between viruses and bacteria in the marine environment to determine the extent to which these interactions influence dissolved organic carbon (DOC) concentrations and the bacterial community composition. Consider a lysed bacterial cell. It will produce a small cloud rich in both dissolved nutrients and viruses. The high nutrient concentrations will likely attract motile bacteria, while the high viral concentrations will increase their chances of infection. This study will use mathematical descriptions of virus-bacteria interactions and bacterial chemotaxis that will be investigated analytically and numerically. The study is expected to produce a model indicating how bacterial communities and DOC concentrations change as functions of viral concentration and infection rates. This is important because changes in bacterial community composition, especially in the deep ocean, affect the amount of carbon that can be sequestered by the oceans, which in turn has implications for the amount of carbon dioxide in the atmosphere.

Fluorescent Protein Incorporation in *E. coli* for Determination of Gene Expression Levels

Andrew Lyon, CURO Research Assistant
Dr. Yajun Yan, College of Engineering

The following research project focuses on a metabolic engineering approach for the creation of a biosensor. The overall goal is to

clone a fluorescent gene in a microorganism to determine expression levels of a protein of interest. Green Fluorescent Protein is derived from the crystal jellyfish *Aequorea Victoria*. By cloning the fluorescent gene under the promoter of interest, gene expression can be monitored. In essence, the protein can be used as a transcription reporter. Following the construction of the plasmid containing the fluorescent gene, we introduced the plasmid in *E. coli*. It is known that acrylic acid has an effect on gene expression levels by interacting with the specific promoter. Shake flask fermentations were subsequently carried out to determine the sensitivity of the fluorescence activity with the addition of varying acrylic acid concentrations. Due to issues with the machine that measures fluorescence intensity, we are still waiting on results. We expect to see an increase in fluorescence activity with increases in acrylic acid. This approach is very useful when studying transcription of genes under various promoters. This is very important for the optimization of microbial processes for the production of chemicals, renewable fuels, biopharmaceuticals, etc.

Exploring Alternative Mechanisms of RidA-Independent 2AA Stress Relief

Samuel Macfie, CURO Research Assistant
Dr. Diana Downs, Microbiology, Franklin College of Arts & Sciences

Many proteins that belong to the widely conserved RidA/YER057c/UK114 protein family hydrolyze reactive enamine/imine intermediates generated by some pyridoxal 5'-pyrophosphate (PLP)-depedent enzymes. The RidA protein in *Salmonella enterica* catalyzes the hydrolysis of the reactive enamine, 2-aminoacrylate (2AA), produced by PLP-dependent serine/threonine dehydratases, preventing 2AA from diffusing through the cell and damaging cellular targets. In *S. enterica*, cystathionine β-lyase (MetC) participates in methionine biosynthesis by cleaving the β-carbon-sulfur bond of cystathionine to yield homocysteine. Suppressor analysis showed overexpression of the *metC* gene in trans could overcome the growth defects of a *ridA* mutant strain. The molecular mechanism that mediates this suppression is currently unknown. Preliminary experiments indicated MetC does not possess RidA activity, suggesting an indirect mechanism of overcoming 2AA stress. β-cystathionase (MalY) and tryptophanase (TnaA) from *Escherichia coli* are PLP-dependent enzymes that perform β-elimination reactions similar to MetC and share a conserved protein fold-type. Our investigation seeks to determine if these enzymatic similarities to MetC allow MalY and/or TnaA to alleviate 2AA stress in the absence of RidA. Work presented here describes the molecular cloning and heterologous expression of *malY* and *tnaA* from *E. coli* in *S. enterica* lacking RidA. Insights from this work will aid us in elucidating the mechanism of MetC suppression of *ridA* strain growth defects.

Eradicating Food Insecurity in Metro Atlanta

Mallika Madhusudan, Foundation Fellow
Dr. Jerry Shannon, Geography, Franklin College of Arts & Sciences

The USDA defines households as food insecure if they are located more than one mile away from a source of fresh produce or are generally unable to purchase fresh food. Because of the high price of fresh produce and the lack of transportation, many Atlanta citizens are considered food insecure. This means they are forced to turn to fast food restaurants or convenience stores for their dietary needs, both of which rarely sell healthy alternatives. A continuous diet lacking in fresh produce contributes to high rates of obesity, heart disease, and hypertension. These diseases not only have serious health implications, but also account for major economic losses. This leaves us with the

question: What action must be taken to address the issue of food insecurity? This paper begins with a background of the issue of food insecurity in the context of Atlanta, describes the issue's various causes, symptoms, and implications and then develops four policy alternatives, including the status quo. The other policy alternatives are a Healthy Corner Store Initiative, Food-to-Institution programs, and public-private partnership loan funds. The paper will then utilize a policy matrix to compare and contrast these various policy alternatives based on health outcomes, change in fresh produce consumption, political feasibility, and a basic cost-benefit analysis. Through this method of policy analysis, this paper concludes that the Healthy Corner Store Initiative best addresses food insecurity within Atlanta. Following this recommendation, the paper will review implementation of the chosen policy and identify potential challenges.

Correspondence between Family Needs and Family Goals: Implications for Early Childhood Interventions for Low-Income Families

Emily Maloney, Foundation Fellow
Dr. Stacey Neuharth-Pritchett, Educational Psychology, College of Education

Children living in poverty often encounter adverse childhood experiences (ACEs), placing them at-risk for prolonged negative cognitive, emotional, physical, and mental health issues. Research from neuroscience suggests children living in toxic stress conditions demonstrate decreased executive functioning skills--the higher cognitive functions responsible for memory, inhibitory control, and mental flexibility. The Head Start program serves as a stabilizing preschool environment for children with ACEs to attenuate the effects of living in poverty. When applying for Head Start, families supply background information on ACEs and family needs. Head Start, then theoretically, uses the family needs assessment to help the family set attainable goals realized by program exit. What is missing from this process is often congruence between stated goals and identified risk factors. Further, interventions that support the needs of families are often misaligned with the true needs of families resulting in less than efficacious outcomes. The research question for this casual-comparative study was: What is the relationship between number of ACEs, family needs and goals, and child developmental outcomes for families with children in home-based and center-based early care and education programs? Results indicated the number of ACEs experienced by families was related to needs expressed by parents including employment, finances, mental health resources, parent/child bonding, and education. About a quarter of children with more ACEs had parents who specified goals inconsistent with needs. Children in families experiencing more ACEs had poorer cognitive development scores. Implications for the highest-need families where goals were misaligned with interventions will be discussed.

Reducing Teacher Turnover in Georgia Public Schools

Emily Maloney, Foundation Fellow
Dr. Linda Renzulli, Sociology, Franklin College of Arts & Sciences

This policy research investigated the teacher turnover rate in public schools in Georgia, particularly in schools with high percentages of low socioeconomic status and minority students. This research considered the symptoms and causes of turnover in these environments, and why previous policies enacted by the Georgia Department of Education have failed. Through the literature review and interview process, some common themes were identified as to why teachers consistently leave schools. These qualities of school environment typically included

practices that de-professionalized teachers, culminating in teachers losing a sense of autonomy within the school, discovering a lack of support from other teachers and administration, and being unsatisfied with their salary in relation to how many hours they put into their jobs both in and out of schools. To address these causes, three policy alternatives were developed: a research and development program, an intensive district-wide mentorship program based off of a highly successful model in Maryland, and treating departments within schools as designers by removing some of the bureaucratic accountability measures which cut into teachers' time both at and away from school. After using a policy matrix to analyze the effectiveness, cost-benefit, and feasibility of each alternative against the status quo, this policy paper asserts that the best option is the research and development model.

A Policy Proposal for the Reduction of Violence in Georgia's State Prisons

Taylor Martin
Rachael Andrews
Dr. Andrew Whitford, Public Administration & Policy, School of Public & International Affairs

Georgia has the 6th highest incarceration rate in the United States and operates the 5th largest prison system in the nation, costing approximately one billion dollars annually. As a result of the high incarceration rates, overcrowding has led to violence and astronomical costs on behalf of the Georgia taxpayers due to housing inmates. In 2014, the Southern Center for Human Rights released a report detailing Georgia's violent prison crisis. Georgia has seen a rise in the number of homicides and assaults throughout the prison system. In 2012, the number of homicides in Georgia surpassed those of many states in the past ten years, from 2001–2011. Despite the State of Georgia's attempted criminal justice reform, prison populations remain high, continuing the cycle of violence and high prison costs. This paper proposes policy options to the Georgia Board of Corrections in an attempt to reduce current prison populations or implement new strategies and policies to decrease the likelihood of violence in the future. The policy options evaluated include: the reworking of current legislation pertaining to drug possession, including but not limited to the de-criminalization of marijuana and the increase in the minimum amount of drugs considered to be possession with intent to distribute; the rehabilitation and improvement of vocational training programs; and the increased provision of resources available to prison officials to facilitate effectiveness and supervision. Ideally these policy approaches would be included in a comprehensive three-pronged approach; however, it is recommended that the State of Georgia adopt policy number two.

Cooling Fabric: The Future of Keeping Cool

Molly Mastin, CURO Research Assistant
Dr. Suraj Sharma, Textiles, Merchandising & Interiors, College of Family & Consumer Sciences

Smart textiles are the future of the textile industry. As technology becomes more readily available, it is integrating into many facets including the textile industry. It allows for more sustainable practices and allows people to be safer, and more comfortable. One such textile is a fabric called Brrr!. This fabric is a cooling, and wicking fabric that uses powered air to keep the wearer cool. Being powered by air means that the air flow through the fabric is used to regenerate your cool, verses a finishing that would wash off over time. It also provides UV protection. There are many instances in which cooling fabric could greatly improve the wearers' experience, and save firms a lot of money. One such case is in the use of health care workers in very hot areas

such as in the case of EBOLA workers in West Africa. Another use could be in military personnel in desert settings. I tested Brrr! Fabric in order to find out more about the fabric's structural characteristics, in order to determine alternative uses outside of the fashion industry. I used several different test methods including determining yarn strength, and wicking capability of the fabric. The result is that this fabric could be suitable for more than just fashion uses. Cooling fabrics could be used in uniforms and other ways in order to help keep wearers safe from overheating, and keeping them cooler in general. This also lead me to ask the question of the appropriateness of using this and other smart fabrics in alternative ways in order to keep users safe, and comfortable.

Male Participation in Chronic Disease Self-Management Education (CDSME) Programs

Jamarcus Mathis, CURO Honors Scholar
Dr. Matthew Smith, Health Promotion & Behavior, College of Public Health

Females outnumber males in the older adult population and are more likely to participate in evidence-based health promotion programs. Despite the widespread availability of Stanford's Chronic Disease Self-Management Education (CDSME) programs, and their known health-related benefits, male participation remains low. This study: (1) compares personal characteristics between males and females who attended CDSME program workshops; and (2) identifies factors associated with successful intervention completion (attending 4+ of the 6 workshop sessions) among male participants. Data were initially analyzed from 62,757 adults collected during a national dissemination of CDSME programs spanning 47 states and two territories. Logistic regression was performed with males only (n=13,088) to examine factors associated with workshop attendance. Of the 62,757 adults who enrolled in CDSME programs, only 20.9% were male. Compared to female participants, male participants were younger ($x^2=316.86$, $P<0.001$) and reported fewer chronic conditions ($x^2=414.94$, $P<0.001$). Among male participants alone, those age 65+ (OR=133, $P<0.001$) and those residing in non-metro areas (OR=1.14, $P=0.019$) were more likely to successfully complete the intervention. Compared to attending workshops in senior centers, males who attended workshops in healthcare organizations (OR=0.79, $P=0.001$) and residential facilities (OR=0.73, $P<0.001$) were less likely to successfully complete the intervention. Men who participated in workshops with a larger proportion of male participants were more likely to successfully complete the intervention (OR=2.21, $P<0.001$). Once engaged in CDSME programs, male participants obtain a similar intervention dose as their female counterparts. Findings highlight opportunities to tailor CDSME program recruitment and retention strategies for men.

An Investigation into the Complex Viral Interactions between *Microplitis demolitor* Bracovirus and TnAV-2a, an Ascovirus

Johnathan Mayfield, CURO Research Assistant
Dr. Gaelen Burke, Entomology, College of Agricultural & Environmental Sciences

Parasitoid wasps are a diverse and abundant group of organisms that spend part of their development either within or on their host. One group of parasitoid wasps, the superfamily Ichneumonoidea, has evolved an obligate, beneficial symbiosis with the double-stranded DNA Polydnaviruses. *Microplitis demolitor* bracovirus, or MdBV, is a polydnavirus found within the ovaries of the wasp host *M. demolitor* and has been shown to alter the immune system of the host to promote parasitism. Our project aimed to determine if MdBV interacts with other

viruses within the host, specifically the ascovirus TnAV-2a. TnAV-2a is a pathogenic, double-stranded DNA virus that infects early stages of Lepidopteran hosts and is only transmitted on the ovipositor of parasitoid wasps like *M. demolitor*. Based on quantitative PCR analysis, we have determined a species specific interaction between these two viruses. In parasitized hosts, TnAV-2a replication was lower at 24, 48, and 168 hours post infection within *Pseudoplusia includens*. In the hosts *Trichoplusia ni*, *Spodoptera frugiperda*, *Helicoverpa zea*, and *Heliothis virescens* we did not see any significant difference between parasitized hosts and unparasitized hosts in terms of TnAV-2a replication at 48 hours post infection. Within *P. includens*, we infected the host with both MdBV and TnAV-2a and determined that MdBV is the cause for lower TnAV-2a replication. Lastly, we unsuccessfully attempted to generalize the effect we saw in *P. includens* to a cell line derived from the same host suggesting that this interaction is more complex and involves many factors within the host.

Earning Disparity among White and Black Women in South Africa

Thomas McBrearty
Dr. Laura Zimmermann, Economics, Terry College of Business

This research will center around the decreasing race-based income inequality in post-Apartheid South Africa over the last 22 years. Before apartheid was abolished there was overt and legal discrimination against black individuals in the country that directly limited their educational and employment opportunities, and there exists thorough Census Data from both before apartheid's abolition and ten years after. This will enable using a difference-in-difference analysis using identical families and their earning potential and familial income over time, using the end of apartheid and extension of the lucrative South African-pension program to every working citizen (i.e., extension to non-white citizens) as the center point of the analysis. It is my contention that the extension of the pension program to the entire working populace drastically increased the educational opportunities for younger black South Africans, both male and female, and therefore drastically increased their lifelong earning potential. I will be using existing research on this topic and raw household Census data to measure if and by what degree the income inequality and earning potential gap has decreased.

An Exploration of Communicative Intent and Its Relation to Early Vocalization Production in Two Young Children with Autism Spectrum Disorder

MacKenzie McGraw, Breanna Johnson, Sherry Sayavongsa, Alexis Pope, Meredith Towey, Hayley O'Hara, Sabrina Williams, Courtney Todd, Brianna Kelley, Anna Fink, Chase Kranzlein
Dr. Sandie Bass-Ringdahl, Communication Sciences & Special Education, College of Education

Autism Spectrum Disorder (ASD) refers to the wide range of symptoms, skills, and levels of impairment or disability that children with ASD can have. The most common sign 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 (Barenek; Mitchell et al.). 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.). The purpose of the current study is to determine if vocalization production is altered in the presence of a caregiver or an electronic

device. The current study is a retrospective analysis of data from two participants with ASD and their caregivers. The first child observed was a 3 year, 9 month old male diagnosed with ASD and developmental screen of 4 months. The second child observed was a 1 year, 7 month old male diagnosed with ASD and developmental screen of 8 months. A 12–16 hour vocalization recording was collected in the home using the LENA device. This recording was then segmented into 5 minute blocks using an automated algorithm for basic components. The results of this analysis may provide insight into intervention techniques that may increase vocal productions serving a communicative function. The results may also have implications for environmental modifications in the home.

Understanding the Public's Relationships with ISIS and Counter-Terrorism Digital Media

Katherine McKeogh
Dr. Juan Meng, Grady College of Journalism & Mass Communication

Purpose: The purpose of this research is to examine and analyze the digital communication strategies used by ISIS, as well as the strategies used by the US State Department against ISIS. The research aims to learn who is viewing ISIS's messages, as well as learn more about who is targeted by and most receptive to their messaging. It also aims to learn whether or not the anti-terrorism social media strategies of the US State Department are effective. *Design/methodology/approach*: The researcher used two research methods in this study to investigate the subject: (1) an online survey of UGA undergraduate students; (2) two focus groups—one with four participants and the other with two participants—with UGA students. *Findings*: Results suggest that students at the University of Georgia are generally unaware of ISIS's social media presence. Despite ISIS's 9,000 social media accounts, almost no students had seen an ISIS tweet. Of the students that had seen ISIS messaging, the majority had been exposed to videos and remembered those most clearly. Students felt negatively about the US State Department's counter-terrorism efforts when compared to ISIS's efforts on social media. *Practical implications*: Contrary to general opinion, most young adults are not exposed to or are aware of ISIS's social media presence. However, the US State Department needs to re-construct its counter-terrorism efforts via social media, especially in video creation as young adults are most frequently exposed in that way. The lack of sophistication in current US State Department videos as compared to ISIS videos, led students to feel more threatened by ISIS. *Originality/value*: This study provides insights into ways to improve the effectiveness of online counter-terrorism efforts. It is important to improve social media tactics now, as terrorist group's influence in the digital sphere will continue to evolve.

Implementation of picoSpin(TM) NMRs into Organic Chemistry Teaching Laboratories through Spectral Analysis of Fischer Esterification Products

Emma Meehan, Doyle Wallace
Dr. Richard Morrison, Chemistry, Franklin College of Arts & Sciences

1H NMR analysis is an important analytical technique discussed in the introductory organic chemistry lecture course as it is most useful in real-world applications for the identification of a product or product mixture. The Chemistry Department recently acquired three desktop 1H NMRs for the undergraduate organic laboratories. Until now, NMR analysis has been largely impossible for the vast majority of students in teaching laboratories. Using these new technologies, the picoSpin(TM) NMRs were integrated into the undergraduate instructional

laboratory to expose students to advanced analytical techniques in the exploration of experimental results. Students specifically used unknown starting alcohols to synthesize esters through Fischer esterification, identifying the unknown starting component via spectral analysis of the product. Over the course of three semesters, 483 students out of 636 (76%) students correctly identified the starting alcohol and 76% of students indicated via survey that 1H NMR was the most helpful identification tool in their analysis. This experience strengthened the concept of NMR spectral analysis and provided students with the opportunity to employ technology commonly used in academic research facilities.

Longitudinal Assessment of a Porcine Traumatic Brain Injury Model Utilizing Immunohistochemistry

Mary Mehegan, CURO Summer Fellow, CURO Research Assistant
Dr. Franklin West, Animal & Dairy Science, College of Agricultural & Environmental Sciences

In the United States alone, approximately 50,000 deaths result from traumatic brain injury (TBI) annually. At this time, there is no adequate TBI treatment. Neural stem cells may serve as a regenerative cell replacement therapy, as they are capable of differentiating into neurons, astrocytes, and oligodendrocytes and produce regenerative factors such as vascular endothelial growth factor. These cells have been shown to lead to structural and functional improvement in rodent models that have suffered similar neural injuries. However, treatments that have been developed in rodent models regularly fail in clinical trials, thus more predictive large animal models are needed. With a large gyrencephalic brain and gray-white matter composition similar to humans, the pig is an effective large animal model. The objective of this study is to longitudinally assess changes in brain cellular composition in a piglet model of TBI. Piglets underwent surgery to generate a concussive TBI. To assess the time course of TBI pathology, piglets were sacrificed and brain tissues were collected 1 day, 1 week, and 4 weeks post-TBI. At the site of neuronal injury we assessed TBI pathology using Olig2, NeuN, and GFAP markers. Although no significant changes in Olig2 were noted; we found that neuronal cell death results in a reduction in NeuN staining 1 week post TBI, and that the upregulation of astrogliosis results in increased GFAP concentrations at both 1 week and 4 weeks post TBI. Once typical TBI pathology is fully established, we can determine if cell therapy aids in recovery of the brain at the cellular level.

Determining the Effect of Gut Microbes on *Drosophila suzukii* Gene Expression

Elijah Mehlferber, CURO Research Assistant
Dr. Patricia Moore, Entomology, College of Agricultural & Environmental Sciences

Drosophila suzukii inhabit a unique ecological niche, rather than ovipositing on rotting fruits they target ripening fruits. The larvae of most drosophilid species obtain the protein in their diets by consuming yeast that grows on rotting fruit, a resource not readily available to *D. suzukii* larvae. This raises interesting questions as to how *D. suzukii* larvae have adapted to thrive in a low protein environment. Previous research has shown that *Drosophila melanogastor* are unable to develop without gut microbes in a low protein environment, due to the inability to modulate their insulin signaling pathways. However, *D. suzukii* are able to develop under the same conditions, leading to the assumption that some function of the gut microbes has been adapted into the organism. In order to test this hypothesis *D. suzukii* larvae will be reared on low/high protein diets and in the presence/absence of gut microbes, and the expression of genes related to the insulin signaling and nutrient management pathways

will be measured. We expect that the *D. suzukii* raised on the low protein diet without gut microbes will show altered expression of these genes due to their hypothesized ability to self-regulate these pathways. This will allow insight into the interaction of gut microbes and *D. suzukii* as a result of their adaptation to lower protein environments.

Proteome and Glycome Profiling of Medaka Exposed to Chronic, Low Level Ionization Radiation

Olivia Mendel
Dr. Carl Bergmann, Biochemistry & Molecular Biology, Franklin College of Arts & Sciences

Within the United States there are over 1000 locations that are contaminated with radiation. These places range from small laboratories to massive nuclear weapon facilities. Although this ionizing radiation (IR) is clearly recognized as problematic, there is minimal understanding of the mechanisms through which radiation influences organismal adaptation. Furthermore, most experimental studies focus on the effects of acute, high dose IR. Thus, little is known about the effects of chronic, low doses of IR on vertebrate. Using Medaka fish as the model aquatic organism, this study aims to 1) quantify comparative proteomic and glycomic responses of Medaka across varying levels of chronic, low doses of IR and 2) identify proteins and glycans involved in organismal adaptation. These goals will be accomplished through coupling mass spectrometry with current bioinformatics tools to analyze samples of Medaka exposed to chronic, low doses of IR. Progress in this study has been made and thus far over 875 proteins have been quantified and glycome analysis has revealed major differences in the glycan composition of the control carcasses as compared to the treated samples. In the long term, these findings will elucidate the physiological responses of organisms to chronic, low dose IR and may be used to generate testable hypotheses regarding the evolutionary pathways associated with IR.

A First Description of Nest Behavior in Red-and-Green Macaws

Courtney Meyer
Dr. Dorothy Fragaszy, Psychology, Franklin College of Arts & Sciences

The nest behavior of the Red-and-Green Macaw (*Ara chloropterus*; the largest species in the *Ara* genus) in the wild is largely unknown and undescribed in the literature. We provide the first description of wild macaw nest behavior in which behaviors are directly observed and quantified. To understand the nest behavior of *A. chloropterus*, we have the following three objectives: to document the behavioral repertoire of nestlings; to examine behavior of the parents in the nest; and to determine nestling behavior in the presence vs absence of an adult. Video footage, recorded from approximately 6AM to 6PM within one nest over 6 days between August and October 2013, recorded the behavior of 4 individuals, including 2 adults and 2 nestlings. Videos are currently being coded using the Observer XT software. We report findings from the first two days, when the chicks were approximately 25 and 40 days old. Stationary behavior (e.g., perching) constituted the majority of the nestlings' time budget (91%). Adults were present with the nestlings 41% of the time, and when there, spent 24% of their time feeding the chicks, 36% stationary, and the remainder of their time in other activity. Nestlings vocalized six times more frequently than adults and only when adults were present. We plan to perform additional analyses of adult and nestling behavior as coding continues. Preliminary results show that Red-and-Green Macaws provide bi-parental care to young chicks, and in particular spend much time feeding them while in the nest.

Computational Modeling of Laboratory X-Ray Emission Due to Low-Energy Collisions of H-like and He-like Ions with H2

Ansley Miller
Dr. Phillip Stancil, Physics & Astronomy, Franklin College of Arts & Sciences

Charge exchange between highly-charged ions and neutral molecules, which occurs when the solar wind, or other astrophysical plasmas, collide with cool gas, emits observable X-rays with specific line intensities. Recent experiments of this process at Lawrence Livermore National Laboratory measured the X-ray hardness ratios of low-energy collisions between hydrogen- and helium-like ions with H2. Using our recently developed X-ray modeling package, Kronos_v2, which utilizes multi-channel Landau-Zener charge exchange cross sections, we have computed theoretical hydrogen-like hardness ratios to aid in interpretation of the experimental data. While the computed hardness ratios are somewhat smaller than the experiment, it provides an improved representation over earlier classical trajectory predictions. We are also in the process of building Kronos_v3; further enhancing the comprehensive charge exchange database to include helium-like and multielectron ions to allow for comparison with experiments and for models of hot astrophysical environments such as supernova remnants, star-forming galaxies, and galaxy clusters.

Results of Gender and Personality Interactions on Mobility in a Sample of Older Adults

Katherine Miller
Dr. Lloyd Stephen Miller, Psychology, Franklin College of Arts & Sciences

Due to a growing elderly population, measures and factors that predict mobility outcomes for older adults could prove useful. The focus of this project is whether personality, as moderated by gender, has an effect on mobility outcomes in late adult life. Based off of the literature of the general adult population, and research of older adult samples, we expected a significant effect. The sample (N = 100) was gathered from baseline measures of several aging studies from the Neuropsychology and Memory Assessment Laboratory at the University of Georgia. The sample composed of 59 women and 41 men, ranging in age from 64.5 to 99 years of age (= 74.46, s = 6.92), with a majority (90%) self-identifying as Caucasian. Using the Five Factor Inventory as a measure of personality, the Short Physical Performance Battery as a measure of mobility, and self-reported gender, the authors performed five separate multiple regressions of the interaction between each factor of personality and gender on mobility. We failed to find any main effects between personality and mobility, and gender and mobility, and we failed to find any significant interaction between personality and gender on mobility (all p-values > 0.05). This result is surprising, since the literature typically shows effects of different personality factors on various aspects of physical health, but it might be due to a relatively healthy sample with overly similar personality profiles. The authors recommend that future studies use more diverse samples for their analyses.

Friends and Coworkers

Molly Minnen
Dr. Michelle vanDellen, Psychology, Franklin College of Arts & Sciences

Although gratitude has been connected to positive outcomes in close relationships, research has not yet examined how people experience and express gratitude in the workplace. In gratitude exchanges, a benefactor makes a sacrifice to provide a favor to a recipient. We expect the characteristics of the benefactor may influence the extent to which recipients perceive a sacrifice as difficult. Recipients may feel as

though it was more of a sacrifice for the low self-control benefactor to do the favor than it was for the high self-control benefactor. Consequently, recipients may experience and express less gratitude toward a high self-control benefactor. The goal of this study will be to assess how a recipient might feel different levels of gratitude towards a benefactor if that benefactor is perceived as having high or low levels of self-control. Participants will read personality profiles for a recipient and a benefactor followed by a scenario where the benefactor does a favor for the recipient. Participants will be randomly assigned to see a benefactor profile reflecting high (vs. low) self-control; the recipient profile will remain constant in all conditions. Participants will evaluate how they think the recipient will respond to the favor. We hypothesize that participants will predict the recipient will feel less gratitude towards benefactor in the high self-control condition than in the low self-control condition. Results from this study could provide novel insights into why people express gratitude differently towards others and how companies could foster positive workplace experiences for valuable employees with high self-control.

