THE UNIVERSITY OF GEORGIA
Center for Undergraduate Research Opportunities

CURO

2014
CURO SYMPOSIUM
PROGRAM & ABSTRACTS

CLASSIC CENTER • ATHENS, GEORGIA
MARCH 31 – APRIL 1

THE UNIVERSITY OF GEORGIA
CENTER FOR UNDERGRADUATE RESEARCH OPPORTUNITIES

2014

CURO

Symposium

Program and Abstracts

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The University of Georgia
Athens, GA 30602
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curo.uga.edu

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CURO

March 31, 2014

Dear Students, Faculty, and Guests,

Welcome to the 14th 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 2014 Symposium is the largest to date, with 258 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 2014 Symposium continues that commitment, featuring presenters from 50 departments in 13 colleges/schools. Thus, this two-day event displays UGA's broad and substantial support of research and the invaluable commitment of UGA's administration and faculty to mentoring and 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 2014 CURO Symposium

Ms. Jami Gilstrap	Administrative Associate, CURO
Mr. Steven Honea	Academic Advisor, Honors Program
Ms. Dorothé Otemann	Coordinator of External Affairs, Honors Program
Ms. Amanda Pruitt	Assistant to the Director, Honors Program
Ms. Chelsea Smith	Administrative Associate, External Affairs, Honors Program

Technology Equipment and Support for 2014 CURO Symposium

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

Reviewers for 2014 CURO Research Mentoring Awards

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

Reviewers for 2014 CURO Symposium Best Paper Awards

Mr. Ethan Boldt	Presidential Graduate Fellow, Department of Political Science
Mr. Benjamin Campbell	Presidential Graduate Fellow, College of Education
Dr. Sean Ingham	Department of Political Science
Mr. Douglas Merchant	Presidential Graduate Fellow, Department of Linguistics
Dr. Martin Rogers	Associate Director of CURO and Honors
Mr. Jerrett Warshaw	Presidential Graduate Fellow, Institute of Higher Education

Oral Session Conveners for 2014 CURO Symposium

Ms. Jessica Chappell	Odum School of Ecology
Ms. Laura Fletcher	Presidential Graduate Fellow, Department of Psychology
Ms. Sayonita Ghosh Hajra	Department of Mathematics
Ms. Arlana Henry	Department of Sociology
Ms. Linnea Ionno	Department of Public Administration and Policy
Ms. Michele Johnson	Academic Advisor, Honors Program
Mr. Adrian Klemme	Institute of Higher Education
Mr. Bill McDowell	Odum School of Ecology
Ms. Emily Myers	Administrative Associate, Foundation Fellowship Office, Honors Program
Ms. Kathleen Pieper	Presidential Graduate Fellow, Department of Genetics
Mr. Greg Rountree	Administrative Associate, Office of Recruitment, Honors Program
Ms. Elizabeth Sassler	Department of Public Administration and Policy

Schedule

Monday, March 31, 2014

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

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

Awards and Keynote Session **4:00-5:00 p.m.**
Athena Room E

Poster Session and Reception **5:00-6:00 p.m.**
Grand Hall South (downstairs – use escalator in lobby)

Tuesday, April 1, 2014

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

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

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

Oral Session VI **2:00-3:15 p.m.**
Athena Breakout Rooms A, B, C, D, G, H, I, J

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

CURO Research Mentoring Awards

The Office of the Senior Vice President for Academic Affairs and Provost and the Honors Program established the CURO Research Mentoring Awards, formerly the EURM awards, in 2001.

These awards recognize outstanding faculty who consistently engage undergraduate researchers through CURO Programming (courses, the symposium, summer fellows, JURO, theses, et al.) and enhance the learning experience of undergraduate researchers at the University of Georgia. Award recipients have provided superior research opportunities and mentoring and have collaborated with undergraduate researchers on publications and presentations at professional conferences.

Before 2014, awards were designated as "Early Career" and "Master Level" and were granted to corresponding faculty ranks.

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

CURO Research Mentoring Awards

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

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

CURO Research Mentoring Awards

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.

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

Each recipient is recognized at the Symposium's Award and Keynote Session, and each award carries $100 in financial support, generously provided by the UGA Alumni Association. Winners from the 2014 CURO Symposium are listed below.

Arts, Humanities and Media:

Greyson Clark	Power Dynamics in Georgia's Poultry Industry, 1950-1965

Life Sciences:

Katherine Hsieh	The Effect of a Patellar Tendon Strap on Knee Power during a Drop-Jump

Physical and Environmental Sciences:

Carmen Kraus	Density Dependent Regulation of Survival and Reproduction in Dogbane Beetles and Underlying Host-Plant Interactions

Public and International Affairs:

Anne Chen	Sex-Ratio Imbalances and Risky Behavior in College

Social Sciences:

Lindsay DeFrancesco	Students' Perceptions of the Police – An Analysis of Greek and Non-Greek Affiliated Students

Program: Monday, March, 31, 2014

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

Room A	**Julia Carpenter**	A Storyworld with Incalculable Authors: Defining, Finding and Committing Narrative in the World of Social Media
	Connor Hamm	The Digital Future – Investing and Investigating
	Noah Boswell	Marketing an Online Based Education Platform
Room B	**Stephanie Wilding**	The Expression of the Bile Acid Receptor TGR5 in Prostate Cancer Cells and its Role in Bile Acid-Induced Cell Death
	Anjali Kumar	Glycoproteomic Approaches for Pancreatic Cancer Biomarker Discovery
	Taylor Chishom	Polyadenylation in Stationary Phase *Escherichia coli:* Analysis of the Role of RNA Polymerase
Room C	**Carmen Kraus**	Density Dependent Regulation of Survival and Reproduction in Dogbane Beetles and Underlying Host-Plant Interactions
	Lara Mengak	Why is There an Alligator in My Pool? Assessing Potential Range Shifts with Sea Level Rise
	Chelsea Sexton	Parasite Selective-Pressure Alters Reproductive Strategy in *Littorina saxatilis*, an Intertidal Snail
Room D	**Leslie Stapley**	The Influence of Neuroticism, Openness, and Conscientiousness on Executive Functioning in Older Adults
	Kirstie Chu	Predicting Functional Independence with Impulsivity
	Savannah Boyd	What Predicts Willingness to Support a Partner's Smoking Cessation Attempt?

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

Room A	**Brian Underwood**	Against All Reason: Rousseau and the Counter-Enlightenment
	Ryan Slauer	The Lines are Drawn: Christian Apologies in Late Antiquity
	Joseph Hopkins	Norse Mythology in Modern Popular Culture: Sixty Interviews Conducted in Athens, Georgia and Copenhagen, Denmark during the Summer of 2013

Room B	**Lucas Wachsmuth**	Ectopic Endodermal Expression of Foxn1 in a Murine Model
	Francine Katz	The Role of tRNA Nucleotidyl Transferase in tRNA Processing in *Escherichia coli*
	Aparna Philip	Transferrin-Crosslinked Liposomes for Targeted Drug Delivery to *Trypanosoma brucei*
Room C	**Minhnguyen Cao**	Parenting Stress, Emotion Dysregulation, and Emotion Coaching as Predictors of Child Behavior Problems in the Context of SES and Race
	Charlotte Goldman, Amy Davis, Kelsie Flanigan	Parent and Child Perceptions of Health-Related Quality of Life and Psychological Functioning in Children with Tourette Syndrome
	Hania Bisat	Embodiment and Altruism
Room D	**Patrick Wheat**	The Justification for Ethnic War
	Anne Pellegrino, Jonah Driggers, Elijah Scott, Meili Swanson, Luke Thompson, Patrick Wheat	New Aid for Africa
	Melanie Kent	Nationalism vs. Global Jihad: Al-Qaeda and Precursors in Algeria, Somalia and Yemen

Awards and Keynote Session: 4:00-5:00 p.m.
Athena Room E

Welcome and Introductions	Dr. David S. Williams, Associate Provost and Director of Honors and CURO
Remarks	UGA President Jere W. Morehead
Introduction to Awards	Dr. Martin Rogers, Associate Director of CURO and Honors
CURO Research Mentoring Awards	Dr. David C. Lee, Vice President for Research
2014 Symposium Best Paper Awards	Dr. Laura Jolly, Vice President for Instruction

Program: Monday, March, 31, 2014

UGA Libraries' Research Awards	Ms. Elizabeth White, Librarian, UGA Libraries
Introduction of Keynote Speaker	Ms. Smitha Ganeshan, Foundation Fellow '14, Biology
Keynote Address	Dr. Phaedra Corso, Professor of Health Policy and Management, "Health Policy and the Promise of Research"
Closing Comments	Dr. David S. Williams, Associate Provost and Director of Honors and CURO

Poster Session: 5:00-6:00pm
Sponsored by the Office of the President
Grand Hall South (downstairs – use the escalator in the lobby)

Poster #1	**Justin Dumrongkulraksa**	Bridging the Gap: The History of British Science Examined through Literature
Poster #2	**Moriah Jackson**	*Mycoplasma gallisepticum* Infection and Shed in Commercial and Wild Turkeys
Poster #3	**Rachel Jude**	The Pathogenicity of *Mycoplasma gallopavonis* in Wild and Commercial Turkeys
Poster #4	**George Grant**	Impacts of Organic Soil Amendments on Micro-Nutrient and Carbon Sequestration under Natural Rainfall Conditions, 2010-2013
Poster #5	**Keelan Lawrence**	Wavefront Sensorless Adaptive Optics with Differential Interference Contrast Microscopy
Poster #6	**Billie Hardigree**	Viscosity-Dependent Behavior of Cyclopenta[b]naphthalene Fluorophores
Poster #7	**Victoria DeLeo**	Intron Loss in the ABCB1 Gene
Poster #8	**Rachel Rotz**	An Integrated Approach for Verification of Rapid Focused Recharge Zones in the Arabian Peninsula Using Thermal and VNIR Remote Sensing
Poster #9	**Adam Jones**	Stable Isotope and Crystallinity Variations in Kaolin Deposits of Georgia in Up Dip to Down Dip Occurrences
Poster #10	**Philippe Bauchau**	Clinoptilolite Formation in the Lower Floridan Aquifer
Poster #11	**Hayden Field**	Hemlock Embryo Rescue Project

Poster #12	**Carmen Kraus**	Density Dependent Regulation of Survival and Reproduction in Dogbane Beetles and Underlying Host-Plant Interactions
Poster #13	**Kyungmin Ko**	The Trade-Off between Mating and Fighting in *Nicrophorus vespilloides*
Poster #14	**Lara Mengak**	Why is There an Alligator in My Pool? Assessing Potential Range Shifts with Sea Level Rise
Poster #15	**Timothy Montgomery**	Balancing Carbon and Phosphorus for Consumers: Does Nutrient Enrichment Tip the Scale?
Poster #16	**Blake Edwards**	Enzymatic Assay of DHPS Degradation in Abundant Marine Alphaproteobacteria
Poster #17	**Jasmin Melara**	Carbon Flux in the Amundsen Sea Polynya
Poster #18	**Dylan Goetz**	Data Analysis of Seawater Samples Collected Off the Coast of Barrow, Alaska
Poster #19	**Shannon Burns**	Riverwater and Seawater Dissolved Inorganic Carbon Endmembers for the Amazon River Plume
Poster #20	**Laurence Black**	Response of Microbial Nitrification and Denitrification to Redox Shifts in Beach Sand
Poster #21	**Amala Malladi**	Development of an In-Frame Deletion System for *Ruegeria pomeroyi*
Poster #22	**Laura Alexander**	Identification of a Novel O-Antigen and its Role in the Virulence of *Aeromonas hydrophila* Isolated from Diseased Catfish
Poster #23	**Anquilla Deleveaux**	Determining the Role of FhlA in Transcriptional Activation of Newly Identified RpoN Dependent Promoters
Poster #24	**Cameron Story**	Characterization of the *rsr-rtcBA* operon in *Salmonella typhimurium*
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Poster #27	**Babajide Oluwadare**	Analysis of P1 Function in *Mycoplasma pneumoniae* Adherence and Gliding
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Poster #30	**Breanna Crowell**	The Evolution and Tradeoffs of Physical and Chemical Leaf Defenses in *Helianthus*
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Poster #37	**Ishwarya Soundappan**	Genetic Analysis of the Role of *SMAX7* in Regulating Shoot Architecture
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Poster #85	**Swayamdipto Misra**	Generation of Transgenic Plants Carrying Promoter: Reporter-Gene Constructs to Investigate Transcriptional Expression of GAUT Genes in Arabidopsis
Poster #86	**Lisa Ishii**	Molecular and Functional Characterization of FUCOSYLTRANSFERASE 10 in *Arabidopsis thaliana*
Poster #87	**Korry Tauber**	Examining the Function of O-GlcNAc in Regulating Inter- and Intracellular Signaling Pathways during Drosophila Development

Poster #88	**Leah Caplan**	Pigmentation and Protein Glycosylation in the Drosophila Embryo
Poster #89	**Ramon Reddick**	Purification of Xyloglucan-Specific Endo-β-1, 4 - Glucanase after Expression in *Escherichia coli*
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Poster #93	**Natalie Taylor**	Differences in Children's Physical Fitness by Rural or Urban Location
Poster #94	**Tracy Phan**	Football Facemask Mass Influences Head Impact Location
Poster #95	**Brice Hsu**	Mitochondrial Up-Regulation after Moderate Exercise in Able-Bodied Individuals with Near-Infrared Spectroscopy
Poster #96	**Hannah Bossie, Miller Singleton**	Evaluation of Mitochondria on Persons with Mitochondrial Myopathies Using Near-Infrared Spectroscopy
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Poster #103	**Megan Ernst**	Addressing Inequality in Early Childhood Executive Function Development
Poster #104	**Brett McCardel, Breanna Ernst, Meghana R. Nathan, Victoria Smith**	The Effect of Order and Condition on Assessments of Executive Function
Poster #105	**Allison Fialkowski**	Single-Case Research Designs to Evaluate Social Behavior Development of Children with Autism Spectrum Disorders
Poster #106	**Amy Davis, Kelsie Flanigan**	Social Skills as Protective Factors against Poor Attitudes Towards Having Tourette Syndrome in Children
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Poster #117	**Aaron Conley**	The Politicization of Soccer and the Effects of the 2014 World Cup on Brazilian Politics
Poster #118	**Alexa DeAntonio**	Perceptions about Global Development
Poster #119	**Jessie Lian, Alex Ballasiotes**	The Emergence of Sustainability as the New Dominant Logic in Business

Program: Tuesday, April 1, 2014

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

Room A	**Richard Gardiner**	The Death of the Death Penalty
	Cecilia Moore, Holly Boggs	Analysis of International Media Coverage of Key North Korean Military Events
	James Barrow	Game Theory and Literature
Room B	**Amelia Watson**	Polio Eradication: What's Still Needed?
	Hannah Reiss	Neonatal Mortality in Uttar Pradesh, India and Possible Policy Solutions
	Smitha Ganeshan	Positive Psychology in Teen Mothers
	Max Tarica	Oxidative Stress within the Placenta during Malaria Infection
Room C	**Minh Ngoc Nguyen**	Metaphors of Color: The Linguistics of Internalized Racism
	McKinley Alden	Age and Formality in German Inalienable Possession Constructions
	Jonathan Dickens	Towards a Dynamical Model of Language Processing
	Ashleigh Starnes	The Linguistics of Artistic Language: Poetry, Complexity, and Mass-Market Novels
Room D	**Katherine Partrick**	Exploring the Variable Weaning Strategies of Female Rhesus Macaques through Stable Isotope Biochemistry
	Natalie Schwob	Vocal Repertoire of Red and Green Macaws
	Leigh Anna Young	Swath Size in Boa Vista's Bearded Capuchin Monkeys
	Thomas Johnston	Influence of Maternal Presence, Age, and Sex on Social Learning
Room G	**Anne Fernandes**	The Evolution of the Little Black Dress
	Lindsay Nation	The DIY Phenomenon: Why We "Do It Ourselves"
	Nancy Satola	Lesbian Dress: Recognizing and Being Recognized
	Devon Sprague	Native American Traditional Dress: Drawing the Line between Celebrating a Culture and Making a Mockery of It
Room H	**Hannah Bossie, Miller Singleton**	Evaluation of Mitochondria in Persons with Mitochondrial Myopathies Using Near-Infrared Spectroscopy

	Sudeepti Kuppa	The Dynamics of MglA in *Myxococcus xanthus* Motility Systems
	Kristen Farley	*Salmonella enterica* and *Escherichia coli* Can Exploit Diverse Pathways to Form Vitamin B1 in the Cell
	Megan Chesne	Applying CRISPR-Cas Interference for Genomic Manipulation in *Streptococcus thermophilus*
Room I	**Lindsay DeFrancesco**	Students' Perceptions of the Police – An Analysis of Greek and Non-Greek Affiliated Students
	Mitra Kumareswaran	A Tax-Deferred Trust: Reducing the Financial Burden of Families with Special Needs Children
	Walker Marlatt	A Change in the Winds: How the 'Dawgs Can Be Proud of More than Just Sports
Room J	**Giovanni Righi**	Addressing Droughts and Water Overuse in the Flint River
	Kirstie Hostetter	The Negative Side Effects of Organophosphate Pesticide Usage in Thailand
	Jasmin Melara	Carbon Flux in the Amundsen Sea Polynya

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

Room A	**Mallory Cox**	Ta-Tas or Not: The Needs of Female Breast Cancer Survivors Will Not Be Forgotten
	Lisa Ye Suh	Solution to Allworthy: The Magisterial Roles of Henry Fielding and Allworthy in *Tom Jones*
	Justin Dumrongkulraksa	Bridging the Gap: The History of British Science Examined through Literature
Room B	**Piyush Joshi**	Integrating of Human Neural Progenitor Cells into a Developing Chicken Embryo for a Toxicology Model
	Moriah Jackson	*Mycoplasma gallisepticum* Infection and Shed in Commercial and Wild Turkeys
	Julia McElreath	Arkansas Vaccine Virus Transmitted to SPF Chickens from Vaccinated Broilers Does Not Provide Protection from Challenge
	Hannah Reiss	Creating a Chimeric Chicken Resistant to Newcastle's Disease Virus

Room C	**Meili Swanson**	Improving Access to Screening for Post-Traumatic Stress Disorder in Operation Enduring Freedom and Operation Iraqi Freedom Veterans
	Karishma Sriram	Increasing Physical Education in American High Schools
	Christina Nguyen	Work-Sites with Physical Exercise Facilities and their Effect on Employee BMI and Waist Circumference
	Carver Goodhue	Applying International Strategies to Domestic Issues of Micronutrient Deficiency
Room D	**Pete Nkengasong**	Effects of Patellar Tendon Strapping on Lower-Extremity Kinematics
	Tyler Daugherty	On a Lack of Identifying Obstructive Sleep Apnea
	Jonathan Brown	Comparison of Peak Vertical Ground Reaction Forces between Individuals with Patellar Tendinopathy and Asymptomatic Individuals

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

Room A	**Sara Black**	And Justice for All: Scale, Solidarity, and Integrational Organizing in the Climate and Immigrant Justice Movements in Georgia
	Manisha Banga	A Mythological Chain of Oppression
	Kinsey Pebley	Issues in the Therapy Experience for the LGBT Community and Their Implications
	Tiffany Brown	The Importance of Local Grassroots Organizations in the Reshaping of Afro-Argentine Consciousness
Room B	**Emily Vermillion**	An Investigation of the Metabolic Changes Associated with Feeding a High-Fat/High-Sugar Diet in Swine
	Amanda Seamon	Incidence of Anesthesia-Related Fatality in Birds
	Elizabeth Wilkins	The Role of Notch Signaling in Astrocyte and Oligodendrocyte Derivation
	Kayla Hargrove	Necessity of Universal Pre-Operative Blood Work Testing in Healthy Dogs

Room C	**Shaun Kleber**	Decreasing Summer Learning Loss among Low-Income Students in Athens-Clarke County
	Shalin Jyotishi	The Executive Science Network: Variations between Public and Private Trustee Networks
	Megan Ernst	Addressing Inequality in Early Childhood Executive Function Development
	Paul Kirschenbauer	Closing the Income Gap – Education and Technology in the United States
Room D	**Mary Douthit**	Octopaminergic Gene Expression and Flexible Social Behavior in the Subsocial Burying Beetle *Nicrophorus vespilloides*
	Tuan Nguyen	Mitogen Activated Protein Kinase Flanking C-Terminal Tail: Structure and Function
	Matthew Hess	Nanoparticle-Delivered Therapeutics for African Trypanosomiasis
	Travis Williams	Fermentation of Cull Peaches Using a Pectinase Producing *Saccharomyces cerevisiae* Strain
Room G	**Megan Griffin**	Do Knee Straps Decrease Self-Reported Patellar Tendon Pain after Jump Landings?
	Katherine Hsieh	The Effect of a Patellar Tendon Strap on Knee Power during a Drop-Jump
	Edmund Afful	The Association between High Intensity Athletic Participation and Chronic Ankle Instability

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

Room A	**Patrick Wheat**	The Rationality of Peacekeeping
	Cody Knapp	Building a Record: Requesting Roll Call Votes under Changing Institutions
	Mitchell (Trey) Flynn	Modifying Appointments to the FISA Court
	Marco Roca	1970s Czechoslovakia: A Foundation for the Study of International Human Rights Law

Room B	**Amy Webster**	Breaking Mendel's Laws: How Abnormal Chromosome 10 Causes Meiotic Drive
	Jennifer Pallansch	Bioluminescent Color Shifts in North American Fireflies
	Emily Fawcett	Investigating Female Remating Rates in Wild *Drosophila neotestacea* and Their Association with Sex-Ratio Drive
	Philip Grayeski	Cell Cycle Gating of the Mammalian Sonic Hedgehog Signaling Pathway
Room C	**Aaron Conley**	The Politicization of Soccer and the Effects of the 2014 World Cup on Brazilian Politics
	Molly Malone	Job Training to Combat Poverty among Unemployed Coal Miners
	Thomas Oliver	Max Contracts: Savings or Reallocation?
Room D	**Jerica Bornstein**	Keeping Good Company: Creating Social Environments that Promote Goal Pursuit
	Joseph Coppiano	Individual Differences in Cognitive Control: Antisaccade Performance in Those with Schizophrenia and Low Cognitive Control
	Alan Gerlich	Neural Abnormalities in Ocular-Motor Inhibition in Schizophrenia, Bipolar Disorder, and First-Degree Relatives
Room G	**Anne Chen**	Sex-Ratio Imbalances and Risky Behavior in College
	Alexandra Edquist	Capital-Intensive Punishment: Reducing the High Costs of Federal Drug Incarceration
	Tiffany Toteno	Variables Affecting Attitudes toward Police
	Anthony Reyna	College Credit Experience and Financial Literacy
Room H	**Tiffany Washington**	Concussions from the Past Continue to Predict Present Symptomology Above and Beyond Mood Symptoms
	Victoria Moreira	EnVISIONeD: Examining VISion among Inpatients with Diabetes
	Brett McCardel	Neural Activation Changes Associated with Antisaccade Task Practice
Room I	**Isaiah Norris**	Hydrothermal Synthesis and Particle Size Study of Ancient Pigments

	Samuel Kennedy, Trenton Berding	Attacking the Fire and Fuel: Nano Formulation of Platin-A for Cancer and Associated Inflammation
	Joseph Sanchez	A Unique Mechanism in *Staphylococcus aureus* Ketopantoate Reductase
Room J	**Sheela Sheth**	Reducing Vitamin D Deficiency among Individuals Aged 50 and Older in Georgia
	Torre Lavelle	How to Tackle the Bike Share Helmet Problem
	Rahul Shah	Decreasing HIV Incidence in Russia through Needle & Syringe Programs

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

Room A	**Greyson Clark**	Power Dynamics in Georgia's Poultry Industry, 1950-1965
	Laura Nelson	"Please Excuse Me as I Am in Need:" Bondage and Freedom in Civil War-Era Athens
	Anthony Sadler	Lester Moody: A Man, a River, and a Quest for Industry in the Twentieth Century South
	Seth Euster	Uncovering the Heritage of Slavery at the Shields Ethridge Farm: Memory, Identity, and Heritage Tourism
Room B	**Matthew Winn**	Interactions between Neutrophils and *Pseudomonas aeruginosa* Flagellum
	Raja Atchutuni	Distribution of Novel Genes in *Salmonella* Isolated from the Environment
	Kapil Chandora	Role of Mir-34a in Regulation of Macrophage M2 Phenotype
Room C	**Giovanni Righi**	Searching for Noise-Induced Phase Transitions in Ecological Systems
	Kelly Murray	Evidence for Indirect Effects of a Predatory Fish on the Size Distribution and Behavior of a Larval Caddisfly Species in Trinidadian Streams
	Mariana Satterly	Issues of Economic Efficiency in the Domestic Conservation Easement System
	Scott Saunders	A Mechanistic Explanation of How Regional Winter Climate Differences Influence Lyme Disease Distribution

Room D	**Anudeep Neelam**	ChuW as a Class C Radical SAM Methyl Transferase
	Allison Becker	Plasmonemes: A Novel Cell-Cell Interacting Structure in *Trypanosoma brucei*
	Allison Doyle	Measuring Brain Tissue Factor Levels in Malaria Infection
	Chris Slade	Genetic Assessment of the Role of TNF and its Receptors (RI and RII) in Placental Malaria Pathogenesis
Room G	**Julian Traas**	The Five-Fold Division: Shadow Personalities in Beckett's Three Novels
	Molly Dodd	Grace Kelly: Femininity in Film
	Hannah Klevesahl	Henry V: Legitimacy in Kingship and Film
	Chiara Tondi Resta	Reexamining a Little-Known Aphrodite Anadyomene Statue from Ancient Stabiae
Room H	**Scarlett Sumner**	Ecology and Genetic Characteristics of Haemogregarines in Fresh Water Turtles
	Shannon Burns	Riverwater and Seawater Dissolved Inorganic Carbon Endmembers for the Amazon River Plume
	Meg Babcock-Adams	Chemistry at Sea: An Expedition to the North Pacific to Analyze Deep Ocean Refractory Carbon (DORC)
Room I	**Fred Hohman**	3D Printing Techniques in Topology
	John Stroud	The Monkey Saddle
	David Flake	Membrane Electrode Assembly Preparation Utilizing Platinum Catalysts for Use in Polymer-Electrolyte-Membrane Fuel Cells
	Mehreen Sultana	Fabrication of Hinged Nano-Motors Utilizing Metal Assisted Chemical Etching, Nano-Sphere Lithography, and Physical Vapor Deposition
Room J	**Erin Hollander**	Increasing Nutrition through Genetically Modified Organisms
	Dayna Hardgrove	An Integrative Outlook on the State of Sustainable Development in Sarawak, Malaysia
	Kristyn Nock	*In Vitro* Protease Digestion and Reduction of Tropomyosin using Shrimp and Tropomyosin-Enriched Samples

Abstracts

The Association between High Intensity Athletic Participation and Chronic Ankle Instability

Edmund Afful
Dr. Cathleen Brown Crowell, Kinesiology, College of Education

Ankle sprains are a common athletic injury and may develop into Chronic Ankle Instability (CAI). CAI onset, determining factors, and relationship to sport participation remain unclear. The purpose of this study was to determine whether there was a relationship between participating in high intensity physical activity and CAI status. We hypothesized because of dynamic activity involved, there would a greater association of CAI in higher intensity sporting activities. In this retrospective review, recreationally active individuals' (90 female, 98 male, 21.0±2.9years, 173.3±9.6cm, 70.9±13.7kg) self-reported questionnaires quantifying ankle function were used to determine CAI status with appropriate cut-off values. Subjects also indicated the types of physical activities in which they participated. Activities that included jumping, cutting, and multiplanar motion (basketball, volleyball, field sports, etc.) were labeled as high-risk activities. Low-risk activities were those that did not require jumping, landing, and were uniplanar (walking, running, weightlifting etc.). A chi-square analysis was completed to assess the relationship between high-risk sporting activities and CAI status. There was a significant association (X^2=8.665 $p<0.01$) between those who participated in high-risk activities and the likelihood of having CAI. It appears those who participated in less demanding activities such as walking and lifting weights were less likely to report CAI, while those who did participate in high intensity activities were more likely to have CAI. High demand sports, with muliplanar movements and larger loading forces, may exacerbate symptoms of CAI. Future research should determine if specific sport participation is a risk factor for developing CAI.