Investigating miRNA-195-Mediated Regulation of Cell Cycle Gene CHEK1 in Respiratory Syncytial Virus (RSV) Replication

Madison Miracle
Dr. Ralph Tripp, Infectious Diseases, College of Veterinary Medicine

Respiratory syncytial virus (RSV) is the most common cause of bronchiolitis in young children and the elderly, often resulting in complications such as asthma. A class of 21-23nt small RNAs called microRNAs (miRNAs) can regulate post-transcriptional expression of host genes and modify viral replication. Of the validated miRNAs known to influence RSV replication, we have focused on miR-195, which is predicted to regulate CHEK1—a host gene involved in cell cycle regulation and RSV replication. CHEK1 expression and its subsequent impact on viral replication will be monitored using qPCR and viral plaque assays following transfection of miR-195 inhibitors and mimics, such as silenced using short interfering RNAs (siRNAs). Additionally, we will assay for cell cycle regulation and DNA damage upon CHEK-1 and miR-195 modulation. These findings will increase our understanding of molecular mechanisms at the viral-host interface that contribute to virulence and aid future development of targeted RSV therapeutics using RNAi technology.

Differences in Brain Morphometry as a Predictor of Smoking Cessation Treatment Success in Nicotine-Dependent Smokers

Abigail Mistretta
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Tobacco use is the leading preventable cause of death in the U.S, with most cessation attempts ending in failure. Although smokers have been shown to have reduced grey matter in certain brain regions compared to non-smokers, there is a lack of knowledge about how differences in neural structure affect smokers' ability to stop smoking cigarettes. In this study we aim to identify structural differences between the brains of participants who successfully quit smoking and those who failed to quit smoking. As part of a larger neuroimaging study, anatomical images were acquired for 51 healthy, nicotine-dependent participants**.** Following the MRI scan, participants completed an eight-week smoking cessation treatment program. Using the program FreeSurfer, we will analyze structural MRI data from these subjects to determine volumes of six a priori regions of interest (ROI) that have been previously implicated in nicotine dependence, habit learning, and drug reinforcement. These regions include the

thalamus, putamen, hippocampus, cuneus, dorsolateral prefrontal cortex, and anterior cingulate cortex. We will then test volume, thickness, and surface area of regions located in the cortex as predictors of treatment success using multiple regression analysis. Based on prior literature, we expect to find significant differences in the morphometric properties of the a priori ROI's between successful and non-successful quitters.

Assessing Trapezius Endurance Using Electrical Twitch Stimulation after Exercise

Kajal Mistry, CURO Research Assistant
Dr. Kevin McCully, Kinesiology, College of Education

Muscle fatigue from daily activities can cause problems in both healthy and diseased/injured populations. The purpose of the present study was to quantify fatigue in the trapezius muscle after carrying a weighted backpack. This project is important because we can compare a rested muscle to an exercised muscle and clinically use that information to make a positive impact on the affected population. Specifically, we are hoping to be able to translate the results to help people with mitochondrial diseases. We hypothesize that walking one mile with a backpack will alter the fatigue test results. Participants consisted of healthy, college aged students Muscle fatigue was measured using a tri-axial accelerometer to measure muscle contraction during five minutes of electrical twitch stimulation (6Hz) at a comfortable current level. The accelerometer was placed on the surface of the skin over the trapezius muscle, and fatigue was measured before and after carrying a loaded backpack one mile at a brisk pace. We initially identified a supermaximal current level for seven participants. Each of the seven participants were able to reach there maximal current (mean=59mA sd=7.35). Furthermore, each of the participants were able to go above there threshold (mean= 54% SD= 0.209). This allowed us to measure both the amount of fatigue and the response of a fatigued muscle to a fatigue test. Our study will demonstrate how muscle fatigue can be quantified as a result of daily activities. The results confirmed that the backpack does fatigue the muscle more than a rested muscle. To have a successful comparison, we first completely fatigued the muscle doing shoulder shrugs; therefore, we had the best possible comparison.

The Spatial Interaction between Cordgrass and Oysters across an Estuarine Gradient

Lucas Montouchet, CURO Summer Fellow
Dr. Jeb Byers, Odum School of Ecology

Spatial interaction patterns between the reef forming oyster *Crassostrea virginica* and marsh cordgrass *Spartina alterniflora* are not well understood. These species are the predominant ecosystem engineers in Georgia saltmarshes and provide extensive ecosystem services. However little is known about of what mechanisms drive their patch distribution and morphology, and how these patterns may vary over environmental gradients. This project describes these spatial relationships and how they change over an estuarine gradient. Through analysis, of high resolution unmanned aerial vehicle imagery, species patch morphology, distribution and relationship to one-another were obtained. Flow, salinity and wave energy predictor variables were assessed through multiple linear regression. The project analyzes the relationship in 4 different ways. Analysis (1a) characterizes the reef shape and how perimeter affects the area of oyster reefs. (1b) characterizes the reef length in relation to area. (2a) examines the distance between reefs and the closest *Spartina* patch. (2b) explores the area of *Spartina* patches in relation to oyster reefs. While this project enhances our knowledge of the spatial interplay between

two important ecosystem engineers, it also provides valuable data for resource managers. This project will directly inform sight specific Living Shoreline design and oyster restoration projects by describing oyster and *Spartina* distribution patterns.

Georgia SOL (Solar Optimization by Location)
Elena Morais
Dr. David Stooksbury, College of Engineering

We are using a minimum of 15 years of daily solar radiation date from Blairsville, Tifton, and Griffin, Georgia to improve the current recommendation for the installation of fixed solar photovoltaic panels. We are finding the optimal angle for fixed solar panels based on what most beneficial and when electricity demand is highest. The current recommendations are to maximize the total solar electrical production over a year. However, the recommendation assumes a cloud free sky. In the Southeast, it is common for summer mornings to begin clear and for clouds to form in the early afternoon. Thus a due south orientation, the recommendation, may not be the optimum for Georgia. There are many cases where optimization for certain seasons rather than for the entire year is better. Schools are in session during the fall, winter, and spring. It would make more economic and environmental sense to optimize for the part of the year that has a higher electricity demand. This research will give recommendations specifically for Georgia.

Trace Level Determination of Trichloroethylene in Plasma by Headspace Solid-Phase Microextraction Gas Chromatography/Negative Chemical Ionization Mass Spectrometry
Kyle Mott, CURO Research Assistant
Dr. Michael Bartlett, Pharmaceutical & Biomedical Sciences, College of Pharmacy

Sensitive determination of trichloroethylene (TCE) is necessary for low-level doses given to rats during toxicokinetic experiments. An improved gas chromatography/negative chemical ionization mass spectrometry (GC-NCI-MS) method utilizing headspace solid-phase microextraction (SPME) was used for the determination of TCE in plasma. The method was optimized with respect to conditioning time of the SPME fiber, extraction time, desorption time, and inlet injection. The method displayed better sensitivity than previous bioanalytical methods, giving linearity over the range of 10 pg/mL – 10ng/mL, with a correlation coefficient (R2) of better than 0.99. The precision and accuracy of the method was determined to be better than 20% at the lower limit of quantitation and better than 15% over the remaining linear range, according to FDA guidelines. Validation determined that selected ion monitoring (SIM) of the 35Cl and 37Cl isotopes using NCI showed great sensitivity, down to ppt levels, due to the nature of NCI's affinity for halogens and the presence of three chlorine ions on the measured chemical of interest, TCE.

Characterization of murI, racD and racR of *Acinetobacter baylyi*
William Moxley
Dr. Ellen Neidle, Microbiology, Franklin College of Arts & Sciences

This project focuses on genes predicted to encode amino acid racemases. Such racemases are important for bacterial cell wall synthesis and biofilm formation. In higher organisms, D-amino acids are sometimes involved in cell signaling. Studies of amino acid racemization have broad significance and could lead to the development of beneficial drugs. As a first step toward such goals, we investigated *murI* (encoding D-glutamate racemase), *racD* (encoding D-aspartate racemase), and *rac*R (encoding a racD transcriptional regulator). Previous studies in *Vibrio fischeri* showed that

the lethal effect of deleting *murI* was counteracted by high-level *racD* expression, which appeared to be mediated by a RacR variant (M. Jones and E. Stabb, personal communication). These results suggest substrate ambiguity allowing RacD to produce D-glutamate. My goals were to improve understanding of *murI*, *racD*, and *rac*R by exploiting the ease of genetic manipulation in a bacterium, *Acinetobacter baylyi*. Mutants were created and characterized that contain deletions of the three genes of interest. As expected, the *murI* mutant required D-glutamate to grow. Site-directed and random mutagenesis methods were used to isolate strains that grow prototrophically despite the absence of *murI*. We predicted that these strains would have increased *racD* expression. Additionally, we tested the ability of *V. fischeri* genes to substitute for deletion of their *A. baylyi* homologs. Although these studies are not yet complete, our initial results indicate that this approach can improve our understanding of the function and regulation of *racD, rac*R, and *murI*. Alicia Schmidt, another lab member, contributed to this project.

Expression Analysis of Immune Genes in the Liver and Ceca of Blackhead Infected Turkeys

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Histomoniasis, commonly referred to as Blackhead disease, is a threat currently faced by the poultry industry. Blackhead is caused by infection of the parasitic protozoa *Histomonas meleagridis* in the ceca (and eventually liver). In turkeys this disease is highly fatal; symptoms include drooping head, pale neck, and yellow bile around the cloaca. There are no approved drugs on the market today that combat the disease and immunization attempts have only been partially successful. We hypothesize that feed additives such as fermentation products may be effective in prevention of colonization of *Histomonas meleagridis* and may also improve bird performance under a challenged situation. To test this, a yeast product was fed to turkeys and the immune response of control infected birds compared to birds fed a control diet. The weight of poults was taken prior to cloacal infection at day 18. Samples of liver and cecal tissue were collected from euthanized birds 5 and 10 days post infection. Initial data suggests that there is no statistical difference in treatment regarding infection percentage or in the liver and ceca lesion scores of infected birds on the control and treatment diets. Poult weight gain also remained statistically similar between control and yeast product diets. RNA from samples has been isolated and gene expression of CXCLi2, IFN-y, IL-10, IL-1B, IL-4, and IL-13 genes will be analyzed using rtPCR to examine immune response. Future research will be conducted to determine the yeast product's capability as a Histomoniasis prevention method and its effects on the immune response of turkeys.

Charge Exchange: Atomic Data of Astronomical Significance

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Charge exchange has emerged in X-ray emission modeling as a dominant process that must be considered in many astrophysical environments—such as comets, supernova remnants, the heliosphere, astrospheres of stars, galaxy clusters, and generally, highly ionized regions of the interstellar medium. With a motivation to bring resolution to the current lack of atomic and molecular data for such a vital process, we have applied the multi-channel Landau-Zener approach to quickly provide charge exchange data for any single electron capture system. By

implementing the resulting nlS-resolved cross sections into a cascade model for X-ray emission, we are able to generate theoretical emission lines and spectra for charge exchange. With this data, we pursue the application of such charge exchange data to modeling the X-ray emission of Comet C/2000 WM1 (linear). Further, sulfur charge exchange data is applied to develop a model that explains the anomalous ~3.5 keV emission line in nearby galaxy clusters that was previously attributed to dark matter. This work was performed in collaboration with R. S. Cumbee, D. Lyons, P. C. Stancil, B. J. Wargelin, L. Gu, and J. Kaastra. Work at UGA was partially funded by NASA grant NNX13AF31G.

Investigation and Structural Inhibition of Rce1 and Ste24 Activity in a Prokaryotic System

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There are two major CAAX proteases – Rce1 and Ste24. The protease Rce1 is involved in post-translational modification mechanisms in eukaryotes and has unknown functions prokaryotes. In eukaryotes, Rce1 is involved in the CAAX modification pathway where it cleaves the –AAX terminal sequence of GTPase enzymes such as RAS oncological proteins. Rce1 is considered an anticancer target because of its role in modifying RAS. Inhibition of Rce1 can potentially obstruct the function of RAS and prevent tumor formation. The functional roles of Ste24p in eukaryotes and prokaryotes is less well understood. Research in the Schmidt lab investigates the target site specificity of Rce1 and Ste24 in an effort to contrast the activities of the two proteases. The goals of this project are to develop activity assays for prokaryotic Rce1 and Ste24. These assays will be invaluable for contrasting the activities of the prokaryotic enzymes from their eukaryotic counterparts. Orthologs of Ste24 and Rce1, HtpX and MmRce1 respectively, were subcloned into an expression vector, transformed into *E. coli*, and over-expressed. Membrane fractions with these enzymes will be used in *in vitro* assays typically used to monitor the eukaryotic enzyme activities. Such assays will be useful for testing structure-function hypotheses related to novel Rce1 inhibitors and for evaluating novel functional properties recently assigned to Ste24. Long term medical applications of this project include anti-cancer drug developments.

White Matter Structure Differs between Schizophrenia and Healthy Comparison Groups as a Function of Cognitive Control and Age

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Advances in neuroimaging have allowed researchers to study neural correlates of schizophrenia (SZ) *in vivo*. Despite contributions to the understanding of these correlates, neuroimaging studies have shown mixed findings regarding white matter (WM) abnormalities related to SZ. Some suggest discrepancies in findings may be due to heterogeneity of patient characteristics, such as variations in cognitive characteristics and age; a high level of cognitive control (CC) in healthy comparison groups may bias the results to differences in CC rather than the disease process of SZ, and WM follows a quadratic trend as age increases but differs between the healthy population and SZ. Poor CC is a hallmark behavioral trait of SZ and is likely related to WM abnormalities. Deficits in CC are not solely associated with SZ; a subset of the healthy population shows similar deficits. Given these potential confounds, this study aimed to explore the effects of CC and

age on WM comparisons between SZ and healthy subjects. Using diffusion tensor imaging, WM integrity was analyzed and compared between SZ and two healthy comparison groups with either high (HCC) or low (LCC) levels of CC, ages 20 to 50 years. The results showed differences in WM integrity depended on both CC capacity and age of the control group, with significant differences between HCC and SZ in the 41 to 50 age range. These results are important with respect to selecting appropriate control groups for psychiatric studies—future studies must control for both differing levels of CC and age.

The Role of Trehalose-6-Phosphate Synthase in the Development and Transmission of *Cryptosporidium parvum* Oocysts

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Cryptosporidium is an apicomplexan parasite that infects the gastrointestinal tract of many animals. Cryptosporidiosis is the second leading cause of severe diarrhea in young children worldwide. No vaccine exists for cryptosporidiosis, and the only approved drug does not benefit those most in need of treatment—immunocompromised individuals and young children. Our lab developed tools to genetically modify *Cryptosporidium* using CRISPR/Cas9, and we developed a mouse model of infection. We can use these tools to better understand parasite biology and pathogenesis. We are interested in studying the oocyst, the transmissive life cycle stage of *Cryptosporidium*. The oocyst is a thick shell composed of proteins, lipids, and sugars that protect parasites from environmental stresses. One of the predicted components of the oocyst wall is trehalose, a dimer of glucose. Trehalose protects against desiccation in many organisms and is a virulence factor in *Mycobacterium* and *Cryptococcus*. We predict that this sugar plays similar roles in *Cryptosporidium*. In *Cryptosporidium*, trehalose-6-phosphate synthase (*t6ps*) catalyzes the final two steps of trehalose synthesis. Using our CRISPR/Cas9 and mouse infection model, we failed to generate a *t6ps* parasite knockout, suggesting that this gene is essential for parasite survival. We endogenously epitope tagged *t6ps* and observed cytosolic localization throughout the life cycle, with increased expression during oocyst development. To verify the biochemical function of *t6ps*, I am performing a genetic complementation test in *Saccharomyces cerevisiae* and *Escherichia coli* mutants lacking the orthologous gene. The results indicate a crucial role for trehalose in oocyst development and transmission, so this enzyme could make a novel drug target.

The Determination of Sunflower Growth in Different Genetic Lines and under Various Nutrient Conditions

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Modern agriculture techniques commonly use excess amounts of fertilizers to grow crops, in both infertile and fertile soils, despite ineffectiveness past a certain threshold. In encouraging production of stress resistant crops, the amount of excess fertilizer used can be decreased and yield can be optimized under infertile conditions. This greenhouse study compared genetic lines of cultivated sunflower (*Helianthus annuus*) to determine which would have higher production across a variety of nutrient conditions, ranging from very nutrient poor to nutrient rich. One of the areas of emphasis in particular was discovering what traits are associated with plant performance and stress resistance in sunflowers. The traits of the most recent leaf (MRL) were analyzed using a variety of methods, including leaf area, thickness and strength. Data analysis is currently underway,

but we expect that the plants that are successful under higher levels of nutrient stress have physical traits that will optimize photosynthetic capability in their MRLs, leading to more efficient nutrient use and increased growth under such conditions. With this information, we can promote more sustainable crop production and enhance food security for people around the world, particularly in areas with infertile soils and limited economic resources.

Examining Intercellular Heme Transport via Freixenet Transgenic Zebrafish

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It is currently thought that every cell in the human body produces its own supply of heme, an essential molecule required for many biological processes. However, recent data suggests that heme may actually be transported intercellularly and utilized by cells. To test this hypothesis, we are generating transgenic wild-type and heme-deficient (freixenet) zebrafish, which synthesize heme in specific tissues, to elucidate the role of putative heme transporters in growth and development. My role in this research is to genotype, via PCR, homozygous freixenet transgenic fish which are ferrochelatase null, thus lacking a crucial enzyme in the heme biosynthesis pathway. This will allow me to identify their inheritance patterns and assess their ability to survive. The goal is to rescue heme-deficient fish by instigating heme production in red blood cells and liver tissue, showing that heme can be transported and utilized by other body cells. As of yet, we have not found an adult fish rescued by the transgenes, but we are continuing to genotype fish of this line. Additionally, I began a crossing scheme to assess the heme rescue capability of these genes in freixenet zebrafish, comparing the offspring mortality rates with those associated with specific genotypes. I anticipate that these mortality rates will correlate with the proportion of freixenet fish without the heme rescue gene insert. The data obtained in these studies will be used to validate the rescue of heme-deficient zebrafish and heme trafficking for utilization, either confirming or refuting the existing scheme of thought on heme transport.

Examining the Relation between Stigma and Self-Esteem, Self-Efficacy, and Social Satisfaction in Young Adults with Autism Spectrum Disorder

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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), but much less research has investigated the consequences stigma has on the diagnosed individual. The current study examines the negative outcomes of stigma among five young adults (M = 21.54 years, range = 18.59-25.35 years) diagnosed with ASD by assessing the relationship between experienced stigma and social outcomes such as self-esteem, self-efficacy, and social satisfaction. Stigma was assessed using an adapted version of Stigma Scale (King et al., 2007). The participants also completed psychometrically supported measures of self-esteem, social satisfaction, and adaptive social skills. The relations between stigma and social outcome variables were examined by correlational analyses. Analyses revealed that young adults that have more experiences with stigma have lower self-esteem (r = .824, p = .043), and perceive more social hostility from others (r = -.826, p = .042). As rates of ASD continue to rise, more young adults with ASD will attend college or enter the workforce. They will likely

experience stigma and it is important to know how these experiences impact quality of life to determine how to best support young adults with ASD in these environments.

Cognitive-Behavioral Therapy for Adults with ADHD: A Meta-Analysis

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Although empirical investigation of pharmacological treatment options for adult Attention-Deficit/Hyperactivity Disorder (ADHD) has indicated positive results, there is also evidence that medication alone is insufficient for many adults with ADHD. Approximately 20% to 50% of adults with ADHD are not responders to medication. Several nonpharmacological interventions have been developed and empirically investigated, but cognitive-behavioral therapy (CBT) has received the most empirical attention. The purpose of this current study was to conduct a meta-analysis to determine the efficacy of CBT in the treatment of adults with ADHD. To locate relevant studies, we searched a variety of psychology-related databases (e.g., PsycINFO). Inclusion criteria were that studies (a) used a group design (i.e., no case studies), (b) used adult participants formally diagnosed with ADHD, (c) implemented CBT as a treatment option, (d) had a control group, and (e) reported statistics necessary for calculating effect size. Of the 122 studies reviewed, 10 met these criteria. For these studies, we examined the effect of CBT on ADHD symptoms and emotional functioning. The overall effect size for ADHD symptom reduction was statistically significant ($z = 5.02$, $p < .001$) and medium in magnitude ($d = .76$); Improvement in emotional functioning was also statistically significant ($z = 3.87$, $p < .001$) and medium in magnitude ($d = .54$). The significance of this study lies in its findings that CBT is a promising treatment option for adults with ADHD. CBT participants demonstrated both improvement of ADHD symptoms and emotional functioning.

Alpha-Tocopheryl Succinate Encapsulated Nanoparticles for the Enhancement of Mitochondrial ATP Production

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Mitochondria are the energy-producers of animal cells, converting chemical energy stored in the bonds of organic compounds into adenosine triphosphate (ATP), the main energy source for many of the human body's metabolic processes. While the body manages the rate of ATP production, it is of particular interest to find ways to stimulate ATP production in the mitochondria to increase the amount of available energy for the cell, without harming the cell in the process. A biodegradable polymer, PLGA-b-PEG-TPP derived from FDA approved polymers polylactide-co-glycotide (PLGA), polyethylene glycol (PEG), and a mitochondria targeting ligand triphenylphosphonium (TPP) cation which is used in FDA approved drug MitoQ has the ability to self-assemble into a nanoparticle (NP) with the ability to enter mitochondria due to their surface charge and size. This nanoparticle has demonstrated extraordinary abilities to encapsulate a variety of therapeutic agents and deliver to the mitochondria of cells in a controlled release fashion. A recent study from our lab has shown that *alpha*-tocopheryl succinate (*α*-TOS), a mitochondria-acting chemotherapeutic, increases ATP production in the mitochondria of cells. This research shows the nano-encapsulation of *α*-TOS in PLGA-PEG NPs with both targeting and non-targeting functional groups, the characterization and stability of the NPs, the cytotoxic effects of the NPs on various cell lines, and the energy-generating effects of the

NPs. Further studies will focus on the effects of these *a*-TOS-PLGA-PEG NPs on the energy production of other living systems.

"I Just Wanted a Roof over My Head": Possible Housing Solutions for Asylum-Seekers in Germany

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Since January 2015, over 1.1 million refugees have entered Germany seeking asylum after news spread of Angela Merkel's open door policy. Predominantly of Syrian origin, displaced people are making their way to Europe to escape war torn homes. In the wake of this massive refugee influx, Germany is seeking creative ideas to provide more housing. The most controversial housing strategy to date has been the attempt of a couple German cities to accommodate refugees in former outposts of concentration camps. I suggest living arrangements and reforms which would provide ethical shelter for refugees. Having created three policy proposals and examined their theoretical strengths and weaknesses as they related to effectiveness, cost, and decency, I will propose a final policy which includes both restrictions on living arrangements that could be viewed as unethical as well as guidelines for transforming alternate locations for refugee use. I will argue this policy to be superior due to its relatively low cost, high degree of effectiveness, and its ability to maintain respect for the human dignity of refugees.

The True Cost of Medical Credit Cards on Patient Credit Scores

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The purpose of this research was to discover if using a medical credit card to pay off medical costs and procedures could positively or negatively affect a patient's credit score. A medical credit card mostly functions as a traditional credit card; the patient takes out a loan to cover the cost of medical care and then pays back the debt over time. However unlike traditional credit cards, medical credit cards use a deferred interest system, which results in the patient owing interest on the entire amount if the patient does not make the minimum monthly payments or pay off the debt during a zero percent promotional period. The first research phase included actively visiting medical providers in order to obtain the information presented to patients when inquiring about using medical credit cards as a form of payment. Additionally, online research of scholarly journals, reports from consumer organizations, and forms of primary literature were also consulted to gain knowledge about the effects of medical credit cards, and other medical debt, on credit scores. The second phase involved contacting the medical credit card companies identified in the first phase to learn if they report to credit bureaus and, if they did, we contacted credit scoring companies to learn if they considered medical credit card use in building credit scores. Based on gathered information we were able to determine how using a medical credit card to pay for a patient's incurred medical care bill could be beneficial or detrimental to their credit score.

Role of Human Intelectin-1 in the Innate Immune System

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Although its exact biological function and involvement in the human innate immune system are still unknown, HL-1, a homolog of XL35 and member of the X-lectin family, has been shown to have affinities for ribose as

well as galactofuranosyl residues. The affinity for galactofuranosyl residues is significant due to its presence on many bacterial cell walls. Some of the X-lectin family members have been shown to bind to other carbohydrate residues on bacterial pathogens, although the specific binding mechanisms and exact functions are unknown. HL-1 is expressed in human embryonic kidney (HEK) cells transfected with HL-1 cDNA in pTracer vector and secreted into the medium. To test whether HL-1 interacts with macrophage and bacteria, it was first isolated from the medium. Using affinity chromatography, HL-1 was purified and then used in binding assays to show whether it effectively bound to macrophage cells. The purity of the HL-1 samples isolated from the medium was confirmed by polyacrylamide gel electrophoresis followed by silver staining. Future research will help reveal the ligand-binding specificities used by HL-1 as a part of the innate immune system.

Re-evaluating Proposed Identities of *Brooksella alternata* of the Conasauga Shale of Georgia and Alabama

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Brooksella alternata is putatively an important fossil of the middle Cambrian Conasauga Shale of Georgia and Alabama, USA, but its identity remains obscure. It has been variously identified as a jellyfish, multiple trace fossils, a concretion, and most recently a silica sponge (hexactinellid). Each of these identifications remains tentative. I examined and quantified the external and internal morphology, chemical composition, and in situ orientation of *Brooksella* in sediments to reevaluate these proposed identities. If a hexactinellid sponge, *Brooksella* would be expected to exhibit oscula, ostia, internal structures, and arranged spicules. After considering external morphology, computer assisted tomography of internal structure, and the geochemical and electron microprobe analysis of *Brooksella*, I found the evidence is not consistent with a sponge interpretation. Previous chemical examination of *Brooksella* has dealt largely with bulk composition; my analysis is more targeted, analyzing specific internal features of the specimens. Several weathering features, including the role of modern lichen and plant roots in modifying the surface of *Brooksella*, could have produced ostia-like features. Thin sections of the samples have not yielded unambiguous spicules, but they have shown many signs of root or hyphae weathering and possibly spores worked into the samples' interiors. My results indicate that *Brooksella* is incompatible with previously proposed identities and call into question the identity of other suggested Cambrian sponges of similar composition and structure.

How the Market Responds to Changes in Firm Health Policy

John-Jordan Nunnery
Dr. Sara Holland, Banking & Finance, Terry College of Business

With the costs of US healthcare growing faster than the economy, firms are taking novel approaches to manage healthcare coverage for their workforce. In this paper, I study the market's reaction to firms' announcements to invest or disinvest in employee healthcare. Using a set of 63 events classified as expansions, reductions, restructurings, and acknowledgement, I find that on average the market responds negatively to changes in healthcare policy. It responds less negatively when the firm market value and dividend yield are large, and it responds more negatively when the firm has a larger employee base and current ratio. Additionally, I find that restructuring events lead to significantly steeper declines in equity value. These findings have implications for the efficient market hypothesis and investor myopia.

Investigations of How *Lysinibacillus sphaericus* Bin Toxin Kills a Cell Line Derived from the Malarial Mosquito *Anopheles gambiae*

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Binary toxin (Bin) produced by the bacterium *Lysinibacillus sphaericus* is toxic to *Culex* and *Anopheles* mosquito larvae. It has been used world-wide for the control of mosquitoes that vector human diseases, including West Nile virus, lymphatic filiariasis and malaria. The Bin toxin interacts with a receptor in the gut of *Anopheles* mosquitoes. However, the exact mechanism of its mode of action is not clearly understood. The Adang laboratory developed an *Anopheles gambiae* Ag55 cultured cell line as a model for investigating the molecular action of Bin toxin. The Bin toxin, composed of BinA and BinB proteins, internalizes and kills the Ag55 cells via a process that is consistent with autophagy. The goal of this project was to determine whether BinA or BinB alone is sufficient to kill *A. gambiae* larvae and Ag55 cells or whether the BinA/B pair is required for toxicity. Our approach was to individually produce BinA and BinB in recombinant *Eschericia* coli and test the toxicity of each separately and together against *A. gambiae* larvae; followed by testing the cytoxicity of BinA and BinB against Ag55 cells. Preliminary results with purified BinA alone show toxicity to Ag55 cells and now we are beginning to analyze uptake of BinA by the cells. This information will contribute to the understanding of how Bin toxin kills mosquito larvae, and could provide insights into approaches to prevent mosquitoes from acquiring Bin resistance.

The Effect of Corporate Wellness Program Benefits Over Time on End-Of-Workday Strain

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In the current study, we examined changes in employee well-being by assessing employee perspectives of their organization's wellness program. We asked employees to rate their perceived change in medication use, weight, and eating habits since joining the wellness program. We then examined how these measures related to end-of-workday strain, which is based on how physically, mentally, and emotionally drained employees feel. To conduct a longitudinal study, surveys were administered in 2012-2013 and 2015 to employees undergoing a wellness program at a utility company in the Southeastern United States. We hypothesized that the composite of benefits from the wellness program is positively related to a decrease in end of workday strain from time 1 (2012-2013) to time 2 (2015). Our sample *(N*=78) consist of 65% males, with a mean age of 45.6. Of 78 the employees who complete both time 1 and time 2 surveys, 55% reported working inside while 45% reported working outside. On average, employees worked 42.3 hours per week. We ran a simple regression using R software to test whether the composite and individual benefits from the wellness program predicted change in strain by time 2. With the variables measured on a five-point likert scale, the mean of the composite program benefits was 3.5 *(sd = 0.53)* and the mean of healthy eating habits was 3.71 (*sd = 0.69)*. The average change in end of workday strain was 0.427 (*sd = 0.824)*. The results of the regression were not statistically significant: $F(1,76)(=0.02$, $p > .05$). We will perform additional analyses examining the facets of end of workday strain (physical tiredness, mental tiredness, and tenseness).

Structural Characterization of an LTTR in *Acinetobacter baumannii*

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Dr. Cory Momany, Pharmaceutical & Biomedical Sciences, College of Pharmacy

Bacterial transcriptional regulators such as the LysR-type transcriptional regulators (LTTR) are responsible for controlling many biological processes in different bacteria. Therefore understanding how these transcriptional factors function is important in the development of drugs that could target these proteins. This project is focused on elucidating the structural interactions between LTTRs and their various ligands, the DNA to which they bind, as well as the RNA polymerase that they interact with during transcription in the bacterium, *Acinetobacter baumannii*. *A. baumannii* is an opportunistic clinical pathogen that causes urinary tract infections and biofilm formation on plastics. Because of *A. baumannii's* ability to form a biofilm, *A. baumannii* is resistant to many classes of antibiotic drugs by intrinsic and acquired antibiotic resistance genes. One of the genes is *bfmL*, which encodes an LTTR that is responsible for controlling the expression of the chaperone-usher pilus assembly system needed for cell attachment and biofilm formation. The *bfmL* gene was PCR amplified and successfully cloned into an in-house engineered expression vector. A restriction digest confirmed that the cloning was successful, and the resulting plasmid was transformed into a protein production strain of *E. coli*. Preliminary results on the purification of the protein by metal-chelate chromatography indicate that the protein is poorly soluble. After improving the solubility of the protein, biochemical analysis and crystallization studies will be initiated. Successful crystallization of this protein and other LTTRs will pave the way for understanding their structures, which is a critical step in developing novel antibiotics targeted at *A. baumannii*.

Coalitional Stability: Apportioning the Legislature at the U.S. Constitutional Convention

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Principles of legislative apportionment determine the number of seats each state receives in Congress. Apportionment was one of the issues most fiercely debated at the U.S. Constitutional Convention of 1787. States small and large, free and slave, and poor and wealthy squabbled over the constitutional principle that would decide what interests would control Congress. Delegates eventually agreed to apportion the House by the number of free inhabitants plus three-fifths of the slave population and the Senate by equal state voting. However, there were nearly twenty other principles of apportionments that were proposed and debated. Assuming delegates wanted to maximize their state's vote share, we examine which principles of apportionment were coalitionally stable. We do this by comparing vote shares of all the principals proposed, both for a unicameral or a bicameral body. This allows us to ask whether the apportionment principle adopted was in equilibrium among those considered, to identify principles which dominate those enumerated in the Constitution, and to provide clear examples of vote cycling. Our research suggests that the coalitions that formed around different apportionment methods were unstable and that the adopted principle was not inevitable. Instead, it was a compromise between competing interests who, perhaps unknowingly, sowed the seeds of the American Civil War by over representing the south in the new republic.

Sensitive Liquid Chromatography/Mass Spectrometry Method for the Determination of the Lipophilic Anticancer Drug in Rat Plasma

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In this research study, a robust and sensitive liquid chromatography mass spectrometry (LC-MS) method was developed and validated to measure a preclinical candidate GH501 in rat plasma. This compound has been developed for the treatment of bone metastatic prostate cancer. GH501 was samples were prepared using liquid-liquid extraction and separated on a Waters AtlantisTM dC-18(30 mm x 2.1 mm i.d., 3 μm) column using a mobile phase of acetonitrile/20 mM ammonium formate (pH 4.25 adjusted with formic acid) with gradient elution. GH501 was detected in positive ion mode using MRM (multiple reaction monitoring). The MS response was linear over the concentration range from 0.4 – 200 ng/ml in plasma. The limit of detection (LOD) and quantitation (LOQ) were calculated from the peak-to-noise ratio as 0.2 and 0.4 ng/ml respectively. This method was validated based on FDA guidelines, and the measured signal was shown to be precise, accurate, and linear over the concentration range tested.

Tolstoy's Second Epilogue: On Page and Screen

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The breadth of Leo Tolstoy's *War and Peace* may indeed mean that the novel's plot and plentiful characters cannot be condensed to yield a faithful, abridged version. Tolstoy himself, however, captured the spirit of his work perhaps most completely in its final section: the second epilogue. Lacking any narrative structure, Tolstoy divulges his philosophy of history, including most notably a discussion of the struggle between free will and determinism, the nature of consciousness, and the essence of time. Such impenetrable subjects may leave readers and filmmakers alike wondering about the plausibility of including it in an adaptation. Sergei Bondarchuk, in his 1966 film version, successfully incorporates this portion of the novel. Bondarchuk's epic eight-hour film evokes the epilogue in both fundamental and nuanced ways. Film itself, I argue, is a most suitable medium for the epilogue. On a secondary level, camera techniques and stylistic choices of the director together reproduce one of Tolstoy's central philosophical struggles: reconciling immensity and fragments - of time, man, and existence.

Investigating a Potentially Novel Cache Valley Virus Variant in a Clinical Case in Missouri

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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*) that was euthanized after showing signs of hemorrhagic disease. A virus isolated from 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. While exposure to several orthobunyaviruses has been detected in white-tailed deer, they are not known to cause disease in white-tailed deer, though they cause acute disease in other ruminants. Two orthobunyaviruses, Cache Valley and Potosi viruses, have been previously isolated from deer in Missouri; as RNA viruses, they lack proofreading mechanisms and frequently exchange genetic

material. The unusual clinical presentation of this case was seen as potentially resulting from infection with a mutant or hybrid orthobunyavirus capable of causing illness in deer. In order to explore this possibility, RT-PCR reactions were conducted to amplify partial segments of the virus's genome; these segments were then sequenced. Comparative analysis of the sequence data showed high similarity between this case and Cache Valley virus. Conclusive identification is still being pursued; orthobunyavirus species are often closely related and few reference sequences are available to compare experimental sequence results to. Further investigation will endeavor to sequence more of the viral genome and explore how the virus's structure and function are impacted by identified mutations.

To Close or Not to Close for Severe Winds: Two Cable-Stayed Bridges in the Georgia Coast Region

Maximillian Ovett
Dr. Mi Geum Chorzepa, College of Engineering

The ultimate goal of this research is to understand and model the behavior of the two cable-stay bridges, the Eugene Tallmadge Bridge located in Savannah, GA and the Sidney Lanier Bridge in Brunswick, GA and to propose to the Georgia Department of Transportation the criteria for closing the bridges to traffic. A cable-stayed bridge is readily open to the excitation forces of the wind. These aerodynamic forces result in vibrations emanating throughout the bridge-deck and cables. Once these vibrations reach a specific threshold, they can cause torsional divergence, flutter, galloping, and ultimately self-destruction. These two bridges are of similar structural nature were each has 2 main support towers and 2 planes of tension cables supporting the pre-stressed concrete bridge-deck. Due to the location of theses bridges being near the coast they are constantly under wind loading as well as in the direct path of hurricanes. The need to model and understand their performance and general cable-stayed bridge behavior in peak winds and large scale hurricanes is pertinent. These analysis and models will help further wind-resistant designs of cable-stayed bridges. This semester's research will focus in on understanding the underlying structural dynamics of cable-stayed bridges and their supporting structures. This will primarily be done through the review of published literature on the subject of bridge, wind, and vibration analyses. The study will be focused on conceptual understanding of modal vibrations, torsion, wind analysis, and flutter. If understanding and time allow, a simple model of one of the bridges may be built to validate conceptual understanding.

Exploring Uncertainty in Models of Mosquito Vector-Borne Disease

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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 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. Because mosquitos are prevalent in many hot, humid areas, little work has been done to investigate which factor is more responsible for mosquito transmission potential. This experiment will use a factorial design to monitor mosquito

mortality, bite rate, and fecundity across a range of humidity and temperature points. From the results, we will be able to further specify which variable is the more important driver of mosquito transmission potential.

Wild Bearded Capuchins (*Sapajus libidinosus*) Use Tools in Fazenda Boa Vista, Brazil: Positioning the Nut Predicts Success

Rachel Pack
Dr. Dorothy Fragaszy, Psychology, Franklin College of Arts & Sciences

What challenges capuchins learning to crack nuts? Prior studies showed that adults position (place) nuts precisely on anvils, often several times, before each strike, and that positioning the nut is the last feature of nut-cracking to appear in juveniles. We predicted that positioning the nut on the anvil would index juveniles' mastery of nut-cracking. We observed fourteen capuchin monkeys (eight juveniles - four that could crack nuts, four that could not - and six proficient adults) using continuous focal animal sampling during 2011-2013. After extracting episodes in which monkeys struck nuts, we examined correlations among the duration of cracking episodes, rate per episode of positioning a nut on an anvil, age and success at opening a nut. We found a positive correlation between juveniles' age and rate of positioning a nut ($r = +0.57$, $n = 8$, $p=.021$). Rate of positioning correlated positively with success for the juveniles that cracked, significantly for two of them. The rate of positioning a nut increased from juveniles who could not crack, to juveniles who could crack, to adults (mean=0.7, 2.3, 3.4 times/min). Coefficient of variation for rate of positioning the nut is highest in juveniles who cannot crack (CV=140, cannot crack; CV=11 and 24, can crack and adults). Consistently positioning the nut appears to be a key feature predicting efficient nut-cracking in young capuchins.

Psychiatric Drug Use and the Business Cycle

Meredith Paker, Foundation Fellow, CURO Research Assistant
Dr. W. David Bradford, Public Administration & Policy, School of Public & International Affairs

Previous literature suggests that many indicators of health improve during recessionary periods. This countercyclical health effect has been attributed to increases in leisure time due to lower employment, which can reduce job-related stress and permit higher investment in healthy lifestyle changes. However, earlier work by David Bradford and Bill Lastrapes finds that psychiatric drug utilization increases during recessions, suggesting that mental health is largely procyclical. Using the Medical Expenditure Panel Survey data from 1996-2012, we explore how changes in employment affect psychiatric drug utilization. We aim to understand the mechanism behind any increases in drug utilization due to the business cycle.

Effect of Different Concentrations of 25-Hydroxycholestrol on Osteogenic Differentiation of Mesenchymal Stem Cells (MSC) from Broiler Compact Bone

Daye Park, CURO Research Assistant
Dr. Woo Kyun Kim, Poultry Science, College of Agricultural & 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. The compact bones were

flushed with PBS, chopped to small pieces, and digested with a digestion buffer containing 0.25% collagenase and 20% Fetal Bovine Serum (FBS). Digested cells were filtered, centrifuged, and cultured in a growth medium DMEM containing 10% FBS. MSC were successfully isolated 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/cm2. 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 was 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.

Genetic Analysis of *Exobasidium maculosum* Using Microsatellites

Sabrina Park, CURO Research Assistant
Dr. Marin Talbot Brewer, Plant Pathology, College of Agricultural & Environmental Sciences

Exobasidium maculosum is a recently described emerging fungal pathogen of blueberry in the southeastern USA. It causes leaf and fruit spots, with the latter resulting in unmarketable berries and economic losses. Previous studies showed an elevated level of genetic diversity based on the analysis of three loci: ITS, EF-1α, and CAL. This high level of genetic diversity, which is especially surprising for an emerging pathogen, is believed to have resulted from a combination of high mutation rates and recombination within populations. Our objective is to understand how this genetic diversity is hierarchically distributed within spots, leaves, bushes, fields, and regions. This information will provide information on the life cycle and dispersal of *E. maculosum*. To accomplish the objectives, we collected and genotyped 379 isolates from ten bushes in each of two different commercial blueberry fields in Georgia. Isolates were genotyped at ten loci using microsatellite markers. Spatial genetic diversity analyses and measures of population subdivision are currently underway. Results from this study will help us to understand the genetic basis disease emergence, as well as the life cycle and dispersal patterns of the fungus, potentially leading to improved disease management strategies.

Cytotoxicity of Gold Nanoparticles with Feline Injection Site Sarcoma, *In Vitro*

Arjun Patel, CURO Research Assistant
Dr. Robert Gogal, Anatomy & Radiology, College of Veterinary Medicine

Injection site sarcoma (ISS) is an aggressive cancer associated with vaccination in felines. ISS is locally invasive and can be difficult to control even with aggressive therapy. The focus of this study was to assess whether 15 nm gold nanoparticles could be employed as a cytotoxic agent. Nanoparticles have an increasing usage in numerous fields due to size and biological properties they possess. The study focused on culturing ISS cells with gold nanoparticles at 0.0, 0.25, 0.5, 1.0, 2.0, and 4.0 mM for 72 hr. Changes in cell proliferation, viability, and cytology were assessed. The data obtained suggested that gold nanoparticles concentration yielded an inverse correlation with ISS cell proliferation. Plating 5,000 ISS cells per well in a 96 well tissue culture plate, an IC 25 was determined to be 3 mM concentration. Results from this preliminary study suggest that 15 nm gold

nanoparticles at concentrations greater than 3 mM can induce cytotoxicity in ISS cells.

The Implications of International Intellectual Property Law on Global Access to Medicines

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The affordability of medicines remains an issue both in economically resilient countries such as the U.S. and in developing countries such as India. International intellectual property law and pharmaceutical patents complicate the matter. The balancing act between providing protection for innovation and honoring the universal right to health, including access to essential and life-saving medicines, creates controversy. One particular bilateral relationship, between the U.S. and India, has had a disproportionate effect on global access to medicines. The domestic intellectual property law of the U.S. and other developed countries was favored in the development of international law. Most notably, the TRIPS agreement demonstrates a global movement toward more rigorous intellectual property law. However, the pressure from major pharmaceutical companies in the U.S. to impose trade sanctions on India, as a result of the immense generic pharmaceutical industry built from the reverse engineering of drugs innovated in countries such as the U.S., France, the U.K., and Germany, directly contradicts the ostensible commitment to global health all of these countries have pledged. While respecting the concerns of domestically based pharmaceutical companies and maintaining protection of pharmaceutical patents, the U.S. must find a way to also defer to the interest of global health and access to medicines. India must find equilibrium between attracting foreign investment and continuing to create the generic medicines that are so vital for medically underserved communities globally.

Genetic and Metabolic Modeling the Methanogenic Archaeon *Methanococcus maripaludis*

Hirel Patel, Lucas Bougang, Rebecca Buchanan, John Buchanan
Dr. William Whitman, Microbiology, Franklin College of Arts & Sciences

Methanococcus maripaludis is a model organism for Archaea, which affords researchers the opportunity to take advantage of beneficial qualities such as (1) production of methane to be used as a biogas and (2) manufacturing high volumes of isoprenoids to be used as precursors for high-value biochemicals. However, there are few genetic tools for metabolic engineering available for Archaea. Our goal is to create, characterize, and model some useful tools for the utilization of this adept organism for synthetic biology. Building on our past *M. maripaludis* projects, which created and characterized a mCherry reporter system as well as a recombinant mutant making the high-value isoprenoid geraniol, our team is now working to (1) create, characterize, and model a ribosome-binding site (RBS) library using the mCherry reporter system and (2) model geraniol production of the recombinant *M. maripaludis* using flux balance analyses. Preliminary results have shown varying levels of expression in our developing RBS library, as well as the determination of growth substrates that can increase the yield of geraniol production. Additionally, our team has initiated an Archaeal InterLab Study to further characterize the reproducibility of our mCherry reporter system.

Maternal Obesity and Trabecular Bone Microarchitecture in C57BL Mice

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Diet-induced obesity has a negative impact on bone microarchitecture by decreasing trabecular number and volume. However, the effects of obesity during gestation on trabecular bone architecture are unclear. Studying the effect of obesity on bone in the context of gestation is of particular importance given that nearly 40% of women of childbearing ages are currently considered obese. The aim of this study is to analyze the effects of maternal obesity on trabecular bone microarchitecture in C57BL mice. Female mice were either provided a low fat diet (n=12) or a high fat diet (n=12) over a 6-week period and were then mated with males. Trabecular bone at the tibia distal metaphysis was analyzed at the 6-week time point and prior to delivery using micro-computed tomography. For simplicity, we present data on bone volume to total volume (BV/TV), one outcome of particular interest. There were significant main effects for both obesity ($F(1,10)=10.07$, $p=0.010$), and pregnancy ($F(1,10)=144.8$, $p<0.001$). The interaction effect was also significant ($F(1,10)=8.768$, $p=0.014$), demonstrating that the effect of obesity on BV/TV is evident only prior to gestation. Our data indicate that the high-fat fed obese mice had lower BV/TV compared to the low-fat fed mice during pre-pregnancy. However, given the robust negative effect of pregnancy on BV/TV, this likely explains the lack of diet-related BV/TV differences during gestation. These findings underscore the negative effect of excess adiposity and pregnancy on trabecular bone microarchitecture. Fetal and offspring musculoskeletal outcomes warrant consideration in future studies.

Investigating the Antiparasitic Activity of Cry5B Protein against Fourth-Stage Nematode Parasites

Nirali Patel
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Helminth infections in humans and animals are a prominent concern due to their ability to impair health, well-being, and productivity. In livestock animals, the problem has become further amplified due the development of drug resistance which is reaching critical levels. One possible and novel treatment is the natural antiparastic protein, Cry5B, produced by the bacterium *Bacillus thuringiensis (Bt). Bt* is a spore-forming soil bacterium that produces a variety of crystalline (Cry) proteins. Cry5B has shown high potency against several important parasites in lab animal models, and it is hoped it also can be used as a natural antiparasitic to treat livestock. Cry5B must be ingested by the parasite to be active, however, pre-parasitic third-stage larvae (L3), which are typically used for *in vitro* drug screening, are a non-feeding stage and thus are not a viable experimental model. In contrast, L4 have fully developed GI systems, making the L4 stage ideal for an *in vitro* model for determining the efficacy of Cry5B. *Cooperia* spp. are the most common and important nematodes infecting young cattle and are the focus of this study. Recently, our lab has developed a culturing system that permits the development and molting of L3 *Cooperia* nematodes to the L4 stage. Exsheathed L3 are added to a nutritive media consisting of LB, NCTC, and fetal bovine serum, and are incubated at 39oC under 20% CO2. As the research progresses, the efficacy of Cry5B will be tested using L4 stage *Cooperia* in a series of in vitro drug assays.

Evaluation of Electric Twitch Endurance Index of the Lower Back Muscles

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Our lab has developed an Electrical Twitch Stimulation Fatigue test which measures fatigue as a decrease in contraction velocity. Back pain and fatigue is a common and

debilitating clinical problem. The purpose of my study was to use an electrically stimulated muscle twitch test to measure fatigue in the erectors muscles of the lower back. Healthy males and females between the ages of 20-30 were tested. The electrodes were placed alongside the T12 and L1 vertebrae separated by 5cm to allow space for placement of the accelerometer. Subjects are in a seated position for this protocol which makes this test clinically applicable to the elderly and wheelchair bound. The testing protocol was 5 minutes of stimulation at a frequency of 4Hz using a tolerable current level. The fatigue of the muscle will be represented as an endurance index value. The endurance index is the difference between the maximum acceleration value and the end value. A frequency of 4Hz will cause fatigue in the muscle which can be measured by an accelerometer. A sample of 5 participants all resulted in a fatigued lower back erector (Mean = 25.2 +/- 12.25). I hypothesize a lower endurance index in the lower back muscles could be possibly correlated to conditions such as lower back pain or poor spine stability. An evaluation of the endurance index of the lower back muscles has the potential to be clinically relevant in identifying causes of lower back pain.

The Role of Dual Oxidase 1 in Tracheal Immunological Functions

Urmi Patel
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Life-threatening viruses such as the Influenza A virus (IAV) have the ability to wipe out multiple bodily functions and can therefore be fatal to one's health. The innate mechanism by which our body shows viral inactivation is connected to Dual Oxidase 1 and 2; major oxidases in the NADPH oxidase family that play a role in the production of hydrogen peroxide (H_2O_2) in tracheal airways through the activity of lactoperoxidase (LPO), thiocyanite (SCN^-) and iodide (I^-). LPO catalyzes the reaction between SCN^- and H_2O_2 to form hypothiocyanite ($OSCN^-$). A similar mechanism is seen with I^-. These reactive oxygen species play a major role in the production of H_2O_2, which lead to the inactivation of IAV. In order to test this, rat tracheal cells are harvested, grown and infected with the H1N2 strain of the virus in a mixture with the presence or absence of LPO, SCN^-, and I^-. The supernatants collected are then used to perform plaque assays on Madin-Darby canine kidney epithelial cells (MDCK) to measure the extent of inactivation of the virus. The data arrays to several log differences between inactivation in the systems without the 3 components (LPO, I^- and SCN^-) versus the systems with. Another comparison is made between the SCN^- and I^- systems to visualize which one forms a stronger response. The difference seen in the 3-component system could potentially hint to future studies that not only develop the knowledge of the Duox1 mechanism but also enhance applied research on the treatment of IAV.

Integration of Multispectral Imaging into UAS

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Dr. Changying Li, College of Engineering

Remote sensing devices will soon become common place in the field of agriculture, as unmanned aerial systems (UAS) are an incredibly efficient means of gathering crop data with high spatial and temporal resolution. Information such as canopy coverage, plant height, and normalized difference vegetation index can be gathered and processed to determine which genotypes of a species exhibit the most robust phenotypic traits. There are many UAS on the market that have integrated cameras, but few that have integrated multi-spectral cameras. Our challenge is to integrate a multispectral camera into a hobbyist aircraft that is light, compact,

and relatively inexpensive. This is accomplished through the use of a microcontroller that records data from sensors including an accelerometer, gyroscope, magnetometer, and barometer. The UAS will also collect GPS coordinates and calculate orientation data that will be used in conjunction with the multispectral images to create 3D models of crops. All flight data and images are recorded onto SD cards. This project entails the design and fabrication of vibration dampening mounting hardware for a multispectral camera, the integration of electrical components, and the coding of a microcontroller and image processing. The resulting data acquisition system can be incorporated into variety of commercially available unmanned aerial vehicles.

Photodissociation of CS from Excited Rovibrational Levels in Interstellar Environments

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This research is focused on determining the abundance of CS molecules in various ultraviolet (UV) photon-irradiated interstellar (IS) environments. Photodissociation due to UV photons is a dominant molecular destruction process in a variety of UV-irradiated IS environments, so having reliable photodissociation rates for CS is necessary to accurately determine its abundance in these environments. While most astrochemical models adopt photodissociation rates computed from cross sections out of the molecule's ground rotational and vibrational (rovibrational) level (v=0,J=0), they also assume a standard local IS radiation field and opacity due to standard IS dust. However, none of these conditions are satisfied in a host of environments including photodissociation regions, protoplanetary disks, and outflows from AGB stars. To allow for the calculation of more reliable photodissociation rates, we compute cross sections from all bound rovibrational levels of the ground electronic state of the CS molecule. The cross sections are computed for a large number of excited electronic states using a two-state fully quantum perturbation approach. New *ab initio* potential energies and transition dipole moment functions, used in the photodissociation calculations, were obtained at the MRCI+Q level of theory using the quantum chemistry package MOLPRO. Applications of the rovibrational-state-resolved cross sections will be presented as well as LTE photodissociation cross sections which assume a Boltzmann distribution of initial rovibrational levels.

Keyword Extraction Using Artificial Neural Networks and a TextRank Variant

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Keyword extraction is an important task in natural language processing that aids in information retrieval, document clustering, summarization, and many other useful endeavors. The task involves automatically selecting the most representative words and phrases from natural language documents. Most approaches consider all nouns and noun phrases as candidates, and a classification model determines which of those candidate keywords should be included in the set of selected keywords. Some of these classifiers have used linguistic information, some have used statistical information, and others use machine learning. We combine the linguistically informed approach with the machine learning approach to select keywords from scientific abstracts in the journals *Computers and Control* and *Information Technology*. The candidate keyphrases are classified by an artificial neural network, a variant of Mihalcea and Tarau's TextRank algorithm, or a combination of the two algorithms. We measure the precision, recall, and F1-score of

our algorithm as compared to previous results on this dataset. Our approach gives promising results.

Functions of the Discourse Marker *"Bon"* in Spoken French

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This study seeks to determine the pragmatic functions of the discourse marker *bon* and their frequency in spoken French. Discourse markers, such as English *well*, are often misconstrued as nothing more than fillers used in moments of hesitation (Hansen 1998:238). However, research in pragmatics reveals them to be a means of communicating the structure of a conversation or the speaker's attitude to the listener. For example, Barnes (1995:813) considers *bon* to be a marker of transitions appearing at "junctures or points of discontinuity," whereas Hansen (1998:254) considers it to mark an "undesirable discourse phenomenon." An analysis of 223 examples of this marker in the Corpus Montpellier-Rognes, composed of conversations recorded in 2005 and 2006 with 37 native speakers (22 women and 15 men), has revealed a set of finely distinguished functions of *bon* ranging from indicating the insertion of a quote, to highlighting a contrast, to introducing an opposing point of view. These functions call into question whether *bon* always marks a transition (Barnes 1995) or an undesirable discourse phenomenon (Hansen 1998). This study advances our understanding of *bon* by uncovering new pragmatic functions, refining those previously mentioned in the literature, and responding to proposals regarding its central purpose in discourse. Furthermore, it presents for the first time a quantitative analysis of the frequency of the various functions of *bon*.

Words That Lead and Words That Follow: Lexical Indicators of Leadership

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Tackling large-scale societal challenges often requires multiple teams from different disciplines, organizations, and geographic locations to collaborate using virtual collaboration tools communication. Arguably, *leadership* can have profound effects on the success of these systems. However, in complex multiteam contexts, leadership is often an informal social process whereby leaders emerge and exert influence through their interactions with others. Novel analytic techniques are now providing the means to capture interactions in virtual teamwork contexts and link these interactions with critical social processes such as leadership. In this study, we analyze the digital traces of social interactions among participants in a multiteam system laboratory task in order to identify word choices that indicate *leader/follower emergence.* In this task, 12 participants are randomly assigned to a specific role on one of four 3-member teams and are required to apply their role-specific information during a multiteam decision-making activity. Throughout the activity, all inter-team communication is restricted to an embedded text-based chat system. We analyze this body of text-based chat using a semantic analysis program called LIWC that examines the frequency of certain key words that fall under a specific construct or language style (e.g., affect or pronoun use). Finally, we use a class of inferential models of network emergence called *exponential random graph models*, which identify statistically significant antecedents of relationship emergence. This allows us to identify the lexical indicators that predict leadership and followership relationships between teammates.

3D Distribution of High Galactic Latitude Interstellar Clouds

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The Milky Way Galaxy is composed of stars, gas, dust, and dark matter. The gas component can take very different forms. There is a cold; molecular phase; a cold atomic phase; a warm atomic phase; a warm; ionized plasma; and a hot, ionized plasma. The cold molecular component is especially important because it is the material that forms stars. Most of the cold molecular gas in the Galaxy is tied up in large structures called molecular clouds, most of which are distributed along the Galactic plane. About 10 percent of the clouds can be found away from the Galactic plane at high Galactic latitudes. Many of the objects appear to be a part of large structures, which might indicate a formation mechanism; however, it is difficult to determine whether these structures are real from two-dimensional maps. Recently, accurate distances to many of these high latitude molecular clouds have been determined (Schlafly et. al 2014). We present here a three-dimensional representation of the spatial distribution of these objects in an effort to discern global structure patterns.