Age and Formality in German Inalienable Possession Constructions

McKinley Alden
Dr. Vera Lee-Schoenfeld, Germanic & Slavic Studies, Franklin College of Arts & Sciences

In German, possessive constructions with inalienable prepositional phrase-embedded objects wield either an accusative- or dative-marked possessor. The construction in question is defined by the seemingly random interchangeability of the accusative and dative case, for example, "Das Mädchen kneift mich/mir in den Arm" ("The girl has me *Acc./Dat.* in the arm pinched," or, less literally, "The girl pinched me *Acc./Dat.* in the arm."). Recent studies show that formality tends to influence the case used in these constructions (Lee-Schoenfeld and Diewald 2013). This analysis posits that the preferred case is dependent on the age distribution of the speaker, specifically that younger speakers prefer the dative case to the more formal accusative case. The pilot data for this study was collected via survey, in which native speakers from Germany rated minimally paired sentences on a scale of *Very Inappropriate* to *Very Appropriate* for colloquial use. These results were then stratified by age of the participants in order to observe the relationship between this feature and the use of case. These ratings were imposed onto a numerical index, 1 for *Very Inappropriate* and 5 for *Very Appropriate*, and averages of the total responses of each stratum were taken. Within the aforementioned sentence pair, speakers 21 to 30 preferred the dative case, giving the accusative an average rating of only 3.5 (*Neutral*), whereas participants over age 61 gave the accusative an average rating of 4.67 (*Appropriate)* in the same sentences. This methodology has yielded results that will, when superimposed on preordained German case laws, generate valuable sociolinguistic

information on the relationship between age and formality.

Identification of a Novel O-Antigen and its Role in the Virulence of *Aeromonas hydrophila* Isolated from Diseased Catfish

Laura Alexander
Dr. Timothy Hoover, Microbiology, Franklin College of Arts & Sciences

Affecting primarily mature, market-sized catfish, *Aeromonas hydrophila* has caused the loss of millions of pounds of the largest product in America's aquaculture industry since 2009. This gram negative, rod-shaped bacterium causes septicemia in catfish, which is quickly followed by death. In an effort to characterize the virulence factors of *A. hydrophila,* genes suspected of playing a role in causing disease in catfish are being explored, such as those involved in the synthesis of O-antigen. In order to investigate its role in the virulence of *A. hydrophila,* a mutant lacking O-antigen ligase (Δ*waal*) was constructed and found to be avirulent in an aquarium model of infection using fingerling catfish. In order to further confirm this result and to determine how it allows the bacterium to infect catfish, the ligase (*waal)* gene was complemented in the mutant *in trans*, and visualized through SDS page analysis. Motility assays comparing the abilities of wild type, ligase mutant and ligase complement to swarm were conducted in order to both confirm complementation and determine if O-antigen affects motility in *A. hydrophila*. Upon discovery that the structure of *A. hydrophila* O-antigen is unique and possibly novel, we conducted a Multi-Locus Sequence Typing analysis using multiple housekeeping genes: *dnaJ*, *dnaX*, *recA*, *gyrB*, *rpoD*, and *gyrA* in an attempt to ascertain whether virulent strains of *Aeromonas hydrophila* may be classified as a novel subspecies. The results support the high degree of genomic homogeneity among virulent *A. hydrophila* strains and their tentative classification as a novel subspecies.

Effect of Folate on Lipid Accumulation and Proliferation in Human Primary Adipocytes

Courtney Alvis
Dr. Hea-Jin Park, Foods & Nutrition, College of Family & Consumer Sciences

Folate is an essential water-soluble vitamin that is involved in multiple cellular metabolisms including DNA synthesis and epigenetic regulation. Epidemiological studies report inverse associations between serum folate concentrations and body mass index; however the potential influence of changes in folate status on adipose cell development and metabolism has only been examined in animal models or a murine cell line, which is why this research is significant. The question of this study was to determine how folate influences differentiation and proliferation of human primary subcutaneous preadipocytes. Human primary preadipocytes, derived from subcutaneous adipose tissue of normal weight female donors (ZenBio Inc.), were exposed to 0.06, 6 or 60 uM folic acid (FA, oxidized form of folate; Sigma) and 5-methyltetrahydrofolate (MTHF, reduced form of folate; Merck). The impact of treatment on differentiation and proliferation were determined by AdipoRedTM Adipogenesis assay (Lonza) and CellTiter-Blue® Cell Viability assay (Promega), respectively. Results indicate that FA and MTHF decrease lipid accumulation in mature adipocytes after adjusting for cell number. Interestingly, MTHF, reduced form of folate, exhibited a greater inhibitory effect on lipid accumulation. Proliferation data suggest that FA had no effect on proliferation, while MTHF increased proliferation in a dose-dependent manner. Taken together, these results suggest that biologically active reduced forms of folate may have a greater effect on adipocyte proliferation and differentiation in human adipocytes. This study also supports preliminary findings in murine cell lines demonstrating the importance of maintaining

folate availability during adipose cell development.

Personal Distress and Response to Ambiguous Emotions

Ian Anderson
Dr. Brian Haas, Psychology, Franklin College of Arts & Sciences

Personal Distress (PD) is a tendency towards experiencing a high level of stress in response to intense emotional situations. Prior studies have shown that higher levels of PD are associated with higher social dysfunction, anxiety, and fearfulness. It is currently unknown, however, if PD is associated with the interpretation of ambiguous emotional stimuli and/or the speed at which people make emotion-based decisions. Based on prior studies, we predicted that higher PD scores would be associated with a negative emotional bias during the interpretation of ambiguous emotional stimuli. Furthermore, we predicted that higher PD scores would be associated with faster reaction times to negative emotional stimuli. To test these predictions, participants (N=59) performed a task in which brief movies of neutral faces morphed into emotional faces. Each participant was instructed to decide whether they believed the person in the image had just received either good or bad news. The three emotions presented were happy, fearful, and surprised. The results show that PD scores were positively correlated with a greater tendency to interpret surprised faces as negative ($r=.268$, $p=0.040$) as well as negatively correlated with fear response time ($r=-0.354$, $p=0.006$) and negatively correlated with reaction time when interpreting surprised faces as good ($r=-0.295$, $p=0.023$). These findings support the hypothesis that a higher PD score is associated with a negative emotional bias during the interpretation of ambiguous emotional situations and suggests that PD affects reaction time differently for negative and positive stimuli.

Distribution of Novel Genes in *Salmonella* Isolated from the Environment

Raja Atchutuni
Dr. John Maurer, Population Health, College of Veterinary Medicine

Salmonella is responsible for 1 million gastroenteritis cases in the United States each year. In the past, most illnesses were attributed to the consumption of fecally contaminated meat, milk, and eggs. However over the past 20 years, we have seen a significant increase in foodborne outbreaks linked to produce. Water is believed to be a potential source of *Salmonella* contamination in produce production. We have recently performed whole genome sequencing on a number of non-traditional *Salmonella* serovars, some of which have been isolated from the environment. We identified several unique mobile genetic elements, pilus, and metabolic genes. We screened environment *Salmonella* isolates by southern hybridization and PCR for the presence of several of these novel genes. We identified a large molecular weight, conjugative plasmid in *S*. Mikawasima, and found that this plasmid was widely disseminated among our environmental isolates. We also identified a pilus operon homologous to the *E. coli* common pilus that was also widely distributed in our isolates. However, we also found certain lysogenic phages that were limited to a handful of *Salmonella* isolates. From screening these different environmental isolates, we observed that the water isolates had a different pattern of genes present, compared to *Salmonella* that inhabit animal isolates. The variation in the distribution of genes in the water isolates from the animal isolates explains the adaptation of these particular *Salmonella* strains to the aquatic environment.

Abstracts

Chemistry at Sea: An Expedition to the North Pacific to Analyze Deep Ocean Refractory Carbon (DORC)
Meg Babcock-Adams, CURO Summer Fellow
Dr. William Miller, Marine Sciences, Franklin College of Arts & Sciences

In the summer of 2013, I participated in a 3-week oceanographic research cruise aboard the *RV Melville* in the North Pacific. There we collected water from 33 stations, from multiple depths, and ran onboard experiments. These experiments were designed to measure several different chemical components, all working towards obtaining a comprehensive picture of the deep ocean refractory carbon (DORC) pool and the role of marine photochemistry in its removal from the ocean. The amount of dissolved organic carbon (DOC) in the entire ocean, of which a large portion is DORC, is equal to that of carbon dioxide (CO2) in the atmosphere; therefore, interconversion between DOC and CO2 is essential to understanding air-sea carbon exchange and global carbon budgets. Fueled by solar energy, photochemistry converts DOC in the ocean to CO2 and CO, which can be released to the atmosphere. This is the central idea that my project was based on. While the entire Miller lab worked together in conducting experiments, I directed most of my time to measuring CO accumulation in seawater throughout long-term exposures in a solar simulator. Using experimentally determined ratios, CO can be related to CO2 and consequently, the total mass of carbon gases that may be released into the atmosphere as a direct result of marine photochemistry can be estimated. Shipboard results look promising and follow-up experiments are underway to interpret results for contribution to new calculations of the role of DORC and photochemistry in the global ocean carbon budget.

A Mythological Chain of Oppression
Manisha Banga
Dr. Benjamin Wolkow, Classics, Franklin College of Arts & Sciences

This research examines a chain of oppression that connects the ancient Greek mythological figures of Hades, Persephone, and Adonis—ancient characters who are seldom connected in modern retellings but whose stories are surprisingly intertwined. The focus of the research will be on the following: How does Hades' oppression and objectification of Persephone lead to Persephone's oppression and objectification of Adonis? Moreover, how can these stories be related? In order to examine these relationships, the researcher will reference both primary and secondary sources, including translations of the original myths and critical essays on the myths themselves. The research will involve a primarily analytical and literary examination of the archetypes that Persephone's relationships embody, as well as the application of these archetypes in the modern world. Additionally, the research will examine the descriptions of these characters in their original myths and will place these descriptions in conversation with each other in order to further explore the characters' interconnectedness. Ultimately, classical, literary, and feminist viewpoints on the myths will be considered in order to examine the myths in ways that have not yet been explored.

Game Theory and Literature
James Barrow
Prof. Michael Lynch, Political Science, School of Public & International Affairs

William Poundstone, writes "[g]ame theory is a study of conflict between thoughtful and potentially deceitful opponents" (Poundstone, 1993). One problem with game theory is that scientists typically examine an event of the past and attempt to explain why certain results emerged but they assume one thing: that all

actors acted rational. This is not always the case; in fact most people act irrationally. It is through literature that we observe how irrational people behave and the consequences that ensue. As Walter Wangerin Jr. wrote in *The Orphean Passages*, "[i]n order to comprehend the experience one is living in, he must by imagination and by intellect be lifted out of it. He must be given to see it whole; but since he can never wholly gaze upon his own life while he lives it, he gazes upon the lift that, in symbol, comprehends his own" (Dickerson & O'Hara, 35). It is only through literature and looking at an experience that was not our own, but one we can relate to, that we are truly able to study game theory. Therefore, the point of this research is to examine literature of the ages, from the Bible to Shakespeare to Jane Austin to J.K. Rowling, and observe the game theory that occurs between characters, not rational actors.

Light-Dependent Protein Degradation in *Plasmodium falciparum*

Kristen Bascombe
Dr. Vasant Muralidharan, Cellular Biology, Franklin College of Arts & Sciences

Malaria is a deadly parasitic disease, and there is widespread resistance against anti-malarial drugs. In order to develop new therapies, the biology of malaria parasites must be further understood. Gene knockdown methods used in other organisms are not effective in *Plasmodium* species. To study parasite biology we currently use drug-dependent degradation domains that require costly and toxic chemicals. Recently, light-dependent protein degradation has been reported in yeast. The purpose of this research is to develop an optogenetic tool for protein knockdown in *Plasmodium falciparum* to determine their roles in the parasite's biology. A preliminary *in vitro* assay for light-dependent protein degradation will be developed using purified proteins and *P. falciparum* lysates. If protein degradation is successful *in vitro*, *in vivo* experiments in *P. falciparum* will follow. Expression constructs for GFP, and GFP fusion proteins (GFP-Ddd and GFP-psd) were created using PCR, restriction enzyme digestion, and ligation into the pET28a vector. The resulting constructs were analyzed using diagnostic restriction digestion and DNA sequencing. The verified constructs were transformed into BL21 *E. coli* for protein production. Proteins purified from *E. coli* via HIS-tag affinity chromatography will be incubated with *P. falciparum* lysates under protein degradation and protein stabilization conditions. Protein degradation will be assessed via visual confirmation of green fluorescence and western blot with anti-GFP antibodies. This new tool for studying *P. falciparum* will help identify proteins necessary for blood stage infection and provide targets for new antimalarial drug development.

Clinoptilolite Formation in the Lower Floridan Aquifer

Philippe Bauchau
Dr. Paul Schroeder, Geology, Franklin College of Arts & Sciences

Clinoptilolite is a natural zeolite that most commonly forms in volcanic tuffs by devitrification (i.e., the transformation of amorphous glass to crystalline phases). A mineralogical study of the Miocene Lower Floridan Formation at Cockspur Island, Georgia by Ostrowicki (2012) reveals the unusual occurrence of clinoptilolite within a quartz-bearing limestone. This limestone hosted zeolite was examined by electron microprobe analysis and results indicate the clinoptilolite bears structural Na-K-Ca-Mg, giving it an average empirical formula of (NaK2MgCa1.5Al8Si30O72*24H2O). Thermodynamic modeling using Geochemist's Workbench® shows that a Na-clinoptilolite is more stable than Ca-clinoptilolite when inputting the present day pore water chemistry as reported by the U.S.

Geological Survey (Gonthier, 2012). When comparing the non zeolite-bearing Upper Floridan Formation pore water chemistry to the Lower Flordian pore waters, thermodynamic models favor the formation of Na-clinoptilolite in the Lower Floridan. The depositional environments were likely in a tropical marine setting, however when clinoptilolite is present, it suggests a higher silica activity, perhaps sourced from more basic waters and diatomaceous blooms. The question "when during diagenesis (early versus late) did clinoptilolite originate in the aquifer?" is still being considered. The occurrence of clinoptilolite is important because clinoptilolite acts as an ion exchanger for heavy metals and ammonia. The effect of clinoptilolite on formation factors used to evaluate aquifer storage potential is important, particularly as coastal communities in the SE United States look to manage fresh water sources.

Plasmonemes: A Novel Cell-Cell Interacting Structure in *Trypanosoma brucei*

Allison Becker
Anthony Szempruch, Graduate Research Assistant
Dr. Stephen Hajduk, Biochemistry & Molecular Biology, Franklin College of Arts & Sciences

Trypanosoma brucei is the causative agent of human African sleeping sickness and the cattle-wasting disease Nagana. During the mammalian infection the parasite is exposed to the host immune system. To subvert the adaptive immune response, trypanosomes express a single variant surface glycoprotein (VSG) that prevents antibody recognition of other cell surface components. The VSG can undergo antigenic variation allowing for immune evasion. It has been hypothesized that while in the blood stream cell-cell and cell-host interactions take place. Recent research has shown that trypanosomes produces exosomes, small lipid vesicles, possibly as a means of communication during stress. The production of exosomes is highly correlated with the presence of plasmonemes. These plasmonemes are easily observed by Differential Interference Contrast (DIC) microscopy and appear at the posterior end of the parasite. The posterior end is the location of the flagellar pocket, the only site of endocytosis and exocytosis in the cell. Our research determined physiologically relevant conditions that increase the formation of plasmonemes. The increased production of plasmonemes, mediated by biological stresses, appears to increase cell-cell interactions and may serve as another mechanism for cell communication.

Differential Expression of Genes Involved in the Insulin Growth Factor Pathway in Breast Cancer

Briana Bennett
Dr. Melissa Davis, Genetics, Franklin College of Arts & Sciences

Insulin Receptor Substrate 1 (IRS1) and Insulin-like Growth Factor Binding Protein 6 (IGFBP6) are key players in the Insulin Growth Factor (IGF) pathway, and their expression is often altered in breast cancer subtypes. IGFBP6 binds to both IGF1 and IGFII, normally with higher affinity to the latter. This interaction modulates the activity of the IGFs in the cell, and IGF1 modifies IRS1 via post-translational mechanisms. In order to determine if the levels of IGFBP6 and IRS1expression varies among normal breast epithelial cells and cancerous cells, we used qPCR to obtain quantitative transcript levels and immunofluorescence microscopy to verify the gene product levels. IGFBP6 is overexpressed in Basal-like breast cancer cells and underexpressed in ER+ cancer cells compared to normal cells. IRS1 has higher levels of expression in ER+ cancer cells compared to normal. Utilizing immunofluorescence microscopy, IGFBP6

shows higher levels of fluorescence in the Basal-like cancer cells and lower levels in the ER+ cells. The microscopy also revealed that IGFBP6 is localized to the cytoplasm and shows small areas of concentration where it is likely binding to its substrate(s). The images obtained of IRS1 show higher levels of fluorescence in ER+ cells, confirming its qPCR results. The differential expression of these genes may affect the properties of cancerous cells as the growth factor pathways are possibly linked to cancer subtype etiology. Further investigation into the expression levels of other genes in the insulin pathway will provide insight into how it could be a potential target for treatment.

The Creation of an Anticancer Prodrug – Combining Aspirin with Cisplatin

Trenton Berding
Prof. Shanta Dhar, Chemistry, Franklin College of Arts & Sciences

Cisplatin is a chemotherapeutic drug which targets the DNA of cancer cells causing apoptosis. Treatment with cisplatin commonly demonstrates severe adverse side effects related to inflammation, such as nephrotoxicity and ototoxicity. Creation of a prodrug, Platin-A, from the synthesis of aspirin and cisplatin, has been found to reduce the inflammatory complications and cytotoxic effects of treatment with cisplatin alone. These findings highlight the advantages of using a prodrug to decrease inflammation associated with the delivery of a chemotherapeutic agent.

Embodiment and Altruism

Hania Bisat, CURO Graduation Distinction
Dr. Leonard Martin, Psychology, Franklin College of Arts & Sciences

Embodied cognition is the idea that physical factors in a person's environment, whether the temperature, the surface a person is sitting on, or the position of certain items in a room, subconsciously affect how people perceive their surroundings, as well as how they respond to them. One of the most controversial studies on this topic is that of Williams and Bargh (2008), in which participants who were asked to hold a warm cup of coffee were more generous and more likely to see others in a positive light than those who were asked to hold a cold cup of coffee. We sought to replicate and extend this study. We gave participants various personality tests, asked them to hold a warm or cold cup of coffee, gave them Bargh's Impression Formation task, and noted if they volunteered to help the experimenter pick up a box of dropped pencils after the experiment was officially over. We hypothesized that those who held a warm drink would be more likely to rate the person in Bargh's computer task more warmly, and would also be more likely to help the experimenter. We also hypothesized that participants who labeled themselves as conservative would be more influenced by the temperature of the drink they held than liberals. If our results mirror those of Williams and Bargh, they will serve as further proof of the subconscious effects the environment has on a human's feelings, perception, and actions.

Response of Microbial Nitrification and Denitrification to Redox Shifts in Beach Sand

Laurence Black
Dr. Samantha Joye, Marine Sciences, Franklin College of Arts & Sciences

The concentration of atmospheric nitrous oxide (N2O), one of the most important greenhouse gases, has increased by 18% (270 to 320 ppb) since the industrial revolution. Human activity, such as agriculture, has increased the amount of fixed nitrogen entering the natural nitrogen cycle, in turn increasing microbial N2O production. Oxygen availability is a key driver of N2O production rates by nitrifying and denitrifying

microorganisms, and oxygen availability in beach sands may fluctuate in response to tidal oscillation. Here we test the hypothesis that N2O concentrations in these sands will increase following sudden changes in oxygen availability. Beach sand was collected from Cabretta Island, a barrier island on the Georgia coast. Sand was enriched with either nitrification (NTR) substrates (ammonium (NH4+)) or denitrification (DNF) substrates (nitrate (NO3-) and organic carbon) and incubated in bottles under oxic or anoxic conditions. After four days, some bottles were switched from oxic to anoxic conditions and vice versa while others remained unchanged. The concentration of nitrous oxide in the headspace of each bottle was measured before and after this switch using a gas chromatograph with an electron capture detector. The data generated suggest that microorganisms have a greater tendency to produce sudden spikes and depletions of N2O due to fluctuations in nutrient and oxygen availability. Tides drive this type of redox oscillation in beach sands, potentially making them an important source of N2O to the atmosphere.

And Justice for All: Scale, Solidarity, and Integrational Organizing in the Climate and Immigrant Justice Movements in Georgia

Sara Black, Foundation Fellow
Dr. Nik Heynen, Geography, Franklin College of Arts & Sciences

Georgia enters 2014 as a state with some of the most draconian anti-immigrant laws in the U.S. and two of the most carbon-intensive coal plants in the world. The immigrant justice and climate justice movements have active front lines in Georgia, peopled by local grassroots organizations navigating issues primarily framed at the state level, albeit rich with the context of national movement strategy. In the fall of 2012, student organizers from UGA Beyond Coal and the Undocumented Student Alliance at UGA coordinated a direct action tactic that offered not just statements of solidarity, but a unified message and underlying narrative justifying collaboration between immigrant and climate justice activists. This paper documents the continuing effort to deepen the relationships of solidarity and collaboration that were started with that action, and asserts that these collaborative spaces, which are not seen as strategically efficient, nevertheless create power in the form of relationships, knowledge, and narrative. Using a participant action research methodology, I have worked with local organizers to identify justifications and avenues for collaborations spanning a gradient of strategic value. In developing an underlying narrative that supports and invigorates collaborative action, local actors resisting primarily local ordinances offer frames rooted in the politics of scale which encompass and integrate the large-scale drivers of climate change and migration. Translating these frames into local action has the potential to challenge the whiteness of the climate movement and to tie more deeply the story of climate disruption to the story of economic disruption and vulnerability.

***Pax6* Expression in the Adult Sey and Wildtype Brain**

Caroline Blatcher
Dr. James Lauderdale, Cellular Biology, Franklin College of Arts & Sciences

Pax6, a member of the Pax family of transcription factors, is expressed in distinct regions of the central nervous system, specifically the eye, forebrain, hindbrain, and spinal cord. It is critical for development of the eye as well as development and patterning of the forebrain, including establishing dorsal-ventral boundaries, neuronal migration, and axon guidance. Aniridia is a human congenital condition characterized by a semidominant mutation in *Pax6*. Although well-studied for the eye phenotypes, relatively little is known

about the effects of the *Pax6* mutation on the forebrain. The mouse model for Aniridia, *Small eye (Sey),* also has a mutation in one copy of the gene, making it a good rodent model for understanding the human condition. To date, no studies have attempted to find out if there are any differences in the forebrains of *Sey* mice at the cellular level. The attempt of this study was to determine any potential differences in the structure and expression pattern in the brain of *Small eye* mice compared to wild-type. Structural analyses were performed by hematoxylin and eosin staining (H&E) on paraffin-prepared histological sections. Differences in protein expression were tested using immunohistochemistry, also on paraffin-prepared histological sections of the brain. Expression levels in adult brains were also measured at the level of mRNA by whole mount RNA *in-situ* hybridization. The differences found in this study could lead to understanding some of the non-eye-related symptoms experienced by people with Aniridia.

Keeping Good Company: Creating Social Environments that Promote Goal Pursuit

Jerica Bornstein
Dr. Michelle vanDellen, Psychology, Franklin College of Arts & Sciences

We examined how people look for goal support, namely how others' self-control affects how much time people wanted to spend with them. Specifically, we examined how individuals' own self-control affects their feelings towards people they perceive to be (a) high versus low in self-control or (b) helpful versus unhelpful. In Study 1, participants were randomly assigned to write about someone they recently met whom they judged to have either high or low self-control. Results indicated that participants with high self-control reported wanting to spend more time with people who also had high self-control relative to people who had poor self-control. In Study 2, students in a research statistics class were invited to take part in a survey about their feelings on the course. Students reported about a friend who was helpful in their goal pursuit and a friend who interfered with their goal pursuit. Results indicated that when high self-control participants were nervous before the first exam they wanted to spend more time with their friend who would help their goal pursuit and avoid the friend who would interfere with their goal pursuit. However, when high self-control students were not nervous before the first exam they did not show a preference between their helpful and interfering friend. Trait self-control predicts preferences to spend time with others who have high trait self-control, particularly when individuals feel like they need help with their goals pursuits.

Evaluation of Mitochondria in Persons with Mitochondrial Myopathies Using Near-Infrared Spectroscopy

Hannah Bossie, Miller Singleton
Dr. Kevin McCully, Kinesiology, College of Education

The aim of this study is to measure skeletal muscle mitochondrial function in individuals with mitochondrial myopathies (MITO) and compare these results to controls. These measurements will be made utilizing near-infrared spectroscopy (NIRS). The NIRS method has been used to assess mitochondrial function in individuals with various chronic conditions, including spinal cord injury, multiple sclerosis, cystic fibrosis, and heart failure. I hypothesize that patients with mitochondrial myopathies will have impaired mitochondrial function, and this will correlate with clinical symptom severity. The study will be performed in the Exercise Muscle Physiology Laboratory in the Kinesiology Department. I am collaborating with a clinical geneticist, Dr. Fran Kendall, who works specifically with mitochondrial myopathies. Participants with and without a genetically

confirmed diagnosis of mitochondrial myopathy (n=20 each) will be tested after we get IRB approval. Several recent review papers have highlighted the need for a noninvasive method that can monitor the treatment of people with mitochondrial myopathies, including one by Dr. Kendall. Because the NIRS test that we will use is noninvasive, and takes 30 minutes or less, NIRS has the potential to fill this important need. The NIRS test can serve as an important adjunct test for diagnosis of mitochondrial myopathies. It can also lead to future studies evaluating treatments for mitochondrial myopathies with various antioxidant supplements and or pharmacological interventions.

Marketing an Online Based Education Platform

Noah Boswell, CURO Honors Scholar
Dr. Piyush Kumar, Marketing, Terry College of Business

In today's world we are in the Wild West of free online education. While there are established websites such as Khan Academy and Coursera, they are not perfect and can certainly improve. It is important that these education platforms improve too, as the rising cost of college is making it increasingly harder for people to get the knowledge they need. Our goal with Faqulty.com is to attempt to make a website where people can be the student and the teacher for free. Our website will offer a way for people to aggregate information on a subject and structure it in a course-like manner for anyone to see. People will then be able to go to this website and be able to learn about a subject from the viewpoint of multiple people. Our directive is to now make sure that Faqulty.com is marketed well enough so that we can achieve these goals of improving the free online education space. If we can achieve this, this website will be a great tool and a valuable resource for everyone who accesses it.

What Predicts Willingness to Support a Partner's Smoking Cessation Attempt?

Savannah Boyd
Dr. Michelle vanDellen, Psychology, Franklin College of Arts & Sciences

People are constantly pursuing new goals, often with the expectation of support from their significant other. In this project, we focused on the goal of smoking cessation. Compared to individuals not partnered with another smoker, dual-smoker couples are less likely to both try to quit smoking and be successful. This issue prompted us to further examine factors that predict support during an individual's quit attempt. Participants were recruited via a crowdsourcing website and were screened to ensure they were in a relationship with a partner who smoked at least ten cigarettes per week. During the survey, participants answered questions about their demographics as well as their own smoking status. Then they completed the Partner Interaction Questionnaire, which measured the intended frequency of positive and negative support the participant would provide their partner if he or she attempted to quit smoking. Lastly, participants reported their own motivation to quit smoking. Analyses show that smokers are less willing than non-smokers to provide support. Among smokers, we found that self-directed beliefs (i.e., their own motivation to quit smoking) and partner-directed beliefs (i.e., worry about their partners' smoking) increased willingness to provide support. These data show there is a differential amount of support given by smokers versus non-smokers. Furthermore, beliefs about their own and their partners' smoking affect their willingness to provide support among smokers. We hope that this study clarifies the effect of smoking status on support while stimulating research to further examine the dynamics of dual-smoker couples.

Abstracts

Comparison of Peak Vertical Ground Reaction Forces between Individuals with Patellar Tendinopathy and Asymptomatic Individuals

Jonathan Brown
Dr. Cathleen Brown Crowell, Kinesiology, College of Education

Patellar tendinopathy (PT) is common in jumping sports, but mechanisms causing PT are unclear. Our purpose was to compare peak vertical ground reaction forces (VGRF) between individuals with symptomatic PT and healthy control participants during a jump landing. We hypothesized the PT group would display greater peak VGRF compared to healthy participants. Forty-four individuals completed this study; 23 had self-reported PT symptoms and a Victorian Institute of Sport Assessment-Patella (VISA-P) of <80 indicating decreased knee function (14 female, 9 male, age 21.6 ± 3.5years, height 174.2 ± 8.3cm, mass 70.8 ± 10.9kg, VISA-P 64.2 ± 8.5), while 21 were healthy with no history of knee joint pain (female 12, male 9, age 22.0 ± 3.4years, height 175.2 ± 10.6cm, mass 72.6 ± 12.6kg, VISA-P 100.0 ± 0.0). Participants performed 5 trials of two-legged drop jump landings followed immediately by a 50% maximum vertical jump on a force platform. The peak VGRF of the PT participants' affected limb and controls' matched limb were averaged over 3 trials. The average peak VGRF was normalized to body mass (BM). Independent samples *t*-tests ($p<.05$) identified differences between the two groups. The PT group had significantly ($p<.001$) lower scores on the VISA-P compared to the control group. PT peak VGRF (2.06 ± 0.41xBM) was lower than controls (2.30 ± 0.56xBM), but the difference was not statistically significant ($p=.11$). Peak VGRF may actually be decreased in PT compared to control participants. Peak VGRF may not be related to PT pain and decreased function at the knee.

The Importance of Local Grassroots Organizations in the Reshaping of Afro-Argentine Consciousness

Tiffany Brown, CURO Summer Fellow
Dr. Nicolás Lucero, Romance Languages, Franklin College of Arts & Sciences

In the 19th century, Afro-Argentines made up roughly 33% of the total population of Buenos Aires. Yet within the last century, the Afro-Argentine population has been decimated so thoroughly that many do not acknowledge their existence in Argentine society. The narrative of this group consequently has been silenced and few studies exist pertaining to it. In recent years, Argentina has experienced a resurgence in "orgullo negro" or black pride. Afro-Argentine groups like *Misibamba* and *AfricaVive* have dedicated themselves to promoting awareness and reconstructing the Afro-Argentine's role in Argentine history and society through cultural events and programs. The objective of this study is to document the role of grassroots organizations and local efforts in the reconstruction of the Afro-Argentine identity. The bulk of this research centered on interviews with individuals from grassroots organizations such as *Casa de Africa* and *AfricaVive*, as well as more informal interviews with white Argentine citizens. Although I am still synthesizing data from these interviews, the common thread that I found amongst these various groups is a concerted effort in promoting recognition of their daily lived experiences and hardships as they focus on educating both the government and the general populace of Argentina. This preliminary study serves to spread awareness about the importance of self-identity and local organization in the fight to redefine and reconstruct Afro-Argentine history.

Abstracts

Sphingolipid Metabolism and the Biological Clock in *Neurospora crassa*

John Brunson
Dr. Jonathan Arnold, Genetics, Franklin College of Arts & Sciences

The bread mold *Neurospora crassa* is a model organism that has been used for studies of the biological clock for decades. Clock function is generally conserved across many different species, and by studying the clock in a simple model like Neurospora, we can learn more about how our own biological clock functions. This area of research is growing in importance as humans take on more and more "alternative" sleep schedules and increase their exposure to sources of artificial light at odd hours. Disorders of the biological clock, such as Sundowner's Syndrome, are also reported to affect proper sleep cycles. What's more, proper knowledge of clock function may have implications for medicine, like knowing when to administer certain medicines. In this particular research effort, we look at the effects of ceramide synthase knock outs, namely *lag-1* and *lac-1*, on the clock in Neurospora. Mutants of the *bd* gene are used in conjunction with *lag-1* and *lac-1* knockouts in order to visualize the clock phenotype on race tubes. We also use cell counting methods to determine a chronological senescence phenotype for the double mutants, *lag-1KO bd* and *lac-1KO bd*. We find that both *lag-1KO bd* and *lac-1KO bd* display a unique "double banding" phenotype when run on racetubes, and that *lac-1KO bd* has a unique senescent phenotype different from *lag-1KO bd* when run through a cell counter over a 7-day experiment on minimal media. We aim to confirm the *lac-1KO bd* results using plasmid transformation with *lac-1* under a qa-inducible promoter.

Riverwater and Seawater Dissolved Inorganic Carbon Endmembers for the Amazon River Plume

Shannon Burns
Dr. Patricia Yager, Marine Sciences, Franklin College of Arts & Sciences

As the world's largest river, the Amazon River ecosystem significantly influences the global carbon cycle. Previous research identified the Amazon River Plume as a natural sink for atmospheric carbon dioxide (CO2). However, anthropogenic-driven changes to the tropical hydrologic cycle may alter the photosynthesis-respiration balance in the river's associated waters, impacting atmospheric CO2 concentrations and feedback to climate change. Here we improve calculations of the offshore sink's size using a mixing model between the river and offshore seawater. Key variables are the dissolved inorganic carbon (DIC) endmember concentrations at the river mouth and offshore, which are used to determine the ΔDIC attributed to biology (ΔDICbio). Without precedent, in July 2012 ANACONDAS expedition scientists collected measurements at the river's mouth using a CTD (Conductivity, Temperature, Depth) recorder/Niskin bottle rosette at eight stations and an uncontaminated surface seawater pumping system while underway. Salinity (S) and DIC were measured using a SOMMA (Single Operator Multi-parameter Metabolic Analyzer) system connected to a coulometer. From this data, seawater (s) and riverwater (r) DIC endmembers were identified as µmol C/kg () and µmol C/kg (), respectively. Mixing model results using these new endmembers suggest net heterotrophy nearshore (0-20ppt) and net autotrophy farther offshore (>20ppt), differing from previous studies that suggested either reduced net heterotrophy in the inner plume or sustained net autotrophy. We suspect that light limitation due to riverine sediments influences inner plume water biology. Further analysis of factors influencing the ΔDICbio

will better determine the plume's role as a carbon sink and anthropogenic activity sensitivity.

Purification and Characterization of APAP1-Like Proteoglycans from Rice Suspension Culture Media

Stanislav Bushik, CURO Summer Fellow
Dr. Debra Mohnen, Biochemistry & Molecular Biology, Franklin College of Arts & Sciences

Rice is one of the most commonly grown and cultivated plants in the world. It is primarily used as a food crop which is cheap to grow and yields high returns. The non-edible structures of the rice plant may also be used to produce biofuels. If the rice plant could be modified to decrease the recalcitrance of the biomass to deconstruction and simultaneously maintain good growth under standard or harsh environmental conditions, the result could be greater food stocks around the world and a source of biomass for the cost effective and efficient manufacture of biofuels. The objective of this research is to identify specific genes responsible for cell wall structures in the plant cell. If these genes could be modified to yield biomass with improved properties, the objectives described above could potentially be accomplished. These genes can be identified using a specific process that has been shown to identify novel proteoglycan structures in the plant cell. First, proteins, glycoproteins, and/or proteoglycans are purified from the rice suspension culture cell media using High Performance Liquid Chromatography (HPLC) and the proteins are sequenced using proteomics. Once sequenced, the genes that encode these glycoproteins are identified by examining the rice plant genome. The goal is to produce knock-down, knock-out, and over-expression rice plants that can be studied in regards to their cell wall, growth and development phenotypes, and their biomass feedstock potential. At this point, the sugar compositions of several selected samples were analyzed. Preliminary data suggest that these samples are, as expected, arabinogalactan proteins (AGPs). Two selected AGP fractions are xylosylated, possibly similar to the structure of arabinoxylan-pectin-arabinogalactan protein 1 (APAP1).

Parenting Stress, Emotion Dysregulation, and Emotion Coaching as Predictors of Child Behavior Problems in the Context of SES and Race

Minhnguyen Cao, CURO Graduation Distinction
Dr. Anne Shaffer, Psychology, Franklin College of Arts & Sciences

The goal of this study is to examine the relationship between parenting factors (stress, emotion dysregulation, and emotion coaching) and child psychopathology, while exploring socioeconomic status (SES) and race as moderators. This research is motivated by ongoing needs to identify family-level predictors of child behavior problems, while considering the importance of social contextual factors that may lead to individual variability in these relations. The following hypotheses were tested: 1) higher parenting stress, higher parental emotion dysregulation (ED), and lower levels of parental emotion coaching will predict greater child internalizing and externalizing problems, and 2) these relations will be moderated by socioeconomic status and race. The study used data obtained from a community-based sample of 34 families from racially and economically diverse backgrounds. Bivariate correlations indicated that parenting stress was significantly related to child internalizing (r=.43, p<.05) and externalizing behaviors (r=.56, p<.01). However, ED was not significantly related to internalizing (r=.26, p=.13) or externalizing (r=−.20, p=.25) behaviors. Similarly, coaching was not significantly related to either internalizing (r=−.01, p=.97) or externalizing (r=−.15,

p=.44) behaviors, although most relationships were in the predicted direction. Regressions were performed to test the last hypothesis with parenting stress and emotion dysregulation as predictors. Results indicated a significant interaction in one instance: at high levels of stress, African American mothers reported higher levels of externalizing problems than White mothers (β=.49, *p*<.05). These findings suggest the importance of considering demographic differences, although future studies would benefit from larger sample sizes to improve statistical power, as well as using multi-informant reports of child problems.

Pigmentation and Protein Glycosylation in the Drosophila Embryo

Leah Caplan
Dr. Michael Tiemeyer, Biochemistry & Molecular Biology, Franklin College of Arts & Sciences

Glycoprotein glycans are important for cell-cell interactions and intracellular communication, but very little is understood about the genetic and biochemical pathways that influence cell- and tissue-specific glycoprotein glycosylation. We have isolated mutations in the fruit fly, *Drosophila melanogaster*, that alter glycoprotein glycosylation in the embryonic nervous system. The phenotypes of two of these mutations (designated *sff* and *ms16*) are strongly affected by mutations in the *white* gene. In Drosophila, the *white* gene plays a role in eye pigmentation, but its absence (*w-*) is also accompanied by neurological and behavioral defects, suggesting that this pigmentation gene functions in other metabolic processes. Many other genes also affect eye pigmentation in Drosophila, including *cinnabar, brown, henna*, and *vermillion*. To determine whether the pigmentation pathway itself, or some undefined autonomous function of the white gene, is more important for the tissue-specific glycosylation defects that we have detected, we screened other pigmentation mutants for possible genetic interactions with *sff*, *ms16*, and *white*. We assessed neural-specific glycosylation in pigmentation mutants and in transheterozygous combinations of pigmentation and glycosylation mutants by staining with anti-HRP antibodies, which detect the production of a specific N-linked glycan epitope on neural glycoproteins. All 4 pigmentation mutants exhibited genetic interactions with the glycosylation mutants, indicating that multiple components of pigment production pathways impact glycoprotein glycosylation. Further experiments will define the specific molecular contribution of these pigmentation genes to Golgi processing of N-linked glycoprotein glycans.

A Storyworld with Incalculable Authors: Defining, Finding and Committing Narrative in the World of Social Media

Julia Carpenter
Dr. Elizabeth Davis, English, Franklin College of Arts & Sciences

New media theorist Lev Manovich once declared database and narrative "natural enemies." But tweet by tweet and story by story, he's being proven wrong. Tools like Storify, Scoop.it, and even Twitter's own "custom timeline" function enable users to curate, select, and order data into a narrative — effectively, to narrativize the database. A narrative built over Twitter, for example, is an instantaneous reconciliation of prior with emergent knowledge, and in building from a vast database, "author" and "narrator" roles disappear as "community member" roles become more important. These expanded powers of agency and disruption in temporality create a hallmark intimacy in social media narrative. In deciding what constitutes a story and what "counts as" a narrative, literary critics and social media story analysts can learn from journalists, who take vast amounts of data and synthesize it in a

way that's understandable (and palatable) to audiences. This presentation will examine several different social media feeds as narrative, the roles their creators and community members play in the story inception, and the tools that enable this kind of storytelling, thereby analyzing story creation from beginning to end. Such an examination further provides a method for measuring reader engagement within the database itself.

Role of Mir-34a in Regulation of Macrophage M2 Phenotype

Kapil Chandora
Dr. Donald Harn, Infectious Diseases, College of Veterinary Medicine

Inflammation plays an important role in providing protection against infection as well as in the development of metabolic and cardiovascular diseases. Uncontrolled inflammation is detrimental due to tissue damage and a shift in cellular metabolism and insulin sensitivity. Macrophages play important roles in regulation of inflammation as macrophage M1 or M2 phenotypes can promote or suppress inflammation respectively. M1 (classical activation) phenotype is driven by Th1/pro-inflammatory cytokines (IFNg, IL-12, TNFa) while Th2 or anti-inflammatory cytokines (IL-4, IL-13, IL-10) drive M2 (alternative) phenotype. M2 macrophages suppress inflammation, repair tissue damage, and improve insulin sensitivity. However, little is known regarding regulation of M2 macrophages *in-vivo*. In this regard, my project focused on investigating the role of microRNAs in controlling macrophage phenotype. Using various cellular biological techniques (flow cytomtery, qRT-PCR, reporter assays, western blots) we determined that mir-34a regulates macrophage M2 phenotype *via* targeting the IL-4Ra-STAT6 pathway. Specifically, macrophages transfected with mir-34a mimics failed to undergo M2 phenotypic change, associated with reduction in the expression of STAT6 transcription factor (M2 mediator), suggesting that mir-34a controls STAT6 expression to regulate M2 polarization. Further, we have bred heterezygous (mir34a+/-) male and female mice in order to obtain homozygous mir-34a deficient mice for *in-vivo* validation of our findings. Overall, findings from this study suggest that mir-34a is a potential candidate in developing therapeutic interventions against inflammatory diseases.

Proteomic Identification and Analysis of Potential Biomarkers for Pancreatic Adenocarcinoma

Joshua Chang, Foundation Fellow
Peng (Linda) Zhao, PhD
Dr. Lance Wells, Biochemistry & Molecular Biology, Franklin College of Arts & Sciences

Pancreatic adenocarcinoma is currently the fourth leading cause of cancer-related death in the United States even though it is not in the top 10 for diagnosed cancers. The lack of specific methods for its detection has kept five-year survival percentages particularly low; the identification of a pancreatic cancer biomarker would thus allow for its earlier diagnosis and an increased overall survival rate. As protein alterations are commonly observed in many cancers, proteomic analysis is often the starting point for such investigations. Pancreatic ductal fluid samples were collected from four patient groups – normal, intraductal papillary mucinous neoplasm, pancreatitis, and adenocarcinoma – and are being assessed for variations in proteins and glycans. While we have already detected preliminary changes in the proteome, we are currently optimizing proteomic methods and combining this with glycomic data being generated in the group. Also, we will be examining whether observed changes in protein expression can also be observed in serum of the same patients. If specific glycoproteins can be demonstrated to have

altered expression in precancerous and/or cancerous samples, a simple, non-invasive biomarker for pancreatic adenocarcinoma can then be readily produced and applied in clinical settings.

Sex-Ratio Imbalances and Risky Behavior in College

Anne Chen, CURO Summer Fellow
Dr. Christopher Cornwell, Economics, Terry College of Business

On today's college campuses, female students make up almost 60 percent of the undergraduate population. Once male dominated, in the past 50 years four-year universities have seen great transformations in their male to female ratio. In 1960, there were 160 male students for every 100 female students in college. By 1980, there were just as many women enrolled as men. By 2003, there were 135 female students for every 100 male students graduating from a four-year institution. My research focuses on the gender imbalance on college campuses and its effects on the dating market. I hypothesize that the gender imbalance shifts the power in relationship formation to men and encourages women to engage in riskier behaviors in an effort to secure and maintain a relationship. Using data on campus arrest records and enrollment, I examine the relationship between college sex ratios and prevalence of alcohol violations and sexual assaults. Preliminary results indicate that a shortage of men significantly increases the rate of both sexual assaults and aggravated assaults. The effect of the sex ratio on alcohol violations is imprecise. My research emphasizes how behaviors and attitudes shift in an increasingly female-dominated environment and how this may affect future policy in education, public health, and beyond.

***Saccharomyces cerevisiae* as a Model System of Aβ Peptides Using a Copper Resistance Reporter**

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

Alzheimer's disease (AD) is a progressive neurodegenerative disorder primarily characterized by a decline in cognitive function caused by the damage and death of neurons and the loss of synapses in the brain. AD affects millions worldwide and currently has no cure, method of prevention, or effective treatment. The mechanism of the disease is not fully understood, but beta-amyloid (Aβ) peptides, specifically Aβ 1-42, are highly implicated as a causative agent of AD, due to their neurotoxicity and strong association with the disease. Currently, Aβ peptides are primarily studied through transgenic mice and Alzheimer's patients. The principal objective of this research is to create a cost-effective and efficient model system for the expression and evaluation of Aβ peptides using yeast (*S cerevisiae*). Because Aβ peptides are not toxic to yeast, a copper resistance reporter will be used. Aβ peptides 1-19, 1-28, 1-40, and 1-42 will be attached to an enzyme (CUP1) that mediates resistance in yeast to high concentrations of copper. The presence of Aβ 1-19 fused to CUP1 does not significantly interfere with the activity of the enzyme, and it is hypothesized that the subsequent Aβ peptide and CUP1 fusions will behave similarly. The proper function of CUP1 will serve as a marker for the presence of the Aβ peptides. If successful, this model system can be used as a tool for future studies of Aβ peptides, potentially leading to greater understanding of the mechanism of AD and the development of effective treatments for the disease.

Abstracts

Applying CRISPR-Cas Interference for Genomic Manipulation in *Streptococcus thermophilus*

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

Prokaryotes have adapted a versatile immune system called the CRISPR (Clustered, Regularly Interspaced, Short Palindromic, Repeat) -Cas (CRISPR associated) system to defend against invading nucleic acids of viruses or plasmids. CRISPR loci are composed of identical short repeat DNA sequences separated by variable spacer sequences that are identical to those found in invaders. When a microorganism is attacked by a phage, the CRISPR system selectively incorporates a segment of the invading DNA into the CRISPR array. The foreign DNA is then used as a template to generate CRISPR RNAs (crRNAs), which guide Cas protein complexes to disrupt the original invading sequence (interference). CRISPR-Cas systems have been applied for editing genomes of a variety of organisms. Previous research of *Streptococcus pneumoniae* and *Escherichia coli* indicate that crRNA and interference machinery can be designed to select for specific mutations. To create deletions, targeting plasmids and linear PCR deletion templates are introduced into cells. By selecting for the targeting plasmids, survivors will have undergone recombination, creating chromosomal deletions. Specifically, Cas2 in the CRISPR system 3 (Cas2-3) of *Streptococcus thermophilus* will be deleted as a pilot study to verify the feasibility of this technology. An artificial CRISPR plasmid targeting Cas2-3 and a PCR deletion template have been created, and transformation procedures are being optimized. Expansion of CRISPR guided genome editing into *Streptococcus thermophilus* will establish an efficient genetic approach to study CRIPSR-Cas and other processes in this important bacterium.

Polyadenylation in Stationary Phase *Escherichia coli:* Analysis of the Role of RNA Polymerase

Taylor Chishom, CURO Honors Scholar
Dr. Sidney Kushner, Genetics, Franklin College of Arts & Sciences

During exponential growth there are two enzymes in *E. coli*, poly(A) polymerase I (PAP I) and polynucleotide phosphorylase (PNPase) that can post-transcriptionally add extensions to the 3' termini of messenger RNAs (mRNAs). PAP I adds tails, primarily after Rho-independent transcription terminators, that consist entirely of A residues. These tails can range in length from 1-60 nucleotides. In contrast, PNPase adds tails, which contain all four nucleotides, at very different locations within the mRNAs. These tails can be anywhere from 20-500 nucleotides long. Previous work has shown that if both PAP I and PNPase are inactivated there are no detectable post-transcriptionally added tails in exponentially growing cells. However, when these cells enter stationary phase, which occurs under conditions of nutrient starvation, long poly(A) reappear. Since the structural genes for both PAP I and PNPase were deleted in such a strain, efforts have been made to identify the enzyme responsible for adding the poly(A) tails in stationary phase. Recent work has suggested that RNA polymerase, the enzyme that normally synthesizes RNA in the cell, is responsible for most if not all of the poly(A) tails seen in stationary phase cells. The process by which RNA polymerase could be adding the poly(A) tails is called transcriptional slippage. We have recently obtained a mutant in the b subunit (*rpoB*) of RNA polymerase that exhibits increased transcriptional slippage in *in vitro* experiments. My project involves cloning the mutationally altered *rpoB* gene into a low copy number plasmid to use in the further analysis of stationary polyadenylation. Subsequently, I will attempt to isolate mutants of *rpoB* gene that yield reduced levels of transcriptional

slippage. The long-term goal is to determine the biological importance of stationary phase polyadenylation.

Predicting Functional Independence with Impulsivity

Kirstie Chu
Dr. L. Stephen Miller, Psychology, Franklin College of Arts & Sciences

Finding a more accurate way to track functional independence is critical for early intervention among individuals who may require assisted living. Previous studies have shown a link between inhibition and functional independence in older adults, suggesting that impulsivity may serve as a predictor of functional ability. The study evaluated this hypothesis in a sample of 65 community-dwelling older adults (65-85 years old). Functional independence was assessed using the Direct Assessment of Functional Status (DAFS) to measure instrumental activities of daily living (IADLs). Impulsivity, a multidimensional construct, was assessed using the UPPS Impulsive Behavior Scale (UPPS), a self-report inventory evaluating four distinct facets of impulsivity (Urgency, Lack of Premeditation, Sensation Seeking, and Lack of Perseverance), and the Delis-Kaplan Executive Function System (D-KEFS) Color-Word Test. More specifically, impulsivity was operationalized as facet and total score on the UPPS Impulsive Behavior score and as scores on the inhibition and the inhibition/switching condition, as well as the error rates of the conditions, of the D-KEFS. Multiple regression analyses revealed that the inhibition condition task on the D-KEFS was the strongest predictor of IADLs, though the switching condition and its error rates were also significantly strong. While total UPPS score was not found to significantly predict IADLs, all but one of the facets of the UPPS, Lack of Perseverance, were able to predict IADLs, despite the unexpected directionality of Sensation Seeking and Lack of Premeditation. These findings suggest that certain aspects of impulsivity hold potential as markers of older adults' capacity to live independently.

Power Dynamics in Georgia's Poultry Industry, 1950-1965

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The emergence of industrial-style poultry production, poultry agribusiness, between 1950 and 1965 in Georgia was a watershed period and encompassed a wide range of actors. Among the cast are government policy makers, government agents, national companies, individual farmers, agricultural specialists, technological innovators, and furnishing merchants. This project examines the relationships among these different actors with particular attention paid to the social power dynamics between government actors, small producers, and integrators. A significant portion of the historiography covering this period describes the economic establishment of the poultry industry as an agribusiness model. This project will build on the framework developed by studies of the development of the agribusiness model by focusing directly on the power dynamics between the actors within that emerging model, giving more attention to the relationships between different groups rather than retelling an account of the rise of agribusiness. To develop sound historical results, this project makes extensive use of primary source documents produced by government officials, businessmen, small producers, and others. The agribusiness poultry production which emerged in this period had ramifications beyond business model. The results of the study elaborate upon a generalized and often impersonal economic history, revealing sharp disparities of power and self-determination across different types of actors in the industrialization of poultry production. The

preponderance of evidence illustrates that small producers were disempowered and government actors were sidelined while integrators rose in prominence, concentrated decision-making power within their hands, and led the development of the new style of poultry production.

The Politicization of Soccer and the Effects of the 2014 World Cup on Brazilian Politics

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The summer of 2014 will be extremely significant in terms of political and social issues in Brazil. Those actions will focus on a range of topics including public health and education, high tax rates, corruption, multi-billion dollar projects for the World Cup and Olympics, and social injustice for the poor in the *favelas* in major cities such as Sao Paulo and Rio de Janeiro. The catalyst for all of this comes in the form of the 2014 World Cup, hosted by Brazil, and played out in twelve major cities around the country. This research analyzes the political revolts that occurred during the 2013 Confederations Cup through media reports and public opinion polling. The uprisings staged during the tournament set a precedent that is all but assured to be upheld at the 2014 World Cup. The immediate future of Brazil will be entirely determined by the events that will unfold this year. The way that the World Cup changes the political nature of Brazil will have major ramifications on the 2014 presidential election, the 2016 Rio Olympics, and ultimately determine if Brazil will become the global power that some believe that it is capable of becoming. Politics and soccer are being combined in ways that have not been seen before, and this unique mixture will unfold on the world stage this summer. Held in this balance of politics and sport are the future of a nation, a continent, and ultimately the world.

Individual Differences in Cognitive Control: Antisaccade Performance in Those with Schizophrenia and Low Cognitive Control

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Cognitive control is the ability to filter irrelevant information to make task-related responses. This can be measured with antisaccade tasks, where subjects fixate on a central target and are instructed to look at the mirror image location (opposite direction, same distance) when it jumps to the side. Performance is compared with prosaccade tasks, where subjects must look *toward* the target. Compared with healthy controls, those with schizophrenia (SZ) (a psychiatric disorder) make more errors and have slower reaction times (RTs) during antisaccades, but relatively preserved prosaccade performance, except for increases in express saccades (premature saccades made in 90-135ms). Neuroimaging studies based on these tasks using fMRI are abundant, but most compare SZ to those with high cognitive control (HCC), which could lead to discrepancies in brain activation due to differences in behavior rather than SZ-specific circuitry. We suggest using low cognitive control (LCC) individuals for comparison, given our hypothesis that their behavioral performance is more similar to SZ. Subjects (HCC=17, LCC=34, SZ=12) performed both pro- and anti-saccades while eyes were tracked and behavioral measures recorded. For antisaccades, the LCC group exhibited similar error rate and RTs as SZ, while HCC individuals exhibited lower error rate and faster RTs. Express saccades were more frequent in SZ and LCC than HCC. Results support our hypothesis that LCC individuals perform more similar behaviorally to SZ in

saccade tasks. This recruitment strategy is useful for neuroimaging studies, as it identifies a more comparable control group for SZ and may better inform fMRI study design.