Yield Improvement of *Pyrococcus furiosus* Soluble Hydrogenase I by Overexpression of Accessory Proteins

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Due to the recent increase in demand for alternative sources of energy, hydrogen gas has begun to receive a great deal of attention. The focus of this study is Soluble Hydrogenase I (SHI) from *Pyrococcus furiosus*, an anaerobic hyperthermophile. SHI has been used in a highly efficient *in vitro* pathway for hydrogen production requiring a large amount of enzyme for up-scaling. Previous studies have shown that eight accessory proteins are involved in the biosynthesis of SHI. However, the expression levels of these accessory genes were unchanged when SHI was overproduced in *P. furiosus*. The purpose of this study is to determine if overexpressing the genes encoding the three key accessory proteins, FrxA and HypC/D, would lead to increased production of SHI. This objective will be carried out by creating two separate knock-in cassettes containing the FrxA and HypC/D genes, pyrF as the genetic marker and a stronger promoter, Pslp, to over express these genes. The parent strain MW450, with SHI over-expressed, lacks a pyrF marker and is therefore unable to synthesize uracil. After confirming overlapping PCR of these cassettes, transformations will be performed. Maintaining anaerobic conditions, subsequent strains will undergo plate purification, popping out the marker for reuse, and qPCR analyses to determine expression levels of the genes encoding the accessory proteins and SHI between the control and experimental strains. In vitro hydrogen production assay will also be performed to determine SHI activity. These procedures provide the basis for improving the yield of SHI and up-scaling the hydrogen production pathway.

Standardized Public Education Funding Formulas: A Best-Practice Evaluation

Laura Pontari
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The use of standardized public school funding formulas by states across the US has become a widespread practice in modern education. Studies have shown that the cost of education varies per student based on identified factors such as socioeconomic status, disability, district size, and English language skills. Funding formulas are meant to allot state funds based on these factors, thus providing a comprehensive plan for equitable allocation. The factors considered in funding formulas vary state by state, as does the weight assigned

to each factor. The study examines the standardized public education funding formulas used by eight states, selected based on overall education quality and geographic distribution. The selected states are Mississippi, New Jersey, Colorado, Massachusetts, Indiana, Arizona, Michigan, and Texas. After an evaluation of the funding formulas used and education quality provided by each state, this study will provide a policy recommendation for a standardized funding formula best-practice.

Developmental Trends in Infant Temporal Processing Speed

Katelynn Porto, CURO Graduation Distinction
Dr. Janet Frick, Psychology, Franklin College of Arts & Sciences

Critical flicker fusion (CFF) is a measure of temporal processing speed, or the speed at which the visual system can detect changes over time. In adults, CFF has been determined to be a strong indicator of executive functioning, neural efficiency, and central nervous system health, and has been positively associated with dietary intake of the carotenoids lutein (L) and zeaxanthin (Z). Previous studies of infant CFF development have been limited and marked by methodological challenges (e.g., Regal 1981), leaving a gap in our understanding of how temporal processing speed develops early in life. The present longitudinal study sought to characterize the development of CFF thresholds in breastfed babies (from 3 to 6 months of age) using a repeated-measures design. Infant CFF thresholds were measured using a two-alternative forced choice preferential looking task displayed on a custom-built device. Growth curve modeling will be used to analyze all data. We anticipate that infants' CFF trajectories will depend upon their baseline (3 month) CFF threshold and their mother's self-reported intake of green leafy vegetables (rich sources of L and Z). In infants, deficits in basic cognitive functioning, such as temporal processing speed, can negatively impact more complex cognitive processes in a cascading manner with age. Therefore, identifying developmental trends in temporal processing speed, as well as potential moderating factors (e.g., L and Z intake), is the first step in being able to detect deficits in this domain early in life, before higher level developmental processes are negatively impacted.

Approaches to Reducing the Cost of Algal Biomass Production

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Alternative fuels must be developed to replace the dangers caused by burning fossil fuels and serve as fuel sources once fossil fuels are depleted. Algae biofuels offer a potential fuel for the future. The most prominent hurdle facing algae biofuels currently is cost. This project aimed to increase the yields of algae grown on a large scale to make algae production more cost efficient. 1-Napthaleneacetic Acid, a plant growth hormone, was used to enhance algal growth in 200L carboys. Two preliminary experiments were conducted to optimize growth medium and phytohormone concentration. The optimum media was determined to be 1-NAA concentration to be 5 ppm (parts per million) and the optimum medium to be F2 media. Algae was grown in a scale-up method to reach a total volume of 200 Liters. Two strains were grown, one inoculated with 1-NAA dissolved into a 1:1 ethanol/water solution and one inoculated with the same concentration of a 1:1 ethanol/water solution for control. Algae was grown in a 250mL flask until optimal density was reached, then was transferred to the next volume stage. This process was repeated until the algae was growing in a 200L carboy. Dry weight, chlorophyll, and optical density measurements were taken regularly between Day 0 and Day

16 in the 200L carboys. Control and treatment test groups showed similar growth rates. Nutritionally optimal harvest was obtained after 9 days of growth. 1-NAA-treated algae produced consistently higher biomass throughout the experiment.

Evaluation of Recovery of Skeletal Muscle after Fatiguing Contractions

Payton Prins
Dr. Kevin McCully, Kinesiology, College of Education

Skeletal muscle fatigue has been an extensively studied topic in order to understand the underlying physiological mechanisms of this occurrence. Our laboratory has developed an electrical twitch stimulation fatigue test for clinical populations. Past literature in the field has pointed to a significant difference in muscle function between populations with neuromuscular disease and deficiencies compared to healthy populations. The aim of my study is to determine the initial rate of recovery of muscle contractions after fatigue has occurred, and to evaluate whether the rate of recovery could be a useful measurement in patients with various neuromuscular diseases or injuries. Measurements were taken in the trapezius muscles of healthy human volunteers. Muscle contractions were induced with sub-maximal twitch stimulations at 6 Hz. Muscle force was estimated using an accelerometer to measure the speed of the twitch contractions. Five minutes of 6 Hz contractions resulted in fatigue of 70% (n=7). In the first three minutes of recovery, muscle force recovered to 30% of the initial force. The ½ time of this early phase of recovery was 15 seconds. Because the muscle is depotentiating as well as recovering during the early phase of recovery, we are in the process of characterizing the time course of depotentiation in order to separate out this effect from recovery. This study has the potential to characterize the rate of recovery after fatigue, a little studied but potentially useful muscle parameter.

The Role of Mitochondrial Maintenance in Skeletal Muscle Strength and Repair

Anita Qualls, CURO Research Assistant
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Fukutin knockout mice serve as a mouse model of human muscular dystrophy, i.e., dystroglycanopathies, which are characterized by skeletal muscle weakness and impaired muscle regeneration after injury. Poor mitochondrial quality may underlie these phenotypes, as skeletal muscle mitochondria are responsible for producing the energy required to meet the demands of muscle contraction and muscle repair. Mitochondrial quality is maintained by the proper removal of dysfunctional mitochondria via a cellular process called autophagy. The primary objective of this study is to determine the extent to which enhancing or attenuating autophagy affects muscle strength and repair in the Fukutin knockout mice. We hypothesize that increasing autophagy will lead to greater muscle strength and greater recovery from myotoxic muscle injury. AICAR (an autophagy activator) or 3-MA (an autophagy inhibitor) will be administered to Fukutin knockouts and littermate controls daily for four weeks. To determine if autophagy activation improves dystrophic muscle function, muscle strength will be assessed after two weeks of treatment. To determine if autophagy activation enhances dystrophic muscle regeneration, muscle strength recovery will be assessed two weeks following a myotoxic injury. To determine if autophagy activation affects mitochondrial function in dystrophic muscle, mitochondrial respiration will be assessed from injured and uninjured permeabilized fibers using a Clark-type oxygen electrode. Immunoblots for autophagy-related proteins will be used to examine the autophagy signaling cascade

during muscle regeneration after injury. Overall, by utilizing a mouse model we can gain insight into the importance of mitochondrial maintenance in improving muscle function in muscular dystrophy patients.

Mental and Sexual Health Post-War: Trauma, Depression, and Interpersonal Violence— Attitudes among Liberian Women

Mehabuba Rahman, CURO Research Assistant
Dr. Tamora Callands, Health Promotion & Behavior, College of Public Health

From 1989 to 2003, Liberia experienced two of the most violent civil wars in African history. Fourteen years of war shattered the West African country's infrastructure and community resulting in one-third of population being displaced and 7% of the population being killed. Although millions of people were affected by the war-related violence, violence against women reached unprecedented levels. It is estimated that up to 70% of young women in Liberia experienced some form of sexual and gender-based violence (SBGV). SGBV has wide-spread implications for the mental health, sexual health, and the overall psychosocial well-being of young women. While significant strides have been made to reduce rates of SGBV, little empirical research has focused on consequences associated with violence exposure. Using cross-sectional data collected between November 2015 - February 2016 from 100 young women, ages 18-25, we aim to examine the relationships between violence exposure, war-related trauma, mental health and sexual risk behavior. We hypothesize that violence exposure will be associated with greater sexual and mental health outcomes. Preliminary analysis demonstrates that risky sexual behavior, such as multiple partners and lack of condom usage, is associated with violence exposure. These data underscore the impact that SGBV has on the mental and sexual health of young women. These findings suggest the need for continued efforts to change the policies and implement and infrastructure to protect young women in post-conflict settings.

Examining *Mycobacterium tuberculosis* Genes for Roles in B12 Synthesis

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Mycobacterium tuberculosis (*M.tb*) is a leading cause of morbidity and mortality in humans. In 2013, *M.tb* caused 9 million new cases of tuberculosis (TB) and 1.5 million deaths. Understanding the physiology and biosynthetic capabilities of *M.tb* bacteria may aid in the development of new drugs and vaccines to fight this global health threat. Coenzyme B12 (Co-B12) functions as a cofactor in various metabolic enzymes in a wide range of organisms, but is only made by bacteria and archaea. Co-B12 is a complex molecule requiring over 20 enzymes for its synthesis. The *M.tb* genome encodes homologs of many Co-B12 synthesis genes; however, the coenzyme is not detected in strains grown under standard culture conditions. Either all of these strains have mutations in the Co-B12 synthesis pathway or production of this molecule only occurs under specific environmental conditions, such as those found inside a human host. *Mycobacterium smegmatis* is a non-pathogenic species of mycobacteria found in soil that produces Co-B12. The goal of this project is to determine if *M.tb Rv2228* and *cobS* function in Co-B12 synthesis. The approach is to first delete *MSMEG4305* and *cobS* from the *M. smegmatis* genome and demonstrate absence of Co-B12 production in the mutants. Next, a wild type copy of the deleted gene or the homologous *M.tb* gene (*Rv2228* and *cobS* respectively) will be introduced into the mutants and the resulting strains assayed for

production of Co-B12. If a *M.tb* gene enables a *M. smegmatis* mutant to produce Co-B12, then the genes likely encode functional homologs. The progress and results of this project will be presented.

Eliminating Cultural and Linguistic Boundaries in Healthcare: Creating Standards and Funding for Medical Interpreters

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The U.S. has increasingly become more culturally and linguistically diverse with the influx of migrants from around the world. The number of Americans speaking a language besides English at home has increased by almost fifty percent, thereby also increasing the number of patients with limited English proficiency (LEP) by over fifty percent. However, weak federal regulation has allowed states to leave the use of appropriate language services at the discretion of individual hospitals, creating a gap in care between English-speakers and patients with limited English proficiency and a surge in the use of untrained *ad hoc* interpreters. The miscommunication that results from the underutilization of professional language services has inescapable consequences for health outcomes in LEP patients. New federal funding for interpreters is available via the Affordable Care Act, and states should be required to use these funds to implement a standard of interpreter of their choice in their hospitals.

A Review of the Use of Telemedicine in Nursing Homes

Sona Rao
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Telemedicine, the exchange of medical information through long-distance electronic communication, is a practice that nursing homes adopt to improve the effectiveness of their care and reduce health and financial risks. The purpose of this literature review is to evaluate research on the implementation of telemedicine systems in a nursing home setting. Review of this literature was conducted using CINAHL, EBSCO Electronic Journals, Academic Search Complete, ERIC, and PubMed databases and search terms included telemedicine, telehealth, nursing home and homes, elderly, and geriatric. This literature review is based on twenty-six studies related to telemedicine in nursing homes and the following themes were evaluated: benefits, challenges, and limitations in terms of cost and quality of care. Telemedicine is an innovative approach to making medical services more accessible to nursing home residents and nursing homes can experience significant benefits as a result of adopting telemedicine systems.

Behavioral Economic Analysis of Relative Reinforcing Value as a Predictor of Smoking Cessation Treatment Outcomes

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

Behavioral economic studies investigating demand for a substance represent an attempt to quantify the amount an individual values a substance relative to other reinforcers using a behavioral paradigm. This approach has been successfully used to characterize the progression of substance use and risk for future substance abuse. The cigarette purchase task (CPT) is designed to assess demand for nicotine in smokers by quantifying the value of cigarettes in monetary units. In the present study, we investigated the relationship between demand and smoking cessation treatment outcome in smokers after

nine weeks of nicotine replacement therapy and cognitive behavioral therapy. In this version of the CPT, participants were asked to report how many cigarettes they would hypothetically purchase across 23 price points, ranging from $0-$10 per cigarette. Principal components analysis was completed using responses on the cigarette purchase task to divide demand into two components based on previous research: amplitude (demand at low costs) and persistence (sensitivity to increasing price). The results showed that, controlling for income, amplitude was significantly predictive of days to relapse, days to lapse, and number of therapy sessions attended**.** The results suggest an individual's valuation of cigarettes independent of competing reinforcers is predictive of smoking cessation treatment outcome while sensitivity to increasing price does not appear to be predictive of treatment outcomes.

A Bright and Budding Future for Sunflowers: Understanding the Predictive Properties of *Helianthus annuus* Seedlings for Improving Adult-Stage Crop Yield

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Sunflowers are a multibillion-dollar industry in the United States, are a crucial oil-seed crop, and offer extraordinary agricultural, environmental, and economic potential. Fertilizers are a major expense for farmers, as well as an environmental hazard if excessively applied to croplands. Finding Sunflower varieties that exhibit the relatively best growth under nutrient stress would increase yield, and subsequently reduce expenses for the agricultural and consumer sectors alike. Of even greater interest, better understanding the nutrient application versus yield relationship between the seedling and adult stages of Sunflowers allows for greater efforts on those seedling varieties that offer the greatest probability of success later in the growth cycle. Our greenhouse study examined 12 genetically dissimilar Sunflowers at the seedling and adult growth stages under variable nutrient applications, to better understand which Sunflower varieties demonstrated the best nutrient-stress resistance, and to determine if seedling performance is predictive of adult yield. Results from the seedling stage show that four genetic lines are excellent candidates for producing high yield under diverse fertilizer treatments, especially in low treatments. Results from the adult stage are ongoing, but we expect that many of the Sunflower lines that exhibited relatively high yield in the seedling stage will also exhibit relatively high yield in the adult stage. The results of this study will provide incredible information into correlations between yield and fertilizer application from the seedling to adult stage, benefiting farmers, consumers, and the environment alike.

Lutein and Zeaxanthin Are Unrelated to Performance on the Short Physical Performance Battery

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The carotenoids lutein (L) and zeaxanthin (Z) have been shown to benefit eye health and more recently cognitive function. The present study investigated whether L and Z may also benefit physical ability. In light of their strong antioxidant properties and prior research showing a positive relation between antioxidants and physical functioning, it was hypothesized that greater L and Z levels would be associated with better physical performance in late life. Pearson product-moment correlations were used to evaluate this relationship in a sample of 62 community-dwelling older adults (mean age=73.31, 57% female, 100% Caucasian). Physical performance was assessed using the

Short Physical Performance Battery (SPPB), while L and Z levels were measured using two standard, validated procedures: blood serum concentrations and macular pigment optical density (MPOD). Contrary to expectation, no significant relationship was found between SPPB total scores and L and Z, as measured in serum ($r=0.098$, $p>0.05$) or MPOD ($r=0.022$, $p>0.05$). Furthermore, no significant correlations were found between L and Z levels and SPPB subscale scores, which include measures of balance, gait, and lower extremity strength (ps all >.05). The observed findings suggest that the beneficial effects of L and Z may be limited to eye and cognitive health, perhaps due to their preferential accumulation in human retina and brain relative to other body tissues. However, it is possible that a more sensitive measure of physical functioning would reveal a relationship and replication is warranted in a sample characterized by greater variability in physical ability.

Subtracting the Effects of Carbonization of Hickory Nut to Predict Mean Annual Precipitation in Archaeological Sites

Sidney Reynolds
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Carbonized hickory nut from archaeological contexts could be indicative of mean annual precipitation in the past. By burning modern hickory nut samples from St. Catherine's Island, Georgia at different temperatures and using a mass spectrometer to produce δ13C values, we hope to subtract the effects of carbonization to estimate 13C values before the hickory nut was burned. Then, we will compare those δ13C values to the mean annual precipitation of the years for which we have modern nut samples to create a predictive graph that will be used to establish the relationship between archaeological carbonized nut samples and mean annual precipitation. Knowing the mean annual precipitation for archaeological contexts will greatly contribute to our understanding of paleoclimate and the conditions under which different populations, specifically the Guale Indian population on St. Catherine's Island, sustained themselves.

Synthesis and Surface Engineering of Fe5C2 Nanoparticles for Superior r2 Relaxivity in Liver-Specific MR Imaging

David Rink
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Liver-specific magnetic resonance imaging (MRI) has been used extensively in detection of malignant liver masses, metastasis indication, as well as observing liver storage disorders. In order to enhance the imaging quality, T2 contrast agents, which induce hypo-intensities on MRI maps, are often administered before imaging. Magnetic nanoparticles, more importantly Fe3O4/Fe2O3-based nanoparticles, have emerged as one of the standards in T2 contrast agents due to their low toxicity, biodegradability, and facile synthetic conditions. However, the iron-based nanoparticles only have a moderate magnetic moment. In this research, iron carbide nanoparticles, here Fe5C2 based carbides, have been successfully synthesized by high temperature thermal decomposition. Fe5C2 nanoparticles possess a superior magnetic moment and do not have oxidation-induced magnetization drops. Samples of 5, 14, and 22 nm carbides were prepared for study. Their surfaces were modified via ligand addition with phospholipids, ligand exchange with zwitterion-dopamine-sulfonate (ZDS), and protein adsorption with casein. These engineered Fe5C2 nanoparticles all exhibit excellent aqueous stability, low toxicity, and high r2 relaxivity. In particular, the casein surface coating resulted in an r2 enhancement of more than two fold, measuring 973 mM-1s-1 for the 22 nm nanoparticles, which is

among the highest of all T2 contrast agents reported to date. Small animal studies further confirmed the improvement of the Fe5C2 nanoparticles over the iron oxides in inducing hypo-intensities on MRI maps and causing little toxicity to the host. This research expands upon our ability to modify contrast character of magnetic nanoparticles and helps to create a new class of MRI contrast agents.

Offensive Realism in a World of Hegemons

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Offensive realism describes a world in which states try to maximize their relative power at the expense of every other state. Under this grand theory, the goal of each state is to become a (regional) hegemon (i.e., the most powerful state in the geographic area).The foundation for this aggressive behavior is the international system. Because no overarching entity sits above states to protect them from one another, every state develops offensive capabilities, remains suspicious of each other's intentions, and acts rationally to ensure its survival by working toward hegemony. If one accepts this theory and its premises, the behavior of many revisionist states becomes understandable; they want hegemony to ensure security. However, once a state reaches hegemony, as the United States has, the theory is lacking. I challenge the assumptions made by offensive realist theory about the rational behavior a hegemon should enact and consider the implications of a world with several regional hegemons.

Quantification of Contaminants of Emerging Concern in Fish and Shark Tissue from Sapelo Island, Georgia

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Contaminants of emerging concern (CECs) range from pharmaceuticals to industrial pollutants. There is little research on how CECs affect marine environments and the organisms living in marine habitats. Quantifying these pollutants in marine organisms may indicate inputs from sewage/septic systems from local populations. Research also indicates that CECs pose a potential risk to marine organisms through chronic exposures that could adversely affect their health and that dietary transfer of CECs to higher level organisms is possible. My CURO project investigated if CECs are present in fish tissue and shark plasma from estuaries at Sapelo Island, Georgia. Whole fish tissue samples from silver perch, striped mullet and sea trout were collected from 2013-2016 as part of a NOAA and Georgia Aquarium research project at Sapelo Island. Shark plasma was collected from Lemon and Atlantic Sharpnose sharks during the summer of 2015. These samples were analyzed for 30 pharmaceuticals and personal care products via LC-MS/MS analysis and over 200 pesticides via GC-MS analysis. Initial results indicate that CECs accumulate at low ng/g (parts-per-billion) concentrations in fish tissue and low ng/ml concentrations in shark plasma samples. My research supports evidence our lab has of CECs detected in oysters, water and sediment samples. The detection of diphenhydramine, DEET and sertraline in all media indicates accumulation in multiple levels of the food web. Chronic toxicity may be caused by a cocktail effect of CEC exposure on the organism with multiple modes of action in play, but how these chemicals interact is mostly unknown.

Who Is Better at Cracking Nuts: Humans or Monkeys?

Lindsey Roles
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Dating back at least 2.5-3.3 million years, tool-assisted percussion still remains a key technology for hominins. Tool-assisted percussion is not unique to hominins; wild populations of bearded capuchin monkeys, long-tailed macaques, and chimpanzees use anvil-and-hammer tools to crack open nuts and other encased food. To address fundamental questions about the evolution of tool-assisted percussion in hominins, we need to know about species-specific cognitive and motor skills. We quantified nut-cracking skill in wild bearded capuchin monkeys (*Sapajus libidinosus*) and novice and expert humans, as they used anvil-and-hammer tools to crack tucum (*Astrocaryum spp.*) nuts. The monkeys outperformed the novice humans, and the expert humans outperformed the monkeys. The monkeys cracked the nuts by undergoing multiple strikes with a moderate amount of force; the novice humans used the same amount of force the monkeys did, having to undergo multiple strikes in order to crack the nuts. The expert humans used a greater amount of force to crack the nuts and a fewer number of hits than the monkeys and novice humans. The monkeys also modulated the force of their strikes on the basis of the condition of the nut (i.e. presence of fracture in nut). These results indicate that the nut cracking skill involves motor actions that are learned over time with practice, and not just abstract knowledge of the affordances of the task, i.e., nut cracking is an embodied skill. We suggest that hypotheses linking tool-assisted percussion to traits unique to hominins need a reassessment.

Muscle Adiposity, Forearm Muscle Strength, and Radius Cortical Bone Geometry in Children

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Background: Cortical bone strength is highly dependent upon skeletal muscle, specifically muscular contractile forces. Adipose tissue that infiltrates the muscle may influence muscle strength, and subsequently the muscle-cortical bone relationships. *Objective:* The aim of this study was to determine the effect of muscle adiposity on the relationships between forearm muscle strength and mid-radius cortical bone outcomes. *Methods:* This cross-sectional study utilized data from a cohort of 237 reportedly healthy black and white boys and girls who participated in a vitamin D supplementation trial. A hand dynamometer was used to measure forearm muscle strength. Mid-forearm muscle adiposity and radius cortical bone geometry were measured via peripheral quantitative computed tomography. Polar strength strain index (pSSI) provided an estimated measure of bone bending strength. A median cutoff determined groups of high and low muscle adiposity. Linear regression and hierarchical linear regression were performed adjusting for race, sex, and sexual maturation rating stage. *Results:* Handgrip strength was greater in the children with low versus high muscle adiposity ($P = .001$). Handgrip strength was a positive predictor of pSSI in both the low ($\beta = 0.252$, $P = .002$) and high ($\beta = 0.377$, $P < .001$) muscle adiposity groups. However, this relationship was significantly stronger in the high muscle adiposity group ($P_{interaction} = .014$). *Conclusions:* Obese vs. normal weight children have a greater risk for fractures, though the etiology is unclear. Our data do not support the position that muscle adiposity hinders the muscle strength-cortical bone relationship despite corresponding deficits in forearm muscle strength.

Malaria in the Late Stages of Pregnancy and the Significance of Tissue Factor

Kerryn Roome
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Despite immunity in malaria-endemic regions, pregnant women have an increased

susceptibility to an infection. In these women, malaria infected red blood cells can accumulate in the maternal side of the placenta, causing drastic changes in the placental tissue, hampering fetal intrauterine growth, which leads to low birth weight, stillbirth, and abortion. Due to ethical and anatomical limitations in studying this in humans, murine models are a common alternative. We have previously shown that Tissue Factor (TF), the initiator of coagulation, is associated with abortion in C57BL/6 mice infected with *Plasmodium chabaudi*. While we know TF is upregulated in response to TNF, the relationship between TF and TNF signaling has not been investigated. TNF is a pro-inflammatory cytokine that has been associated with malaria pathogenesis in mice and in humans. TNF acts through its surface receptors, TNFR1 and TNFR2. We hypothesize that TNF signaling through its surface receptors is required for upregulation of TF and induction of the coagulation cascade followed by tissue damage and abortion. To verify this hypothesis, we will use mice lacking TNF, TNFR1, TNFR2, and wild-type C57BL/6 mice infected on day 0, 6, 8 or 10 of gestation and uninfected controls. The courses of infection and pregnancy will be monitored and mice will be sacrificed to have organs and plasmas collected for TF expression assessment on gestation days 10 and 18. We expect that wild-type C57BL/6 mice will have significantly higher expression of TF while mice lacking TNF and its receptors will have lower TF expression.

Predictable Variation in Temporal Transmission Potential: West Nile Virus as a Case Study

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Dr. Andrew Park, Odum School of Ecology

Generalist parasites such as West Nile virus (WNV) are characterized by their ability to infect, and transmit among, multiple host species. In the case of WNV, passerine song birds are particularly important in maintaining transmission, while other bird orders dilute the transmission potential because of relatively low viral replication in those hosts. Due to the predictable migrations of bird species, as well as the emergence and overwintering times of mosquitoes that vector the virus, we expect a given location to exhibit robust annual seasons when transmission is intense. As WNV spills over into human populations, we have the potential to develop risk profiles which vary in time according to the mosquito and bird population dynamics. To achieve this, we developed a set of equations describing the dynamics of WNV transmission in the mosquito-bird community system, and derived a metric of transmission potential. We parameterized the model using data on mosquito and bird dynamics in New York, confirming transmission intensity had pronounced, repeatable seasonal variation. We then tested the hypothesis that human cases of WNV in New York correspond to periods of high transmission intensity in the bird-mosquito cycle (with some delay expected in the human cases for various reasons). Using records of WNV in New York from 2000 to 2013, we found a significant correlation between our predicted timing of maximum transmission and peak cases in human populations, with a consistent 5-week delay. This novel approach to modeling disease outbreak potential may improve predictions of epidemics more generally.

Evaluation of Georgia Bridges and Development of Large-Scale Bridge Testing Procedure

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Dr. Mi Geum Chorzepa, College of Engineering

The primary goals of this research are to (1) evaluate existing bridge drawings to determine critical bridge parameters necessary for severe

storm evaluations and; (2) develop a test procedure for evaluating large-scale bridge components. How would these bridges hold up in severe weather, specifically hurricane weather, and how can traffic be simulated through single component force testing? The first part of this research includes a review of 50-60 bridge drawings and evaluation of critical bridge components for a Georgia Department of Transportation project. This includes gathering information from the drawings about the design, elevations, spans, slab, beams, girders etc. The other part of the research includes construction of a large-scale bridge beam specimen and development of test procedures for simulating ordinary highway traffic. The test procedure can be used for future research projects. For example, testing closure pours between precast elements utilizing Ultra-High Performance Concrete (UHPC) is of particular interest. The UHPC allows for tighter joints between precast elements and facilitates rapid construction. This semester's research will focus on identifying critical bridge parameters and testing a beam specimen for traffic or long-term fatigue loading. The beam testing will be done in UGA's STRENGTH lab by using a high tech camera and sensors to measure inflections not visible to the eye.

Analysis of Forces Acting on the Equine Navicular Bone in Normal and Dorsiflexed Positions

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Navicular disease is one of the most common forms of lameness in horses and is generally thought to be a chronic condition that can be managed in some horses but not effectively treated. However, a pathomechanical paradigm may offer a better explanation of the disease and provide better treatment options. The navicular apparatus is a functional enthesis organ that is highly adapted to dissipate forces away from the osteotendinous junction between the deep digital flexor tendon and the third phalanx. Based upon functional analyses of horses with navicular disease, we have hypothesized that chronic overloading of the forelimbs, which induces the habitual and exaggerated dorsiflexion of the foot, changes the balance of forces acting on the navicular apparatus. We tested our hypothesis by comparing the forces acting on the navicular apparatus of an equine foot in a normal position to those acting on the navicular apparatus in a dorsiflexed foot, using the method of free-body analysis on 3D models, which were reconstructed from data of x-ray CT scans of a horse forelimb. Results indicate that the dorsiflexed position of the foot puts the deep digital flexor tendon under greater tension, thereby creating a larger compressive force on the navicular bone. This site of compression corresponds to the characteristic "bone bruise" of navicular disease. The dorsiflexed position of the foot also pulls taut the impar and suspensory ligaments, thereby increasing tension on their attachments sites on the navicular bone. This increased tension explains the presence of osteophytes along the entheses of these ligaments, which is a common lesion in navicular disease. Thus, decreasing the habitual and exaggerated dorsiflexion of the foot by taking the extra weight off of the forelimb is likely to be an effective treatment for many cases of navicular disease.

Investigating the Influence of Geospatial Attributes on Spider Species Richness and Diversity

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The maintenance of local biodiversity is an important aspect of the long-term sustainability of agricultural production.

Maintaining biodiversity, especially in regards to predator species, promotes natural pest control and many other ecosystem services. Spiders (*Araneae*) often prey upon common pest species, making them a beneficial component of agroecosystems. Spider species richness and diversity varies across landscapes and is often correlated with certain abiotic factors. This project investigates how four geospatial attributes – elevation, soil moisture, NDVI, and distance to edge habitat – influence spider species distributions across a farm-scape in South Georgia. Samples for the project were obtained from pitfall traps placed along a grid pattern within a farm-scape in the Tift county area. Spiders were later removed, preserved in alcohol, and manually counted and identified. Counts and species data were compiled into a spreadsheet and correlated with the four selected attributes using multivariate methods and geospatial statistics. Final results are pending. Preliminary analysis shows at least 12 different species of spiders present across the farm-scape, with wolf spiders (*Lycosidae*) numerically dominating the communities. Further identification of spiders and more in-depth analysis of the data will allow for greater exploration of the relationship between spider abundance, diversity, and the farm-scape's geospatial attributes. Ultimately, the results should help growers identify potential spider hotspots within their farm-scapes, which could then be maintained to promote healthy populations of this beneficial predator.

How the Recruitment of Female Fighters for Islam Has Changed Transnational Terrorist Organizations and What the Long-Term Implications of This Trend Will Be for Interstate Conflicts

Sarah Sammons
Dr. Andrew Owsiak, International Affairs, School of Public & International Affairs

The purpose of this research is to answer the question of: what has made the messages of terrorist organizations so appealing to women, despite the fact that they come from an element of the Muslim spectrum that has sought to suppress and silence female participation in public life? The initial roots of the feminization of armed conflicts can be traced back to the revolutionary movements of the region of the Middle East during the mid to late 20th and early 21st centuries, with women serving as couriers, nurses, combatants, and intelligence officers. Since 9/11 there has been an empirical shift towards female involvement in terrorist activities, especially in participation in suicide bombings. My goal is to conceptualize these types of female violence in terms of a larger paradigm shift; I will accomplish this by examining quantitative data from feminist groups participating in civil societies across the Middle East and completing a literature review to produce new qualitative research. A new vision is needed in international relations to addressing issues such as female participation in terrorist organizations through a "gendered lens," where agency and the very identity of who a terrorist can be is adjusted at a theoretical level. On a very basic level, addressing terrorism means studying more than states and organizations. Terrorism is executed by people, increasing numbers of whom are women, and developing ways to see the societal framework that propels them toward destruction is crucial in approaching ways to combat the ever-evolving transnational terrorist organizations.

Evaluation of Novel Antiviral Drug NS95397 for Treatment of Swine Influenza Infections in Pig Cells

Preston Samowitz, CURO Graduation Distinction
Dr. Ralph Tripp, Infectious Diseases, College of Veterinary Medicine

The influenza virus causes morbidity and mortality in both humans and animals. Swine influenza effects pigs worldwide and can be

transmitted to humans. Additionally, the influenza virus possesses a major threat in the swine industry that may affect production output. Discovering countermeasures for the influenza virus has faced many obstacles because the virus constantly evolves, a feature often causing vaccines and antiviral drugs to be ineffective. In this study, swine influenza was assessed to discover if a novel antiviral drug could be used as a treatment option. A novel drug, NSC95397, targets host cell mechanisms captured by the influenza virus that are needed for replication. Importantly, NSC95397 has been shown to alleviate influenza symptoms in mice. A host cell factor, cell division cycle 25 B is the target for NSC95397 that indirectly inhibits a key viral protein NS1, involved in the replication of the virus. The goal was to characterize the escape mutant virus after serially passaging the virus in the presence of NSC95397. Drug sensitivity assays on various passages demonstrated that the strain does not appear to have resistance to this novel drug. This finding has implications on understanding how targeting host genes limits virus resistance and development of a novel influenza antiviral therapeutic.

Cognitive Control as Assessed by Multiple Eye Tracking Paradigms

Kodiak Sauer
Dr. Jennifer McDowell, Psychology, Franklin College of Arts & Sciences

Ocular motor tasks are an effective way to assess cognitive control easily and accurately. One such task, the antisaccade task (AS), is used to measure inhibition in diverse populations, but requires more cognitive operations than inhibition alone to volitionally move the eyes to the mirror image location of a stimulus. Therefore, it is unknown if poor performance on the AS is due to difficulties in inhibition, working memory, or other factors. In order to differentiate components of cognitive control in ocular motor tasks, college-aged participants (n=51) completed an ocular motor battery. In addition to the AS task, participants completed an ocular motor delayed response task (ODR), which tests both working memory and inhibition, and a minimally delayed ocular motor response task (MDOR), which tests inhibition in isolation. Preliminary results (n=10) show a relationship between MDOR error rate and both ODR and AS error rate. This suggests that these tasks assess a similar construct, presumably inhibition. We also found similar reaction times in the ODR and AS tasks, which suggests that generating a volitional saccade to a blank location in both tasks requires similar processing time, despite differences in task demands. The findings from this study will clarify how various cognitive control processes interact in each of these ocular motor tasks and will inform the design of an efficient set of tasks to study people with cognitive control impairment.

The Relationship between Central Nervous System Xanthophyll Status and Brain Activation in Healthy Older Adults

Kodiak Sauer, Jacob Beckham
Dr. Lisa Renzi, Psychology, Franklin College of Arts & Sciences

Xanthophyll carotenoids lutein (L) and zeaxanthin (Z) are the only carotenoids found in the neural retina and are the dominant carotenoids in the rest of the central nervous system. An emerging body of literature suggests that high levels of these carotenoids in the neural retina are predictive of improved cognitive function in adults across the lifespan. Renzi and Hammond (2010) proposed a hypothesis for how lutein and zeaxanthin might influence cognition, known as the neural efficiency hypothesis. This hypothesis suggests that individuals with higher levels of the xanthophylls are capable of processing information rapidly and with less noise than individuals with low levels. In order to test this hypothesis, a total of 51

older adults (*M* = 73 +/- 8.2 years) were supplemented with either 12 mg L+Z or placebo. Retinal L+Z levels were measured psychophysically using heterochromatic flicker photometry. At baseline, participants in the highest and lowest quintiles for retinal L+Z levels were selected for analysis. High density electroencephalography was performed to measure brain activation at rest, as well as to measure steady-state visual evoked potentials at three driving frequencies. Participants with high retinal L+Z levels showed increased brain activation at each driving frequency, suggesting improved neural efficiency. These individuals also showed increased brain activation at rest.

Off-Campus Housing and the Gentrification of Downtown Athens, GA

Kari Saunders, CURO Research Assistant
Dr. Juan Meng, Grady College of Journalism & Mass Communication

Purpose: The purpose of this research is to study the effects of different types of student housing accommodations on the city of Athens, specifically in the downtown area. There has been an influx of large, luxury-style apartment complexes built within the last five years, and the impact of these complexes could prove meaningful to students, non-student Athens residents and city officials. *Design/methodology/approach*: The researcher used two research methods in this study to investigate the subject: (1) an online survey of UGA undergraduate students currently living in the Athens area; (2) two focus groups—one with five participants and the other with four participants—with UGA undergraduate students currently living in the Athens area. *Findings*: Results suggest that the downtown Athens area is certainly being affected by the large, luxury apartment complexes being built nearby and that students are drawn to these complexes most because of the location and proximity to campus. *Practical implications*: The influx of luxury apartment complexes has impacted the displacement of low-income Athens residents and aided in the wave of large chain retailers such as J. Crew and Urban Outfitters buying retail space in downtown Athens. The diversity in these complexes is low, and the individuality of the downtown Athens area is being reduced because of the shift in businesses located there. *Originality/value*: The study focuses on an issue that is inherently related to the University of Georgia. While the research did show some insights from Athens specifically, the specificity of this research is certainly unique. It is important that the change of the Athens area because of student impact is measured and explored.

The Effect of Maternal Diet on Gastrointestinal Health of Offspring

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The gut communicates to the brain the quality and quantity of nutrients in the gastrointestinal tract as a way of regulating food intake, and this regulation mechanism can be influenced by environmental factors like maternal diet. Bacteria are a source of inflammation in the gut, so hosts have anti-inflammation mechanisms to control for this. One of these mechanisms, Intestinal Alkaline Phosphatase (IAP), is a duodenal enzyme that detoxifies bacterial LPS products. Chronic high fat diets decrease the activity of IAP, and low IAP activity is associated with a propensity for obesity, so what is the effect of maternal diet on IAP levels in offspring? Female mice were put in three groups with each group consuming diets high in fat, low in fat, or high in fat with added glycan. These lasted from three weeks before mating, through the duration of pregnancy, and throughout a three week lactation period. After the offspring were weaned, they were either fed the same, high or low fat, diet as the mother, or the opposite diet, over the course

of ninety days. At the end of this period, tissue samples were collected and levels of IAP were analyzed. It was found that the offspring of mothers fed a high fat diet had decreased IAP activity, which may increase their risk for obesity.

The Effects of Lifetime Sports Participation and Sedentary Time on Muscle Capacity: Does More Activity Offset the Effects of Prolonged Sitting?

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In concurrence with the infiltration of technology into our daily lives, emerging evidence suggests that sedentary behavior (SED) is rising, and that the population generally fails to adhere to physical activity guidelines. SED and inactivity have independent effects on a range of cardiometabolic outcomes but few studies have explored whether this is the case regarding muscle capacity. Muscle capacity is a predictor of cardiometabolic risk and all-cause mortality, and is positively associated with weight management and functional capacity through its close ties to lean mass and metabolic rate. Thus, greater muscle capacity is advantageous to health. Due to the pervasiveness of SED and inactivity, the aim of this study was to examine the extent to which lifetime sports participation might offset potentially negative effects of SED on muscular capacity. Participants were part of a longitudinally studied cohort [n=99 (n=33 male); 12-19 yo]. Lifetime sports participation was measured using the Bone-specific Physical Activity Questionnaire. SED was measured using the Adolescent Sedentary Activity Questionnaire. Muscle capacity was measured using the Nottingham Leg Extensor Power Rig (Power) and the Biodex isokinetic dynamometer (Strength), combining the greatest trial in each, with lean mass of the corresponding region from Dual Energy X-ray Absorptiometry to create normalized ratios. It is expected that frequent sports participation during youth will be positively associated with muscle capacity, and greater SED will be inversely associated with muscle capacity. We anticipate that the negative effects of high SED will be attenuated by greater lifetime sports participation.

The Effects of Migration and Infection on Resting and Flight Metabolism in Monarchs

Hayley Schroeder, CURO Research Assistant
Dr. Sonia Altizer, Odum School of Ecology

Long-distance migration requires physiological changes to prepare for and sustain energetically costly migratory movements. Some migrants, such as the monarch butterfly (*Danaus plexippus*), atrophy reproductive organs and enter reproductive diapause to minimize energetic costs. The ability to migrate, however, can be jeopardized by infection. This study explored the effects of reproductive diapause and infection by a protozoan parasite *Ophryocystis elektroscirrha* on flight metabolism of the monarch butterfly. We expected that migratory monarchs in reproductive diapause would have a lower flight metabolism than reproductively active non-migratory monarchs as a mechanism to conserve energy for the long journey. We also predicted that infected migratory monarchs would show higher flight metabolism than healthy migrants due to the accelerated dehydration and reduced flight performance that are known to result from infection. Wild migratory monarchs and lab-reared monarchs were used in the study. We used a tethered flight mill to induce 10 minutes of continuous flight, immediately after which we measured flight metabolism (quantified as an O2 consumption). Results indicate that migratory monarchs in reproductive diapause demonstrate a lower flight metabolism than reproductively active non-migrants. We also found no difference in

flight metabolism between infected and healthy individuals. Our findings enhance the understanding of the mechanisms underlying monarch migration and the implications of disease on this migratory species.

Comparing Immune Defenses and Pathogen Susceptibility in Closely Related Host Species

Hayley Schroeder, CURO Summer Fellow
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Closely related species often exhibit similar immune responses against parasites. However, exceptions occur in which closely related species can show different immune responses against shared parasites. Differences in host defenses can be influential for infectious disease dynamics in wildlife. Monarch (*Danaus plexippus*) and queen (*D. gilippus*) butterflies belong to the subfamily Danainae. Previous observations suggest that monarchs and queens could have different immune responses to shared parasites. As one example, both species are known to host a protozoan parasite that specializes on *Danaus* spp. Despite similar levels of exposure, queens are more resistant to the protozoan than monarchs in experiments and show a lower prevalence of infection in the wild. The goal of this study was to investigate if these closely related butterfly species differ in susceptibility and immune responses to a different, generalist pathogen commonly found in insects. We also tested if fitness measurements varied among species after infection. We inoculated both queens and monarchs with the generalist pathogen *Serratia marcescens*. The results indicated that queens were innately better defended, as demonstrated by higher hemocyte concentrations and greater phenoloxidase activity. There was also a trend of lower mortality in queens, but a larger sample size is required to determine if this trend is significant. Because wild monarchs must energetically invest heavily in migration in eastern North America, the possibility for a trade-off exists where monarchs might be less well defended, making them more susceptible than queens to infection by both generalist and specialist pathogens.

Nazi vs. "Soup Nazi": The Double-Talk of Holocaust Rhetoric

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Between 1933 and 1945, Jews in Europe were subjected to harsh dehumanization, which culminated in the systematic murder of more than six million Jews in what is now called the Holocaust. The persecution of European Jewry did not happen overnight. Rather, it was a slow and careful manipulation of the masses that turned humanity against itself. Seventy years later, this event still holds a central role in the world's psyche, influencing the way we use words related to it. The question posed by this project is, "How is Holocaust rhetoric used in the contemporary world?" Analysis of political speeches and popular media suggests that the Holocaust is used as a double-edged sword in the contemporary setting: with seriousness in the political arena, but with frivolity in popular culture. On one hand, the use of Holocaust rhetoric in the contemporary political arena confirms that Holocaust rhetoric remains powerful. Politicians routinely invoke the Holocaust to further their agendas, imbuing a malicious situation or individual ("He is another Hitler!") with such strong meaning that it triggers a collective memory and cannot be ignored. On the other hand, as time progresses we are becoming distanced and desensitized to the Holocaust. This has led, in turn, to flippant use of Holocaust terminology in popular culture. Thus, while once representing the epitome of evil, some terms specifically related to the Holocaust (e.g., Nazi) have become overused and

commonplace in popular culture (e.g., *Seinfeld's* "Soup Nazi").

"Brave Little Belgium": The British Home Front Response to Belgian Refugees, 1914-1918

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The outbreak of World War I brought with it an unprecedented rate of noncombatant displacement in Europe. Among the first populations displaced by German invasion were Belgian civilians, who fled to France and Great Britain. With a strong history of privately funded humanitarian aid, the influx of approximately 200,000 Belgian refugees was initially received with enthusiasm by British civilians isolated from the battlegrounds of the continent. But as the war stretched over years rather than months, British civilians became agitated by the continued presence of the Belgians. This paper examines the evolution of public perception of Belgian refugees in Great Britain from 1914-1918. Using the British Newspaper Archive and the text analysis program Voyant Tools, this paper tracks the words chosen in association with refugees over the course of the war in the most appropriate form of public discourse—the local newspaper. Personal diaries supplement the newspaper database to glean an accurate picture of the British home front experience with refugees. In the public eye, Belgians transformed from romanticized martyrs victimized by German brutality to burdens, troublemakers, and even criminals. This British disillusionment is due to a number of factors, including Victorian morals, employment concerns, and the failure of Belgians to live up to the highly idealized image promoted upon their arrival. The British response to the Belgian refugee influx reveals both an insight into the early 20th century British national identity and the patterns of emotion experienced by host countries the longer refugees remain.

Development of a Non-Radioactive High Throughput Assay to Detect Thyroid Hormone Uptake in Cryopreserved Hepatocytes in Suspension

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Transporter proteins (transporters) play a large role in uptake and distribution of many natural and medicinal chemicals within the body. The liver specifically relies on transporters for the uptake and efflux of chemicals, as it is involved in the pharmacokinetic parameters of absorption, distribution, metabolism, and excretion (ADME). A multitude of radiolabeled transporter assays exist for the detection of chemical uptake and drug-drug interactions. However, few non-radioactive assays involving uptake transporters have been developed; and none, to our knowledge, have been developed specifically for the uptake of thyroid hormone. An assay for the detection of thyroid hormone uptake would be advantageous in identifying potential inhibitors. In this study, a high-throughput non-radiolabeled thyroid hormone uptake assay was developed using a procedure similar to the Oil Stop method commonly used with radioactive assays, however this technique employs the use of LC-MS/MS technology and cryopreserved hepatocytes. The 96 well assay exposes cells to thyroid hormone as a substrate and other chemical agents as possible inhibitors, and allows for the rapid assessment of potential inhibition. We hope to be able to employ this technique in future research to identify environmental chemicals as potential inhibitors of thyroid hormone uptake.

Use of Social Recognition Test and Open Field Test to Assess Piglet Cognition

Kathryn Sellman
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Due to similarities to children in brain formation and development, the piglet is an ideal model to assess cognitive function using behavioral tests. Two important cognitive tests utilized in this study are social recognition and open field tests, which quantitatively assess social memory and piglet behaviors including anxiety and willingness to explore. In the social recognition test, piglets are exposed to an unfamiliar pig and a novel object in a sociability test, followed by a 10 minute inter-phase interval, and then exposed to a familiar pig and a novel pig in a social recognition test. Piglets are expected to spend more time with the unfamiliar pig in the sociability trial than the novel object and are expected to spend more time with the novel pig in the social recognition trial than the familiar pig, indicating that the piglet had retained a social memory of the familiar piglet. In the open field test, piglets are placed in an open arena for 10 minutes to monitor different aspects of behavior such as ambulation, exploratory interest, and anxiety. Piglets are expected to explore fewer zones and become less ambulatory over time, demonstrating significantly decreased exploratory interest as time passes, and generally to become less anxious. This test overall should display that the piglets will become habituated to the arena. Taken together, these two tests will quantify normal piglet behavior, which can be used in the future as a basis of comparison to assess cognitive deficits associated with neural disease and injury models.

Susceptibility to Chronic Social Defeat Stress Increases Ethanol Consumption in Mice

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Stressful life events are known to cause and worsen both depression and alcohol use disorders. In the human population, these stressful events are often social in nature. Because of the prevalence of these two disorders and their comorbidity, chronic social defeat stress has been used as a preclinical model in mice. The social defeat paradigm involves placing an intruder mouse into the home cage of a resident mouse and allowing the resident mouse to attack the intruder. Mice exposed to chronic social defeat stress display two phenotypes: resilient and susceptible. Susceptible mice display the depressive-like phenotype of decreased social interaction while resilient mice exhibit social interaction behavior that does not differ from controls. The goal of this experiment was to determine the effect of the social defeat paradigm on social avoidance and ethanol consumption. First, the phenotype of each mouse was determined using a social interaction task after defeat. Ethanol consumption was then measured using a two-bottle choice between water and 20% ethanol. The data indicated that susceptible mice display significantly increased avoidance behavior and ethanol consumption than both the control and resilient mice. The resilient mice display avoidance behavior and ethanol consumption that is not significantly different from controls.

Variation of Nanoparticle Surface Lipophilicity for Blood Brain Barrier Penetration

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Prof. Shanta Dhar, Chemistry, Franklin College of Arts & Sciences

Several medical complications occur in the brain and cause significant damages. One such example is stroke: the third leading cause of death in the United States. Unfortunately, there is only one FDA approved drug for stroke treatment, tissue plasminogen activator. A plethora of drugs for stroke treatment is not available because the brain is protected by a layer of tightly packed endothelial cells, which forms the blood brain barrier (BBB). The BBB restricts movement of substances across the barrier and into the brain. This protects foreign and usually harmful substances from entering the brain and causing unwarranted damage. However, substances that can cross the BBB are small in size and highly lipophilic. A potential for stroke treatment that we are working towards is using aspirin to reduce inflammation in the brain after a stroke occurs. Reducing inflammation is the precursor to using stem cells to regenerate damaged neurons that can revive lost brain function. A highly lipophilic mitochondria targeted nanoparticle is ideal to deliver aspirin across the BBB. Therefore, this project focuses on optimizing the surface lipophilicity of nanoparticles by varying carbon chain lengths of the targeting ligands that are attached to the surface of the polymeric nanoparticles. The targeting ligands are comprised of a triphenylphosphonium cation attached to a carbon chain. Here, we study varying chain lengths from three to eight alkyl groups to evaluate which carbon chain length most effectively increases the surface lipophilicity of the nanoparticle; thus, optimizing the nanoparticle's ability to cross the BBB.

Parasite Infection and Host Behavioral Complexity

Caroline Shearer, Foundation Fellow, CURO Research Assistant
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This study examines whether parasites affect the behavioral complexity of their hosts. We addressed this question by examining behavioral data collected from Grant's gazelles (*Nanger granti*) that were part of an experimental parasite removal study. Some of these gazelles were treated with an anthelmintic drug to clear gastrointestinal worms. The way that treated gazelles distributed their time among various behaviors was compared to the way that untreated control gazelles distributed their time. Behavioral complexity was measured as the time it took for an individual to switch from one behavior to another. We tested the hypothesis that treated gazelles have more complex behavior than untreated gazelles because they spend more time performing one behavior before switching to another. Preliminary analyses show that treated individuals had longer bouts of feeding before switching, when compared with their untreated counterparts. These findings reveal that parasite infection can influence subtle aspects of behavior in wildlife.

Using an Unconventional Tool: A Capuchin Monkey Becomes Skillful

Spencer Sheheane
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Skillful individuals adapt their movements in accordance with the changing constraints of the task, body, and environment. We explored how one tufted capuchin monkey developed skill in using a tool. We used a tool presenting unfamiliar properties to probe the monkey's dexterity. The task was to use a hoe to retrieve a token from a solid, smooth surface. The handle of the tool was rigid, or had one or two joints that permitted the head of the hoe to move at right angles (novel compositions). In Training, the monkey used the tool 100 times in each condition in fixed order (rigid, one joint, two joints). In a Test phase, the monkey was presented with 40 trials of each

condition (120 trials in total) in randomized order. The monkey's behavior with the tool in the first and last 20 trials of each condition in Training and the last 20 trials of each condition in the Test phase were coded using video playback. The number of all actions with the tool declined in each condition between start and end of Training, and again between the end of Training and the Test phase. Terminal performance with the jointed tools averaged 2.92 moves per trial, barely above the minimum possible (2 moves/trial). These results suggest that the monkey mastered using altered tools with a relatively small amount of practice.

The Influence of Nutrient Stress on Mass Performance Rankings among Cultivated Sunflowers

Kiara Shelby
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As sunflower crops become of higher demand for their many uses as ornamentals, food and as a major oil-seed crop, there is also an increasing need for the development of nutrient efficient sunflower cultivars that can produced relatively high crop yields in varying nutrient conditions. Due to the nutrient availability around the world, the development of these cultivars can lead to a reduction in the economic and environmental impacts associated with fertilization. The purpose of this study is to serve as a pilot study for assessing a small subset of diverse cultivated sunflower lines in the greenhouse for resistance to nutrient stress using biomass as a measure of performance. Mass performance rankings are assigned to lines in each maturity stage, seedling and budding, across several nutrient treatments to determine whether or not line performance rankings change as plants at the seedling stage develop to the budding stage and across nutrient treatments. Rankings for both above ground shoot mass, a trait greatly associated with plant yield, and below ground root mass, a trait greatly associated with nutrient acquisition, were used to identify if line performance at the seedling stage is indicative of their performance at the adult stage for overall plant yield and nutrient stress tolerance. Analysis is currently under way, however, the traits noted in this study and in the later study to be conducted on a larger subset of the cultivated sunflower population can lead to further research towards breeding efforts in developing more nutrient efficient sunflower cultivars.

Personality Predictors of Team Work Relationships: Characteristics that Make Friends

Benjamin Shepard, Julia Willis, Alex Moore, Holly Wright, Nick Sciales
Dr. Dorothy Carter, Psychology, Franklin College of Arts & Sciences

Industrial and Organizational Psychologists have demonstrated repeatedly that individuals' stable personality traits, especially their levels of conscientiousness and emotional stability, predict *individual* job performance. However, in the 21st century, organizations are increasingly relying on flatter, team-based work structures, and individuals are required to *team-up* with other individuals to solve larger problems. Thus, there is a pressing need to better understand the degree to which the previously observed relationships between personality traits and individual job performance translate to team contexts. In our study, we investigate the degree to which the Big Five personality traits of Conscientiousness, Agreeableness, Neuroticism, Openness to Experience, and Extraversion predict the emergence of *teamwork relationships* between participants in a complex interdisciplinary multiteam task. In this task, 12 participants are randomly assigned to a role on one of four 3-member teams and are required to apply their role-specific information during a multiteam decision-making activity. Prior to participating

in the study, participants complete self-report measures of personality. Then, during the experiment, participants complete a series of self-report sociometric perceptual measures of teamwork relationships (e.g., information sharing, trust, collaboration, ease of interaction). This measurement approach identifies the networked patterns of teamwork relationships that have emerged during collaboration. In our analysis, we use a class of inferential models of network emergence and development called *exponential random graph models* that model the antecedents of relationship emergence. This analytic approach allows us to identify the personality traits that are the strongest predictors of effective teamwork interactions.

IO Variables in Gaming: When Work is Play

Benjamin Shepard
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Over the past decade, virtual environments have become more and more prevalent in many people's day-to-day lives. Because of this increase, it has become important for us to better understand their impact on individuals and organizations. In this study, our research group will be examining variables from many different fields of psychology. Some of these variables include variables related to Industrial and Organizational (IO) psychology: personality, leadership, informal leadership, and judgement and decision making in virtual environments. The IO team in this study will be trying to develop an understanding of the individual differences in attitudes and behaviors in different types of virtual environments. We will also examine the impacts of the real world context on the virtual environment so that we may develop interventions to improve the experience and well-being of people in the work place. This section of the study will be specifically focused on finding player that are highly involved in guilds or clans in an online video game. Examining these variables in a virtual environment will help tell us what similarities and differences exist between these guilds and real world jobs. By identifying what similarities and differences are between these two environments, employers can better create their work environment to help have more committed and engaged employees.