Effect of Drying on Pulp Characteristics

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Incorporation of more nutraceuticals such as phytosterols into the average US diet can have a positive impact in the overall health of our country. One of the main issues in incorporating phytosterols into foods is that they are water insoluble and poorly-to-moderately soluble in vegetable oils. The microstructure and hydrophobic nature of citrus pulp (juice vesicles) allows for absorption of compounds that are water insoluble. In addition, citrus pulp is one of the by-products of the citrus juice industry with greatest market increase as it can be used to impart to beverages a mouth-feel and flavor that is perceived by consumers as "natural" and "fresh". Processing citrus pulp requires separation from the pulpy juice, pasteurization, and usually storage frozen. Pulp can also be dried. However, drying affects the microstructure of the pulp. We hypothesize that the method of drying impacts the oil-holding capacity of dried citrus pulp. The overall objective of this research project was to maximize the amount of oil that can be absorbed by citrus pulp, thus maximizing the amount of oil-soluble nutraceuticals that can be incorporated into a pulpy fruit beverage. Three drying methods were examined in this research project–drum drying, tray drying, and freeze drying–to determine the best way to process the pulp to maximize the amount of phytosterol-rich oils absorbed by the pulp. Our preliminary results indicate the drum dried pulp is able to absorb more oil compared to the freeze dried pulp. After three trials, I found that the drum dried pulp on average was able to absorb 24.49 % soybean oil (grams oil/ gram pulp) and the freeze dried pulp was able to absorb on average 19.66 % of oil.

Ta-Tas or Not: The Needs of Female Breast Cancer Survivors Will Not Be Forgotten

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After battling breast cancer, many women undergo a mastectomy procedure in which one or two of their breasts are removed to get rid of the cancerous tumor. After their operations, breast cancer survivors have difficulty finding clothing that fits their new body comfortably and allows them to feel "normal" again. Because of this, a niche market has developed to accommodate the physical changes female breast cancer survivors have endured. Several department stores and specialty boutiques are catering to breast cancer survivors by supplying garments that meet the specific needs of these consumers. *Nordstrom* has a prosthesis program offering post-mastectomy bras with pockets for the prosthesis, while specialty boutiques such as *Wear Ease* and the *Alloro Collection* offer garments such as post-surgical camisoles with fiber-filled breast forms to imitate real breasts, compression garments that help with swelling caused by lymphedema, and dolman sleeves that make it easy to put on and take off a garment. Through my research, I found that specialty garments significantly increase the quality of life of cancer survivors because they allow them to find a renewed sense of identity. The clothing items created for breast cancer survivors provide a number of functional benefits; they allow for comfort and ease. However, the positive psychological impact that these clothes have on female breast cancer survivors surpasses the functional benefits because they help them accept their

new body, complete the healing process, and get on with their lives.

The Evolution and Tradeoffs of Physical and Chemical Leaf Defenses in *Helianthus*

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Plant defenses are a result of adaptations to biotic and abiotic factors. Plant defenses can be either physical or chemical and act in a number of ways to prevent herbivory. Because organisms are ultimately limited by resource availability, plants have been seen to balance resource allocation to defenses, growth, reproduction, and other functions in response to their particular environment. These strategies vary across species and populations and are described by the concept of the worldwide leaf economics spectrum. In part, this concept hypothesizes that plants with short leaf lifespans and high leaf nutrient concentrations will invest less in defense while plants with long leaf lifespans and low leaf nutrient concentrations will invest more in defense. Studies have been done to investigate if tradeoffs between chemical and physical defenses and growth exist across multiple taxonomies and geographies. While no evidence was found for syndromes of defense or latitudinal gradients in defense across broad collections of plant families, it has been proposed that these tradeoffs could exist at lower levels of organization like the genus level. This study uses a phylogenetic comparative study of leaf defenses across wild sunflowers (the genus *Helianthus*) to investigate evolutionary tradeoffs between physical and chemical defenses, latitudinal gradients in defenses, and the relationship between leaf defenses and the leaf economics spectrum. Traits under study include trichome density, tannin activity, leaf lipid content, and leaf ash content. Preliminary trichome and tannin data has shown variance in levels of these defenses across 84 populations of 28 species across *Helianthus*.

Modeling the Biological Clock in *Neurospora crassa*

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The genome of *Neurospora crassa* contains several genes that create a closed loop network describing the function of the biological clock. The dynamic concentrations of the genes *white collar-1*, *white collar-2*, *frequency*, *vivid*, and *clock controlled genes* and their RNA and protein products in this network regulate cell growth. Several models of the clock have been suggested that include more interactions and differentiate between reactions of proteins that occur in the cytoplasm versus the nucleus. Using computer simulations and ensemble runs to test for fit to available data, the fit of each network is determined. The best network was identified and the effectiveness of other networks (previously published and otherwise) was compared. The network identified as having the best fit can now be used to gain insight into mechanisms underlying circadian rhythms in Neurospora, such as aging and metabolism, and the structure of genetic networks in general.

On a Lack of Identifying Obstructive Sleep Apnea

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Obstructive Sleep Apnea (OSA) is a disorder "in which the flow of air pauses or decreases during breathing" while an individual is asleep "because the airway has become narrowed, blocked, or floppy." It afflicts a large percentage of the adult population but is most associated with the obese. OSA's mistaken exclusive association with obesity leads to a

paucity of diagnosis—only 10% of those affected are diagnosed. Undiagnosed sleep apnea is a major risk factor for Alzheimer's disease, stroke, high blood pressure, hypertension, insomnia, diabetes, cardiovascular disease, and many others. It also doubles an individual's likelihood of being involved in an automotive accident. Recognizing that approximately 56.5 million people in the U.S., 18% of the population, are undiagnosed sleep apneics, a substantial portion of society has a considerably increased likelihood of being burdened with the personal health *and* monetary costs of contracting these disorders. Additionally, societal costs to under-diagnosing this disorder are manifold and include loss of productivity and increased healthcare costs. But, through the use of a national awareness campaign and health care procedural reform, the effects and even the presence of this detrimental affliction can be significantly reduced, improving the quality of life of a large section of the population.

The Effects of Centralization on Performance When Moderated by Diversity

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We were interested in using network analysis to study centralization's impact on performance when moderated by diversity. In order to explore such team dynamics, data was collected from the National Basketball Association. 800 total games played by 30 different teams were recorded from the website www.basketball-reference.com. Our diversity variable was the relationship between tenure (time with that particular team) and centrality of the team. We believe social identity theory will decrease any of the negative effects of diversity on performance because people will be associating less with their individual diversity and be focusing more on their identity as an organizational team. We hypothesize that centralization will have a significant impact on performance, specifically when moderated by diversity. Centralization measures were calculated by assembling matrices for each of the 800 games and calculating overall centralization, indegree centralization, and outdegree centralization using the assist link patterns. Finally, our dependent variable of team performance is measured by "true shooting percentage," a measure of shooting efficiency that takes into account field goals, 3-point field goals, and free throws. The main effect model results indicate a nonsignificant model fit ($F(1,798)= 1.589$, NS) and nonsignificant beta weights for Centralization as a predictor of Performance ($\beta= .045$, NS); thus, the main effect was not supported. The interaction effect was examined by comparing the R2 between the two models and testing whether the change in R2 value was significant. Results of the comparison indicate that $\Delta R2 = .011$, which was significant ($p<.05$). Further, beta weights for the interaction term ($\beta= -.024$, $p <.05$) were also significant. Thus, our interaction hypothesis was supported. Overall, our results provide support for the idea that diversity of tenure can moderate the effect of team centralization on team performance.

Social Skills as Protective Factors against Poor Attitudes towards Having Tourette Syndrome in Children

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Children with Tourette syndrome (TS) are more likely to have poor social relationships than healthy peers. Social skills deficits may be related to children's attitudes towards living with TS. The current study aimed to examine social skills as potential protective factors that may support better attitudes toward living with TS. This study is important because the

relationship between social skills and attitudes has not been investigated and may be a target of intervention to support better attitudes towards having TS. Participants included 28 parents and 32 children with TS who completed questionnaires before attending a camp for children with TS. Children reported attitudes regarding their diagnosis with TS on the Child Attitude Toward Illness Scale (CATIS). Child self-reports and parent-proxy reports were obtained from the Social Skills scale of a camp growth measure, which included the following subscales: Making Friends, Insecurity, and Peer Relationships. Bivariate correlations showed statistically significant relationships between the CATIS and child self-reports on the Social Skills subscales, with medium to large effect sizes. There was a statistically significant relationship between the CATIS and parent report on the Insecurity and Peer Relationships subscales with large effect sizes; the Making Friends subscale was not significant. Results indicated that higher social skills might be protective factors against developing poor attitudes toward living with TS. Social skills interventions could benefit this population by supporting social competence, and therefore improve children's adjustment to having TS.

Evolution of Flowering Time and Disc Color across the Genus *Helianthus*

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This research explores the effects of various environmental factors on flowering time evolution across the genus *Helianthus*, as well as the role flowering time and disc color might play as an evolutionary mechanism for sympatric speciation. Previous research in *Helianthus* has proposed two potential paths for the evolution of dark discs from light, and demonstrated a positive correlation between flowering time and latitude. Since this research, a second common garden including additional *Helianthus* species has generated a data set of multiple populations for 28 species. This has allowed for robust phylogenetic analysis of both flowering time and disc color evolution that will be used to test relationships between flowering time and temperature seasonality, frost and drought risk, soil fertility, and life history. Species and populations from more seasonal habitats and habitats with high risk of drought and frost are hypothesized to flower earlier, while species and populations from more fertile habitats are hypothesized to flower later. It is hypothesized that annuals will flower earlier than perennials due to the evolutionary risks involved in monocarpy. Furthermore, it is hypothesized that sympatric sister species will exhibit larger differences in flowering time than allopatric sister species, due to the process of reinforcement. This research expands our understanding of the ecological and evolutionary responses of flowering time, which will allow for improved prediction of species persistence and displacement under global climate change.

Perceptions about Global Development

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The conflict in the Democratic Republic of Congo is the deadliest conflict since World War II, and it is ongoing. Why, then, does the general public seem not to know or care much about this issue? This research analyzes the public's awareness, knowledge, and attitudes about the developing world, and the role that the media has (or has not) played in shaping these perceptions. A content analysis of online news articles assesses the coverage of the developing world with a focus on Africa and the Americas. Interviews will provide insight into individuals' knowledge and opinions about development in these regions.

The interviews will also be used to determine from where research participants receive their information and how their perceptions about development have been shaped. Thus far, results indicate that in the time frame analyzed, the media presents an ongoing theme of violence as it relates to the developing world, but news on development, itself, is extremely limited. Overall, the research will examine the differences between participants in levels of awareness, knowledge, and attitudes about global development and the developing world, and the reasons behind these differences, with a special focus on the sources of information and news coverage.

Students' Perceptions of the Police – An Analysis of Greek and Non-Greek Affiliated Students

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This study investigates students' perceptions of the police in college towns. A survey was taken of 214 University of Georgia students who answered a series of statements intended to reflect their attitudes towards police in the area. This study is unique in that it broke down the sample of responses between students who are members of the University's Greek system and students who are not. The analysis also measured alcohol consumption amongst respondents to determine if drinking habits were correlated with Greek and non-Greek students' attitudes towards the police. It was found that Greek perceptions of the police were overwhelmingly negative and also significantly worse than students who were not members of a Greek organization. Frequent drinking habits did not have an effect on Greek perceptions of the police but did have a negative effect on non-Greek members' attitudes towards the police in that weekly drinkers' perceptions were worse than monthly drinkers.

Intron Loss in the ABCB1 Gene

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The *ABCB1* gene encodes an auxin transporter protein, knockouts of which cause an economically important dwarfing phenotype. The gene shows remarkable intron number variance, particularly among the *Poaceae*, from the ancestral state of nine introns, found in dicots, to as few as two, found in rice and millet. The mechanism by which intron loss occurs is not well understood, so we sought to identify patterns of loss and characteristics of this particular gene that may explain the frequency of the intron loss. Previously, we acquired and aligned sequences for *ABCB1* homologs in plant species for which sequence data was available. For non-sequenced species, we designed primers near intron/ exon boundaries to amplify across introns and determine, based on fragment size, intron presence. Based on this data, introns 1, 2, 5, and 6 were lost independently in various lineages, and introns 1, 3, 4, 8, and 9 were lost together after the divergence of grasses. To validate the results of our PCR analyses, the entire *ABCB1* gene from representative species has been cloned into *E. coli* for sequencing. In addition to tracking intron loss events, we are investigating whether the most widely conserved intron, 7, was retained for functional reasons. We are transforming an *ABCB1*/*ABCB19* Arabidopsis mutant which lacks both *ABCB1* and its functionally redundant homolog *ABCB19* with a copy of *ABCB1* from which intron 7 has been removed to see whether and how phenotype restoration is affected. Finally, we compare *ABCB1* to other genes showing high frequencies of recurrent intron loss.

Abstracts

Determining the Role of FhlA in Transcriptional Activation of Newly Identified RpoN Dependent Promoters

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In our characterization of the RpoN regulon of *Salmonella* Typhimurium, 278 RpoN binding sites were identified. One of the sites is located in the 5' untranslated region of a hydrogenase two operon where it overlaps a RpoD promoter. When the RpoD promoter is activated, genes *hybC, hybB* and *hypO* are transcribed. With the activation of the RpoN promoter, its orientation is antisense of the RpoD promoter; therefore, it activates genes in the opposite direction while blocking the RpoD promoter from transcribing the *hypO* operon. Characterizing the RpoN regulon involves analyzing active bacterial enhancer binding proteins required to activate transcription at RpoN dependent promoters. A constitutive activator, DctD250, initially was used to activate the RpoN promoter; however, distinct bEBP's and environmental factors will be examined to investigate what cells use naturally to activate this promoter. A specific activator known as FhlA may serve as the activator to bind near this promoter to activate its genes. FhlA controls transcription of operons that include hydrogenase maturation genes, formate hydrogen lyase, and formate dehydrogenase which are similar to the hydrogenase operon. Our hypothesis is that FhlA will bind near the RpoN promoter in the presence of the right environmental stimulus. FhlA will be cloned into a high copy plasmid, pTrcHisC, which contains a His-tag for protein purification for the isolation of FhlA. DNA binding assays will test if protein FhlA will bind upstream of the promoter. This will be the first indicator of whether FhlA is the correct activator.

Mechanism of Mammalian Resistance to Trypanosome Lytic Factor

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African sleeping sickness is a vector-borne parasitic disease that is the result of infection by certain subspecies of African Trypanosomes. One subspecies, *Trypanosoma brucei brucei*, is non-lethal to humans due to the innate immune molecule Trypanosome Lytic Factor (TLF). TLF contains the apolipoproteins characteristic of HDL (Apolipoprotein A-1) but also contains two additional proteins unique to higher primates, haptoglobin related protein (Hpr) and apolipoprotein L-I (APOL1). Upon binding of free hemoglobin to Hpr, TLF is able to bind to an HpHb receptor expressed exclusively in trypanosomes. Once bound to the receptor, TLF is endocytosed and trafficked to the lysosome where it initiates lysosomal breakdown, resulting in cell lysis. After observing the interactions of TLF and African trypanosomes, we were led to question what mechanisms are in place to protect the mammalian system from the toxic effects of TLF. Here we confirm HEK resistance to TLF using concentrations of TLF thousands of times greater than that required to kills trypanosomes. Using imaging flow-cytometry, we found that TLF was indeed taken up by mammalian cells and localized to lysosomes. Contrary to trypanosomes however, the mechanism of uptake in mammalian cells is not dependent on hemoglobin. Additional studies to address the possibility that physiological concentrations of TLF-1 (around 10μg/ml) are simply insufficient to produce the phenotype found in *T. b. brucei* will be carried out. Once the mechanism of resistance is better understood, it is possible that certain cells, such as tumor cells, may be made susceptible to this natural toxin.

Abstracts

Towards a Dynamical Model of Language Processing

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A central assumption in contemporary linguistics is that language is a cognitive system, or a structured object seated in the brain that consists of rule-governed units. The result of this view has been the instantiation of grammar as a biological object in linguistic theory, and linguistics now faces the challenge of being reconciled with cognitive neuroscience. Evidence from linguistic surveys and corpora shows that rather than being a hierarchical system of fixed relations, language is a dynamical system, or an emergent phenomenon that arises from the continuous interactions between speakers and their environment. In this paper, I examine generative and cognitive approaches to linguistics in conjunction with Edelman's (1987) selectional model of brain function and Pulvermüller's (2002) neuronal grammar in order to motivate the rejection of grammar as a neurocognitive object. Specifically, I argue that the reification of linguistic structure fails to take into account the dynamical and embodied nature of language such that it precludes the development of a model that integrates language behavior and cognitive neuroscience. Furthermore, evaluation of symbolic and connectionist models of information processing against neuroscientific considerations demonstrates that the computational and modular theories of mind as espoused by Fodor (1983) and generative models fail as modes for characterizing the language-brain interface. I propose that dynamical modeling and neuronal group selection should instead serve as the basis for a neurocognitive theory of language processing. Adopting a dynamical framework grounded in neuroscience has significant implications regarding how models conceive mental representation and grammar.

Grace Kelly: Femininity in Film

Molly Dodd
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Females have always faced the stigma of adhering to evolving ideas of femininity, or characteristics of "acting feminine." American feminist Susan Brownmiller defines femininity as "a romantic sentiment, a nostalgic tradition imposed of limitations" (1984, p. 14). She continues to delineate that women instinctively act upon these societal constraints to avoid the risk of losing one's sexual identification as a woman. Ideas towards femininity continually alter to meet social demand. In this paper, I present ideas of femininity and how Grace Kelly's costumes, in conjunction with her character's actions, expressed femininity in two of Alfred Hitchcock's films: *Rear Window*, 1954 and *To Catch a Thief,* 1955. Additionally, I will compare silhouettes as seen in Grace Kelly's films to popular fashions of her contemporary time, including variations of Dior's New Look, correlating her representations of femininity through the work of costume designer Edith Head. Grace Kelly was considered one of the leading actresses of her time, known for her beauty and analytical mind. The 1950s is generally regarded as a time period of conservative dress and attitude. A definition of femininity evolved that centered on domesticity and dress (Dunar, 2006, p. 590). How dress is reflected in the movies gives 21st century viewers an understanding of historical evolution of how women dressed and how dress represents the zeitgeist of a time period.

Abstracts

Octopaminergic Gene Expression and Flexible Social Behavior in the Subsocial Burying Beetle *Nicrophorus vespilloides*

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Flexible behavior allows organisms to respond appropriately to changing resources and social conditions. Behavioral flexibility plays a major role in successful breeding for the beetle, *Nicrophorus vespilloides*, which exhibits highly developed parental care. Adults are socially tolerant when mating, express aggression when defending reproductive resources, and return to social tolerance when parenting. Previous works link octopamine, a molecule that acts as a neurotransmitter and neurohormone, to aggression in insects. Based on this association, we hypothesized that genes directly involved in the octopaminergic system would be differentially expressed across different social and reproductive environments important to *N. vespilloides'* life history. Following PCR verification of eight genes in the octopaminergic system, we used qRT-PCR to compare relative expression of the eight genes from virgin females, mated females, mated females on a resource required for reproduction, and mated females on a resource with a male. Contrary to our predictions, we found neither enzyme gene changed expression levels, while many of the receptor genes did. The expression of octβr1 and octβr2 was relatively higher in mated females. octαr and tyrr1 gene expression was relatively lower in mated females with a reproductive resource and a male. Considering these results along with studies on other insects, we suggest each receptor might uniquely influence *N. vespilloides*' social behaviors. We also suggest that in *N. vespilloides* the octopaminergic system is associated with resource defense, alternative mating tactics, social tolerance, and indirect parental care.

Measuring Brain Tissue Factor Levels in Malaria Infection

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Malaria remains a highly prevalent disease in many regions and accounts for at least 1 million deaths every year. While several theories exist to explain the disease in humans, the mechanisms of malaria pathogenesis remain incompletely understood. Infection by *Plasmodium falciparum* has been shown to be associated with increased levels of markers of coagulation and fibrinolysis in placental malaria and cerebral malaria patients, suggesting that increased blood coagulation activation occurs in malaria pathogenesis. Although coagulation activation is known to occur in malaria, its precise role in pathogenesis is still being elucidated. In coagulation-based models of pathogenesis, the protein tissue factor (TF) is of great interest, as it is an important interface between a host's immune response and coagulation processes. Assays were performed utilizing a hemostasis analyzer to measure TF activity levels in organs of mice infected separately with *P. chabaudi* and *P. berghei*. Results demonstrate increased levels of TF activation in the lung tissue of infected mice relative to uninfected controls, as expected. However, in the brain, an unexplained trend in TF activity levels was observed: uninfected samples and samples from *P. chabaudi*-infected mice showed approximately equal levels of TF activity, but samples from *P. berghei*-infected mice showed substantially less activity. Determining whether these variations in TF levels resulted from the assay or underlying physiological mechanisms is the objective of this study. Several aspects of the assay will be altered and tested: (1) the amount of brain tissue in each sample; (2) if utilizing different regions of the brain in samples affects observed TF activity levels; (3) if lipid separation in tissue samples

after homogenization affects the observed TF levels.

Bridging the Gap: The History of British Science Examined through Literature
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Science and technology have evolved considerably since the Restoration of Charles II, and these changes have been etched in the literary history of the United Kingdom. This paper will be tracing the general shifts in British public perception toward science and technology from the Restoration era to the present with focus on the mid-nineteenth-century clash between science and religion concerning Charles Darwin's *On the Origin of Species*. With the advent of the Royal Society in 1660, prominent scholars such as Isaac Newton and Joseph Priestly engaged in scientific discourse with public support throughout the eighteenth century. It was not until Romanticism in conjunction with Industrialization that public opinion began to turn to the negatives of technology, pondering the costs of recklessly pursuing scientific inquiry without regard for nature or the common man. Technology such as the camera also incorporated the public into war, exposing people to the horrors science can bring to the human body on the battlefield such as in Crimea. To this day, the popular topic of discourse concerns the future of science and society and how the two will eventually integrate given the rate of discoveries. Questions such as the future of culture, nationhood, and human interaction are widespread, with people divided as to whether technology will be our transcendence or damnation. Understanding the form technology has assumed in the past will help bridge the gap between scientist and public that has been fueled with over three centuries of distrust and exploitation.

Capital-Intensive Punishment: Reducing the High Costs of Federal Drug Incarceration
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Dr. David Mustard, Economics, Terry College of Business

The federal government spent roughly $3.7 billion in 2013 incarcerating drug offenders, but the government reaped little in benefit from this extraordinary expense. The massive increase in drug incarceration from 1980 until today has only slightly decreased the crime rate, and at current levels of incarceration, incarcerating additional drug offenders actually increases the crime rate because they crowd out violent and property offenders, who must be released early to make room in prisons for drug offenders with mandatory minimum sentences, and those violent and property offenders are more likely to re-offend. Furthermore, current policy does little to address high recidivism rates and therefore future crime. This research did cost-benefit analyses on different ideas proposed to reform drug incarceration to find which would be the most effective way of closing the current cost-benefit gap. The research found that adding proven rehabilitation programs, such as vocational training and drug treatment, would increase the overall costs of incarceration but make incarceration more cost-efficient by reducing future crime. Removing mandatory minimums was the second-most effective of the methods studied at making drug incarceration more cost-efficient.

Enzymatic Assay of DHPS Degradation in Abundant Marine Alphaproteobacteria
Blake Edwards
Dr. Mary Ann Moran, Marine Sciences, Franklin College of Arts & Sciences

Patterns of gene expression in members of a bacterial-diatom model system between *Ruegeria pomeroyi* DSS-3, a member of the

alphaproteobacterial Roseobacter clade, and *Thalassiosira pseudonana*, a cosmopolitan diatom, indicate that the novel sulfonate compound 2,3-dihydroxypropane-1-sulfoante (DHPS) serves as a key carbon and sulfur source for bacteria when in co-culture with diatoms. This compound has never been described in ocean organosulfur cycling and may represent gaps in our reconstruction of marine carbon and sulfur models. With enzymatic data for homologous dehydrogenases found in *R. pomeroyi* DSS-3, a "calibration curve" can be created to help identify which other marine bacterial taxa harbor dehydrogenases that are active in DHPS degradation. Specifically, the orthologous proteins in the alphaproteobacterial clades SAR116 and SAR11 will be examined since these are two very abundant and ecologically important groups of marine bacteria, like the Roseobacter clade. With purified protein extracts from *R. pomeroyi* DSS-3 of the verified DHPS dehydrogenase, HpsN, and the paralog histidinol dehydrogenase, HisD, as positive and negative controls, respectively, enzyme activity for other "HpsN-like" dehydrogenases will be photometrically tested with DHPS through the production of NADH+. Taxonomic identification of HpsN activity across important marine alphaproteobacterial taxa will lend valuable insight into which members of the bacterioplankton community drive sulfonate cycling in the ocean and ultimately determine the fate of sulfonate-derived carbon and sulfur. Characterization of DHPS degradation will further help to determine its role in primary and secondary production and its impact on major biochemical transformations in the ocean.

The Preliminary Investigation of Whether Switchgrass SND1 Orthologs Can Activate the Secondary Wall Biosynthesis

Janefrances Egbosiuba, CURO Summer Fellow
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In plants, there are two types of cell walls that are formed: primary and secondary cell walls. Primary cell walls provide mechanical strength for the cell as it grows and divides. Secondary cell walls are produced once the cell has ceased to grow. For plants secondary cell walls help produce strong xylem, which is used to transport water and minerals from the roots to the remaining parts of the plant. The secondary cell walls also offer strong rigid structure, which allows trees and other woody plants to stand tall for many years. Secondary cell walls serve a very important role for human life because they are huge components for woods and other products such as paper, musical instruments and many others (Zhong and Ye, 2009). Secondary cell walls in wood and fibers are also important renewable source of biofuels; therefore, this could reduce our dependency on other resources such as petroleum. My research focuses on the transcriptional regulation of secondary cell wall production in biofuel crop plants. Transcription factors control the activation of genes in the genome. The transcription factor binds to DNA and other proteins, in order to turn genes off or on. Transcription factors work by recognizing certain nucleotide sequences in the promoter region of the gene on the chromosome. The transcription factor that this research will be focusing on is SND1. This particular transcription factor is known to activate the biosynthesis of the secondary wall and particularly the secondary wall biosynthesis of Arabidopsis. We will be investigating whether switchgrass SND1 orthologs can activate the secondary wall biosynthetic program, as does Arabidopsis SND1. Switchgrass, also known

as *Panicum virgatum*, is a warm-season tall grass found in North America. It is very versatile and adaptable. Today, it is mostly used to control erosion. Switchgrass is also known to provide excellent habitat for wildlife. Research has proven that switchgrass is a good renewable bioenergy crop because of its ability to produce high yields on marginal farmlands. Benefits such as stand longevity, drought and flooding resistance, and relatively low herbicide and fertilizer input requirements are some of the many advantages of producing switchgrass. Using various scientific techniques, we investigated whether switchgrass SND1 orthologs play a role in the biosynthesis of secondary wall biosynthesis. This research project involved the use of the GenBank database to identify switchgrass transcription factor genes that show close sequence homology to the Arabidopsis SND1 gene. The PCR was used to amplify the swtichgrass transcription factor cDNA, which was engineered between the CaMV 35S promoter and a terminator in an expression vector. The engineered genes were transferred into Arabidopsis protoplasts to test their ability for activation of secondary wall biosynthesis genes. Our results showed that switchgrass SND1 genes were able to activate secondary wall biosynthetic genes, indicating that they might function as transcriptional switches controlling biomass (secondary walls) production in switchgrass.

Addressing Inequality in Early Childhood Executive Function Development

Megan Ernst, Foundation Fellow
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This paper will demonstrate how addressing executive function in early childhood for low-income students can positively affect the achievement gap in Athens-Clarke County, Georgia. This gap is evident by the time a child enters school and only grows as children progress, indicating that school readiness is a primary factor in the sustained disadvantage of low-income students. While this reflects delays in the acquisition of academic knowledge, it also reflects delays in cognitive development, primarily executive function, the cognitive skills that support academic success. Executive function develops rapidly between birth and age six, and continues to significantly develop throughout the elementary years as well. Proper executive function plays a central role in early academic and social-behavior readiness. Through the analysis of current research and community need, and after evaluating three alternatives and the status quo against measures of equality, cost-effectiveness, and feasibility, this paper recommends an expansion of elementary school teacher education in cognitive development and its role in the connection between the classroom and home life. This paper suggests modifying the county's Comprehensive School Improvement Plan to require that 50 percent of professional training required for recertification consist of curriculum in executive function and family engagement. Long-term, this paper suggests a collaborative partnership between the local government, the school district, the state department of education, the University of Georgia, and local nonprofits to provide a home-visit program to all families below 133 percent of the federal poverty level with children through first grade.

Uncovering the Heritage of Slavery at the Shields Ethridge Farm: Memory, Identity, and Heritage Tourism

Seth Euster, Foundation Fellow, CURO Summer Fellow
Dr. Christopher Lawton, History, Franklin College of Arts & Sciences

On the morning of November 20th 1799, Joseph Roberts Shields rode towards the slave market in Lewisville, Georgia. There, he purchased two slaves, Leah and her infant

child Sophia, from the slave trader Willis Gunnels. For Shields this was a morning that marked his first investment in human chattel, a step towards agricultural success in the Georgia upcountry. For Leah and Sophia it was a morning that shaped the courses of their lives and the lives of their descendants into the 21st century. Shields's farm prospered and he and his descendants became some of the wealthiest and most powerful men in Jackson County. The number of people enslaved by the family continued to grow, as well. Yet, at the end of the Civil War, some 66 years after she and her mother were purchased, when she was the eldest of nearly 20 slaves on the place, Sophia marked an "X" by her name on a contract defining the terms of her emancipation. She and generations of her decedents lived and worked on and nearby the farm into the 1960s. Building on recent historiography, this project is an attempt to understand slavery through the lens of those who were enslaved. Drawing on a rich archive of primary documents, most still held at the Shields-Ethridge Farm, this project both reconstructs the biographies of the slaves who served the Shields family and conducts a historiographical analysis of their community. The content has been incorporated into a digital documentary for the Georgia Virtual History Project, which, when viewed on-site, can better help visitors understand the farm's rich, complex, and truly multicultural past.

Salmonella enterica and *Escherichia coli* Can Exploit Diverse Pathways to Form Vitamin B1 in the Cell

Kristen Farley
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Phosphoribosyl amine (PRA) is an essential intermediate for both thiamine (vitamin B1) and purine biosynthesis in *Salmonella enterica*. PRA is synthesized by the enzyme phosphoribosylpyrophosphate amidotransferase (PurF). A null mutation in the gene encoding PurF causes the cell to have both a purine auxotrophy and a conditional thiamine auxotrophy. It has been shown that increased flux through the oxidative pentose phosphate pathway can allow PRA formation that is sufficient for thiamine-independent growth in a *purF* mutant. In a *purF gnd* mutant, flux through the oxidative pentose phosphate pathway is disturbed and thiamine-independent growth is eliminated. Suppressor mutation analysis of a *Salmonella purF gnd* strain has uncovered suppressor mutations in various genes which restore PRA formation and growth without thiamine. Due to the vast genetic similarity between *S. enterica* and *E. coli*, this study will probe the alternative PRA forming pathways in *Escherichia coli* to test the hypothesis that PurF-independent thiamine synthesis (PRA formation) is conserved in these two model systems. Preliminary data has shown that in *E. coli* i) a *purF* mutant is a thiamine prototroph, ii) a *purF gnd* mutant maintains modest thiamine-independent growth (i.e. PRA formation), and iii) at least three alternative PRA forming pathways are conserved. An in-depth suppressor mutation analysis of *S. enterica* and *E. coli purF gnd* mutants will identify the similarities and differences in their metabolic networks surrounding thiamine biosynthesis.

Investigating Female Remating Rates in Wild *Drosophila neotestacea* and Their Association with Sex-Ratio Drive

Emily Fawcett, CURO Summer Fellow, CURO Graduation Distinction
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Selfish genetic elements (SGEs) are portions of DNA that increase rates of their own transmission even if harmful to the host. Sex ratio (SR) drive is a specific type of SGE found on the X chromosome that acts in males to destroy Y-bearing sperm and can

ultimately have grave effects on populations. The frequency of SR in wild populations of *Drosophila neotestacea* varies from 0 to 30%, although the exact cause for this variation is unknown. One proposed method for the maintenance of SR in wild populations is polyandry, or multiple mating by females, because it allows for increased sperm competition, which may affect SR males more than non-SR males because of their reduced sperm count. In this study, I explore the levels of female mating rates in wild *Drosophila neotestacea* to determine if a relationship exists between mating rates and SR levels in the wild using flies collected from two time points in the Great Smoky Mountains. I also examine number of offspring produced by wild-collected males to determine if SR males actually produce fewer offspring than do normal males. I found no evidence for a relationship between levels of polyandry and SR prevalence in the wild, nor for decreased numbers of offspring sired by SR males compared to normal males. However, we plan to update our methods to test these hypotheses once more.

The Evolution of the Little Black Dress

Anne Fernandes
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The little black dress is an iconic piece of women's clothing with a long history. Its everlasting popularity has come from the fact that it is a "cultural lexicon" (Smith 5). People know what you are referring to when you say little black dress: effortlessly chic, while still showing that a woman has style and taste. It is versatile, sophisticated, practical, and even sexy. To prove just how timeless the little black dress is, I researched books and *New York Times* articles dating back from 1921 to 2009. First in 1921, the *New York Times* reported that women had adopted "all-black costumes with lilac chapeaux," which Paul Poiret, a famous designer at the time, called the women's uniform ("Paris Women Wear Black," Jun 11, 1921, p. 7). Later in 1984, Paula Deitz wrote about an exhibit of little black dresses from the past. She said what was "immediately striking about the display of 21 dresses from the English and French couture is that any one of them could walk out to a real cocktail party today and look as fresh and classic as the day it was designed" (Deitz, Mar 4, 1984, p. 188). Through newspaper articles, I found a great deal of information about how the little black dress has transformed over time and why it has remained a staple in women's wardrobes. Despite the many changes the little black dress has gone through, it has always remained a classic and important piece of women's clothing.

Single-Case Research Designs to Evaluate Social Behavior Development of Children with Autism Spectrum Disorders

Allison Fialkowski, CURO Honors Scholar
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The autism spectrum disorder (ASD) affects an estimated one in eighty-eight children, and the numbers of diagnoses have been rising drastically since autism was first added to the third edition of Diagnostic and Statistical Manual of Mental Disorders in 1980. Characterized by an impairment in the nature and quality of social and communicative development, those with autism spectrum disorders often fail to naturally build social relationships. In a thorough literature review of autism spectrum disorders, theories such as blindness to context in situations, a tendency to systemize rather than empathize, and a cycle of negative peer interaction and social anxiety were analyzed as sources of this disordered social development. In education, an evidence-based intervention approach to promote social interaction and behavioral change is applied behavioral analysis. This systematic use of positive reinforcement

procedures when matched with data collection allows the interventionist to determine the effectiveness of certain motivators in promoting behavioral change. In promotion of intervention methods that are conducive to the classroom environment and each individual, this literature review investigates the effectiveness of applied behavioral analysis, and use of single-case research methodology, to evaluate positive social behavior change in children with autism spectrum disorders.

Hemlock Embryo Rescue Project

Hayden Field
Dr. Scott Merkle, Warnell School of Forestry & Natural Resources

The hemlock woolly adelgid (*Adelges tsugae*), an exotic insect pest, is currently causing widespread devastation of two species of hemlock: eastern (*Tsuga canadensis*) and Carolina (*Tsuga caroliniana*) in the eastern United States. Before all of the surviving examples of these two coniferous tree species are destroyed by this pest, we must attempt to save them. Working with cooperators from Camcore at North Carolina State University, we have used seeds (some up to 10 years old) collected by them from surviving hemlocks from throughout the ranges of these trees to conduct an embryo rescue experiment. We are testing embryo rescue techniques because the longer the seeds have been cold-stored, the less likely it is that they will have high percentages of germination. Our embryo rescue experiment explores alternative methods to encourage seeds from various seed lots of different ages to germinate, using three different seed pre-treatments (intact seed, megagametophyte, and embryo) and two different germination environments (moist germination paper and *in vitro* culture on a conifer germination medium). The end result, which will be measured as the percentage of germination for each seed lot on each treatment, will aid us in determining which treatments are the most promising for producing trees from the stored seeds to aid in restoration of these threatened trees.

Examination of the Function of *cobU* in Vitamin B12 Synthesis in Mycobacteria

Chelsea Fitzhugh
Samantha Tucker, Graduate Researcher
Dr. Frederick Quinn & Dr. Russell Karls, Infectious Diseases, College of Veterinary Medicine

Tuberculosis, caused by Mycobacterium *tuberculosis (Mtb),* is a disease that presents major public health issues across the world claiming over a million lives each year. Although *Mtb* uses cobalamin (vitamin B12) in some metabolic processes, it is unknown if this bacterium synthesizes cobalamin. The *Mtb* genome contains homologs of B12 synthesis genes, including *cobU*, which encodes an enzyme that functions in a late stage of B12 synthesis in other bacteria. The study of B12 synthesis by the slow-growing pathogen *Mtb* is being accelerated by examining the function of homologous genes in the nonpathogenic fast-growing species *Mycobacterium smegmatis*. The overall purpose of my project is to develop and use a suicide plasmid system to generate a *cobU* knockout in *M. smegmatis*. After the mutant has been obtained, it will be complemented separately with *cobU* from *M. smegmatis* and *Mtb*. It is predicted that vitamin B12 production will be blocked in the *cobU* mutant, but restored when complemented with *M. smegmatis cobU*. If the *Mtb cobU* homolog has the same function, it too should restore B12 production. Progress toward this study will be reported.

Membrane Electrode Assembly Preparation Utilizing Platinum Catalysts for Use in Polymer-Electrolyte-Membrane Fuel Cells

David Flake
Dr. Ramaraja Ramasamy, College of Engineering

Clean energy has been a major focus in almost every industry and development of fuel cells is becoming increasingly more prominent in recent years. Fuel cells directly convert chemical energy into electrical energy. Hydrogen gas and oxygen gas are passed through the anode and cathode respectively to produce a difference in chemical potential between the two electrodes. The chemical potential results in an electrical voltage when connected in a circuit. A polymer-electrolyte-membrane fuel cell functions through the separation of oxidation and reduction reactions by use of a semi-permeable polymer electrolyte. In this research, a Nafion membrane, a perfluorinated ion-conducting and electrically insulating membrane, is used as the electrolyte. Within the fuel cell, hydrogen is oxidized into positive hydrogen ions at the anode catalyst and diffuses through the electrolyte. During this oxidation, free electrons are produced and collected with a conductive plate and pass through the circuit. At the cathode, oxygen is reduced at the catalyst layer which results in the production of water vapor. In this research, pre-prepared platinum nanowire catalysts are applied using an air gun to a gas diffusion layer (GDL). A Nafion membrane is placed between two GDLs and then is heated and pressed to form a membrane electrode assembly (MEA). Different parameters of preparation such as the press operating pressure and temperature will be optimized. The power density is maximized by varying gas flow rates, cathode and anode backpressure, operating temperature, and plate pressure. Gas flow rates, cathode and anode backpressure, operating temperature, and plate pressure are varied to achieve the maximum power density possible and compared to commercial products.

Modifying Appointments to the FISA Court

Mitchell (Trey) Flynn
Dr. John Maltese, Political Science, School of Public & International Affairs

With the Foreign Intelligence Surveillance Act of 1978, Congress created the Foreign Intelligence Surveillance Court to hear surveillance warrant requests from executive agencies. Appointment power to the Court was vested in the Chief Justice. My research explores the following questions: Does the current appointment structure enable the Court to review warrant requests with proper scrutiny and jurisprudence? And if not, what appointment structure would be more effective? Drawing from news articles, law reviews, and declassified Court rulings, research suggests that the concentration of appointment power in the office of Chief Justice fails to insulate the Court from political imbalance. Shifting to a Court-based appointment structure that requires Senatorial consent, I propose, would restore the Court to political balance and foster greater scrutiny of surveillance activity.

Healthcare, Genetics, Society and the Black-White Breast Cancer Survival Disparity

DeJuana Ford
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Black and African-American (BaAA) women have lower breast cancer incidence than European-American women, but suffer greater breast cancer mortality. This disparity is discussed widely in diverse fields, and the degree to which genetic factors are implicated in the disparity may vary significantly across disciplines. It is important to compare

researchers' assertions about the role of genetics in the disparity with the degree to which BaAA women attribute their relatively lower breast cancer survival rates to genetic versus environmental factors. In this study, I review literature on breast cancer disparities in the U.S. to explore whether researchers in social science, public health, and clinical medicine perceive the disparity as arising more from genetic or environmental factors, and I compare these perceptions to data from literature on BaAA women's perspectives on factors underlying the disparity. Using keywords "breast cancer AND (African-Americans OR black) AND disparity" to search the NCBI PubMed database, I located 140 articles and studied those focusing on factors driving the Black-White breast cancer survival disparity. I categorized articles as "genetic," "behavioral," "healthcare system," or "societal" based on their explanations for the disparity. Preliminary data suggest that differences in tumor type and healthcare system disparities are commonly implicated across fields in driving the survival disparity. Future data will elucidate connections between factors BaAA women perceive as underlying the disparity and statements made by researchers. Understanding these connections is crucial for more informed discussions on the breast cancer disparity and for improved communication between the medical community and minority patients.

Positive Psychology in Teen Mothers
Smitha Ganeshan, Foundation Fellow
Dr. Neale Chumbler, Health Policy and Management, College of Public Health

While the rates of teen pregnancy have been on the decline, the United States continues to have one of the highest rates among developed nations. Teen pregnancy and parenting is associated with societal stigma resulting from a perceived shortcoming of the individual's moral character. Most studies focus exclusively on the negative consequences of stigma on health, social, and behavioral outcomes. An emic perspective on teen pregnancy and parenting mothers is crucial to elucidate the complex and convoluted role of stigma and stereotypes in these women's lives. Pregnant and parenting teen mothers in Indiana were recruited to participate in a journaling study in Lake County, India through a community partner, Empowering Teens As Parents (ETAP) that allowed the mothers to keep daily journals. The journal content of twenty unique individuals were coded and analyzed by NVivo software. Analysis of the data demonstrated that negative stereotypes and stigma do serve as stressors, but that parenting and overcoming these stereotypes generate positive affect that can mitigate or counteract this stress. Parenting's contribution to positive psychology results in positive self-image and augmented motivation. All of the women, regardless of the degree of social support experienced, indicated that their role as a mother was the best part of their life. Further, the desire to provide a good life for their children and the ability to teach their children new things lead to positive self-image and an emphasis on goal-setting, optimism, and happiness.

The Death of the Death Penalty
Richard Gardiner
Dr. James Monogan, Political Science, School of Public & International Affairs

This paper researches why states differ in their capital punishment policies and in the total number of executions. To explore the issue, this research identifies variables that likely shape death penalty policy and practice. The variables that I have identified as possible predictors are state ideology, issue opinion, political culture, unemployment, and violent crimes. The results show that state ideology is a strong predictor of both policy (measured with an original index of death penalty policy) and the number of executions in the states

(measured from 1976-2012). How death penalty policy is made in the U.S. depends on what the states are doing, and this study can help forecast which states are most likely to continue the trend of reducing or even eliminating death penalty provisions in the law.

The Genetics of Early Hybrid Lethality between Two Species of *Mimulus*

Austin Garner, CURO Summer Fellow, CURO Graduation Distinction
Dr. Andrea Sweigart, Genetics, Franklin College of Arts & Sciences

Speciation occurs when genetically diverging populations develop reproductive isolating barriers that limit interbreeding or reduce the viability and/or fertility of their hybrid offspring. The evolution of these hybrid dysfunctions riddled Darwin and his contemporaries because they knew that unfit hybrids could not be favored by natural selection. We now understand that hybrid dysfunction results from incompatible interactions between genes from divergent species; however, our understanding of the identity, number, and function of the genes involved remains insufficient. To resolve this deficiency I am investigating the genetic basis of hybrid lethality between two closely related wildflower species, *Mimulus guttatus* and *Mimulus tilingii,* by 1) Quantifying the strength of hybrid lethality as a reproductive barrier and 2) Identifying the genes involved. To date, I have shown that when these species are artificially hybridized, 99% of the offspring die during early embryonic development, confirming that hybrid lethality is a strong reproductive barrier between these species. Self-fertilizing the few viable offspring, I generated 250 second generation hybrids, F2s, each containing unique arrangements of both parental species genomes. Quantitative measurements of lethality in crosses between these F2s and parental lines indicate that multiple gene interactions underlie this incompatibility. I am now performing genome-wide sequencing on each F2 and will combine our quantitative and genomic data in order to identify our hybrid lethal genes. This project will thus expand upon the solution to Darwin's conundrum by identifying the genes causing hybrid embryonic lethality and providing a basis for understanding their function in creating and maintaining biodiversity.

Mapping the Horn, 1991-2011

Joseph Gerber, Foundation Fellow
Dr. Brock Tessman, International Affairs, School of Public & International Affairs

While the standard political maps are helpful representations of certain realities in international affairs, they are insufficient at capturing the whole picture of any region, and understanding actors' interactions in and among North and South Sudan, Ethiopia, Eritrea, Djibouti, and Somalia requires more than an understanding of those government's actions. It requires helpful representations of the interests and the interactions among many different kinds of actors in this complex, multifaceted and unstable region. This research project's aim is to answer the question of how the Horn of Africa as a region has changed over time with regards to questions most pertinent to the study of international relations. To answer this question, four different aspects of this region are mapped over time in four different sets of depictions spaced along sensible time intervals: 1) each Westphalian state's relative material capabilities; 2) the presence of various significant non-state armed actors; 3) behavior among various ethnic groups, including migration flow and ethnic tension; and 4) various great powers' economic involvement in the region. These maps are constructed from data gathered from 1991 to 2011 and those actors whose interactions in that area have generated sufficient data, either in set or in map form, are represented visually

in the four maps listed above. This data is compiled in spreadsheet format. Specific methods of representing this data are determined sensibly according to what data is available with the guidance of the research mentor.

Neural Abnormalities in Ocular-Motor Inhibition in Schizophrenia, Bipolar Disorder, and First-Degree Relatives

Alan Gerlich
Dr. Brett Clementz, Psychology, Franklin College of Arts & Sciences

Schizophrenia (SZ) and bipolar disorder (BPD) are characterized by poor prefrontal cortex (PFC) mediated cognitive control. Ocular-motor saccade activity is indicative of the deficit in inhibitory control commonly found in BPD and SZ. Furthermore, biomarkers of such a lack of inhibitory control can be isolated and analyzed using high temporal resolution electroencephalography (EEG) in order to pinpoint the neural basis of the phenotypical deficits of BPD and SZ. The current study included 59 healthy control subjects, 43 with SZ, 56 with BPD, 51 relatives of those with SZ (SZrel), and 71 relatives of those with BPD (BPrel). Each subject completed an inhibition control task in which 3 checkerboard patterns were presented in a horizontal row. On prosaccade trails, the subject was asked to make a saccade toward whichever peripheral checkerboard became more luminous after initial presentation, and on antisaccade trials, the subject was asked to make a saccade toward the more-luminous checkerboard's mirror image. Analyses of the EEG data were performed to evaluate event-related potentials (ERP) resulting from presentation of the steady-state stimulus as well as presentation of the pro/anti-cue. Voltage topographies across the scalp at ERP peaks will be compared across groups. We hypothesize all patients and relative groups will show differences from healthy controls, while patients will show greater differences than relatives. Such data could be used to open new avenues of research to help delve deeper into the underlying etiologies, manifestation, and possible treatment of BPD, SZ, and similar disorders.

The Role of O-Linked β-N-Acetylglucosamine in the Epigenetic Regulation of Colon Cancer Stem Cells

Caitlin Gilbert
Dr. Michael Pierce, Biochemistry & Molecular Biology, Franklin College of Arts & Sciences

Growing evidence suggests that cancer stem cell (CSC) populations have a role in the initiation and maintenance of some cancers. These populations are regulated by post-translational modifications, such as O-linked b-N-acetylglucosamine (O-GlcNAc). O-GlcNAcylation is regulated by two enzymes: O-linked β-N-acetylglucosamine transferase (OGT) and O-GlcNAcase (OGA). The transfer of the carbohydrate O-GlcNAc to cytosolic and nuclear proteins is catalyzed by OGT, and OGA regulates the process by removing the glycan. O-GlcNAcylation is analogous to phosphorylation in the sense that both modifications are notably dynamic. O-GlcNAcylation affects numerous cellular processes, so aberrant expression is hazardous and can lead to many diseases. The O-GlcNAc modification is associated with several different varieties of cancer, but its role is still unknown. OGT utilizes uridine diphosphate N-acetylglucosamine (UDP-GlcNAc), which is produced from extracelluar glucose via the hexosamine biosynthetic pathway (HBP), as the substrate for O-GlcNAc transfer. This metabolic shift from oxidative phosphorylation to the HBP is a hallmark characteristic of cancer metabolism. The transition from oxidative phosphorylation to the HBP results in the up-regulation of OGT, which further suggests its involvement in tumor onset. In current studies, the knockdown of O-GlcNAc is

accomplished in two mammary colon cancer cell lines through transfection with OGA. The following experiments will be performed using these cells lines to determine which genes are regulated by O-GlcNAc and support the idea that the down-regulation of OGT may reduce cancer metastasis. Identification of the genes that are regulated by O-GlcNAc expression could yield valuable targets for cancer therapy and treatment.

Data Analysis of Seawater Samples Collected Off the Coast of Barrow, Alaska

Dylan Goetz
Dr. Patricia Yager, Marine Sciences, Franklin College of Arts & Sciences

Seasonal patterns in the Arctic Ocean are largely affected by environmental factors, including ice cover, temperature, and sunlight. In winter, with lower light availability, there is a drop in biological productivity. During summer, with minimal ice coverage, productivity blooms. Understanding these cycles can help us predict the impact of changes in the Arctic Ocean. To better understand these strong seasonal cycles, my research examines biological and biogeochemical data collected from a series of research expeditions conducted by Yager, Frischer, and Bronk near Barrow, Alaska (71° 21'N, 156° 41'W) over two years during the months of January, April, and August. I hypothesize the nutrient data should reflect the strong seasonal patterns described above. By graphing depth profiles for limiting nutrients and determining the seasonal averages, I compared the nutrient concentrations to predicted general patterns. The samples' inorganic nitrogen concentrations showed a general trend of a large depletion in August, indicating an increase in primary productivity as phytoplankton take up these nutrients. Higher amounts are shown during the winter season when sunlight is less available and sea ice coverage is higher, limiting photosynthesis when heterotrophic bacteria and respiration prevail. These microorganisms incorporate the dissolved organic nitrogen (DON) produced by phytoplankton. By measuring rates of incorporation of radioactive leucine, heterotrophic bacterial production rates can be calculated. The full data set allows us to explore the balance between autotrophy and heterotrophy in the Arctic. Continuing to create data sets like these over time will allow us to observe and predict changes of the ocean climate in the future.

Parent and Child Perceptions of Health-Related Quality of Life and Psychological Functioning in Children with Tourette Syndrome

Charlotte Goldman, Amy Davis, Kelsie Flanigan
Dr. Ronald Blount, Psychology, Franklin College of Arts & Sciences

Tourette syndrome (TS) is a chronic neurological disorder characterized by tics, involuntary behaviors, and vocalizations. The aims of this study were (1) to evaluate the degree of agreement between child self- and parent proxy-reports of health-related quality of life (HRQOL) and psychological functioning in children with TS, and (2) to compare these ratings to normative data for healthy children. Twenty-eight children, ages 8-18, and their parents rated the child's HRQOL and psychological functioning (depression, inattention, and hyperactivity). *T*-test and intraclass correlation (ICC) analyses were used to examine study aims. Parent-child agreement was strong on all HRQOL and psychological functioning domains based on ICC analyses. However, *t*-test analyses revealed that parents reported significantly higher levels of depression than their child. In addition, children reported significantly lower levels of physical HRQOL compared to their parents. Compared to normative data, only parents reported significantly higher levels of depression, and only children reported

significantly lower levels of physical HRQOL. Overall, these results indicate that parent-proxy reports may not accurately reflect children's perceptions of all HRQOL and psychological functioning domains. This study is important because it demonstrates that parent-proxy reports should not be used exclusively, but should be collected in conjunction with child self-reports whenever possible in this population. Variations in the degree of agreement between individual parent-child dyads should be further evaluated with factors such as child age, clinical outcomes, and quality of parent-child relationships.

Applying International Strategies to Domestic Issues of Micronutrient Deficiency

Carver Goodhue, Foundation Fellow
Dr. J. Peter Brosius, Anthropology, Franklin College of Arts & Sciences

This paper provides a brief analysis of micronutrient deficiency in impoverished communities in Athens-Clarke County, its causes, effects, and the possible approaches to resolve it. Our conclusion is that the establishment of a program to fund vitamin purchases for SNAP (Supplemental Nutrition Assistance Program) eligible Athens residents would provide this sector of the population with a cheap, easily implemented method for increasing micronutrient consumption. This option stands in contrast to others which demand a greater investment of time and money on the part of poor communities least capable of supplying it.

Impacts of Organic Soil Amendments on Micro-Nutrient and Carbon Sequestration under Natural Rainfall Conditions, 2010-2013

George Grant
Dr. Mark Risse, College of Engineering

Organic soil additives also considered as amendments have become widely used throughout the agriculture industry in response to controlling soil erosion. This property as well as the sequestration of valuable micro-nutrients and organic Carbon back into the soil are important areas of study given the variety of soil amendments available in today's market. This experiment explores the following scientific questions: how do present day soil amendments affect the accumulation/sequestration of micro-nutrients, % Carbon, and pH stability under natural climate conditions and what duration of time do these effects require to be available in the soil? 5 years (currently the 3rd year) of data collection and analysis will help the agricultural community understand these available soil treatments and their benefits over time when applied to soil as ground cover or amendment. The following data analysis is based on the average % Carbon (Organic matter) and micro-nutrients found in an 18 plot experimental area located off Hog Mountain Rd. in Athens, GA. There are 24 total plots; however, only 18 out of the 24 are being tested. Each plot is 1.52 m × 4.57m set at a 10% slope and exposed to natural environmental conditions. The variable which is being tested is a specific treatment of soil amendment. The five treatments are as follows: control grass (grass seed) (CG), mulch (M), surface compost (SC), incorporated compost (IC), incorporated biochar (BC), and a control bare soil (BS). Other data such as micro-nutrient concentrations, total soil particle mass from erosion, and rain fall occurrences have also been recorded during this experiment; however, the primary area of interest is the relative increase or decrease in % Carbon and

micro-nutrients accumulation over time(annually) in response to the described soil treatment additives and natural climate conditions. The treatments correspond to the plot numbers as follows: BS: 5,9,20; BC: 6,13,21; M: 2,14,23; CG:4,11,24; SC: 3.10,19; IC: 1,12,22; Not Tested Plots: 7,8,15,16,17,18. The plots not tested are due to limited resource availability and to ensure spacing for needed maintenance and soil sampling. The soil data was taken annually starting in 2010. Soil samples were taken using a soil auger. For the BC and IC treatments only two measurements were taken, one at 4-6 inches, and one at 10-12 inches. This is due to the 0-2 inches region being incorporated into the 4-6 region during the beginning experiment (preliminary incorporation of compost and biochar). For the remainder of the treatments three measurements were taken: 0-2 inches, 4-6 inches, and 10-12 inches. (The following data was analyzed by the University of Georgia's Plant and Soil Analysis Lab.) No results are available at this time. A total micro nutrient, pH and % Carbon ANOVA analysis will be presented along with a discussion of results.