Small Molecule Inhibition of CARM1 in Adipocytes to Control the Epigenome-Induced Risks of Obesity

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Obesity is the condition of having excess body fat, and a Body Mass Index greater than 30. Obesity has reached epidemic proportions with 35% of adult Americans being obese. It is also the leading cause of preventable death in the USA, making it one of the top research priorities. Obesity results from the increased production and size of adipocytes in adipose tissue. This results from imbalance between food intake and energy expenditure, leading to an excessive accumulation of adipose tissue. The health risks of obesity and the difficulty individuals have losing weight is explained by epigenetic factors. One such epigenetic factor, Coactivator-Associated Arginine Methyltransferase 1 (CARM1) catalyzes modification of proteins at adipogenic genes and appears essential to the transformation of preadipocytes into mature adipocytes. The cellular memory of CARM1-catalyzes asymmetric arginine modifications in visceral and subcutaneous adipose tissue (VAT and SAT) adipocytes that may impact the ability to gain and lose weight. Dr. Meagher's laboratory recently developed innovative tools to enable adipocyte-specific epigenetic analysis of chromatin structures including fluorescence activated nuclear sorting of adipose tissue nuclei and a preadipocyte cell line that fluoresces when

cells become mature adipocytes (ADNp::RFP). In this project, I will begin by inhibiting adipocyte development of this cell line using the natural product CARM1 inhibitor Ellagic Acid and then move on to pharmaceuticals newly designed to inhibit CARM1. Our translational medicine goal is to reduce obesity and its harmful comorbidities including cardiovascular disease, some cancers, type II diabetes, inflammation, and dementia testing this next in mouse models.

Designing Chiral Metasurfaces and Understanding their Optical Properties

Joseph Skehan
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When an array of micrometer or nanometer sized chiral patterns are arranged regularly in three dimensional space, they can show unique optical properties which do not occur naturally, and can be used to tune the polarization of light. When these chiral materials are made of noble metals, such as Ag, Au, or Pt, they are called chiral metamaterial and can exhibit enhanced chiral optical properties, which may result in a wide range of applications, such as negative refractive index material, stealth coating, improved detection devices, super resolution lenses, etc. However, production of these ordered, chiral structures usually requires expensive fabrication techniques, such as electron beam lithography. Here, we propose to combine close packed nanosphere monolayers, reactive plasma etching, and oblique angle deposition to fabricate large area chiral nanostructures. Based on a MATLAB program developed in our lab and modified by me, I have predicted the etching process and the resulting chiral patterns on the substrate. With a Labview program developed by me, I can deposit chiral patterns on the substrate by controlling the substrate rotation. The resulting chiral metamaterials are then characterized by scanning electron microscope, ellipsometry, and optical transmission measurements, and demonstrate large chiral optical activity. With the help of finite difference time domain simulations, their optical properties can be predicted. We will systematically vary both the etching and deposition conditions to generate different chiral metamaterials and to establish a good relationship between the optical properties and the chiral structures.

The Political Evolution of Malcolm X

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The legacy of Malcolm X continues to undergo reinvention as researchers gain access to his personal life through the written work he left behind. The development in the theory in his religious and political thought is an important scholarly question, particularly in understanding the changes that he made after his split from the Nation of Islam (NOI). Elijah Muhammad, the leader of the NOI, discouraged political affiliations when Malcolm X was the national minster of his organization, leaving Malcolm restless to express his public voice. In my research, I examine the period after his break from the NOI and find that this movement gave him political independence. His religious commitments intersected with his politics as well. From African thinkers, he was inspired to adopt some of the methods they had used to attain independence from colonial powers in Europe. He developed strategies that he planned to implement during political campaigns as the founder of the Organization of Afro-American Unity (OAAU). In notes from collections of personal writings, housed at the Schomburg Center for Research in Black Culture, Malcolm X detailed these plans with the help of student researchers who accompanied him at political summits in Africa. The OAAU was modeled after the Organization of African Unity (OAU), which

called for the political and social unification of African nations. With the information that I collected as I completed research in Harlem, I ask: What new insights can be deduced about the political legacy of Malcolm X from his template for the OAAU?

Diazinon Promotes Adipogenesis in 3T3-L1 Preadipocytes

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Diazinon, a common organophosphate, has been widely used in the agricultural setting, thus exposure in the general population is possible. Studies show diazinon has neurotoxic effects in humans and animals and possible adverse effects as an endocrine disruptor. However, its association with dysregulation of adipogenesis has been poorly investigated. Obesity is an increasing health issue. Research suggests that environmental factors play a role in the obesity epidemic in addition to diet and exercise. The current study investigated the mechanism of diazinon's effect on adipogenesis by examining adipocyte differentiation after exposure. 3T3-L1 mouse preadipocytes were used as an *in vitro* model and treated with increasing doses of diazinon (0, 1, 10 100 μM). Using Oil Red O staining for visualization, lipid droplet accumulation was found to increase in a dose-dependent manner. Multiple adipogenic specific proteins were measured via Western blotting at the three stages of adipogenesis (induction, differentiation, and maturation) in each treatment condition. Diazinon significantly induced expression of transcriptional factors CCAAT-enhancer-binding proteins α (C/EBPα) and peroxisome proliferator-activated receptor γ (PPARγ) and their downstream genes fatty acid synthase (FASN) and Acetyl-CoA Carboxylase (CoA) in a dose and time-dependent manner compared to the relative controls. The current study demonstrates that diazinon promotes lipid accumulation and activates the adipogenic signaling pathway in the *in vitro* model.

Ecosystem Decomposition Using Fluxes

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Ecosystems are often described as flows of biomass among species, which form ecological networks. These networks can be fairly large and complex. Decomposing an ecosystem model into smaller pieces for detailed analysis is often tempting. However, essential ecosystem behavior may be lost by breaking connections, or excluding species. Ecosystems are made up of organisms and flows of biomass, but neither can function by themselves. In this research, we propose a new building block for ecosystems, called fluxes. A flux is a smaller network within an ecosystem that can sustain itself. For example, a forest ecosystem may have hundreds of interconnected species and flows, but a flux would contain grass, rabbits, wolves, and the flow between these species. Any ecosystem can be broken apart into these fluxes and examined without losing any significant properties of the full ecosystem. Furthermore, flux decomposition can be used to identify essential organisms (keystone species) or flows, because an organism or a flow may appear in multiple fluxes. We have shown that it is possible to decompose any ecosystem model into its fluxes regardless of its size or complexity. We are currently developing the algorithms necessary to automate the process so that any ecosystem can be decomposed without requiring any manual work. Our research is ongoing.

Population Dynamics and the Ecology of the Common Bottlenose Dolphin of the Central Georgia Coast

Caroline Spohn, CURO Honors Scholar
Dr. John Schacke, Odum School of Ecology

The barrier islands and estuarine system of the central Georgia coast provide a unique environment for the study of dolphin population dynamics, ecology, and behavior as one of the few areas along the eastern coast that remains largely undeveloped. Bordered to the north by Savannah and to the south by Brunswick, this area is relatively untouched by human populations and commercial industry. The study of this population of dolphins over time will provide a baseline against which to compare the results of future coastal developments on terrestrial and aquatic environments. The results of my research will be valuable to environmental protection and conservation organizations, fishery departments, coastal development activities, and state and federal agencies in efforts to preserve and protect the region. The goal of this project is to identify and measure seasonal, annual, and other periodic fluctuations in the abundance and distribution of dolphin populations along the central Georgia coast. Data will be documented photographically to identify individual dolphins and catalog them. Through this process, we are able to observe the associations between the physical environment and dolphin population and ecology, which will provide us with insight into the positive and negative effects of coastal development on habitat health. In order to complete this analysis, boat-based surveys of the region are completed in order to collect photographic and demographic data. These surveys identify individual dolphins, their distribution over time, and behavior in specific geographic areas. Identification of individual dolphins is possible because scars on dorsal fins can be as unique as human fingerprints.

Acceleration of Human Transportation and Its Impacts on Energy Consumption
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Dr. John Schramski, College of Engineering

Throughout history, the transportation sector, which is one of the fundamental areas of energy consumption, has been periodically revolutionized by technological development. The adoption of each successive technology—such as roads, carriages, cars, and planes—has been akin to shifting into a higher gear, where the new technology is leveraged to allow for faster, and therefore more expansive, travel. Increased travel requires increases in energy consumption. In this project, we mechanistically model the historical kinetic energy discharge of ever increasing and faster moving human populations. By comparing the resulting values to the published energy consumed by the transportation sector, we derive an energetic efficiency of the transportation sector over historical time. Understanding this trend with additional supporting data meaningfully quantifies and conveys the enormous impact of increasing human kinetic energy on the energetic balance of the planet. This information can be leveraged to engineer sustainable solutions grounded in a mass and energy balance perspective.

Recycled Tire Chips for Use in Concrete Barrier Walls and Other Applications
Katelyn Stallings
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In 2013, the Georgia Department of Transportation (GDOT) constructed more than 42,000 linear feet of concrete barrier utilizing a Class A concrete mixture design (3000 psi). There may be potential for the beneficial utilization of recycled tire chips in concrete barrier applications which may lead to improved safety for vehicle occupants as well as reduce disposed rubber from going to landfills or stockpiles, and potentially saving materials cost for GDOT. Additionally, there may be other applications requiring less compressive strength, Class B – 2200 psi, where rubberized concrete could be advantageous. However, GDOT has not

studied recycled rubber tires for concrete barriers or other concrete related applications despite the potential for safety, environmental, and economic benefits. Concrete safety barriers are one of the widely used impact attenuators that are intended to either decelerate vehicles to a safe stop or redirect them away from a fixed object. Concrete exhibits little plastic deformation when impacted by a vehicle and thus an undesirable trait for safety barriers. This study includes a thorough review of literature pertaining to the inclusion of rubber products in concrete mixtures for transportation related applications and the design, batching, and testing of rubberized concrete mixtures for potential use in barrier walls, curb and gutter, and other non-high strength concrete applications for GDOT. Specifically, coarse aggregate (i.e. rock) will be replaced with incremental proportions of tire chips. The primary goal will be to establish a benchmark concrete mixture for which tire chip inclusion is possible without significant detrimental effects on the structural performance of the concrete. Rubberized concrete mixtures will be tested for compressive strength at 1, 7, and 28 days of age to measure their mechanical performance as tire chip content increases. Ultimately, this research will better inform additional phases of a larger-scale study.

An Environmental Engineering Challenge: Improving the Energy Balance of Global Food Production

Garrett Steck, CURO Research Assistant
Dr. John Schramski, College of Engineering

Global energy consumption continues to exponentially rise as an increasing world population, currently at 7.4 billion, requires more resources to survive. However, despite rising global per capita energy consumption, significant food availability disparities exist between countries. Decisive amounts of energy are used for transportation, urbanization, and industrial development, while food energy (edible calories) for the global population, arguably the most important energy for civilization, is not being evenly distributed. Today, approximately 2 billion people lack one or more nutrients for survival. Organizing available data for 173 countries, we compare food energy surplus or deficit to per capita energy consumption between 1980 and 2005. The results show on average that energy consumption per capita and food energy production per capita are not correlated. This indicates that excess nonrenewable energy usage is not being implemented with intentions to feed a continuously growing population. To aid policy makers, areas of improvement in excess energy consumption above the metabolic needs of the population loads are identified.

Using Mutants to Understand Mechanisms of DNA Methylation in *Brachypodium distachyon*

Madeline Steffensen, CURO Research Assistant
Dr. Robert Schmitz, Genetics, Franklin College of Arts & Sciences

The mechanisms of DNA methylation in plants have been extensively studied in the non-grass species *Arabidopsis thaliana*. While differences in the patterns of methylation have been observed in grass species, the mechanisms for these differences remain poorly understood. *Brachypodium distachyon* is an emerging model for grass species. Genes known to regulate DNA methylation are studied using the WRRC *Brachypodium* T-DNA mutant collection. Tissues from plants with suspected mutant genes are harvested. PCR and gel electrophoresis are then used to genotype the plant and determine its zygosity. This process is used to identify plants that are homozygous for the mutation of interest. Homozygous mutants are then further studied to determine the effect mutations have on DNA methylation. It is expected that genotyping will identify plants that are both

homozygous and heterozygous for mutations. Heterozygous individuals will be carried to the second generation in order to obtain homozygous offspring. Further studies of these mutants are expected to show that the mutants have altered methylation levels compared to non-mutated wild-type plants. The research will provide important information about the mechanisms of DNA methylation in grass species. In this way, we can begin to understand differences that may be present between DNA methylation in grasses and non-grass species of plants.

In Search of Optimal Designs Using Differential Evolution Algorithm

Zack Stokes
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In statistical practice, no matter how excellent data analysis methods are, meaningful conclusions cannot be drawn from data that were not collected carefully. To prevent this issue, designed experiments can be used to target specific research questions and avoid frivolously using resources. Experiments like these can often be very expensive for the researcher due to either a high number of runs or a high per-run cost. This cost restriction is an example of one constraint that may be in place when attempting to generate a worthwhile design. To address this issue, there are different approaches for creating optimal designs. For simpler cases, optimal designs can be obtained theoretically, using formulae and theorems; however, as technology continues to advance, the processes that are being experimented on are growing more and more complex. In these situations it is not always possible to construct an optimal design analytically. This research deals with developing new, numerical techniques for approaching these problems. The Genetic Algorithm (GA) is a popular tool that already exists for identifying these designs; however, our preliminary study has shown that another technique, Differential Evolution (DE), can outperform this algorithm. DE is a search algorithm that has applications in an array of disciplines, but its usefulness in generating designs has never been explored. The goal of this study is to understand how DE compares with other algorithms like GA and then attempt to analyze designs for which optimal solutions have not yet been found.

Detritus Preferences in a Mangrove-Saltmarsh Ecotone

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Climate change is driving range expansions of species worldwide, and warming temperatures are causing global shifts in species distributions to higher latitudes and elevations. In Florida, mangrove forests are advancing their northern limit in response to declines in the frequency of annual freezes. As the mangrove forests extend their northern boundary, they are moving into salt marsh habitats. As a consequence, the organisms in invaded marshes that utilize detritus as a resource may change or shift their food preferences to adapt to the new change in dominant vegetation. To test this, litterbags filled with mangrove and saltmarsh detritus were placed in 20 blocks (10 within mangrove habitat and 10 within saltmarsh habitat) along the mangrove-saltmarsh ecotone. Litterbags were analyzed individually to quantify species composition and abundance. After one month, the results showed more organisms overall in the mangrove plots over the saltmarsh plots. Within the mangrove plots, there were more organisms utilizing saltmarsh detritus than mangrove detritus. Thus, the mangrove detritus is a less than substitutable resource for salt-marsh resident species. However, this may change over time as marsh species adapt or as mangrove associated species also migrate northward.

Abstracts

Beneficial Use of Metakaolin for Georgia Concrete Pavements
Matthew Sullivan
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This study analyzes the use of metakaolin as a supplementary cementitious material (SCM) in concrete mixtures; particularly with the intent of adoption into current Georgia Department of Transportation (GDOT) Standard Specifications. Despite Georgia having significant kaolin deposits, GDOT does not currently allow its use for concrete pavements or other structures. During the last several decades the use of SCMs in Georgia concrete has increased and led to improved performance and lower cost. Fly ash and blast furnace slag have been the primary SCMs used for concrete pavements. Recently, the availability of these SCMs has become limited and resulted in the need to investigate alternative materials. Current research evaluating the use of metakaolin as a SCM is widespread with numerous state DOTs having already adopted specifications for its use. This research is timely in that it will be used to investigate the mechanical performance of concrete mixtures using metakaolin. Ultimately, the study results will allow for the modification of the GDOT Standard Specifications to allow its use. Metakaolin will be introduced as a partial replacement of cement for GDOT Class 1 and 2 concrete pavements. The performance will be examined using ASTM standardized tests for fresh and hardened concrete properties. The successful completion of this research will provide an economical and widely available alternative to the current SCMs being used in the state of Georgia.

Issue Framing and Beliefs about the Importance of Climate Change Policy
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We use an experiment to examine whether the way in which climate change is framed affects individuals' beliefs about its importance as a policy issue. We employ frames that emphasize national security, human rights, and environmental importance about the consequences of climate change. Contrary to our expectations, we find no evidence that issue frames, on average, affect opinions about the importance of climate change policy. We do find some evidence that the effect of issue frames varies across ideological and partisan groups. We conclude by discussing our findings relative to extant literature and considering the implications of our findings for those who seek to address the issue of climate change.

The Effects of Iron Deficiency Anemia on Mitochondrial Capacity
Joanna Szymonik, CURO Research Assistant
Kelly-Ann Peters
Dr. Kevin McCully, Kinesiology, College of Education

Iron is an essential mineral needed by the body. In addition to carrying oxygen from the lungs to the rest of the body, iron is also an important component of enzymes that help to speed up biochemical reactions. Having an inadequate amount of iron in the body is a condition called iron deficiency. According to the World Health Organization, ~30% of the world's population is anemic. This makes it the most common nutritional deficiency in the world. With muscle weakness and fatigue being a major symptom of this condition, it can be hypothesized that a deficiency in iron may impact skeletal muscle performance. Specifically, it can be predicted that a deficiency can impair mitochondrial function in skeletal muscle. The purpose of this study was to compare the mitochondrial capacity of those with iron deficiency to controls. Participants were divided into two groups: an anemic group (n=4) and a control group (n=14). Blood samples were taken in order to

diagnosis anemia severity. Hemoglobin levels were (11.4 + 0.9 g/dL) and (14.3 + 1.3 g/dL), while the hematocrit levels were (36.0 + 4.7 %) and (40.6 + 3.3 %) for the anemic and control groups, respectively. However, there was no significant difference ($p = 0.940$) between the rate constant of the anemic (1.81/min) and control (1.82/min) groups. This study suggests that iron deficiency did not affect the capacity of mitochondria in skeletal muscle. These results suggest that symptoms of fatigue are unrelated to the impairment of iron usage in energy production.

Administration of Varying Carbon and Nitrogen Sources into a Defined Growth Media for Polysaccharide Secretion in *Bacillus cereus*

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The endospore forming *Bacillus cereus* species was recently shown to produce an exocellular polysaccharide (EPS) during later stages of sporulation. The biofilm is composed of an extracellular polysaccharide named X-polymer. While the structure of this X-polysaccharide was recently elucidated in our laboratory, less was known about the mechanism that regulates its formation. Here, we first showed that when *Bacillus* is growing in rich bacterial medium, a medium that support vegetative growth, both the EPS or the spores do not form. To further examine specific nutrient(s) that support glycan formation, we used a different medium. For these studies we used a defined medium containing different sources of carbon, nitrogen, or a combination of the two factors. Following bacterial growth, the polysaccharide was isolated and its composition was determined after hydrolysis by gas chromatography mass spectrometry (GC-MS). The relative amount of the polysaccharide as well as other glycans were recorded. In the presentation I will describe in details our findings.

Influences of Predators on Parasite Prevalence in *Crassostrea virginica*

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Host-parasite relationships do not occur in isolation. It is increasingly recognized that other species, like predators, may both directly and indirectly influence the dynamics between hosts and parasites. If predators preferentially feed on infected or uninfected hosts, they may influence parasite prevalence in the remaining host population. Furthermore, when predators feed on infected hosts, they may release parasites from the prey facilitating their spread to new hosts. In this study we investigated if the blue crab, *Callinectes sapius*, preferentially selects prey (the eastern oysters, *Crassostrea virginica*), infected by one of its most prevalent parasites, *Perkinsus marinus*. Using a series of choice trials in laboratory mesocosms, we presented blue crabs with two oysters. Once the crab had committed to consuming one oyster, we removed both oysters from the mesocosm and assessed their *P. marinus* infection status. Using all trials that included a choice between one infected and one uninfected prey, we analyzed the preference of each predator. Blue crabs did not exhibit preferential feeding as a function of *P. marinus* infection status. Our data thus suggests that crab predators will not alter prevalence patterns of oyster populations through differential predation. This gives us a better understanding of the relationship between the biotic environment and host-parasite interactions.

Code Switching in Tunisian Arabic

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Few modern languages can claim a sociolinguistic history as complex as that of Tunisian Arabic. Beginning with the ancient Berber languages of the Sahara, the Tunisian linguistic landscape was shaped over thousands of years by conquest and trade with nearly a dozen languages and peoples—most notably the Arabs and the French. Today, the language spoken in Tunisia is a precisely executed mélange with Arabic and French intermingling seamlessly in almost all levels of daily interaction. Code switching (CS), typically defined as the mixing by multilinguals of two or more languages in discourse on any level (Poplack 2001), has only recently become a topic of careful research. In the past, CS was thought to be a random and deviant linguistic phenomenon which lacked grammatical constraint. However, linguists have made great strides in quantifying and qualifying CS which in many cultures is fundamental to the way people communicate. From this research have emerged such theories as Poplack's 1978/81 Equivalence Constraint, which dictates that there are predictable "switching points" at which one is free to change languages. Using a corpus of linguistic data gathered from Tunisian television broadcasts, this study examines some of the most commonly switched elements, what social factors may affect them, and how they confirm the Equivalence Constraint.

UGA Campus Sustainability Initiatives: Awareness and Attitudes to Campus Recycling

Emily Taylor, CURO Research Assistant
Dr. Juan Meng, Grady College of Journalism & Mass Communication

Purpose: The purpose of this research is to identify student's awareness and attitudes to on-campus sustainability initiatives. The University of Georgia Office of Sustainability is involved in many different sustainability projects, but this paper chose to focus on one of the biggest: recycling. The research aims at discovering student's thoughts on the recycling programs on campus. *Design/methodology/approach*: The researcher used two research methods in this study to investigate the subject: (1) an online survey of UGA undergraduate and graduate students; (2) in-depth interviews with five UGA undergraduate students. *Findings*: Results suggest that students at the University of Georgia are very aware of recycling programs on campus, such as the recycling trash cans located in almost every classroom and building, and understand recycling on campus is important. Students felt less inclined to recycle at home where it is less convenient and also felt that recycling on game day is difficult. *Practical implications*: The Office of Sustainability needs to focus some of their efforts on making recycling more convenient on game days. They also should spread awareness about the importance of recycling at home and how easy it can be. *Originality/value*: The study provides insights into the awareness and attitudes of on campus sustainability programs, such as recycling. Making sustainable choices is important for the health of our planet and students need to know that they can make a difference with their efforts.

Effects of Campaign Finance on Legislator Polarization

Andrew Teal
Dr. Anthony Madonna, Political Science, School of Public & International Affairs

Gallup polls have indicated growing disapproval of Congress in recent years. Distrust with the legislative system stems from issues of gridlock and the public's perception of an ideologically polarized Congress. Polarization is problematic for both the legislative process and the American public, as it causes gridlock in policy making and rifts in societal interactions through increasing political disagreement. Therefore, it

is important to ask: what is causing Congress to polarize? Existing research shows that polarization is present and has been increasing since the 1970's. The two primary accepted causes of polarization are member replacement and member adaption. However, more specific explanations exist for increasing polarization. This research builds upon existing studies on the effects of campaign finance funding control. It is debated whether independent campaign donors or control of campaign funding by political party establishments might reduce Congressional polarization. Using state legislature data, different campaign finance laws can be simultaneously compared across state lines to analyze the effects of control over funding on polarization levels. Through data analysis, it should be evident that greater proportions of contributions by political parties correspond to less polarization in legislatures.

Biological Function of an AAK1-Like Protein Kinase in *Trypanosoma brucei*

Bryanna Thomas, CURO Graduation Distinction, CURO Research Assistant
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Human African trypanosomiasis (HAT) is a potentially deadly disease endemic to parts of rural Sub-Saharan Africa. The causative agent, *Trypanosoma brucei,* is a protozoan parasite that proliferates in the blood, lymph, and eventually the central nervous system of humans and cattle. New potential HAT drugs may be repurposed from therapies for other illnesses, such as the compound AEE788, which was initially developed for the treatment of glioblastoma. AEE788 is a lead compound for trypanosomiasis drug discovery. An important step in mechanism of action studies is identification of pathways affected by a drug. In humans, AEE788 inhibits activity of the receptor tyrosine kinases EGFR and VEGFR. In trypanosomes, AEE788 is associated with several protein kinases, including casein kinase 1.2. On the basis of these facts, we checked for the effect of AEE788 on the phosphoproteome of *T. brucei*. AEE788 treatment altered the phosphorylation state of protein Tb427tmp.160.4770 (TbAAK1), among others. This protein shares some homology with the human protein kinase AAK1, which is involved in clathrin-mediated endocytosis through interactions with adaptor protein 2 (AP2). In this study, we present results of the effect of a TbAAK1 knockdown on endocytosis pathways in the trypanosome.

Reactive Microglia as a Biomarker in a Piglet Model of Traumatic Brain Injury

Meagan Thomason, CURO Research Assistant
Dr. Franklin West, Animal & Dairy Science, College of Agricultural & Environmental Sciences

Traumatic brain injury (TBI) is a major cause of hospitalization and death in the United States, and patients with TBI often struggle with physical and cognitive impairments for months to years. The development of treatments for TBI have been performed on predominantly rodent models, but because the brain composition of mice is very different compared to humans, the research often fails to translate to human medicine. However, pig brains are more similar to human brains, which make them an appealing alternative for treatment development. The objective of this study is to assess changes in brain cellular composition in a piglet model of TBI. Piglets underwent surgery to receive a controlled cortical impact (CCI). Piglets were sacrificed one day, one week, and four weeks post-TBI and brain samples are collected for analysis. Microglia, which secrete inflammatory cytokines in response to injury, were quantified by immunohistochemistry utilizing Iba1 antibody. We expect that microglial activation will occur as early as one day post-TBI and will peak one week post-TBI. After

four weeks, we expect less activated microglia presence as they begin to return to a resting state. These research findings will be used to determine a normal pattern of TBI pathophysiology to serve as a platform for the development of effective treatments for TBI.

The Doctrinal Development of Sea-Launched Nuclear Capabilities

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India, China, and Pakistan have transformed the face of South Asia over the last several decades. The rise of economic power in the region, coupled with the growth of conventional military might, has generated fierce strategic competitions between India and China, as well as between India and Pakistan. However, the development of nuclear arsenals in India, Pakistan, and China may be of the greatest concern to the international community. In this paper, the author examines the development of sea-launched nuclear capabilities, commonly in the form of ballistic missile submarines, among the Asian powers. He further observes the role of these developments on the nuclear doctrine of each individual state. He finds that India, Pakistan, and China have all faced similar problems in developing their sea-launched nuclear platforms, including challenges to their command-and-control practices and methods of storing and deploying nuclear-armed delivery vehicles. The policy implications of nuclear developments in and around South Asia – namely, the prospect of nuclear war – require attention from the international community.

Has *Laïcité* Transformed into a Law of Islamophobia?

Chelsea Thorpe, CURO Research Assistant
Prof. Lihi Ben Shitrit, International Affairs, School of Public & International Affairs

On November 13, 2015, terrorists unleashed a series of attacks on Paris, killing and injuring more than 125 civilians. As with the Charlie Hebdo attacks earlier that year, the shooters were of Muslim background. The aftermaths of these attacks again brought attention to France's 1905 *laïcité* law. As stipulated by *laïcité*, displays of any religious symbol, including, among other things, prayer, headscarves, and niqabs are severely restricted in the public sphere. Many French politicians use the 1905 law as a pretext for aggressive integrationist policies toward religious minorities. Yet, as a result, some argue, French society has further segregated and *laïcité* has become a form of religious suppression that inequitably targets certain religions and not others. This research highlights questions of religious freedom in relation to the integration of Muslim immigrant communities in France as they are being tested today in social and legal discourse. With a focus on Catholicism, a historical analysis of French majority and minority frameworks provides a thorough understanding of the legislation that led up to *laïcité*. Instead of integrating French society, recent "modifications" to *laïcité*, specifically the bans on the headscarf and the veil, have caused reverse integration by promoting strong Catholic morals as well as secular republican nationalism that excludes pious Muslim members of society. Varieties of Islam and French republican secularism clash as Muslim individuals struggle to form self-identities while simultaneously integrating into society. This study draws on qualitative analyses of local and national French newspaper articles in addition to recent academic literature.