Cell Cycle Gating of the Mammalian Sonic Hedgehog Signaling Pathway

Philip Grayeski, Foundation Fellow
Dr. Jonathan Eggenschwiler, Genetics, Franklin College of Arts & Sciences

The Sonic Hedgehog (SHH) signaling pathway regulates cell fate specification, differentiation, and growth within the tissues, such as the central nervous system during metazoan development. While the regulation of cell cycle progression by SHH signaling has been extensively studied, it remains unclear whether the cell cycle controls response to SHH signals such that individual phases can be conducive or refractory for signaling. One reason to suspect this is the fact that primary cilia are required for SHH signaling in mammals, yet in cultured cells the primary cilium is present only in G1 (or G0) phases. A method in our lab was devised to assay the unspliced (intron-containing) mRNA signal of targets induced by a SHH pathway agonist to provide a real-time assay for pathway activity. Using this method, we analyzed the cell's response to the SHH agonist under different culture conditions and measured the half-life of the unspliced messages. The real-time responses will determined with respect to each phase of the cell cycle and these data will be compared to the ciliogenesis profile in each cell cycle phase. These experiments will test the hypothesis that progression though the cell cycle gates Hedgehog pathway activity and that assembly and disassembly of the primary cilium may be responsible.

Neural White Matter Integrity Differs between Patients with Schizophrenia and Healthy Controls

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

Patients with schizophrenia show alterations in brain structure compared to healthy subjects, and, differences in major frontal white matter (WM) tracts are related to deficits in cognition. Some healthy subjects from the general population, however, also show low levels of cognitive control. The present study sought to examine differences in WM structural integrity between patients with schizophrenia and healthy controls with low cognitive control (LCC). WM integrity was assessed in 15 individuals with schizophrenia and 15 LCC healthy controls using a magnetic resonance imaging (MRI) scanner. Specifically, diffusion tensor imaging, an MRI method which measures the diffusion of water to index the organization of WM, was used to characterize WM structural integrity. In highly organized, densely myelinated WM tissue water, diffuses primarily along the length of axons, as opposed to diffusing randomly in less

organized tissue. Fractional anisotropy (FA) values occur on a scale of zero (total isotropic diffusion) to one (diffusion only along one axis) and are a commonly used index of the extent of directional diffusion, and thus WM integrity. Whole-brain FA values were calculated using TBSS, and 20 major WM fiber tracts were isolated using a standardized WM tract atlas. The preliminary results demonstrate a statistically significant decrease in the mean FA values for multiple frontal tracts in patients with schizophrenia when compared to healthy subjects with LCC. The present study provides evidence to suggest that structural deficits in schizophrenia may be specific to the disease itself, rather than a function of LCC more generally.

Do Knee Straps Decrease Self-Reported Patellar Tendon Pain after Jump Landings?

Megan Griffin
Dr. Cathleen Brown Crowell, Kinesiology, College of Education

Patellar tendinopathy is a common condition in physically active populations, often treated using knee straps to reduce pain, though there is little quantitative evidence supporting this. The purpose of this study was to determine if self-reported pain was lower in those with symptomatic patellar tendinopathy after performing two jump landing techniques with a patellar tendon strap (PTS), compared to a no-strap, control condition (Con). Twenty-nine individuals (female 14, male 15, age 21.3±3.3years, mass 73.2±12.4kg, height 174.7±9.5cm) with patellar tendon pain who scored <80 out of 100 on the Victorian Institute of Sport Assessment Patella (64.8±8.4) indicating decreased knee function, were consented. Participants performed 5 trials of two-legged drop jump landings followed immediately by a 50% maximum vertical jump (DJ) and 5 single leg landings (SL) in both conditions in a counterbalanced order. After completing each set of 5 landings, participants were asked to mark a 100mm Visual Analog Scale (VAS) to indicate their knee pain; participants were blinded to previous VASs. A single rater measured each VAS once and a repeated measures analysis of variance ($p<.05$) was used to determine differences in the VASs between the strapping conditions. There was significantly lower pain reported during the PTS condition than the Con condition for both DJ (Con= 26.28±3.8mm, PTS= 19.24±3.1mm, $p=.003$) and SL landings (Con= 36.28±4.1mm, PTS= 26.9±3.3mm, $p=.001$). The results indicated PTS may decrease acute knee pain symptoms during jump landings as measured by VAS. Future research should elicit the mechanism by which this occurs.

Examination of the Link between Glycosaminoglycans and Pectins

Elizabeth Guarisco, CURO Summer Fellow
Dr. Carl Bergmann, Biochemistry & Molecular Biology, Franklin College of Arts & Sciences

Glycosaminoglycans (GAGs) are polyanionic macromolecules localized in the extracellular matrix that have important structural roles and are involved in diverse cellular processes including differentiation, communication, proliferation, adhesion, and migration. Thus the impacts of glycosaminoglycans and their degrading enzymes warrant understanding. One way to approach this is the use of non-native GAGs or GAG-like polysaccharides. The corresponding plant matrix polysaccharides are the pectin polysaccharides, partially esterified macromolecular polygalacturonic acids. Glycosaminoglycans and pectins provide, in separate species, similar functions. The similarity between the functions of pectins and GAGs suggests possible insights into the mechanism by which pectins impact human health. Studies in our lab revealed that pectins are able to bind certain glycosaminoglycan degrading enzymes and alter their glycosidic

activity. Likewise, chondroitins, a class of GAGs, are able to bind pectin degrading enzymes and alter activity. Pectin degrading enzymes could alter GAG-moderated cell processes GAGs and chondroitin performance. Testing the effects of non-native GAGs *in vivo* is our next step. Hyaluronic acid (HA) functions in joint connectivity, water transport, receptor-interacting roles in tumor metastasis, and stimulates extracellular matrix production. HA fragment injections into Drosophila cells will allow us to see any functionally relevant effects of the polymer, as HA is not naturally present. The first step in this process is growth and insulation optimization of Drosophila neuronal cells. This *in vivo* approach is likely to reveal new functions for GAGs and new ways to manipulate the availability of these important molecules.

Investigating the Role of HAN Transcription Factors during Plant Development

Vanessa Gutierrez
Dr. Wolfgang Lukowitz, Plant Biology, Franklin College of Arts & Sciences

The development of *Arabidopsis* embryos relies on a sub-family of GATA transcription factors. These genes, which are called HANABA TARANU (HAN), HAN-LIKE 1 and HAN-LIKE 2, are essential for the maintenance of embryonic coordinates, and without them embryogenesis arrests. It is my hypothesis that embryogenesis arrests because HAN mutants do not continue to produce stem cells. To investigate the role of these HAN genes during later stages of plant development in seedlings, I have adopted the approach of using a method called RNA interference (RNAi) to "knock down" HAN expression in normal looking seedlings. This entailed constructing a HAN RNAi vector, a plasmid containing a small fragment of HAN transcript in inverted repeats to form a hairpin. This plasmid is under the control of a promoter that is expressed only in the presence of a hormone, dexamethasone (DEX). I introduced this HAN RNAi construct into the *Arabidopsis* genome using an Agrobacterium and I have conducted experiments to show that the HAN hairpin is indeed expressed in response to DEX treatment. I am currently extending the study to analyze the effects of 'knocking down' HAN gene expression in roots, where I can easily visualize any effects on their development. This will provide me with key information about the ability of HAN genes to regulate plant stem cells, specialized cell-types which play a key role in all aspects of plant tissue formation and plant growth.

The Digital Future – Investing and Investigating

Connor Hamm
Prof. Mark Callahan, Lamar Dodd School of Art

In October 2013 the auction house Phillips partnered with the micro-blogging site Tumblr to create the first ever digital art auction, *Paddles On!*. The auction featured only internet-based and digital art, including webcam recordings, screenshots from video games, and even an entire website, with some works valued over at $10,000. *Paddles On!* epitomizes the artistic, technological, economic, and social implications of positioning digital technology as a dominant and necessary facet of life. But what are these implications? I incorporate arts-based research methods with traditional examination of scholarship in order to investigate the impacts of this auction and of related developments within the art world, such as the Eyebeam Emoji Art+Design Show and the increasing presence of webcam art. I apply my research through creating digital art (including my own Emoji and webcam pieces), and by keeping an evolving critical commentary, all of which are posted on a Tumblr blog. This synthesis of research and application is uniquely

illuminating and has provided innovative and engaged analysis of the real world impacts of digital technology, especially on such issues as the changing nature of the art market, the global reach of Emoji and digital communication, and the power of the digitally-mediated self-image ("selfie"). This combination of objective research and personal application incorporates the very technology that I am studying, and is particularly beneficial in understanding our increasingly networked shared future.

An Integrative Outlook on the State of Sustainable Development in Sarawak, Malaysia

Dayna Hardgrove
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The palm oil industry is growing rapidly all over the world and is threatening both the rainforests and the indigenous communities that inhabit them. In the Malaysian state of Sarawak, the state government has initiated a major effort to expand oil palm production as part of the state's development program. While the palm oil industry has great economic potential, its rapid expansion is currently displacing indigenous communities from their ancestral lands and causing rapid deforestation. The detrimental effects of this growing industry need to be addressed more effectively by acknowledging the trade-offs between conservation and development and seeking a more sustainable development strategy that is supported by multiple actors: the state government, indigenous communities, and the palm oil industry. This paper applies an integrative framework for analyzing trade-offs from multiple conceptual lenses: values and valuation, process and governance, and power and inequality. Such an approach provides a more comprehensive foundation for addressing the state's development priorities while also supporting conservation and indigenous rights.

Viscosity-Dependent Behavior of Cyclopenta[b]naphthalene Fluorophores

Billie Hardigree
Dr. Mark Haidekker, College Of Engineering

Environment-sensitive fluorescent molecules play a significant role in the biological sciences and biological engineering. Recently, a new polarity-sensitive family of fluorophores was introduced (Kocsis et al., Org. Lett 2012; 14: 4430-33). These cyclopenta[b]naphthalene compounds showed intriguing structural similarity with viscosity-sensitive molecular rotors that we recently examined. Our research goal was to explore potential viscosity-sensitivity of the new cyclopenta[b]naphthalene compounds. Measurements were performed in a Fluoromax-3 fluorospectrometer. Polarity sensitivity was examined in Dimethyl sulfoxide (DMSO), methanol, toluene, and water and methanol mixture, and the exact fluorescence spectrum was obtained by performing matrix scans, that is, emission intensity as a function of both excitation and emission wavelength. Viscosity sensitivity was determined in a mixture of methanol, ethylene glycol, and glycerol at different ratios to afford solutions ranging from 4 mPa s to 167 mPas. Peak emission intensity was recorded as a function of viscosity. Two of three cyclopenta[b]naphthalene compounds exhibited dual emission in the viscosity gradient. Depending on the intramolecular distance of the elements of the fluorescent dipole, the second emission peak showed increasing intensity with increasing viscosity. This was an indication of molecular rotor-like behavior. The polarity tests, however, were more inconclusive, but a general trend was observed that more polar solvents lowered the emission intensity and shifted the emission peak toward shorter wavelengths. We concluded that cyclopenta[b]naphthalene-derived fluorophores, which were originally motivated by the polarity probe Prodan, gain viscosity-sensitive behavior and act as

molecular rotors. However, the viscosity sensitivity strongly depends on the spatial structure of the fluorescent dipole.

Necessity of Universal Pre-Operative Blood Work Testing in Healthy Dogs

Kayla Hargrove
Dr. Erik Hofmeister, Small Animal Surgery, College of Veterinary Medicine

The objective of this research study is to determine if performing pre-operative blood work in otherwise healthy dogs sheds light on enough previously unknown and undiagnosed diseases to warrant screening in all patients. This information would be helpful for pet owners because it could potentially cut the costs of surgery by eliminating blood work from their expenses. This would also benefit veterinarians who want to get their patients into surgery as quickly as possible and don't have time to wait for results from blood work. Cases were identified by the anesthesia records and blood work results of 100 dogs that underwent elective orthopedic surgeries. Data collected includes: name, age, weight, breed, diagnosis/problem, ASA status, reason for anesthesia, date of procedure, and abnormalities found in blood work. Results include 40 cases, 7 of which had abnormalities that would have resulted in a more conservative anesthesia protocol.

Differences between Cohabiting and Non-Cohabiting Couples Who Participated in Premarital Education

Lauren Head
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Research on cohabitation - the practice of couples living together prior to marriage - has raised concerns regarding the quality and stability of the future unions of these couples. Premarital relationship education programs have been found to promote healthy relationship behaviors that foster healthy and stable marriages. However, less is known about the effects of these programs on cohabiting couples who subsequently marry. The current study examines couples (n = 83) who completed the PREPARE (PREmarital Personal and Relationship Evaluation) program and compares those who cohabited before marriage (59%; n = 49) to those who did not (41%; n = 34). Data were collected by means of surveys taken prior to the program, two weeks post, six months post, and two years post. Mean scores were examined to explore differences and similarities in marital interactions (e.g., time spent together in shared activities, frequency of disagreements, conflict management), marital quality (e.g., positivity, negativity satisfaction), and marital stability (e.g., dedication, thoughts of divorce, confidence) over time. Preliminary analyses show that, following the premarital education program, male and female cohabiting participants tended to exhibit similar or *more positive* relationship interactions when compared to non-cohabiting participants. Thus, contrary to prior research the risks associated with premarital cohabitation were not found with the present sample. By identifying challenges unique to cohabiting couples, premarital education programs can be adapted to focus on specific needs in an effort to better help couples sustain positive interactions, effectively manage differences, and enhance marital satisfaction and stability.

A Targeted and an Unbiased Screen for Genetic Suppressors of the *Legionella pneumophila* Effector Protein LegC7

Chetan Hebbale
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Legionella pneumophila is a Gram-negative bacterium that causes a severe form of pneumonia known as Legionnaires' disease. During infection, *L. pneumophila* secretes nearly 300 effector proteins into host cells in order to evade lysosomal degradation by

modulating vesicle trafficking pathways. One of these effector proteins, LegC7, has been shown to be toxic upon expression in the budding yeast, *Saccharomyces cerevisiae*. Upon LegC7 expression, *S. cerevisiae* accumulates membranous structures reminiscent of so called "class E" compartments, which result from defects in multivesicular body function. The proteins which comprise the Class E VPS family are members of the endosomal sorting complex required for transport proteins (ESCRT) which are responsible for recognizing, sequestering and packaging membrane proteins into vesicles for vacuolar degradation. Because the Class E phenotype was produced in yeast during LegC7 expression, we hypothesize that LegC7 interacts with one or more of the yeast Class E gene products. We therefore continued a targeted screen of the yeast Class E genes by transforming a plasmid encoding LegC7 into yeast strains with deletions of *vps23, vps28, snf7*, or *bro1* and found that deletion of these genes did not suppress LegC7 toxicity. We then performed an unbiased screen in an attempt to find genetic suppressors of LegC7 toxicity using ethyl methanesulfonate (EMS) mutagenesis to isolate a strain that exhibits a toxicity reversal due to a genomic mutation. We will sequence the genome from this strain to identify the gene products that LegC7 might require for toxicity.

Nanoparticle-Delivered Therapeutics for African Trypanosomiasis

Matthew Hess
Dr. Stephen Hajduk, Biochemistry & Molecular Biology, Franklin College of Arts & Sciences

Trypanosoma brucei causes both Nagana, a wasting disease in cattle, and human African trypanosomiasis, also known as sleeping sickness. In sub-Saharan Africa, an estimated sixty million people are at risk with no available vaccine, and hundreds of millions of dollars are lost in the form of diseased cattle. Our lab previously reported the trypanocidal activity of small, hydrophobic peptides (SHP) that specifically kill blood stream form (BSF) *T. brucei*. Here we package SHP into silica gel, mesoporous nanoparticles (SHP-np) for delivery to *T. brucei*. By measuring the growth of BSF trypanosomes overnight post-treatment, we report 50% survival with SHP-np concentrations of 1mg/mL and 0% survival with concentrations of 5mg/mL. Short-term killing assays indicate that SHP-np concentrations of 10mg/mL completely kill parasites within one hour. A comparison of killing kinetics between SHP and SHP-np shows that free SHP kills rapidly while SHP-np exhibit slower kinetics likely due to controlled release of the peptide. Blocking endocytosis by low temperature demonstrates that uptake of the particles is not necessary for killing. To investigate the specificity of SHP-np, we performed growth and short-term killing assays with human embryonic kidney (HEK) cells. Our results indicate that SHP-np are nontoxic to HEK cells at concentrations sufficient to kill parasites. Furthermore, we show that SHP-np are stable during storage in harsh conditions (37°C for one week). All together, the data suggest that SHP-np represent a potential therapeutic to combat human and animal African trypanosomiasis.

3D Printing Techniques in Topology

Fred Hohman
Dr. David Gay, Mathematics, Franklin College of Arts & Sciences

During the Spring 2014 semester, Dr. Gay and I plan to explore 3D printing in topology by observing the physical geometry of shapes that are particularly tough to visualize. This research will allow us to learn how 3D printers function, test the limits of current 3D printers, and generate mathematical objects that have not been easily explored. To start, we first worked out the mathematical theory behind the creation of the knots, imploring

various concepts such as stereographic projection. For example, one shape to be printed is generated by two cords coming together to form a trefoil knot at the center of the object. Once we had the knot constructed, we began to add other surfaces to the shape to observe the changes in the knot's structure. After finalizing the theory, I generated high resolution 3D models of the desired objects to prepare to print in Mathematica: a symbolic mathematic computer programming environment. With the aid of other modeling software and a MakerBot Replicator 3D printer, I was able to print prototypes of the basic trefoil knot with appropriate supports and code documentation. I successfully published this basic version of the trefoil knot on Thingiverse.com: the official website dedicated to sharing user-created digital design files. I am currently manipulating complex versions of the knot and digitally cutting the surface additions to print separately. Once the components are split in the appropriate way, I plan to print all the pieces in multiple colors so that an observer could pick up the shape and remove surface pieces to reveal the underlying knot at the core.

Increasing Nutrition through Genetically Modified Organisms

Erin Hollander, Ramsey Scholar
Dr. Wayne Parrott, Crop & Soil Sciences, College of Agricultural & Environmental Sciences

Genetically modified foods are organisms meant for consumption in which the genetic code has been changed through human biotechnology. These organisms can be modified for increased yield, nutritional value, or pesticide resistance, and as such have great potential for resolution of the global food crisis. This potential must be tempered by the safety concerns of the long-term effects of GM foods on human and environmental health. Some GM foods such as Golden Rice, however, are modified only for increased nutritional content. This allows impoverished families to obtain necessary nutrients without extra expense. Yet the regulatory obstacles for these crops, despite their safety, are nearly insurmountable. This project analyzes the current regulatory standards for GM foods and assesses policy alternatives: 1) increased government support for public goods research institutions; 2) regulation of GM foods through the same standards as traditional foods; and 3) creation of an international ranking system for GM regulation. After evaluation of the benefits of each option, the third option was selected due to its flexibility and feasibility on an international scale. One major boundary to GM foods such as Golden Rice is the duplication of documentation between countries, as each country has its own rules and requirements that a GM food must pass before it can be planted. The cost and time it takes to pass each standard greatly decreases what a non-profit institution can afford. Standardized ranking would decrease duplication while allowing each country to control the safety level of the GM crops gaining entrance.

Norse Mythology in Modern Popular Culture: Sixty Interviews Conducted in Athens, Georgia and Copenhagen, Denmark during the Summer of 2013

Joseph Hopkins, CURO Summer Fellow
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When we use the phrase Norse mythology, we are referring to a body of texts and images that ultimately stem from the pre-Christian narratives of the North Germanic peoples; tales of gods, beings, and even historic people. This corpus is unique and enigmatic; no other branch of Germanic language-speaking people preserved their traditional pre-Christian narratives to such an extent. Upon the eventual translation and subsequent

reintroduction of these texts into the modern languages of Europe, Norse mythology gained new influence and positions in the now Christianized world, particularly in the cultural spheres of other Germanic language-speaking peoples (such as in England and Germany). The study of the ancient Germanic peoples inspired influential works of art and literature, resulted in a mountain range of scholarship, and became an element of national and ethnic pride and ideology. The latter extension came to a head under the Third Reich, and its defeat led to a lull in popular attention for things 'Germanic'. However, by way of media representations, literature, and, to a lesser extent, new religious movements, Norse mythology is again well represented in the popular culture of modern Germanic language-speaking peoples. Yet how is all this represented in the minds of these modern linguistic descendants? By way of sixty interviews conducted during the summer of 2013 in the southeastern United States (Athens, Georgia) and Scandinavia (Copenhagen, Denmark), this project examines the influence of Norse mythology on individuals between the ages of 18 and 30.

The Negative Side Effects of Organophosphate Pesticide Usage in Thailand

Kirstie Hostetter, Foundation Fellow
Dr. Nicholas Magnan, Agricultural & Applied Economics, College of Agricultural & Environmental Sciences

During the past decade, Thailand's pesticide usage has increased by approximately four-fold as the country has established itself as one of the world's major agricultural producers. This increase in pesticide usage has made organophosphates the most abundantly used insecticide group. However, organophosphate pesticides have detrimental health, economic, and environmental effects. In Thailand, 39% of the population is involved in the agricultural sector and about 12,000 cases of acute pesticide poisoning are reported annually. This statistic is a gross underestimate of actual incidences due to lack of education about poisoning symptoms, lack of proper medical facilities, and a lack of initiative to seek medical help. A literature review and cost-benefit analysis of various policy alternatives was conducted. The criteria used to evaluate the four policy alternatives, which included the status quo, an organic farming initiative, an agricultural worker education program, and bureaucratic streamlining, were cost-effectiveness, overall effectiveness, and political feasibility. Based on this analysis, Thailand's Department of Agricultural Extension should implement a mandatory, nation-wide agricultural worker education program to inform those within the agricultural sector about the negative side effects of organophosphate pesticide use.

The Effect of a Patellar Tendon Strap on Knee Power during a Drop-Jump

Katherine Hsieh
Dr. Cathleen Brown Crowell, Kinesiology, College of Education

Patellar tendinopathy is defined as anterior knee pain with patellar tendon tenderness and is common in jumping sports. Patellar tendon straps are applied as a simple and affordable wearable technology designed to reduce knee pain. There is limited biomechanical evidence supporting straps, but they may alter landing kinetics. The purpose of this study was to determine if a Universal Matt Strap™ increases knee power in a symptomatic population during a drop-jump. Twenty-three recreational athletes (14 females, 9 males, age=21.6 ± 3.5 years, height=174.2 ± 8.3 cm, mass=70.8 ± 10.9 kg) with a history of patellar tendinopathy stepped off a 40cm box, landed on two force plates, and immediately jumped 50% of their measured maximum vertical jump. Five trials were performed with and without the strap in counterbalanced

order. Sagittal plane knee power was calculated, scaled to body mass, and averaged. Peak (greatest positive) and minimum (greatest negative) knee power were compared among strapping and control conditions using paired t-tests ($p<0.05$). No significant differences were found in the peak ($p=0.617$) or minimum ($p=0.613$) values between strapping and control conditions. The Matt strap does not appear to modify concentric or eccentric knee power in patellar tendinopathy subjects compared to a no-strap control condition. Future research should determine if the Matt-strap creates any other kinematic or kinetic changes during jump landing. Alternations in movement pattern may help explain why some symptomatic wearers report improvement in symptoms.

Mitochondrial Up-Regulation after Moderate Exercise in Able-Bodied Individuals with Near-Infrared Spectroscopy

Brice Hsu
Dr. Kevin McCully, Kinesiology, College of Education

The theory of mitochondrial up-regulation after moderate exercise via calcium loading has been suggested, but requires confirmation. By using Near Infrared Spectroscopy (NIRS), mitochondrial up-regulation after moderate exercise can be assessed *in vivo* in healthy-bodied individuals. Understanding mitochondrial function would benefit treatment of mitochondrial-deficient diseases, such as peripheral arterial disease. Mitochondrial recovery testing and analysis were performed on 9 participants (78% male, 23.6 ± 3.1 years old). Changes in the oxygenation of hemoglobin during a series of 15 arterial occlusions were measured in each individual's right medial gastrocnemius before and 5 min after a 6 min bout of plantar flexion targeting 70% max effort. Data on the recovery of mitochondrial oxygen consumption was then used to determine a time constant (Tc) which can be used as an index of mitochondrial function. To better represent mitochondrial recovery, the time constants were converted into rate constants (Vmax/min). The average pre-exercise rate constant was 1.73 ± 2.00 and the average post-exercise rate constant was 2.00 ± 0.42. The average Δrate constant after exercise was -3.8 ± 4.4 ($p=0.008$), showing mitochondrial up-regulation of 15%. Mitochondrial recovery testing using NIRS supported the hypothesis of mitochondrial up-regulation after moderate exercise in the medial gastrocnemius muscle. These findings suggest that there is a possible mechanism towards mitochondrial up-regulation.

Effects of Music on Male Aggression: Do Lyrics Matter?

Courtland Hyatt, CURO Summer Fellow
Dr. Amos Zeichner, Psychology, Franklin College of Arts & Sciences

The purpose of this study was to investigate misogynistic aggression and the factors that inform this behavior. Past research has identified traits that serve as possible predictors of male aggression toward women, such as endorsements of sexist attitudes, high levels of masculinity, and rape myth acceptance. Additionally, past research has found evidence that exposure to media displays of violence increases attendant cognitions regarding violence, and aggressive behavior. This research informs a likely link between sexist attitudes, proximate exposure to violent media, and aggression in a laboratory setting. To examine this relationship, male participants first completed questionnaires designed to gather information about relevant personality and attitudinal traits. In a separate laboratory session, participants were exposed to a piece of music with either aggressive lyrical content detailing a violent act directed toward a woman, or neutral lyrical content. A subsequent laboratory aggression paradigm, in which

participants could either choose to administer electric shocks to an ostensible female confederate or refrain from doing so, was used to operationalize aggressive behavior. It is hoped that this study will elucidate the relationship among ideological attitudes, violent media, and contingent aggression. Furthermore, this research bears clinical significance in its potential for shaping intervention and prevention efforts aimed at reducing aggression and increasing awareness of the effects misogynous media and sexist attitudes have on gender inequality and violence toward women.

Molecular and Functional Characterization of FUCOSYLTRANSFERASE 10 in *Arabidopsis thaliana*

Lisa Ishii, CURO Graduation Distinction
Dr. Michael Hahn, Biochemistry & Molecular Biology, Franklin College of Arts & Sciences

The *FUCOSYLTRANSFERASE (FUT)* gene family of *Arabidopsis thaliana* is known to be involved in cell wall biosynthesis. Fucosyltransferases attach fucose to cell wall components, primarily polysaccharides; arabinogalactans, pectins and xyloglucans are known to contain fucosyl residues as part of their structures. *FUT10* has been identified as a member of this *FUT* gene family. In order to functionally characterize the *FUT10* gene, localization of the gene product by expression of a GFP-tagged transgene in tobacco leaves was used. By visualizing the tagged FUT10 protein using confocal microscopy and comparing the pattern of expression with a known Golgi marker, ST-CFP, my preliminary data show that FUT10 is localized to the Golgi apparatus, which is where most polysaccharides destined for the plant cell wall are made. Further confirmation of these results is under way. Additionally, *Arabidopsis* plant lines carrying T-DNA insertions in the *FUT10* gene were characterized using polymerase chain reaction (PCR) amplification of the *FUT10* genic region to determine whether the plant lines were homozygous or heterozygous. Interestingly, I found that all plant lines failed to produce homozygous offspring, allowing me to explore the possibility of homozygous lethality. The *FUT* gene family encompasses ten genes, most of which, with the exception of *FUT1*, *FUT4*, and *FUT6*, have not been functionally characterized. Thus, detailed characterization of the *FUT10* gene is instrumental for a full understanding of the fucosylation of cell wall polysaccharides.

***Mycoplasma gallisepticum* Infection and Shed in Commercial and Wild Turkeys**

Moriah Jackson
Dr. Naola Ferguson-Noel, Population Health, College of Veterinary Medicine

Avian mycoplasmas are pathogens that affect poultry worldwide. The commercial poultry industry has significantly reduced the prevalence of pathogenic avian mycoplasma, although the rate of infection in non-commercial poultry and wild poultry can be relatively high. Domestic turkeys are highly susceptible to *Mycoplasma gallisepticum* (MG) infection, but it is unknown whether wild turkeys are similarly affected. In this study, we compared the infectivity and shed of a virulent MG strain in commercial and wild turkeys. Twenty wild turkey poults were split into 5 groups (n=5) each and housed in Horsfall-type units. At 2 weeks of age, each group was inoculated via intraocular, intranasal and intratracheal routes with a serial dilution of MG culture. Twenty domestic turkeys were similarly split into groups, housed, and inoculated with the dilutions of MG culture. The doses ranged from 1.9 to 4.9 color changing units (CCU) per 100uL. The birds were euthanized at 9 days post inoculation and evaluated by air sac lesion scoring, air sac cultures, histopathology of tracheal sections and quantitative PCR. MG infection was detected in the wild poults at a

lower inoculation dose than the commercial poults. This indicates that the wild turkeys may be more susceptible to MG infection than commercial poults. Wild turkeys and other non-commercial poultry may be significant sources of infection for commercial flocks. Further research is necessary to investigate whether domestic turkeys are more resistant to other infectious diseases and identify the underlying causes.

Investigating the Relationship between the Complement and Coagulation Cascades in Placental Malaria

Tiffany Jenkinson
Dr. Julie Moore, Infectious Diseases, College of Veterinary Medicine

High rates of maternal morbidity, as well as low birth weight and fetal loss, are attributed to placental malaria (PM), 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. The over-activation of markers of the coagulation cascade and the accompanying expression of C5a in complement activation have been shown to cause impairment of the surrounding placental tissues. Although coagulation and complement are generally viewed separately, they are activated together in an overlapping manner in response to pathophysiological damage. We believe that thrombin, an abundant serine protease involved in the coagulation pathway, could be a key interaction between these proteolytic activated systems. Our previous studies showed that levels of C5a, crucial in mediating innate host immunity, were significantly elevated in the peripheral and placental blood space of women with PM. Therefore, we hypothesize that thrombin is able to cleave C5 into C5a. To test the fundamentals of this hypothesis we will first determine the presence of C5a in cultures of *P. falciparum* (or uninfected red blood cells, as a control). Cultures will either include or lack the anticoagulant, acid citrate dextrose, and be allowed to incubate. By including or lacking the anticoagulant, we will be able to measure the impact of thrombin generation on the formation of C5a in culture. From this experiment we hope to better understand the mechanisms behind the increased cleavage of C5 into C5a and its relationship to the coagulation cascade.

Biosynthesis of Base J by JBP1 and JBP2

Melissa Jennings, CURO Honors Scholar
Dr. Robert Sabatini, Biochemistry & Molecular Biology, Franklin College of Arts & Sciences

Leishmania major (*L. major*) 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 is focused on a novel modified DNA base, called base J, present in kinetoplastid protozoa and shown to regulate RNA polymerase II transcription and gene expression. 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 protozoa. The initial step of J synthesis is catalyzed by two thymidine hydroxylases, JBP1 and JBP2. Somehow these enzymes recognize specific regions of the parasite genome and modify a thymidine base. Our hypothesis is that additional proteins are associated with JBP during base J synthesis. To identify these proteins, we will isolate JBP1 and JBP2 in *L. major* cell extracts followed by mass spectrometry. In order to isolate JBP from the cell, we are creating JBP fused PTP-tag constructs that will be inserted back into the *L. major* genome via homologous recombination and deleting the remaining wild type allele. The appropriate

constructs have been generated and parasite transfections are underway. We will present current data resulting from recombinant *L. major* parasite cell lines and the search for JBP associated proteins involved in J biosynthesis.

Influence of Maternal Presence, Age, and Sex on Social Learning

Thomas Johnston, Ramsey Scholar
Dr. Dorothy Fragaszy, Psychology, Franklin College of Arts & Sciences

Some nonhuman animals learn skills socially; i.e., they have traditions. I am interested in how animals maintain traditions. A previous study showed that capuchin monkeys in captivity developed a traditional technical skill (to get juice from a vending device). Using data from this study, we examined the effects of age, sex, and maternal presence (or absence) on the proximity of monkeys to the device, to begin to understand how young monkeys learned the skill. The data were collected in twelve 30-minute sessions with each of four different groups of tufted capuchin monkeys. All trials were videotaped. The monkeys' interactions with the vending device were coded in playback using one-zero sampling in ten second intervals. Behavioral frequencies were tabulated per individual and visually represented in boxplots. The results presented here are from Group B (3 infants (0 to 2 years of age), 1 juvenile (3 to 4 years of age), 6 adult females, and 1 adult male), the group with the most infants. In this sample, infants stayed in proximity to, contacted, and solved the device more than adults. The lone juvenile was in proximity and contacted the device less than half the amount of the infants but solved almost twice as often. Maternal presence was associated with more frequent proximity, contact, and solving compared to maternal absence. Ultimately we want to determine how social partners affect activity with the device, such as whether joint proximity with others is associated with getting juice. We are exploring this challenging analytical problem now.

Stable Isotope and Crystallinity Variations in Kaolin Deposits of Georgia in Up Dip to Down Dip Occurrences

Adam Jones
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Kaolin is a one billion dollar industry for the state of Georgia, where it is used primarily in paper coating, but also in plastics, ceramics, paints, and pharmaceuticals. Recently, kaolin has been used in the production of polymer nano-composites, showing its versatility and economic importance. Economically exploited kaolin beds south of the Fall Line are formed by weathering of alumino-silicate minerals, the source being granitic rocks in the Georgia Piedmont region. Variations in the crystal structure and chemical state of kaolinite are vital to how the clays can be used in the production industry. This study examined the δ18O and δD isotopic variation in sediment-hosted kaolin deposits geologically located in up dip to down dip occurrences in the Eocene-aged Huber Formation. When isotopic results from gas-source mass-spectrometry were compared with X-ray diffraction, determinations of kaolinite abundances and crystal structure correlations appeared between isotopic values and mine locations. A general trend of δD enrichment and δ18O depletion in the kaolinite occurs up dip, suggesting that post depositional recrystallization captures exchanges with meteoric water. Kaolinite crystallinity at sequence boundaries also shows considerable variability. The amount of recrystallization undergone and kaolinite purity in a deposit determine the quality and economic worth of the clay. As reserve scarcity increases, selective mining becomes a more viable operating practice, exposing the necessity to understand kaolin deposit quality.

Immunopathogenesis of Placental Malaria in Mice Lacking Tumor Necrosis Factor and its Receptors

Mathew Joseph, CURO Summer Fellow
Dr. Julie Moore, Infectious Diseases, College of Veterinary Medicine

Plasmodium falciparum is the deadliest malaria causing parasite in humans. Malaria during pregnancy is associated with the accumulation of parasitized red blood cells and infiltration of white cells in the placenta. This is known as placental malaria (PM). We hypothesize mice lacking TNF (TNF null mutant) and its receptors (TNFRI null mutant, TNFRII null mutant, and TNFRI/RII double null mutant) will have an altered immunopathogenesis to control mice, not exhibiting the same pathogenesis of TNF driven placental pathology. The experiment uses 330 mice, including TNF RI null mutant, TNF RII null mutant,TNFRI/RII double null mutant, TNF null mutant, control, and wild type B6 (C57BL/6) mice. Each strain is infected with Plasmodium chabaudi through IV injections of 103 infected red blood cells at day 8 to 10 of pregnancy. We will include three different groups for each strain: infected pregnant (IP), infected non-pregnant (INP), and uninfected pregnant (UP). We will sacrifice the mice on days 9, 10, 12, 14, and 18, and organs will be collected for study into TNF and its receptors' effects on PM within these mice. In particular, changes in expression of markers of apoptosis, programmed cell death, and autophagy, intracellular recycling of organelles, will be assessed. Continued study of TNF and its receptors, I and II, promises to reveal common and critical mechanisms which contribute universally to malaria compromised pregnancies.

Integrating of Human Neural Progenitor Cells into a Developing Chicken Embryo for a Toxicology Model

Piyush Joshi
Dr. Steven Stice, Animal & Dairy Science, College of Agricultural & Environmental Sciences

The goal of this project is to establish a developmental toxicology model system which can be used in the field of toxicology and regenerative medicine. Human neural progenitor stem cells (hNPs) will be injected into the developing chicken embryo and then tracked with magnetic resonance imaging (MRI) and GFP fluorescent cell tracking. To accomplish this, hNPs will be labeled with iron nanoparticle MRI contrast agents and injected into the chicken embryo at stage 15 in hopes of integrating those cells into the central nervous system (CNS) of the chicken. At specific endpoints, the chicken embryo will be imaged to assess cellular integration. When successful, this will provide us with a developmental toxicology model for further studies intending to assess the impact of endocrine active compounds (EACs) and other toxins on neural development.

The Pathogenicity of *Mycoplasma gallopavonis* in Wild and Commercial Turkeys

Rachel Jude
Dr. Naola Ferguson-Noel, Population Health, College of Veterinary Medicine

Mycoplasma gallopavonis has been commonly isolated from wild turkey (*Meleagris gallopavo*) populations throughout the United States, and the prevalence of infection has been estimated to be very high. *M.gallopavonis* has also been isolated from domestic turkeys that can be readily infected with the organism by contact with wild turkeys. Although the avian *Mycoplasma spp*. that are known to be pathogenic to domestic poultry have been extensively studied, there is currently no

objective information available on whether this common *Mycoplasma* infection can impact the health and survival of turkeys. In this study the pathogenicity of an isolate of *M.gallopavonis* was investigated in commercial and wild turkey poults. Twenty domestic and twenty wild turkey poults were inoculated at 3 weeks of age with *M.gallopavonis* via intraocular, intranasal, intra airsac, intra footpad and intravenous routes. Ten commercial and ten wild turkeys were evaluated and compared to non-inoculated controls at 14 and 21 days post challenge by gross and histological examination of tissues. The primary lesion observed in infected birds was synovitis in footpads and associated lameness. The joints were swollen and contained purulent exudate. The domestic turkeys were more severely affected than the wild turkeys. This study is the first investigation into the pathogenicity of *M.gallopavonis* and its potential impact on wild and commercial turkeys in the United States.

The Executive Science Network: Variations between Public and Private Trustee Networks

Shalin Jyotishi
Dr. Sheila Slaughter, Institute Of Higher Education

The Association of American Universities (AAU) is an invite-only association comprised of 62 elite research-intensive universities. Due to their status as leaders in research, AAU universities become prime incubators for the process of technology transfer, which is characterized as the process of commercializing the research of a university scientist. Prior research has revealed the potential for conflict of interest between the individual scientist and business leaders; however, there is little to no research regarding university trustees and their relationships with business leaders. Trustees act as stewards of a university and sit at the top of the university hierarchy. They are usually highly influential leaders who may also sit on boards of external corporations. Trustees often join a broader "executive science network" because, as directors of both universities and science-based corporations, these trustees are in a position to influence discovery and innovation from the highest level of organizational authority. This study seeks to identify industry-academy relationships among AAU university trustees and independent business firms by constructing a database and using social network analysis. Specifically, a component of the research will address network variations among public and private university trustees. Research has revealed private universities contain highly concentrated networks, while public universities form less robust relationships with industry. Through this study, there lies potential to contribute to public policy concerns regarding understanding of conflict of interest issues, mapping areas of overlapping research interest between industry and the academy, and comprehending how networked universities cooperate with for-profit industry firms.

Identifying Interacting Proteins in the Karrikin and Strigolactone Signaling System

Nikhil Kamath, CURO Graduation Distinction
Dr. David Nelson, Genetics, Franklin College of Arts & Sciences

Karrikins, chemical molecules found in smoke from burning plant matter, and strigolactone, a plant hormone, both act as plant growth regulators that affect the development of plants. Both molecules act through alpha/beta-hydrolase proteins called KAI2 and D14. These receptors genetically interact with MAX2, an F-box protein that ultimately allows the molecules to elicit phenotypic responses affecting branching, height, senescence, hypocotyl elongation,

germination, and root development. F-box proteins characteristically mediate ubiquitination of proteins, targeting them for degradation by the 26S proteasome. SMAX1 and its seven homologs in Arabidopsis have recently been proposed to be candidate targets of MAX2. However, MAX2 may also form complexes with many other proteins. Additionally, downstream physical interactions with SMAX1 have not been deeply studied. We aimed to identify novel protein partners using a truncated form of MAX2 that does not have an F-box domain. Without this domain MAX2 should still bind its normal protein partners yet not be able to bind ubiquitination machinery. Without the ubiquitination machinery MAX2 should be unable to facilitate degradation of its protein partners as usual. We stabilize these preserved protein interactions with MAX2 and purify them through coimmunoprecipitation assays.

The Role of tRNA Nucleotidyl Transferase in tRNA Processing in *Escherichia coli*

Francine Katz
Dr. Sidney Kushner, Genetics, Franklin College of Arts & Sciences

The CCA-adding enzyme tRNA nucleotidyl transferase, encoded by the *cca* gene, synthesizes and repairs the 3'-terminal CCA sequence of tRNAs in both prokaryotic and eukaryotic organisms. It is a member of the superfamily of enzymes that also includes poly(A) polymerase I (PAP I), encoded by the *pcnB* gene, which is the major polyadenylating enzyme in *Escherichia coli* and acts by adding adenosine residues to the 3' ends of mRNAs and tRNAs. All the tRNA genes in *E. coli* have the CCA nucleotide triplet encoded within their DNA sequences, so it is thought that the protein functions mostly to repair tRNAs without an intact CCA sequence which may have been removed by tRNA processing ribonucleases during maturation. Our objective is to characterize the properties of various *cca* mutant strains to study the relationship between the CCA-adding enzyme, PAP I, and specific tRNA-processing enzymes (RNase PH, RNase T). Initially we have examined the growth properties of various multiple mutants. Dot blots and Northern blot analysis will be used to study poly(A) levels and the nature of 3' ends of specific tRNA transcripts respectively. RT-PCR cloning of specific tRNA transcripts will allow us to examine the exact nature of the tRNA 3' ends in *cca* mutants. Our findings are expected to provide new insights into the interactions between tRNA nucleotidyl transferase and other key enzymes involved in the processing of tRNAs in *E. coli*.

Attacking the Fire and Fuel: Nano Formulation of Platin-A for Cancer and Associated Inflammation

Samuel Kennedy, Trenton Berding
Prof. Shanta Dhar, Chemistry, Franklin College of Arts & Sciences

A strong association between chronic inflammation and cancer plays roles in prostate cancer. We recently constructed a Pt(IV) prodrug Platin-*A* with the ability to release cisplatin, a widely used chemotherapeutic, and aspirin, an anti-inflammatory agent. Platin-*A* showed enormous potential for further development. However, clinical translation of small-molecule based therapeutics requires a suitable delivery system to achieve favorable pharmacokinetic parameters and appropriate biodistribution. In this presentation, a promising strategy to entrap Platin-*A* in biodegradable polymeric nanoparticles will be discussed. Specifically, we will focus on the role of the mitochondria in coordinating signaling pathways in cancer-associated inflammation. Activation of various proteins causes mitochondrial dysfunction, resulting in mitochondrial reactive oxygen species production and downstream signaling that

promote inflammation-associated cancer. Using a mitochondria-targeted polymeric-nanoparticle as a delivery vehicle, we anticipated that Platin-*A* could be re-routed to the mitochondria of cancer cells and attack the mitochondrial DNA, thereby designing a targeted pathway for the well-established drug cisplatin. A promising strategy for achieving this goal is discussed here.

Nationalism vs. Global Jihad: Al-Qaeda and Precursors in Algeria, Somalia and Yemen

Melanie Kent
Dr. Seema Gahlaut, Center for International Trade and Security

Global jihad is inherently universalist and trans-national, and therefore opposed to Islamic nationalism. Al-Qaeda has not only rejected Islamic nationalism, but has also been able to successfully influence a number of Islamic nationalist groups to pursue global jihad and target their foreign as well as domestic enemies both within and beyond national boundaries. What explains this success? This research focuses on three terrorist organizations, now officially associated with al-Qaeda, that have nationalist goals: al-Qaeda in the Lands of the Islamic Maghreb, al-Qaeda in the Arabian Peninsula and Harakat al-Shabaab al-Mujahideen. Their choice of targets over time is used as an indicator of their evolution from nationalism to global jihadism. The research attempts to understand if this evolution is a reflection of a strategic or ideological change. If the evolution is a result of strategic change, i.e., a response to specific threats to the organizations' survival, we should see an increase in factors such as: external anti-terror operations against it, local competition from other groups and difficulty in expanding funding, recruitment or expertise. If the evolution is the result of a change in ideological beliefs, we should see changes in the character of leadership ties to al-Qaeda and in the organizations' popular support. As terrorist groups become aligned with larger movements, they gain access to additional funds, expertise, recruits and affirmation, making them more dangerous. It is in the interests of anti-terror agencies around the world to understand the rationale behind such alignments in order to better prevent and combat them.

Marital Security, Depression, and Sleep Quality: Assessing Bidirectional Associations with Actor-Partner Interdependence Model

Yuri Kim
Dr. Steven Beach, Psychology, Franklin College of Arts & Sciences

Perceptions of relationship security and self-reported depressive symptoms have been implicated as important contributors to the understanding of sleep quality (Troxel, Robles, Hall, & Buysse, 2007; Sutter, Zöllig, Allemand, & Martin, 2012). The purpose of this study is to examine an integrative model that investigates the dyadic relationship between marital security, self-reported depressive symptoms, and sleep quality. A total of 196 African American married couples were asked to participate in this study. Participants were asked to complete a battery of questionnaires measuring perceived marital security, self-reported depressive symptoms, and sleep quality. The Actor-Partner Interdependence Model (APIM) was used as a framework for statistical analyses in order to incorporate responses from both members of a dyad into a single model and control for the correlated nature of spouses' reports. There were no significant partner effects. However, there were statistically significant actor effects for husband's depression, wife's sense of security in the relationship, and wife's self-reported depressive symptoms on self-reported sleep quality. In conclusion, self-reported depressive symptoms predicted sleep quality for both partners but did not predict

partner sleep quality. For wives only, relationship security accounted for variance in sleep quality beyond the effect depressive symptoms, but again there was no partner effect. Future research and further implications are discussed.

Closing the Income Gap – Education and Technology in the United States
Paul Kirschenbauer, Foundation Fellow
Dr. Santanu Chatterjee, Economics, Terry College of Business

This paper explores the effects of technology and education on income inequality in the United States. Drawing from bodies of research pertaining to these three factors and their interactions, this thesis begins with an exploration of US income inequality, both past and present. Income inequality expansion over recent decades is largely explained by evidence of earners in the top end of the income spectrum having enjoyed income growth of a much greater magnitude than earners in the lower end of the spectrum. A great deal of this may be attributed to the increased prevalence and utilization of technology by government, businesses and consumers. Ample evidence exists to support the notion that technology increases the wages of skilled workers (typically high earners), while simultaneously decreasing those of unskilled workers (typically low earners). As a means to decrease the skill premium, and thereby decrease income inequality, I recommend an increased investment in public education through scholarships for college tuition. As this thesis elucidates, any such attempt at implementing education policy must be carefully planned and correctly executed (in this case, awarding scholarships based on both merit and financial need) to achieve the desired result of closing the income gap. Otherwise, it may actually increase the income gap in the United States.

Decreasing Summer Learning Loss among Low-Income Students in Athens-Clarke County
Shaun Kleber, Foundation Fellow
Dr. Janna Dresden, Elementary and Social Studies Education, College of Education

Summer learning loss is the phenomenon of children losing knowledge and proficiency in skills—such as reading ability—during the months-long summer vacation. Low-income students suffer most, specifically in reading achievement, because of their lack of access to enrichment opportunities and resources that higher-income students enjoy. The problem is especially severe in Athens-Clarke County given the very high poverty rate. Summer learning loss also creates an ever-expanding achievement gap between low- and higher-income students that presents a myriad of problems as students progress through their later years of school. There are a few policies already in place in Athens-Clarke County to address this issue, but each program leaves gaps unaddressed. A literature review and multi-goal analysis revealed that, through a policy aimed at increasing access to educational resources such as books, the problem of summer learning loss could be significantly reduced. This would help close the achievement gap, decrease the dropout rate, increase the graduation rate, and boost the overall success of a huge portion of the student population in Athens-Clarke County.

Henry V: Legitimacy in Kingship and Film
Hannah Klevesahl
Dr. Fran Teague, Theatre & Film Studies, Franklin College of Arts & Sciences

William Shakespeare's *Henry V* (1599?) is the fourth play in a series that showcases the decay of moral legitimacy of kingship. The tetralogy begins with the murder of Richard II and the takeover of Henry IV, which leads to civil war. When Henry V becomes king in the

fourth play, he seems to reverse this trend with the victory over France at Agincourt. Since the advent of modern cinema, however, the play's performance history has been altered dramatically, as has the character's interpretation. The two most notable film versions of *Henry V* – and the ones that are discussed in this paper – are Laurence Olivier's 1944 version and Kenneth Branagh's 1989 version. Olivier's 1944 film portrays Henry V as a national hero, while Branagh's 1989 version gives us a much darker and unglamorous view of kingship. Since these films are adaptations of the same play, I chose to research whether the radically different adaptations of the title character in Henry V – and, therefore, the tone of the film – are legitimate. I will look at critiques from both movies and attempt to validate or invalidate those criticisms by examining the actors' thoughts behind themes of *Henry V* – as well as their opinions on the role – upon which both Branagh and Olivier wrote. I will then endeavor to show evidence that evaluates their production choices, based on the actors' performance and technical production of the "Once more unto the breach" speech in Act III, scene I of *Henry V*.

Building a Record: Requesting Roll Call Votes under Changing Institutions

Cody Knapp, CURO Honors Scholar
Dr. Anthony Madonna, Political Science, School of Public & International Affairs

The roll call voting behavior of members of Congress is a frequent subject of research on congressional politics, with prior research examining the determinants of members' voting behavior and the development of statistical models to scale roll call votes. Scholars of congressional politics have given less attention to the data generating process through which roll call votes arise. Understanding who requests a roll call vote allows scholars to investigate an important question: Do legislators engage in strategic behavior when requesting that a specific vote receives a roll call? I utilize an original dataset of all amendment votes on major legislation from the 57th to the 68th Congress to examine which legislators request roll call votes. The time period of this study is advantageous because the adoption of the Seventeenth Amendment, which instituted the direct election of U.S. Senators, provides a unique opportunity to assess how institutional change influences members' propensity to request roll call votes. This study focuses on two different aspects of the roll call request process. First, I determine which legislators request a roll call vote. Of particular interest is the extent to which the characteristics of the members who request a roll call diverge from the average legislator. Second, I examine whether members are more likely to request roll call votes for issues they favor or oppose. In doing so, it is possible to discern whether members were more likely to request a public vote in order to signal support for or opposition to an amendment.

The Trade-Off between Mating and Fighting in *Nicrophorus vespilloides*

Kyungmin Ko, CURO Graduation Distinction
Dr. Allen Moore, Genetics, Franklin College of Arts & Sciences

Individuals have finite resources to allocate to three major life-history components: somatic maintenance, growth, and reproduction. When division of resources amongst these cannot ameliorate two traits simultaneously, one trait is optimized and the other weakened. This phenomenon is called trade-off. For most species, if the components are in opposition, trade-offs are likely. Male burying beetles, *Nicrophorus vespilloides*, have many traits that they must perform to be highly successful: resource finding, mating, fighting, and parental care. Among such abilities, trade-offs are likely to occur since each is highly related to fitness. I hypothesized that a trade-

off could exist between mating and fighting. I chose mating as one component of this study because, prior to my experiment, three replicated population lines had been artificially selected by high or low rate of male attempts to mate with females within the first 30 minutes of pairing. I chose fighting because, theoretically, males that invest a majority of their resources here are unlikely to attempt mating as frequently as those that invest more in mating. Individuals from differing line types were pitted against each other over possession of a reproductive resource, a mouse carcass. After conducting 240+ trials, winners were determined based on body mass rather than artificial selection of mating rate. Since body mass was not controlled for, I could not detect if different line types were affecting competitive ability in individuals. Therefore, I am unable to conclude that there is an evolutionary trade-off between mating and fighting ability in *Nicrophorus vespilloides*.

Density Dependent Regulation of Survival and Reproduction in Dogbane Beetles and Underlying Host-Plant Interactions

Carmen Kraus, Ramsey Scholar
Dr. Richard Shefferson, Odum School of Ecology

Ecologists have long debated the factors most responsible for population regulation, including the relative importance of top-down (predation) versus bottom-up (food quality) forces. This experiment examined *Chrysochus auratus*, the dogbane beetle, a specialist herbivore that consumes and sequesters toxins from *Apocynum cannabinum*, the dogbane plant. I conducted a field experiment to examine if *C. auratus* populations are regulated through density dependent survival or reproduction, and whether survival and reproduction are sensitive to bottom-up forces including host-plant quality and plant chemical defenses. I caged the beetles on stems of *A. cannabinum* at four densities with eight replicates per treatment. I tracked beetle survival, collected egg capsules, and measured plant quality traits. I found evidence for density dependence in the reproduction, but not the survival, of *C. auratus*. There was an effect of beetle density on egg mass production, which varied over time. The rapidity of the effect on reproduction indicates that an induced defensive response of the plants may be responsible. I also found strong effects of the beetles on its host plant, with significant reductions in plant growth and leaf area with increasing beetle density. The strong effects on plants likely explain the beetles' density dependent reproduction. To my knowledge, no other studies have examined how bottom-up forces regulate populations of aposematic (warning coloration) species.

Glycoproteomic Approaches for Pancreatic Cancer Biomarker Discovery

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

Pancreatic cancer has one of the lowest 5-year survival rates. The high mortality rate, due in large part to a lack of diagnostic tests and thus late stage detection, has created an important role for pancreatic cancer researchers to change these statistics through discovering more efficient methods for detecting pancreatic cancer early. We are studying pancreatic ductal fluid (PDF) samples which contain proteins and sugars that may aid in finding early diagnostic biomarkers. In our current studies, we are comparing PDF from healthy, chronic pancreatitis and pancreatic cancer patients. Since cancer causes inflammation, we are using the PDF from patients with chronic pancreatitis as our baseline control instead of healthy individuals. My role in this project is to isolate the proteins from PDF, release and permethylate the O-glycans, and perform mass spectrometry analyses to assign and quantify the O-glycans. The goal of this work is to find

glycan/protein biomarkers for pancreatic cancer with the hope that this would increase the survival rate of pancreatic cancer.