Financial Knowledge amongst College Freshmen

Danei Ting
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Financial literacy is the capability to interpret how money works in society and how it is managed. For my research, I want to learn how financial courses are related to the financial knowledge and behavior of college freshmen. For my research, I was able to analyze college freshmen data collected through an online survey. I utilized Excel to filter out the data so I could segment my target group of freshmen students who attended high school in the state of Georgia. This group consisted of 288 students. My focus was questions related to financial literacy. The first question I examined was, "How would you describe how much you learned in course(s) about personal finance/money management in high school?" Ninety-nine of the 288 students responded that after taking the course they knew much more about money management, while 88 were neutral. Looking deeper into the survey I discovered the top two topics covered in high school personal finance courses were financial planning and investment strategies, each with over 100 students. Another question asked whether taking financial-related courses in high school helped the students improve their financial management behaviors. Only 4 students responded that taking a course did not help while the rest answered that taking these courses not only improved their knowledge, but their financial behavior as well. By analyzing these results, I discovered that the surveyed students believed that taking a financial course in high school definitely improved their knowledge and their financial behaviors.

Determining Gene Products Interacting with RtcB of the rsr-rtcBA RNA Repair Operon via a Synthetic Lethal Screen

Isabella Tondi Resta, CURO Research Assistant
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Infections caused by *Salmonella* are among the most common food-borne diseases in the United States, causing thousands of hospitalizations yearly. Due to the increasing resistance to most effective antimicrobials, new targets in *Salmonella* for antimicrobial development must be identified. Our laboratory has identified a potential target as a novel RNA repair complex that is hypothesized to comprise three proteins, Rsr, RtcA, and RtcB, and two Y RNAs. The complex is encoded in a single operon whose expression is controlled by the transcriptional activator, RtcR. Expression of the RNA repair operon is induced by treatment with the antimicrobial mitomycin C (MMC) and cell viability increases in the presence of MMC. In order to further characterize the function of the RNA repair genes, a genetic screen for synthetic lethal mutants on MMC was developed to identify other genes whose products interact or cooperate with the RNA repair complex. In this work, a *Salmonella* strain that was deleted for the RtcB gene, an RNA ligase, and contained an unstable plasmid encoding *rtcB* was used for transposon mutagenesis to identify other gene products that specifically interact with RtcB. Synthetic lethal mutants could only survive in the presence of MMC if they maintained the unstable plasmid expressing *rtcB*. The transposon insertion site was determined for all apparent synthetic lethal mutants, thereby identifying genes whose disruption causes a synthetic lethal phenotype in the absence of *rtcB*. The potential function of these genes in the proposed RNA repair system of *Salmonella* will be addressed.

Investigating the Phenotypic and Genetic Mechanisms of Root Architecture Traits in Cultivated Sunflower Seedlings under Drought Stress

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Approximately 70% of worldwide water is allocated for use in agriculture in the form of irrigation, thus loss of water is the greatest threat to crop productivity. With impending changes to the climate, droughts are predicted to increase in severity, intensity, and duration further limiting water availability for crop production. As such, the focus of this study centers on root architecture and a crop's ability to resist low water availability. First, we determined the natural phenotypic diversity in root architecture traits using cultivated sunflower *(Helianthus annuus L.)* as a model system. Cultivated sunflower seedlings from an association mapping population containing 272 lines were subjected to a well watered control and polyethylene glycol (PEG-6000) stress induced treatment. Root systems were dissected at 2 cm and analyzed using the imaging program, WinRHIZO v2, to determine various architecture traits in both the top and bottom portion. Results indicate significant root allocation differences between top and bottom, control and stressed, and the interaction indicative of a drought avoidance response. Second, we performed a genome wide association study (GWAS) to investigate the underlying genetic mechanisms of these root traits. GWAS analyses are still ongoing; however they should yield candidate genes and regions associated with these traits. This work will inform downstream molecular breeding approaches aimed at producing cultivated lines able to survive under low water availability.

Recycle or Landfill? Assessing the Efficacy of a Green-Themed Intervention

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Problem Statement: Recycling programs have increasingly paired bins labeled "landfill" and "mixed recycling" to encourage and facilitate recycling. This study explored the accuracy of recycle-or-landfill placement behavior and a mechanism for behavior change.
Methods: Data came from a series of "waste audits" conducted in freshman dorms at the University of Georgia during the 2015 Fall Semester. A first audit was conducted the week before an energy- and water-conservation competition (the "Green Cup Challenge"). Three "intervention" dorms targeted by the Challenge were included along with a comparable "control" dorm that was not. Additional waste audits were conducted after the Challenge concluded and repeated a month later. In each dorm, waste-audit materials were collected from two floors and catalogued, producing 24 total audits and 2,362 individual items. *Findings*: Overall, 80% of items in landfill bins and 59% of items in recycling bins were correctly placed. The two most common misplaced items were plastic film and plastic food wrappers (56% of each were misplaced as recyclable); the two most common correctly placed items were cardboard and plastic bottles (88% of each were correctly placed in recycle bins). Dorms targeted by the Challenge showed no increase in placement accuracy, a pattern also found at the control dorm. *Significance*: Incorrect placement of items contaminates mixed recycling streams, creating an added cost to processing facilities, thereby decreasing the overall value of recyclables. The intervention studied here failed to increase placement accuracy. A follow-up study is underway in an effort to identify an effective behavioral intervention.

Impact of Video Captions in Mobile News

Kendall Trammell
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Mobile devices are one of the leading ways in which media audiences are consuming news. The present study sought to examine the impact of the presence of video and video captions in mobile news on attention to the news content, recall of news content, and

attitudes toward the news content. In a single-variable, 3-level between-subjects design (text and image story, video without caption, video with captions), participants (*N*= 83) viewed an online news story on a smartphone while having their eye movements and fixations recorded by an eyetracker and scene camera. Participants were randomly assigned to one version of the news story. The stories and video contained information about the importance of primary debates during presidential elections. After viewing the story, participants completed a questionnaire containing dependent measures, including knowledge, attitudes, fluency and perceived credibility. Preliminary results show differences between story conditions on story recall and attitudes toward the story. Participants who viewed the video versions of the story received higher knowledge scores than participants who viewed the text story; there are no differences when it comes to fluency (ease of use) or perceived credibility. Visual attention results are still being analyzed from the eye-tracking data. These findings are important because there is little research on mobile news consumption. This data is useful to the journalism industry because it enables digital producers at media organizations to make more informed, effective decisions when presenting news stories to the public on mobile platforms, and, thus increasing its audience engagement.

Blackout, the New Binge: A Case Study on Underage Drinking Patterns at the University of Georgia

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From 2012-2015, the University of Georgia has made a consistent appearance on Princeton Review's annual list of Best Party Schools due to the collegiate underage drinking culture in Athens, Georgia. This paper explores the current underage drinking patterns at the University of Georgia by analyzing all publicly documented cases of underage drinking from the University of Georgia Police Department during the 2012-2015 timeframe. The research yields startling results. Data show that the eighteen-year-old and nineteen-year-old age categories require both UGAPD intervention and EMS treatment far more often than the 20-year-old age category. Across all age categories, the percentage of cases requiring EMS treatment has been increasing rapidly since Spring 2013. To test for a relationship, a linear regression was performed on the dataset with case number (time order) serving as the independent variable and blood alcohol concentration (BAC) levels as the dependent variable. The ANOVA table significance column value of .002 shows that BAC levels are, in fact, increasing over time. Underage students in 2015 are drinking to dangerously high levels of intoxication, surpassing the BAC levels known to originate from "binge" drinking, and instead, reaching levels that correlate with extreme intoxication, known by collegiates as "blackout" drunk. Therefore, there is evidence to show that when it comes to underage drinking patterns at the University of Georgia, "blackout" is the new "binge."

Testing for a Correlation between History of Shoulder Injury and Functional Movement Screen Score

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Studies have suggested that poor performance on a functional movement test contributes a 4.7 times greater increased risk of injury in athletes. However, it is unclear how a previous injury may affect functional movement test scores. Our objective was to determine if there is a significant relationship between history of shoulder injury and

Functional Movement Screen (FMS) score for shoulder mobility. Our participants were collegiate club rugby players **(**n=25; 13 female, 12 male; age=20.6±1.2years, height=172.2±9.0cm, weight=80.6±16.8kg). The athletes underwent a full FMS screening by a trained rater prior to a fall rugby season. Previous shoulder injury was defined as any self-reported or medically diagnosed injury or discomfort of the shoulder that affected sport participation. A point-biserial correlation test was used to determine the relationship between the presence of previous shoulder injury and FMS shoulder mobility score. No significant correlation between presence of previous shoulder injury and FMS score for both right (rpb=0.35, rpb2=0.12, p=0.08) and left (rpb= 0.03, rpb2= 0.001, p=0.90) shoulder mobility was found. There was no significant correlation between a previous shoulder injury and FMS shoulder mobility. Previous shoulder injury does not appear to be related to current FMS shoulder mobility score. Clinicians should be able to apply the shoulder mobility FMS test to athletes to interpret injury risk, regardless of previous injury.

The Use of Entertainment Education to Teach Nutrition Messages to Preschool Children: A Feasibility Study

Emily Tyus
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Twenty percent of US children are overweight or obese before they enter kindergarten. To address this problem, health intervention must begin in early childhood. An ideal location to deliver nutrition education is in childcare centers because of the amount of time spent in that environment. One way to promote healthy behavior to young children is to encourage higher intakes of fruit and vegetables. The purpose of this study was to examine the feasibility of using an entertainment education nutrition intervention (i.e. interactive performance lessons) to teach nutrition messages to young children. Researchers conducted a feasibility study at a childcare center in Athens, Georgia for children ages 3 to 5 (Teachers n=8 and Children n=37). The Freggie's Green Machine intervention included theater-based nutrition lessons and tastings for three fruits (blueberries, pears, and kiwi) and three vegetables (carrots, sweet potatoes, and broccoli). The program was conducted for 6 weeks with one new fruit or vegetable being introduced each week. Freggie (fruits + veggies), a fun character, promoted healthy choices with his Green Machine (fruit and veggie cart) by performing skits. Freggie's Friends, life-sized fruit and vegetable characters, accompanied Freggie to teach during performances. Changes in preschool children's willingness to try fruits and vegetables and preferences were measured. Results showed improvements in preschool children's willingness to try fruit and vegetables. Teachers and parents reported high program satisfaction and that children related to the Freggie characters. Findings indicate that entertainment education is a feasible and promising way to teach nutrition messages to preschool children.

Feeding the Urban Stream: How Nutrients and Microbes Impact Stream Carbon Reserves

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Healthy streams and the ecosystem services they provide depend on energy to fuel the food web. Carbon (leaves and wood) from terrestrial landscapes is a vital source of energy for headwater streams where sunlight is limited. This carbon, along with colonizing microorganisms including bacteria and fungi, support stream life. Respiration (CO_2 loss) from microorganisms and associated mass loss rates of carbon deplete the amount of

carbon available for consumers. Streamwater nutrients and contaminants, which can both be elevated in urban streams, can stimulate or suppress microbial activity, respectively. We tested for these effects measuring respiration and breakdown rates on standardized carbon substrates in 9 streams in Athens-Clarke County, GA that differed in urban-derived inputs. Surface water nutrients, dissolved nitrogen (DIN), phosphorus (SRP), and conductivity (a surrogate for contaminant inputs) were measured and correlated to microbial respiration and breakdown rates. Streams with higher concentrations of phosphorus exhibited higher respiration and breakdown rates on carbon substrates, resulting in roughly doubling these rates across the 9 streams; no effects were due to either conductivity or DIN. These results suggest that phosphorus concentrations, which are typically elevated in urban streams, may impact the retention and transport of energy sources in streams.

The Role of Intraflagellar Transport in Ciliary Gliding

Rachel Vaizer
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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 known as ciliary gliding, and it is thought to be both ancient and conserved, even among human cells. Developing an understanding of the mechanism of ciliary gliding in Euglenid flagellates may help us understand this mechanism in other cells. This study is designed to examine the role intraflagellar transport (IFT) plays in ciliary gliding, specifically the location of the IFT particles. The IFT protein complex plays an important role in transporting materials needed for the maintenance or assembly of flagella. As the IFT particle travels to the tip of the flagellum along the axoneme, it carries these materials. As the IFT particle travels back to the cell body, it brings materials that have already been used by the flagella and are being recycled back to the cell. To determine if the position of IFT, relative to the axoneme and the substrate affects ciliary gliding, transmission electron microscopy (TEM) was used to visualize the locations of IFT particles in the cilium. Visualization of the IFT complex can help to determine the role IFT may play in ciliary gliding.

Localization of Casein Kinase 1.2 in *Trypanosoma brucei*

Haley Vale
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Trypanosoma brucei is a protozoan parasite responsible for human African trypanosomiasis (HAT). Drugs currently used to treat HAT are highly toxic and difficult to administer; new drugs must be developed. Casein kinase 1.2 (CK1.2) in *T. brucei* plays a vital role in cell division, particularly replication of the basal body (a microtubule-organizing center for flagella), and as such is an attractive candidate for lead drug discovery. In order to investigate possible mechanisms of regulation and gain a better understanding of how TbCK1.2 regulates basal body duplication, enzyme localization studies were performed using both genetic tagging methods and cell-penetrating peptides containing a fragment of TbCK1.2. Genetic tagging was performed endogenously through transfection of a construct containing the TbCK1.2 coding sequence as well as the coding sequence for an epitope tag. Cell-penetrating peptide TP10 was used as a delivery method for a C-terminal sequence of TbCK1.2 fused to a fluorophore. Gene tagging showed TbCK1.2 in cytoplasmic puncta, and partially at the basal body. Data will be presented on a test of the hypothesis that specific domains of TbCK1.2 are

responsible for targeting of the enzyme to the cytoplasm and/or basal bodies.

Green Power Solutions for Georgia
Ian Van Giesen, Haidi Al-Shabrawey
Prof. David Porinchu, Geography, Franklin College of Arts & Sciences

The purpose of this policy research is to delve into the fundamental legislation inhibiting Georgia's transformation from mainly fossil powered electric generation to mainly renewable energy generation. First we focus on why Georgia should adopt alternative energy from three different perspectives: environmental, health and economic. As well, we present an effective renewable energy policy alternative to Georgia's current legislation. As evidence, we examine various national and global initiatives designed to increase rate and scale of green energy adoption.

The Role of Cas1, Cas2, Csn2, and Cas9 in the Type II CRISPR-Cas Adaptation
Nikita Vantsev, CURO Honors Scholar
Dr. Michael Terns, Biochemistry & Molecular Biology, Franklin College of Arts & Sciences

CRISPR-Cas, prokaryotic adaptive immune systems, provide a significant advantage for bacteria and archaea in their defense against invaders such as plasmids and phages. The three-phase systems work by first integrating fragments of invader DNA into the CRISPR loci of the host genomes followed by synthesizing crRNAs from the incorporated fragments, and lastly, preforming crRNA guided silencing of invaders by Cas proteins. Genetic studies showed that in Type II CRISPR-Cas systems, proteins Cas1, Cas2, Csn2 and Cas9 are involved in adaptation. My project focuses on using biochemical approaches to understand the molecular mechanism in the initial spacer acquisition in Type II CRISPR-Cas systems We demonstrated that Cas1 performs a non-specific transesterfication reaction on the branched dsDNA We also identified complex formations of Cas1, Cas2, and Csn2. We aim to discover individual functions of these proteins and protein complexes.

Proteomic Profiling of a Model Species (Medaka Fish) to Study the Physiological Response to Chronic, Low Level Ionizing Radiation in the Environment
Jerin Varghese, Jason Moraczewski, Brittany Tummings
Dr. Carl Bergmann, Biochemistry & Molecular Biology, Franklin College of Arts & Sciences

Ionizing radiation (IR) is recognized to cause proteomic changes in various organisms. Most prominent studies performed in the field of proteomics primarily focus on the effect of radiation at acute, high doses. However, very little is known about the biological responses of organisms when exposed to chronic, low levels of ionizing radiation. This study seeks to answer the research question: What are the physiological responses associated with exposure to chronic, low- dose IR in the model species Medaka (*Oryzias latipes*)*?* The proteome of Medaka is analyzed to quantify any changes that have occurred due to exposure to low levels of IR. The first part of the project is aimed to standardize the methodology for protein extraction and protein fractionation using a control group and a high dose group. Medaka were first irradiated at the Savannah River Ecology Laboratory (SREL). Following irradiation, in-gel trypsin digestion and liquid-chromatography and mass spectrometry (LC-MS) techniques were used to identify the unique proteins found in the control and high dose group. A total of 1013 unique proteins were discovered between the control and high dose samples and are currently being characterized using bioinformatics tools.

Prevalence of Current Season Injuries in Collegiate Club Rugby Players with a Previous Injury History

Alyssa Varsalona
Dr. Cathleen Brown Crowell, Kinesiology, College of Education

Injuries are prominent among rugby players due to the contact nature of the sport, but it is unknown if individuals with a history of injuries are more susceptible to sustain subsequent injuries. The purpose of this prospective study was to determine if previous injury history increased the occurrence of current season injuries among collegiate club rugby players during a fall semester. Participants were evaluated for self-report previous injury history and Functional Movement Screen (FMS) scores. The data were obtained from 25 participants (13 female, 12 male; age=20.58±1.21yrs, height=172.19±8.95cm, weight=80.64±16.84kg). A point-biserial correlation was used to determine the relationship between the presence of previous injury history and the frequency of current season injuries. Of the 25 participants, 20 (80%) reported having at least one previous injury, while 5 (20%) reported having zero previous injuries. A moderate positive correlation was observed between previous injury history and current season injuries ($r=0.39$), bordering on significance ($p=0.054$). Previous injury history explains 15% of the variation in current season injuries ($r2=0.15$). Although the strength of this relationship appears to be moderate, it is likely influenced by a number of additional factors. Due to these confounding factors, we cannot conclude that a history of injury directly increases an athlete's chance of sustaining injuries in subsequent seasons. In the future, it would be beneficial to further examine what confounding factors exist and to what degree of influence.

DARC Expression in Triple-Negative Breast Cancer

Juhi Varshney
Dr. Melissa Davis, Genetics, Franklin College of Arts & Sciences

DARC (Duffy Antigen Receptor for Chemokines) is now primarily known for its role as a blood group antigen and is functionally recognized as an atypical chemokine receptor. DARC is associated with a host of inflammatory and angiogenic chemokines that are linked to cancer growth. The Duffy Null allele (Fy-) is one polymorphism that has long been associated with malarial resistance but was recently linked to altered regulation of DARC isoforms. The resulting Fy- phenotype exhibits the absence of DARC expression on red blood cells as well as distinct inflammatory responses. Over 98% of West Africans and 50-80% of African-Americans express this phenotype, compared to less than 1% of their European-American counterparts. Triple negative breast cancer is an exceptionally aggressive form of breast cancer that does not exhibit estrogen receptors, progesterone receptors, or HER2 receptors, making it a difficult cancer to target during treatment. It is well-documented that African and African-American women get triple-negative breast cancer at rates much higher than other women, and there is evidence that the DARC isoform variations may be linked to aggressive breast cancer. The objective of this research is to explore if and how the Fy- phenotype contributes to the rapid growth of triple negative breast cancer by examining the expression of differential DARC protein products in both triple-negative and healthy cell lines through Western blot. This study is ongoing, but it hopes to explain differences in triple-negative rates in women of different ancestry groups while providing insight into innovative treatment for the disease.

Abstracts

Computational Investigations of H2-HD Collisions in the Interstellar Medium

Clark Veazey
Dr. Phillip Stancil, Physics & Astronomy, Franklin College of Arts & Sciences

When we want to study the behavior of distant objects in the universe, we rely on measurements derived from astronomical observations. This is done by means of spectroscopy, as the only data available is in the form of radiation being transmitted to us from the source. Ideally, we can interpret this light, which is emitted by molecules throughout the interstellar medium, to understand the way that these molecules are behaving, which describes the temperature and therein the energy of the source. In order to interpret these observations, accurate dynamical information on interstellar molecules is needed. Most of the observable infrared radiation in the universe is emitted by excited molecules due to collisional processes in the interstellar gas, making accurate data on the rate of molecular collisions of salient interest to astronomical endeavors. Here, we evaluate the probability of H2 (Dihydrogen) and HD (Deuterium-Hydride) collisions as these species played important roles in star formation shortly after the Big Bang. We are interested in HD since it has a finite dipole moment and hence is a strong radiator, and H2 due its large abundance in the early Universe. Using a public-domain scattering package, cross-sections of H2-HD collisions are computed for a selection of rotational states over a range of relevant kinetic energies, then integrated to produce rate coefficient. We will also examine the critical density and cooling function associated with this process which will aid in studying non-equilibrium cooling/excitation and possible spectral signatures from the formation of the first stars.

Regulation of DARC Isoforms among Ancestry Groups and Associations with Aggressive Breast Cancer Subtypes

Kathryn Vollum, CURO Graduation Distinction
Dr. Melissa Davis, Genetics, Franklin College of Arts & Sciences

Despite the fact that White women are more often diagnosed with breast cancer, African-American women have more severe and deadly cases. Clues surrounding the tumor behavior in African-Americans point to physiological contexts and the immunological microenvironment of the cancer sites. We hypothesize that higher mortality rates coupled with lower incidence of breast cancer in this population suggests susceptibility is not necessarily a predisposition to cancer, but once a malignant cell forms, the individual's physiological make-up drives the aggression of tumors. We further hypothesize that chronic pro-inflammatory status and altered chemokine profiles in this population are key to tumor progression disparities. We are investigating the role of the ACKR1/DARC gene and its isoforms in influencing a woman's chance of developing aggressive breast cancer subtypes. We aim to demonstrate that altered expression of DARC isoforms plays a role in breast cancer severity by regulating the infiltration of specific immune cell types into the tumor environment by altering the levels of chemokines. We are investigating how the Duffy null allele, prevalent in all women of African descent, affects the ability of transcription factors to properly express ACKR1/DARC in epithelial and lymphoblast cells. Using bioinformatics and ChIP-PCR, we aim to define more precisely the transcription factors responsible for DARC isoform regulation. Currently, we are investigating the roles of GATA1 and GATA3. Once we know what transcription factors are involved with epithelial expression of DARC, we can develop tools to further investigate how

DARC plays a role in tumor progression in women of African descent.

Impact of Investment Bank Advisers on Merger Premiums and Merger Closing Times

Haris Vukotic
Dr. Jeff Netter, Banking & Finance, Terry College of Business

In an era of low growth, many companies turn to mergers and acquisitions as a way to scale up their operations by cutting synergistic costs and increasing revenues. This paper examines the impact of deals on the equity value of the acquired company and possible causes for this impact, also known as a merger premium. Data consists of company financial results, industry specifications, and investment bank advisors, among other deal-related metrics for mergers and acquisitions that have total values of over one billion dollars. I will test which variables drive a deal premium the most; for example, if companies within certain industries command higher premiums due to their growth prospects, or if a selected investment bank advisor results in higher or lower deal premiums, or quicker closing times, on average as compared to their competitor. The results of this study could be novel and interesting in that there is no available literature on which investment bank advisor delivers the best results for their clients in each sector; much of the business is driven by qualitative prestige factors. Preliminary data analysis indicates that certain banks are much more effective than others in demanding higher deal premiums in their sell side engagements and closing their deals in a shorter time frame within parallel industries.

Statistically Modelling the Determinants of Pathogen Transmissibility in Humans

Joseph Walker, CURO Research Assistant
Dr. John Drake, Odum School of Ecology

Every year, emerging infectious diseases enter the human population from external sources and cause outbreaks. After making the jump from its reservoir, a pathogen's impact is primarily a function of its ability to transmit between humans. The goal of my research is to investigate which pathogen traits are the most important determinants of transmissibility, quantify those relationships, and develop predictive models which can be applied to newly discovered pathogens. I have reviewed the literature and compiled a database of all known human viral and bacterial pathogens and associated biological and ecological variables. Machine learning is a field of computer science that concerns identifying complex patterns in data. I am now in the process of fitting boosted regression trees, one method for machine learning, to the data with the goal of developing models which can be used to predict and explain pathogen transmissibility. Preliminary results indicate that these models may be able to predict the transmissibility of viruses in humans with reasonably high accuracy. We've quantified the relationship between the biological and host variables of viruses and their transmission propensity in humans. While it is difficult to discern correlation and causation in these relationships, a framework for predicting the transmissibility of a virus would have immediate value for public health emergency preparedness. Our efforts to model the transmissibility of bacteria have been less successful. This wasn't wholly unexpected, as bacteria are orders of magnitude more complex than viruses and are generally less dependent on transmission for survival.

Large-Scale Plasmid DNA Purification for Gene Therapy of Hemophilia B in Dogs

Vincent Way, CURO Research Assistant
Dr. Dexi Liu, Pharmaceutical & Biomedical Sciences, College of Pharmacy

The objective of this study is to learn basic techniques for plasmid DNA purification and validate the method of cesium chloride gradient centrifugation for large-scale DNA preparation. The preparation of a large batch of pLIVE-cFIX plasmids containing the canine clotting factor IX gene was performed and the purified plasmids were used for gene therapy treatment of hemophilia B dogs, a research project focused on developing the optimal procedure for hydrodynamic gene therapy. E. coli containing pLIVE-cFIX plasmids was cultured using LB medium with ampicillin and incubated at 37°C with shaking. The bacterial cells were pelleted down by centrifugation and lysed by lysozymes containing lysis buffer to release the cytoplasmic contents. Cesium chloride gradient centrifugation procedure was used to isolate the plasmid DNA from the lysate. The extracted DNA yield achieved was approximately 20 mg from 4 liters of bacterial culture. Agarose gel electrophoresis along with restriction enzyme digestion was used to determine the purity of the plasmid DNA. Furthermore, spectrophotometric measurements of purified plasmid DNA were taken and show a ratio of 1.87. These results demonstrate that using cesium chloride gradient centrifugation is a highly effective method for large-scale plasmid purification.

Regulation of Ovarian Cancer by RGS10 and BIN1

Andrew Webster
Dr. Shelley Hooks, Pharmaceutical & Biomedical Sciences, College of Pharmacy

Ovarian cancer is the deadliest gynecological malignancy, and the poor prognosis of ovarian cancer patients is largely a result of the high incidence of chemoresistance in recurring tumors. Understanding and reversing the development of chemoresistance is critical to improving outcomes for ovarian cancer patients. Regulator of G-protein Signaling protein RGS10 has been shown to play a critical role in ovarian cancer cell survival and chemoresistance. Suppression of RGS10 enhances cell survival and promotes chemoresistance. Similarly, the nuclear protein BIN1 functions as a tumor suppressor in multiple cancers and has also been shown to play a key role in ovarian cancer chemoresistance. The pattern of BIN1 expression and function is strikingly similar to that of RGS10, but no functional link between the two proteins has been demonstrated. In the current study, we explore the possibility that BIN1 functionally interacts with RGS10 in an ovarian cancer cell model. Our data suggest that RGS10 and BIN1 may work together in a concerted mechanism to regulate ovarian cancer survival. We have demonstrated that siRNA mediated knock-down of BIN1 yields a near-complete reduction of RGS10, while overexpression of BIN1 yields increased RGS10 levels. Additionally, the ability of BIN1 overexpression to increase cancer cell sensitivity to chemotherapeutic drugs can be partially reversed by a subsequent knock-down of RGS10, indicating the effects of BIN1 and RGS10 on chemosensitivity are integrated. Better understanding role of RGS10 in mediating the effects of BIN1 can provide valuable insight into cancer progression and how to address the issue of chemoresistance.

Pathological Assessment of a Piglet Model of Traumatic Brain Injury Utilizing Non-Invasive Magnetic Resonance Imaging

Madelaine Wendzik
Dr. Franklin West, Animal & Dairy Science, College of Agricultural & Environmental Sciences

Traumatic brain injury (TBI) is a major cause of death and disability in the United States. Stem cell therapies offer a promising treatment for TBI by producing regenerative and anti-inflammatory growth factors while

also functioning as a cell replacement therapy. Animal models not truly representative of the human condition have impeded development of a translatable TBI treatment, suggesting a more human-like animal model, such as a piglet, is necessary for developing a successful cell therapy. Magnetic resonance imaging (MRI) is pertinent in the analysis and treatment of TBI, and combining multiple MR parameters provides a comprehensive understanding of TBI pathophysiology. We hypothesize that controlled cortical impact (CCI) TBI in piglets will result in substantial deficits at the lesion site that can be measured and quantified non-invasively through MRI. TBI was induced in six male piglets. After 24 hours post-TBI, T2 FLAIR was implemented to visualize the lesion. Midline shift, lesion size, brain swelling and edema will be measured from the T2 weighted coronal images. Analyzing the multiple MR parameters will illustrate the differences in the injury 1-day post TBI and 12-weeks post-TBI. A reduced midline shift, lesion size, brain swelling and edema are expected 12-weeks post-TBI as damaged tissue is removed and the brain undergoes global regeneration and remodeling. Development and characterization of key cytoarchitectural changes in the CCI TBI piglet model utilizing MRI in this study will enable more robust and predictive assessment of novel therapeutics and treatments that will likely lead to more success in human clinical trials.

Forensically Influential Beetle Fauna in the Spring

Garrison West, Markus Cleveland, Alan Bosworth, Alexandria Lushaj
Dr. Marianne Shockley, Entomology, College of Agricultural & Environmental Sciences

What beetle fauna colonize carrion in the spring, and which stage of decay is the best time to find each beetle family? Forensic entomology plays a crucial role in urban and criminal court cases. Insects can unlock the hidden truths of a story that investigators may not uncover otherwise. Sadly, there has not been much research done in the field of forensic entomology and that is why we want to conduct this experiment. For our experiment, we are going to be examining beetle fauna that colonize carrion during the spring. The point of this experiment is to follow up on comparable research that was implemented in the fall. The trial conducted in the fall was extremely successful and will be the guideline for this research. As previously mentioned, there has not been much exploration of forensically important fauna. The science we will uncover can help forensic investigators in estimating a post mortem interval in potential homicide cases. The start of the experimental method will be to obtain a pig killed by a single gunshot wound to the head. Next, the pig will be placed in a cage to protect it from scavengers. After the simulated crime scene is in place, pitfall traps will be stationed around the pig, and the beetle fauna from the traps will be collected and examined. The results will be correlated with the fall data and will be arranged in an orderly manner to give an accurate comparison. Using this comparison we will create our presentation for the symposium and attempt to publish a written work of the results.

Social Perceptions of the Impacts and Benefits of Non-Native Species in the Garden: The Case of Chinese Privet in the Southeastern U.S.

Lindsey White, CURO Research Assistant
Prof. Eric MacDonald, College of Environment & Design

This study explores social perceptions of the impacts and benefits of non-native species in garden settings, focusing specifically on gardeners' attitudes toward Chinese privet in the southeastern U.S. Robert Fortune introduced Chinese privet (*Ligustrum sinense*) to the United States from China in 1852. Since

then, the species has escaped cultivation. In much of the U.S. it is widely regarded as an invasive species, and now covers a cumulative land area of roughly 3.2 million acres. Homeowners, gardeners, and institutions that perpetuate the use of *Ligustrum sinense* on their property help facilitate the further spread of the species. To better understand the reasons why homeowners may choose to plant, maintain, or remove non-native species like privet, fourteen semi-structured interviews were conducted with amateur gardeners in Athens-Clarke County, Georgia. The interview transcripts were subjected to qualitative thematic content analysis, which identified key themes and categories of responses. The preliminary interview data suggest that gardening practices are influenced by family connections, aesthetics, therapeutic benefits, and intellectual curiosity. Based on these results, the study concludes with several further questions about how gardeners' perceptions of non-native, invasive species might be changed in the future.

Implications of Inherited Microbial Profile in Long-Term Metabolic Health

Brittany Whitlock
Dr. Claire de La Serre, Foods & Nutrition, College of Family & Consumer Sciences

An obesity epidemic currently plagues the US and other western nations, threatening the health of millions across the globe. Research efforts over the last decade have pointed towards gastrointestinal microflora as a potential cause of obesity and other metabolic disorders. The following study focuses on the inheritance of obesity from mother to child, and asks whether the inheritance of unhealthy GI microbiota could be the vehicle that increases offspring propensity towards metabolic disease. Six week old female C57BL/6 mice were fed either high-fat or low-fat (control) diets, then mated. Dams were fed their respective diets throughout pregnancy. All subsequent pups were fed low-fat diets after weaning. Pups were examined for gastrointestinal microflora composition and GI tract viability. Previous stages of this study demonstrated that 21 day old pups of mother mice fed on a high fat diet (HFD) displayed significant alterations in gut microbiota composition associated with impaired GI epithelial permeability. This microbial profile has previously been associated with obesity and could increase their propensity toward metabolic disorder later in life. This project specifically explores differences between microbes of 21 day old pups and 90 day old pups, evaluating what implications the comparisons have for microbial profile persistence into adulthood.

How Does Mutagenesis of N-Linked Glycosylation Sites of C6f1 Fragment affect MAb109 Binding?

Christopher Whitlock, CURO Research Assistant
Dr. J. Michael Pierce, Biochemistry & Molecular Biology, Franklin College of Arts & Sciences

CEACAM6 is a glycoprotein found attached to the cell membrane of pancreatic adenocarcinoma cells that shows promise for use as biomarker in early pancreatic cancer screening. The five-year survival rate for pancreatic cancer is extremely low, making it important to find a reliable method of detecting pancreatic cancer at its earliest and most treatable stages. MAb109 is a monoclonal IgG antibody that binds specifically to CEACAM6, and recognition of the epitope is likely N-linked glycosylation dependent. N-linked glycans are carbohydrate chains added to proteins at consensus amino acid sequences of asparagine-x-serine/threonine as post-translational modifications. In this study, nine specific N-linked glycosylation sites on CEACAM6 were analyzed through site-directed mutagenesis of C6f1, a plasmid containing the fragment of the CEACAM6 gene expressing

its MAb109 epitope. C6f1 plasmids were mutated in order to alter specific amino acid residues of each particular N-linked glycosylation site, thus preventing N-lined glycan attachment. One test was performed with single mutations at sites N309 and T311 in order to determine if the final N-linked glycan of the C6f1 sequence affects MAb109 recognition, and a second test used nine different serially mutated plasmids, each with one more mutation than the last, for all N-linked glycosylation sites on the plasmid to examine how the loss of multiple N-linked glycans affected MAb109 binding. This study found that MAb109 would not recognize the C6f1 product without the N-linked glycan at N309 and that mutations past the first four N-linked glycosylation sites prevented the protein from being secreted by the cell.

Fracking Governance and Resistance in Western North Carolina

Elizabeth Wilkes, Foundation Fellow, CURO Research Assistant
Julia Connell
Dr. Jennifer Rice, Geography, Franklin College of Arts & Sciences

Hydraulic fracturing (fracking) is largely unregulated at the federal level and is exempt from nearly all federal environmental laws, leaving individual states and localities to regulate the industry. This fragmented landscape of regulatory responsibility has resulted in limited spaces to contest whether or not fracking should be permitted. Our research attempts to determine the spaces and practices of opposition that are possible under neoliberal forms of fracking governance. Using theoretical insights on the nature of democracy, we examine an anti-fracking movement in western North Carolina, one of the only such movements in the United States to coalesce before drilling had started. We argue that contemporary forms of democracy under neoliberalism limit resistance and activism to what we call "micro sites" of contestation. These include: letters to the editors in local newspapers; landowner rights workshops on fracking; local government resolutions against fracking; and the Mining and Energy Commission (MEC) hearing on the rules that permit hydraulic fracturing. This research contributes literature on state theory and environmental governance by showing the ways in which resistance is focused into narrow spaces of dissent under neoliberal governance.

Optogenetic Control of a Neuromuscular Junction Model on a Chip

Elizabeth Wilkins, CURO Honors Scholar
Catherine Callaway
Dr. Steven Stice, Animal & Dairy Science, College of Agricultural & Environmental Sciences

Currently, more than 300,000 people in the United States live with spinal cord injuries (SCIs). Such damage to the central nervous system frequently results in paralysis, impairing a patient's ability to function independently. In one downstream effect of SCI, motor neurons, which control voluntary and involuntary movement, die and fail to properly synapse on muscles at neuromuscular junctions (NMJs). No treatment effectively reverses the damage of an SCI. Pluripotent stem cells (PSCs) are an attractive candidate for post-injury cell replacement therapy because they can differentiate into the three germ layers responsible for forming all adult tissue. Optogenetics, or light control of cells, provides a groundbreaking means to stimulate neurons without electrical or pharmacological agents. Microfluidics devices serve as a high throughput investigative tool to demonstrate the therapeutic potential of PSCs. These apparti provide an optimal setting to mimic three-dimensional microenvironments within the body previously limited to animal model investigations. In this study, we utilized a microfluidic approach to demonstrate

functional optogenetic neuronal control of NMJs. We differentiated a line of PSCs constitutively expressing the optogenetic protein channel rhodopsin-2 (ChR2) into optically excitable motor neurons within a 3D aggregate. We co-cultured these aggregates with muscle strips in the microfluidics device to form NMJs. Our NMJ-on-a-chip will serve as model for cell replacement therapy. The selective activation of specific muscle sets with optogenetic control could be used to retrain an SCI patient to walk again.

Love, Lust, and Loyalty: Female Sexuality in the Auchinleck Romances

Camily Williams
Dr. Cynthia Turner Camp, English, Franklin College of Arts & Sciences

The Auchinleck manuscript, a medieval book produced between 1330 and 1340, is notable for its large collection of romances in Middle English. Many of these stories depict coming of age and the proper socialization of men and women and would have been used to instruct and entertain members of the middle-class household. While the male protagonists serve as models of gendered behavior, the female heroines do not, often seducing or coercing men to have sex. Conduct literature aimed at young women from the same period explicitly condemns these behaviors; however, rather than being punished, the sexually forward romance heroines are rewarded for their actions in the form of greater freedom and power. Because this text likely served instructional purposes, I argue that these misbehaving women offer a different picture of female sexuality that may have been accessible to young laywomen. "Le Fresne" presents a particularly important conversion of these messages since she acts in ways that are both exemplary and non-exemplary by the standards of conduct literature. Comparing these romances to each other in the context of "Le Fresne" reveals a pattern of young women using their sexuality in order to secure their futures. Considering this pattern in conjunction with more conservative conduct literature exposes conflicting messages about female sexuality. These differences are important because they provide insight into the alternate messages young women may have received about their sexuality and their power.

New Challenges: ADHD Goes to College

Sarah Williams, CURO Research Assistant
Dr. James Coverdill, Sociology, Franklin College of Arts & Sciences

Problem Statement: This research explores the experiences and challenges of those who are first diagnosed with ADHD in college. Many studies have explored childhood ADHD; few have considered college ADHD. *Methods:* Fifteen University of Georgia students aged 18-25 (10 women and 5 men) were recruited through social media and interviewed face-to-face. Semi-structured interviews presented a common core of questions followed by prompts for elaboration. Questions fell into three categories: circumstances surrounding the diagnosis; treatment approaches; and ADHD experiences. All interviews were recorded with permission and transcribed verbatim. Analysis involved multiple readings of the interviews to identify main themes. *Findings:* Four main themes emerged in the interviews. First, the circumstances prompting a diagnosis often included substantially lower grades in college relative to high school. Second, symptoms were often experienced and recognized prior to college, but were not acted upon because they did not substantially interfere with academic or social activities. Third, upon coming to college, students felt inadequate compared to peers in study habits, social capabilities, and academic outcomes. Fourth, participants felt that widespread informal use of ADHD medication and the belief that ADHD is a "childhood disease" were stigmatizing. All findings are presented via representative quotations from the

interviews. *Significance:* The results begin to fill a research void by suggesting that the experiences and challenges of those diagnosed with ADHD in college differ from those for children. By understanding the unique challenges that accompany a college-age diagnosis, physicians can better prepare and counsel patients.

Comparison of Oconee and Ocmulgee River Basins for Water Management Improvement

Joshua Willis, CURO Research Assistant
Dr. Ernest Tollner, College of Engineering

With increasing population in Georgia, water demand and wastewater generation are dramatically increasing. This requires refining water management strategies in order to meet future demands and support economic development of the region. The Oconee and Ocmulgee Rivers are adjacent basins and major tributaries that join to form the Altamaha River. Our study examines the ecological effects of alternative water management practices in both the Oconee and Ocmulgee river basins. These rivers harbor high aquatic biodiversity, and protecting these species is of high priority for the region. Thus, we simulate alternative environmental flow regimes and examine trade-offs in water management between ecological impacts and economic development. We simulate unaltered and altered flow regimes using historical streamflow discharge data, which are then examined relative to local hydraulic conditions and aquatic habitat needs. In order to model hydraulics of the river, we use the Hydrologic Engineering Center's River Analysis System (HEC-RAS) developed by the US Army Corps of Engineers. We also use the Hydrologic Engineering Center's Ecosystem Function Model (HEC-EFM) to link hydrologic management with ecological outcomes using fish Habitat Suitability Index (HSI) models. We analyze and evaluate various flow regimes and their environmental impact in order to provide insights into hydrologic similarities and differences when comparing the two river basins. This type of study informs development of environmental flow regulations in the Oconee and Ocmulgee river basins and contributes to the improvement of local water management and planning.

Learning beyond the Lines

Kalyn Wilson, CURO Research Assistant
Dr. Cheryl Hollifield, Grady College of Journalism & Mass Communication

In 2014, a series of police shootings of African American citizens led to widespread civil unrest across the U.S. Research shows that there is a large and continuing gap between the perceptions of Black and White Americans on racial issues in America, and the differences are largest on questions of racism among police and in the justice system (Gallup, 2014). After the racial upheaval of the late 1960s, the Kerner Commission (1968) found that a significant factor in those events was the lack of diversity in U.S. newsrooms, which caused the media to ignore issues important to African American citizens. This study asks what factors in journalism education help prepare 21st century journalism students to understand and cover sensitive issues, including racial issues in society, and what impact a university's environment has on journalism students' career outlooks. The study uses a comparative survey design. The population is journalism majors at the University of Georgia and at Albany State University, an HBCU. The study uses a census of journalism majors in both universities. The researcher hypothesizes that both African American and non-African American journalism students attending the HBCU will be more aware of issues of discrimination because of race, religion and other demographic factors than will journalism students in a non-HBCU,

regardless of the respondent's race. The findings from this project may provide information that will enhance our ability to more effectively prepare journalists to handle socially important, yet sensitive topics in the field.

Copy-Cats: Aphra Behn's *The History of the Nun* and Its Adaptations

Sydney Wilson
Dr. Elizabeth Kraft, English, Franklin College of Arts & Sciences

In this paper, I examine Aphra Behn's *The History of the* Nun and the key changes made in each of Thomas Southerne and David Garrick's dramatic adaptations and analyze possible reasons for the popularity of Isabella's tale in each adaptation's political and socioeconomic time periods. I argue that the reason for Isabella's descent into desperate murder stems from concerns about legitimacy, the conflict of two inheritances during the Succession Crisis, and William of Orange and King George III's reigns as monarch in each successive version of the tale. I also argue that these adaptations' use of children and murder significantly transform the costs and benefits of Isabella's choices, put a knife in her hands, and increase her risk of being caught. Furthermore, I hypothesize that Behn's original story may have itself been an adaptation, drawing inspiration from the French tale of Martin Guerre, a legal case involving a peasant masquerading as war widow's husband back from the dead. In using Isabella as the anti-heroine, Behn, Southerne, and Garrick transform a story of a female victim into one of empowerment, even if Isabella's tale never quite ends well for her. In conclusion, this project, by closely examining one of Behn's less popular works and its adaptations, sheds light on the era's obsession with women and its inability to decide what should be done with a woman who manipulates her own fate both legally, emotionally, and most shockingly of all, with a simple needle or knife.

Theoretical Investigation of the Combustion Chemistry of Acetaldehyde and Ethenol

Alexander Winkles, CURO Research Assistant
Prof. Henry Schaefer, Chemistry, Franklin College of Arts & Sciences

For butanol to be considered a viable fuel source, an understanding of its combustion chemistry is imperative. Incomplete combustion of butanol produces ethenol and acetaldehyde, a known pollutant, which were studied using ab initio techniques at a high level of theory. The focal-point analysis method was utilized to examine hydrogen abstractions of both ethenol and acetaldehyde. Ground electronic state geometries for each species and their radicals were optimized using the "NASA Ames" atomic natural orbital (ANO) basis sets and coupled-cluster theory up to perturbative triple excitations [CCSD(T)/ANO2]. Single-point energies were extrapolated to the complete basis set limit using Dunning's correlation-consistent basis sets and coupled-cluster theory up to full triples with perturbative quadruple excitations [CCSDT(Q)]. Additional corrections for relativistic effects, the Born-Oppenheimer approximation, frozen core approximation, and zero-point vibrational energies were determined. Anharmonic frequencies were obtained at the CCSD(T)/ANO1 level of theory. Our findings will be available to the chemical community to aid in the construction of a more complete combustion model of butanol as well as to identify spectroscopically the molecules in question.

Soldiers of Fortune: The Incidence of Mercenary Usage in Civil Conflict

Rebekah Worick
Dr. Sara Kutchesfahani, International Affairs, School of Public & International Affairs

Mercenaries, soldiers who fight for profit rather than patriotism, are as old as warfare itself. Contrary to international norms discouraging their use, however, mercenary forces still remain the most efficient and reliable source of combat personnel in many civil conflicts. Oftentimes, though, countries engaged in similar states of civil war may vary drastically in their levels of mercenary participation, with some countries dependent upon mercenaries and others avoiding their use entirely. Thus, this research will seek to explain the reasons for uneven incidence of mercenaries in civil conflict by examining two case studies, Algeria and Sierra Leone. Both of these countries experienced civil wars during the same ten year period (1992-2002), but while Algeria abstained from recruitment of mercenaries, Sierra Leone utilized mercenaries heavily. To explain this phenomenon of civil warfare, this research compared potential sources of economic divergence between the two case studies, eventually concluding that the presence of alluvial diamonds in Sierra Leone contributed to the asymmetrical recruitment of mercenaries. This argument was validated by comparing mercenary recruitment rates between countries with and without alluvial diamond deposits. Countries with alluvial diamond deposits were indeed more likely to recruit mercenaries during civil conflict, with a rate of 75% mercenary participation, as opposed to the global average of 36.8% in countries without alluvial diamonds. The conclusions of this research are therefore important in predicting which countries are more susceptible to mercenary involvement, and as such, these findings will help further understanding of mercenary incidence in wartime as a whole.

Divergent Selection in the Context of Source-Sink Dynamics

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Environmental conditions vary through time and across space, exposing natural populations to different abiotic and biotic regimes. In turn, divergent selection can favor specialization to contrasting environments, leading to the evolution of local adaptation. *Vaccinium elliotti,* a native species of blueberry, grows in two different habitats in the southeastern United States: drought-prone upland forests and flood-prone bottomland forests. Upland forests have dry nutrient-poor sandy soils, high light penetration into the understory, and increased susceptibility to drought. In contrast, bottomland forests that flood 1-2 times annually have nutrient-rich clay soils and dark understories. We hypothesized that natural selection in upland forests would favor traits that promote fitness under drought, including deep roots and high root: shoot ratios. In contrast, we expected selection to favor different trait values that promote flood tolerance in wetland populations. These particular populations of *Vaccinium elliotti* present an interesting case study because this species shows evidence of source-sink dynamics, with higher fitness in upland forests and asymmetric gene flow from upland into bottomland populations. In a source-sink demographic system, there is variation in habitat quality among patches. Gene flow from the source habitat allows the population in the sink to persist, despite less favorable conditions. This asymmetric gene flow could inhibit rates of divergence between the two populations, reducing the potential for bottomland (sink) populations to adapt to local conditions. To investigate patterns of selection in *Vaccinium elliotti* we conducted a greenhouse experiment simulating one of the primary ecological differences between the bottomland and upland habitats: long term flooding and drought. We found evidence for divergent selection favoring opposing trait values under different water stress treatments for several ecologically relevant traits. These findings suggest that local adaptation is possible even in populations experiencing

asymmetric gene flow from habitats with different selection pressures.

Wedding Apparel: A New Definition
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The legalization of same sex marriage directly impacts the wedding industry, specifically the cultural definition of what constitutes wedding apparel. Because the legal definition of marriage has recently changed, the traditional definition of wedding apparel is likely to change as well. Historically, wedding apparel has been reflecting traditional gender roles and accepted social norms. However, with the recent legislation, it has also become an important tool of self-identification within the LGBT community. While masculinity and femininity have become more fluid categories, this fact is not reflected in the sartorial options provided by the conventional wedding industry. To understand the issues at stake, I have conducted field research, analyzed blogs and scrutinized future trend reports. Based on the data I have collected, I hypothesize that there will be a significant change in the near future in terms of what is available for same-sex wedding apparel. My research has shown that while there is a considerable demand for alternative wedding apparel, the offering in the actual stores in the Atlanta area remains limited. Although the issue of gay marriage remains controversial, the discrepancy between supply and demand is still puzzling from a business perspective, considering that support for gay marriage among citizens has increased from 35% in 2001 to 55% in 2015. This major and rapid shift in social opinion will directly impact the apparel industry, which tries to stay ahead of popular social movements in order to make a profit. As a result of the legalization of gay marriage, the wedding market is growing and with it the definition of wedding apparel is also changing.

Severity of Cases Admitted into a Small Animal Hospital and the Phase of the Moon
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Dr. Erik Hofmeister, Small Animal Medicine & Surgery, College of Veterinary Medicine

A correlation between the phase of the moon and human/animal behavior has a long tradition. Previous studies have suggested an increase in the number of cases seen or admitted into small animal hospitals during a full moon. In contrast, other studies have shown no significant effect of the full moon. All previous studies have looked only at numbers of cases, not severity of cases. The purpose of this study was to determine if the severity of the cases admitted into a small animal hospital is associated with the phase of the full moon. All data were obtained from the University of Georgia Veterinary Teaching Hospital. Cases were admitted to the hospital between 2009 and 2014. A full moon was defined as the date of the actual full moon plus and minus one day. Variables collected included cost of treatment and duration of stay in the hospital. A total of 82,455 cases were analyzed with approximately 9,935 being on full moon dates. The cost of treatment was 17.9% higher on dates of the full moon versus dates of non-full moons ($p=0.21$), and the duration of hospitalization was 19.7% ($p=0.48$) higher on dates of the full moon versus dates of non-full moons. 100 cases were randomly chosen and are being classified as mild, moderate, or severe illness to compare with duration and cost of hospitalization to establish the utility of those measures as proxies for disease severity.

Prevalence of Pain in Dogs with Cancer
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Kayla Hargrove
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Pain affects 52-77 % of people affected by cancer. The incidence of pain in dogs with cancer is unknown. The purpose of this study was to determine the prevalence of pain in dogs with cancer. We hypothesized that, like humans, dogs experience high rates of clinically significant pain associated with cancer. Dogs presented to the University of Georgia Veterinary Teaching Hospital's oncology service were considered for inclusion. Dogs with interfering medical conditions and those who posed potential risk to the safety of evaluators were excluded. Client consent was obtained for each participant, in addition to a survey assessing their dog's appetite, temperament, activity level, and level of pain they appeared to be experiencing. Each dog was evaluated by one of two undergraduate researchers under the supervision of oncology staff. A physical exam was performed by one of the two evaluators, and patients were given a pain score rating from 0 to 5. Out of 50 patients currently in the study, 61% had a pain score of none, 18% scored mild, and 21% scored moderately. Based on these results, dogs have a lower prevalence of pain compared to that reported in humans.

Heritability of Tissue Glutathione Levels and Redox Status in Aged Mice

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The ubiquitous tripeptide glutathione (GSH) is a critical regulator of the cellular antioxidant defense system, and higher levels are associated with protection against disease-related deterioration. The ratio of GSH to its oxidized form, GSSG, also serves as an informative indicator of oxidative stress. We previously discovered that tissue GSH levels and GSH/GSSG are highly heritable in young mice, but it is unclear whether the genetic control of the GSH system changes over time. We predict that GSH heritability decreases later in life. To test this hypothesis, we employed high performance liquid chromatography (HPLC) to quantify GSH concentrations and GSH/GSSG in the kidneys, liver, pancreas, heart, striatum, and cerebral cortex obtained from a panel of genetically diverse inbred mouse strains. We calculated heritability of GSH levels and GSH/GSSG in the various disease-relevant tissues. The current study is the first to characterize the heritability of GSH in aged mammals. Our results will inform future studies of aging and its influence on redox dysfunction.

Blood Folate and Whole Blood Global DNA Methylation Response to Folic Acid Supplementation Dose during Pregnancy

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Folate is a water-soluble vitamin that is essential for DNA synthesis and epigenetic regulation. Pregnant women are recommended to take 400μg of folic acid (FA) daily for normal fetal development and most over-the counter prenatal vitamins contain 800μg of FA. In this double-blind randomized controlled study, we aimed to determine the effect of FA supplementation dose during gestation on folate status and global methylation in maternal and cord blood. Healthy young pregnant women were provided with 400μg FA/d (RFA; n=16) or 800μg FA/d (HFA; n=12) from their first prenatal visit (<12-weeks gestation) until delivery. Maternal blood at baseline and delivery and cord blood at delivery were collected to measure serum folate, RBC folate (microbiological assay) and global methylation (LC-MS/MS). At delivery, serum and RBC folate concentrations tended to be higher in

HFA compared to RFA in maternal (serum folate (nmol/L); 78.0±7.5 vs 67.9±6.1, RBC folate (nmol/L); 2424.0±304.6 vs. 2046.0±196.8 in HFA and RFA, respectively) and cord blood (serum folate (nmol/L); 98.5±5.1 vs 81.7±7.5, RBC folate (nmol/L); 2097.0±140.4 vs. 1691.0±155.1 in HFA and RFA, respectively), were not significantly different between groups ($p>0.05$). Interestingly, global methylation was higher in RFA than that in HFA in maternal and cord blood. Maternal serum ($p=0.036$, $r=0.285$) and RBC folate concentrations ($p=0.004$, $r=0.389$) correlated with global methylation, while folate status of cord blood was not correlated with global methylation. These data suggest that folate status may be associated with global DNA methylation status in pregnant women, but not in cord blood.

Cognition in the Crosshairs

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Many studies have been conducted on how weapons affect cognition. However, these effects have been studied in pockets of research, most notably in research on the Weapons Effect, the Weapon Focus Effect and the Race-Weapon Effect. This meta-analysis seeks to integrate this literature to examine the overall effect of weapons priming on cognition. With 67 samples contributing effect sizes, the meta-analysis finds that, relative to mundane objects, weapons attract attention and draw attention away from weapon-holders (or object-holders) and surroundings. People also recall more incorrect information when a weapon present but do not demonstrate a corresponding drop in confidence.

Poverty and Shame: Implications for Social Work

Theresa Young, CURO Research Assistant
Dr. Mary Caplan, School of Social Work

Poverty and shame are interwoven in a complex relationship that is time and place-specific, and can be considered as a co-constructed and mutually-reinforcing social and psychological phenomenon (Walker 2014). The experience of shame among people experiencing poverty is nearly universal (Chase and Bantebya-Kyomuhendo 2015), but is largely unrecognized by the general population, as well as by the practitioners working within that population. It is critical for human service professionals to have a working knowledge about the relationship of poverty and shame in order to best aid those experiencing poverty with appropriate demonstrations of empathy and provision of resources. The foundation for understanding poverty and shame has been laid in the work of Adam Smith (1776) and Amartya Sen (1999). This presentation provides results from a research study on the psychosocial results of poverty and shame. The authors employ a method known as a "scoping review" to answer the following question, "What is known about the relationship between poverty and shame?" A scoping review is similar to a systematic review in that it is a transparent, rigorous review of the literature, and uses systematic searching and evaluation criteria within multiple databases to produce findings that are useful for practitioners and policy makers (Arksey and O'Malley 2005). Unlike a systematic review, a scoping review analyzes variety of types of research, including quantitative, qualitative, and conceptual work. The results of this review will enable participants to understand the relationship between poverty and shame more deeply. From our findings, awareness will be raised regarding the external and situational causes of shame and the practice implementations for human service professionals.

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