A Tax-Deferred Trust: Reducing the Financial Burden of Families with Special Needs Children

Mitra Kumareswaran
Dr. Scott Ardoin, Educational Psychology & Instructional Technology, College of Education

In the United States, over twenty million families have a special needs member. Many are children who need extensive healthcare support and provisions for daily living. On top of current expenses, parents must plan how to financially support their special needs children throughout adulthood. Depending on the IQ level, the lifetime expense for the disabled can reach $2.3 million. The average income of a typical middle-class family is currently decreasing, yet the number of families with a special needs child is increasing. Current federal entitlements may also not meet the demands of the future disabled population. If these trends continue, a financial strain will be placed on parents and the state. Currently, special needs trust funds can be created for a beneficiary whose disability impairs the ability to engage in any substantial gainful activity. A literature review was conducted to outline potential policy solutions to assist parents and the government in better providing for special needs individuals. Three viable policy alternatives were identified and then evaluated on the basis of three criteria: cost-effectiveness, political feasibility, and improvement in quality of life for special needs children. The proposed tax-deferred special needs trust fund follows a combined format of 401 (k) and Roth IRA plans so that money deposited into the trust and dividends are tax exempted. This trust reduces the financial strains on parents and society because by not taxing a small portion of the parents' earnings, the government ensures that more money is later available to provide for special needs individuals.

Mapping of the oriT Region of the Virulence Plasmid of *Rhodococcus equi*

Jacob Kumro
Dr. Mary Hondalus, Infectious Diseases, College of Veterinary Medicine

Rhodococcus equi, an aerobic, Gram-positive soil-derived bacterium, is a common cause of chronic granulomatous pneumonia in grazing herbivores and persons with immune deficiencies such as those infected with HIV virus. The virulence plasmid responsible for its disease-causing capacity is transferable to recipient bacteria through conjugation. The plasmid oriT region is essential to conjugation, containing both the nicking and binding sites for TraA, a protein essential for plasmid transfer. Through a series of subcloning and deletion analyses, the oriT has been localized to a 178bp region of the virulence plasmid. This region, when cloned in cis on a small, normally non-conjugating plasmid, confers transmissibility of that plasmid provided the donor *R. equi* strain also carries the virulence plasmid encoding the conjugation machinery including TraA. To identify the specific residues essential for oriT function, the 178bp region of the recombinant plasmid was subjected to timed exonuclease III cleavage. Several of the exonuclease-exposed plasmids were found to be no longer conjugable. Sequencing of the oriT regions of these conjugation defective plasmids is currently underway to identify the deletion mutations associated with loss of plasmid transmissibility. Also ongoing are efforts to express and purify recombinant TraA protein for use in electromobility shift assays (EMSAs). These assays will confirm the interaction of TraA with the wildtype oriT and loss of TraA binding to the mutated fragments associated with defective conjugation. Identifying the TraA interacting

regions of oriT is crucial to understanding the mechanism of conjugation, an important means by which genetic exchange occurs between bacterial species.

The Dynamics of MglA in *Myxococcus xanthus* Motility Systems

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

Myxococcus xanthus cells, when starved, coordinate with other cells in their surrounding area to form fruiting bodies in which cells differentiate into dormant spores. These bacteria glide on solid surfaces and periodically reverse their movement, the direction of which is controlled in part by motility proteins MglA and MglB. These proteins localize to opposite poles of the cell, where MglA is at the leading pole and MglB toward the lagging pole. When MglA and MglB switch poles, the direction of the cell reverses, a process which takes place every 5-10 minutes. We hypothesize that the localization of these proteins within the cytoplasm directs cell movement and aids coordination during and after development of the fruiting body. This project involves creating deletion mutants of MglA and MglB and separately tagging them with fluorescent proteins in order to observe localization of MglA and MglB as well as detecting differences between wild type and mutant movement during sporulation and fruiting body formation. Collection of cell reversal frequency data is in progress for the MglA deletion mutant. MglA and MglB have both been tagged with fluorescent proteins tdTomato and sfGFP, respectively. They will be transformed into *Myxococcus* xanthus and viewed under phase contrast microscopy to visualize their localization within the cell. We also hope to learn how MglA and MglB interact during the reversal and how this affects the directional movement in the short term.

How to Tackle the Bike Share Helmet Problem

Torre Lavelle, Foundation Fellow
Prof. Kevin Kirsche, Director of Sustainability

The reinvention of city and campus transportation is demonstrated most clearly by the popular embrace of bike share programs, short-term bicycle rentals provided at unattended stations. According to both *Annals of Emergency Medicine* and *Time* magazine, however, the discrepancy in helmet use among bike share riders as compared to personal bike users is the one impediment to bike shares' integration into communities. Because helmets are not available at rental stations, New York City's Citi Bike bicycle share program currently recommends that its participants bring a helmet from home. In addition, the company offers $10 helmet coupons for annual members and encourages helmet rentals through a rental company. Nevertheless, geographic inaccessibility is one of the most cited reasons why bike share participants do not wear helmets and any off-site spree to attain a helmet deters commuters, tourists, and quick trips. After conducting a thorough review of existing literature, a multi-goal analysis was performed on multiple policy options, and it was determined that helmet rental vending machines, currently undergoing local expansion at Boston bike share hubs, demonstrate a feasible method to gaining onsite helmet accessibility. Integrating the $2 cost of this vending machine helmet rental into Citi Bike's bike rental fee would challenge an added optional expense that would discourage bike share users from achieving a safe biking experience. A bundled fee still provides the choice to individuals of whether to use a helmet, but with it comes the opportunity to not have to decide between cost and safety.

Abstracts

Wavefront Sensorless Adaptive Optics with Differential Interference Contrast Microscopy

Keelan Lawrence
Dr. Peter Kner, College of Engineering

Many unstained biological specimens cannot be seen when in focus under an ordinary transmitted-light microscope because they are transparent. These transparent samples can be seen with microscopes that convert phase variations due to the refractive index variations into intensity variations by use of interference methods. Differential-interference-contrast (DIC) microscopy is an interference method commonly used for the study of transparent specimens. The DIC image is formed from the difference in phase between two light waves separated by a small lateral displacement. When imaging through tissue samples many microns thick, the light becomes aberrated traveling through the sample, resulting in a distorted, lower resolution image. We demonstrate that adaptive optics can correct distortions in the image, resulting in sharp DIC images throughout multicellular organisms. Adaptive optics improve image resolution by correcting changes to the optical wavefront caused by optical aberrations with the use of a deformable mirror. We determine the optimum correction from a sequence of trial aberrations applied to the deformable mirror. For each trial aberration, we calculate a "metric" which measures the amplitudes of a band of spatial frequencies to be maximized. Trial aberrations were applied on the deformable mirror while looking at the image of a single latex bead. We demonstrate that the maximum intensity of a bad image can be improved by over a factor of 20. We then image *C. elegans* biological samples and correct the DIC images with adaptive optics. DIC imaging with adaptive optics represents a significant improvement over conventional DIC imaging.

The Emergence of Sustainability as the New Dominant Logic in Business

Jessie Lian, Alex Ballasiotes
Dr. Richard Watson, Management Information Systems, Terry College of Business

Every firm needs to establish its dominant logic, which is the critical factor that a business must consider when it makes key decisions. Dominant logics have progressed from goods-dominant (success determined by the ability to produce the most goods with the fewest inputs) to service-dominant (success determined by the ability to retain customers and please them). Firms now face the emergence of a new dominant logic, whereby success is determined by the capacity to conserve resources and provide the most value with the least unsustainable inputs. Our research considers the issues that firms must address during this migration. Through an analysis of corporate annual reports, sustainability reports, and interviews with Chief Sustainability Officers (CSOs), we show that there has been a marked shift in the mentality of motivations for business decisions across industries. Industry leaders understand that a transition to a sustainability focus not only must take place, but will also benefit their company's success. As these findings add to the body of work supporting the transition to sustainability-driven dominant logic, there are important implications for the future of businesses. In particular, we consider the implications for information systems, as they have historically supported the needs of the current dominant logic. Looking to the future, it clearly will be important for observers of the business world, as well as those who operate within it, to understand and utilize sustainability dominant logic and build appropriate information systems.

Abstracts

The Relationships between Zinc and Bone Strength in Healthy Children

Andrea Lobene
Dr. Richard Lewis, Foods & Nutrition, College of Family & Consumer Sciences

Zinc is an essential micronutrient required for childhood bone growth. Zinc deficient children have impaired skeletal development, but it is unclear in healthy children if zinc nutriture is associated with bone strength. The purpose of this study was to determine relationships between dietary and serum zinc and bone measures in white girls entering puberty (11.3±1.3 years of age; n=39). Dietary zinc was assessed using three-day diet records and serum zinc by atomic absorption spectrophotometry. Peripheral quantitative computed tomography was used to measure trabecular and cortical bone geometry at the radius and tibia. Bone mineral content of the total body, lumbar spine, and hip was determined by dual energy X-ray absorptiometry. Mean zinc intakes and serum zinc values were 9.8±4.4 mg/day and 8.8±3.2 mg/dL, respectively. There were significant positive correlations between dietary zinc and several trabecular bone outcomes at the tibia, including trabecular bone strength index (BSI; $r=0.59$, $p<0.001$) and periosteal circumference ($r=0.36$, $p<0.04$). When controlling for energy intake, the correlation with BSI remained significant. There were no positive correlations observed at the radius or with tibial cortical bone, and there were no significant correlations between serum zinc and any of the bone outcomes. These results suggest a link between dietary zinc and trabecular, but not cortical bone strength at the weight-bearing tibia. Since the majority of bone mass is achieved by late adolescence, a zinc intervention trial is warranted to more adequately determine the influence of zinc on bone strength and the potential for osteoporotic fracture prevention later in life.

Development of an In-Frame Deletion System for *Ruegeria pomeroyi*

Amala Malladi
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Ruegeria pomeroyi DSS-3 is an alpha-proteobacteria isolated from coastal Georgia capable of metabolizing the organosulfur compound dimethylsulfoniopropionate (DMSP). DMSP contributes to the global sulfur cycle and marine microbial sulfur and carbon metabolism. To extend the few genetic manipulation tools and antibiotic resistance markers available for use in *R. pomeroyi,* an in-frame deletion system for *R. pomeroyi* is being developed using flippase (Flp)-flp recognition target (FRT) recombination techniques. First, a second antibiotic resistance marker was required. The plasmid pFLP2 carrying ampicillin resistance from *Escherichia coli* was transformed into *R. pomeroyi*. The stability of the pFLP2 plasmid was checked by passing the transformant three times and extracting the plasmid after each passage. It was found to be retained by gel electrophoresis, providing another antibiotic resistance marker in *R. pomeroyi*. Next, FRT sites were added to the tetracycline resistant (TetR) cassette for homologous recombination into the *R. pomeroyi* genome. PCR demonstrated that the TetR cassette was integrated correctly. The final step involved the amplification of regions upstream and downstream of the *katG* gene from *R. pomeroyi* to be used for homologous recombination with the TetR cassette. This attempt to amplify regions surrounding the *katG* gene has not yet been successful. These experiments increase the genetic techniques available in *R. pomeroyi*.

Abstracts

Job Training to Combat Poverty among Unemployed Coal Miners

Molly Malone
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In recent decades significant changes have been made to reduce environmental harm by the coal industry, including more stringent regulations for coal mines which force mines unable to comply to shut down. Many towns which depend on their coal mine as a source of livelihood fall into poverty without other employment options. In some coal mining counties in Kentucky, 72% of income is from the coal industry, and in the past two years alone over 4,000 mine workers in Kentucky have lost their jobs. In Kentucky nine mines are closing, and all have cited the new EPA policies as at least part of the cause for the shutdown. Possible policy solutions include improvement of a program in West Virginia, enacting state policy, and forming a community coalition. In West Virginia, the United Mine Workers Association and WorkForce West Virginia are working together to provide job training for the growing displaced mine workers. The job training program provided by the UMWA and WorkForce West Virginia is funded by a federal grant devoted to efforts in job training. The grant provides up to $5,000 per participant in Classroom Occupational Skills Training, training for occupations expected to be in high demand, such as electrical trades, welding, mechanics, heavy equipment operating, medicine and truck driving. To address the unemployment problem in Kentucky, actions should be taken based off of the program in place by these two groups, though with various changes for improvement.

A Change in the Winds: How the 'Dawgs Can Be Proud of More than Just Sports

Walker Marlatt
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It is well known that Athens-Clarke County is poor; by some reports it is the poorest county of its size in the nation. Not surprisingly, its education statistics fall below the state averages. In contrast, the University of Georgia, whose education and rankings have improved drastically over the last few decades, has an incredible supply of funds. This study looks into how it is possible that such a prestigious and high-functioning university exists in such an impoverished city, and what could be done to alleviate that poverty. Since the academics of the university should be its main concern, I focus less on what the university as a whole could do, and more on nonacademic departments, especially athletics. Despite the fact that it owns some of the most valuable property in the city, the university is tax exempt because it is, of course, a university. However, not all of its money goes to places naturally associated with a college education. For example, it spends almost as much (78 percent!) on athletics every year as the entire county does on education. In looking for ways to change this, I gathered information from census data, websites of the various departments of UGA, and local news articles on both UGA and the nature of poverty in Athens. Ultimately, I seek to prove and persuade that the university should pay taxes on its income that doesn't go to improving the life and education of its student body.

Abstracts

Signaling through TNF Receptors during Placental Malaria.

Omar Martinez-Uribe
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The effects of malarial infection during pregnancy include maternal anemia, low birth weight (LBW), preterm delivery, and increased infant and maternal mortality. Parasites sequester in the placenta and this process is associated with poor birth outcomes, but the mechanisms are still unknown. TNF is a pro-inflammatory cytokine that has been associated with malaria pathogenesis. TNF has a unique ability to induce cell death through its surface receptors, namely TNFR1 and TNFR2. We hypothesize that TNF signaling through its surface receptors (TNFR1 and TNFR2) is required for apoptosis and inflammation followed by tissue damage and pregnancy loss. To verify this hypothesis, we used TNF null-mutant, TNF Receptor 1 Mutant, and TNF Receptor 2 Mutant, as well as wild-type C57BL/6 mice. Mice are infected with *P. chabaudi* AS on day 0 of gestation, and clinical metrics are measured until day 10, day of sacrifice. Spleen, liver, and placental tissue samples are collected and fixed in neutral formalin or fresh frozen in liquid nitrogen. Proteins are isolated and key apoptotic markers such as PARP, caspase 8, RIP1 and cleaved caspase 3 are probed by western blot. Histopathological analysis will also be performed. Preliminary data show that TNFKO and TNFR2 KO are more susceptible to *P. chabaudi* AS infection than B6 mice. Histopathological analysis shows similar features of placental malaria. Continued studies using western blot and immunohistochemistry may unveil new insight into our understanding of the molecular basis of poor pregnancy outcomes in malaria during pregnancy.

The Role of Dopamine in the Perception of Olfactory Inputs in Drosophila Larvae

Melissa Masserant
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When presented with odor inputs, *Drosophila melanogaster* larvae will desire more palatable food; therefore, they will increase the amount they eat. This mechanism requires the neuropil (lateral horn) for higher-order olfactory processing. Higher-order olfactory centers are essential for understanding the motivational significance of the odor inputs. Using *D. melanogaster* in the third instar larval stage, we found a small subset of dopamine neurons along with four neuropeptide F (similar to neuropeptide Y)-producing neurons that project to the larval lateral horns, which mediate the translation from odor signaling to an appetite-driven response. We measure the mouth hook contractions under single odor stimulations to observe the differences in the eating behavior of genetically mutated larvae. However, we are generally subjected to a combination of different odorants; therefore, we primarily focus on how odor combinations affect this mechanism. Our methods also include targeting DA neurons using laser lesion techniques to perform functional analysis studies. Further investigation of this system could lead to a better understanding of anosmia, a major symptom in Parkinson's disease.

The Effect of Order and Condition on Assessments of Executive Function

Brett McCardel, Breanna Ernst, Meghana R. Nathan, Victoria Smith
Bijoyaa Mohapatra, Doctoral Student
Dr. Rebecca Shisler Marshall, Communication Sciences & Special Education, College of Education

Executive functioning is a higher order cognitive ability that enables us to plan, organize, and attend to the stimuli around us. Neurological disorders often present with executive function deficits. A current study in our lab examined executive function in healthy aging individuals. Sixty healthy participants (young=30, aging=30) were evaluated on cognitive tasks that isolate the four fractions of the executive function system. The following tests were administered in a pseudo-random order: Color Trails Test (CTT; set switching), Conner's Continuous Performance Test II (CPT-II; inhibition), Nonverbal N-back Task (updating) and Dual-Task (divided attention). Though these assessments are standard in the literature, ordering and within-test difficulty of these cognitive tests have not been well examined. Due to lack of information in the literature and the potential impact, it is of interest to determine how test order may impact overall executive performance in healthy individuals. It is hypothesized that beginning with a more cognitively demanding test such as the CPT-II will result in poorer performance on subsequent tests. Additionally, analyses of the Dual-Task will be presented; for this Dual-Task, participants were asked to sort cards either by shape, color, or number (three conditions) while simultaneously attending to target sounds played through a computer. It is hypothesized that different conditions may differ in cognitive demands and a less cognitively demanding condition (e.g., sorting by color) may result in better performance scores compared to other conditions. The results of these findings may contribute to a more thorough understanding of test order and presentation for these particular assessments.

Neural Activation Changes Associated with Antisaccade Task Practice

Brett McCardel
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Cognitive control allows us to manage processing of incoming stimuli, and saccade tasks provide valuable insight into how these processes work in the visual system. Prosaccades are rapid, reflexive glances towards a visual stimulus that rely on neural circuitry including visual cortex and frontal and supplementary eye fields. Antisaccades are glances to the mirror location of a stimulus, requiring inhibition of a glance towards the stimulus, thus evoking cognitive control and prefrontal cortex activation. The current study examines the effects of practice on the neural correlates of saccade production when participants perform five runs of varying cognitive load with different probabilities of an antisaccade trial versus a prosaccade trial. Participants will complete a series of eye movement tasks 1) at baseline, 2) during four daily practice sessions, and 3) at post-test. One group of participants will practice five runs with only antisaccade trials while the other group will practice the five probability runs. Functional MRI data collected during the baseline and post-test sessions will be analyzed using an ANOVA to determine the differences in neural activation between the two practice groups using a region of interest (ROI) analysis. It is hypothesized that participants in the antisaccade group will exhibit less neural activation on antisaccade trials at the post-test session compared to the baseline than those in the probability group. These results will help further our understanding of practice-induced plasticity, and how cognitive control

processes are affected by increasing cognitive load.

Arkansas Vaccine Virus Transmitted to SPF Chickens from Vaccinated Broilers Does Not Provide Protection from Challenge

Julia McElreath
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Avian Infectious Bronchitis Virus (IBV) is a gamma Coronavirus (CoV) that causes infectious bronchitis (IB), a highly contagious and economically significant upper respiratory tract disease in poultry. All commercial chickens are vaccinated against IBV but the Arkansas-DelMarVa Poultry Industry (Ark-DPI) serotype vaccine has been shown to provide inadequate protection from challenge and persist in a flock. Previous data show that the Ark vaccine follows an atypical replication pattern in comparison to most IBV vaccines, showing late single or multiple replication peaks throughout the life of the bird. This led us to question whether replication peaks were the result of a single infection with multiple replication peaks, or if chickens are being re-infected by vaccine virus shed into the environment. To test this, we placed 200 Ark-DPI vaccinated broilers and 65 non-vaccinated specific pathogenic free (SPF) chickens together in a colony house at 1 day of age. Swabs were taken for 28 days to monitor vaccine virus replication, and on day 30, select birds were challenged with virulent Ark virus. Vaccine replication was not detected in a significant number of broilers until day 24 post-vaccination and SPF chickens until day 28 post vaccination. Following challenge, 14 of 20 SPF and 9 of 20 broiler chickens tested positive for virus by qRT-PCR. This trial again demonstrates poor protection from challenge after Ark-DPI vaccination and that the Ark-DPI vaccine will spread laterally in a flock, indicating that multiple peaks of vaccine replication may be the result of multiple infections of vaccine virus.

Effect of Metformin Treatment on Feline Sarcoma Cancer Cell Cycle and Apoptosis

Laura McLean
Dr. Robert Gogal, Anatomy and Radiology, College of Veterinary Medicine

The hallmark of a metastatic cancer is uncontrolled cellular proliferation followed by cell cluster expansion into the peripheral tissues of the body. Current therapies are designed to block proliferation by directly inducing cell death via direct DNA damage, blocking cell division or impairing cell-signaling events. Still, there is no silver bullet therapy and the typical drug dose needed to achieve cytotoxicity is associated with severe adverse side effects. Metformin is an oral anti-diabetic drug that is used as a first line of defense for human type-2 diabetes with minimal reported side effects. Recent human-based studies have suggested that this drug may also possess anti-neoplastic properties. The focus of this study is to evaluate the cytotoxic effects of Metformin, *in vitro,* using a feline vaccine associated sarcoma cell line. The assays to be performed to assess cytotoxicity include drug inhibition cell proliferation assays, cell viability and apoptosis assays, cell cycle assays and cytology. Preliminary results at this time support that the drug has an inhibitory proliferative effect on the feline sarcoma cell line, which is concentration dependent. Presently, data are being collected on cell viability and apoptosis, cell cycle and cytology under different concentrations of Metformin. Time permitting, we plan to assess the cytotoxic effects of this drug in combination with another conventional antineoplastic drug and report our findings.

Abstracts

Examination of the Pathogenic Nature of *Mycoplasma pneumoniae*

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Dr. Duncan Krause, Microbiology, Franklin College of Arts & Sciences

Walking pneumonia is a chronic infection commonly found in young adults and children. The primary cause of this infection is a bacterium known as *Mycoplasma pneumoniae*, which generally infects the ciliated epithelium of the conducting airways. We used Normal Human Bronchial Epithelial (NHBE) cells in an *in vitro* model because they create a mucocilliary barrier comparable to the one that forms in the human airway *in vivo*. Preliminary studies have shown that over time, *M. pneumoniae* will migrate from the apical to the basolateral compartment, which may be important in its ability to cause persistent infections. We infected NHBE cells with *M. pneumoniae* and tracked the course of the infection by examining the ability of the bacteria to pass from the apical surface to the basolateral chamber. This was done in an effort to qualitatively and quantitatively characterize pathogenesis and the ability of the NHBE cells to repair damage following infection. Tests were conducted on both mutant and wild type strains of *M. pneumoniae*. We observed NHBE cell sloughing, which appears to parallel what occurs during natural infections, and conducted immuno-histochemical staining and fluorescence microscopy to localize the mycoplasmas. In addition, we measured bacterial numbers in the apical and basolateral chambers to quantify mycoplasma migration. We also assessed ciliary activity visually by videotaping the movement of fluorescently labeled microbeads of various sizes. We hypothesize that colonization of the basolateral compartment provides the bacteria with a niche for hiding from the immune system.

Effect of Differing Larval Diet on Adult Fitness Measured through Body Size, and Novel Methods for Body Size Quantification in *Drosophila suzukii*

Elijah Mehlferber
Dr. Patricia Moore, Biological Sciences, Franklin College of Arts & Sciences

Drosophila suzukii are a recently introduced invasive species and highly destructive agricultural pest. They pose a unique threat because, unlike their close relative *Drosophila melanogastor*, they do not infest rotting fruit, instead attacking fresh ripening fruit. In this project I studied the relationship between larval diet and adult body size. To investigate this I first had to establish wing length as a viable proxy measurement for mesonotum length, which is the measurement usually associated with body size. I then placed *D. suzukii* eggs on blueberries (low protein diet) and artificial media (high protein diet) and allowed them to develop to adulthood, after which I measured and compared their body sizes. Regardless of which larval diet the flies were raised on, their average adult body size was the same. This indicates that *D. suzukii* have adapted to maximize the utility from a lower protein diet, and their body size may depend more on other nutrients. The preliminary steps in this experiment have yielded a reliable and accurate means to quantify the body size of *D. suzukii*, and this information will be useful for future studies of *D. suzukii* and their various life history traits. The research also allows for a better understanding of the adaptations that *D. suzukii* have undergone in reaction to their unique larval diet, and ongoing research is helping to study other related behavioral effects.

Abstracts

Carbon Flux in the Amundsen Sea Polynya

Jasmin Melara
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As atmospheric carbon dioxide levels increase from fossil fuel combustion, so increases the importance of the ocean's role of taking up CO2 and sequestering it at depth for centuries to millennia. The Southern Ocean sequesters about 20% of the global ocean drawdown of atmospheric carbon. During the austral summer (December to January), the Amundsen Sea Polynya off of west Antarctica spans an area of 27,000 km2 and is bursting with primary production, which positively correlates with rates of carbon sequestration. The Amundsen Sea Polynya International Research Expedition (ASPIRE) went during this season in 2010-11 to better understand the Polynya and the processes controlling the amount of carbon sequestered in this important ecosystem. The following was measured and calculated from water samples obtained from various locations around the Polynya to calculate the amount of carbon drawdown: dissolved inorganic carbon (DIC), air-sea CO2 flux (GE), particulate organic carbon (POC), dissolved organic carbon (DOC), dissolved organic nitrate (DON), dissolved inorganic nitrate (DIN), and particulate organic nitrate (PON). Two different methods were used to calculate carbon drawdown: a carbon to nitrogen ratio, and this formula ΔDIC + Δgas exchange – (ΔDOC+ΔPOC) = exported carbon. The average drawdown calculated was about 80g C m-2 d -1, a large drawdown compared to the Polynya's size.

Why is There an Alligator in My Pool? Assessing Potential Range Shifts with Sea Level Rise

Lara Mengak, CURO Summer Fellow
Dr. Nathan Nibbelink, Warnell School of Forestry & Natural Resources

Rising sea levels precipitated by climate change threaten southeastern coasts. Models indicate a substantial loss of salt marsh habitat and a transition from current freshwater marsh to saltwater and brackish marsh habitat, which could adversely affect marsh-dependent species, including the American alligator (*Alligator mississipiensis*). Kayak and spotlight surveys were used to determine alligator occupancy across a gradient of saltwater to freshwater marsh sites. Using this occupancy data, we explored the relationship between habitat composition and alligator occurrence. Our results show that the amount of brackish marsh within 250m of a site best discriminated between presence and absence of alligators. Tolerance to salty environments suggests that alligators may be resilient to changing marsh conditions with sea level rise. Preliminary modeling indicates a slight decline in total suitable habitat area, patch size, and habitat permanence. Habitat quality, however, shows a substantial increase. The models suggest that suitable habitat will move further inland due to sea level rise. These potential range shifts may put alligators into increasing contact with humans. Alligators displaced by sea level changes may be forced into new habitats, both natural and human occupied. Additional research on the population status and carrying capacity of important alligator habitat may allow us to better project consequences for both alligators and human communities.

Clicking on Platinum: Copper(I)-Catalyzed Azide-Alkyne Cycloaddition Chemistry for Axial Functionalization of Pt(IV) Prodrugs

Krupa Merchant
Prof. Shanta Dhar, Chemistry, Franklin College of Arts & Sciences

Cis-diamminedichloridoplatinum(II), or cisplatin, is a platinum-based compound that is widely used as a chemotherapeutic for malignant tumors of the cervix, ovaries, testicles, bladder, and lungs. Despite its great curative success, cisplatin can induce a number of toxic side effects, and certain cancers are resistant to cisplatin treatment. Chemical reactions that can manipulate the cisplatin platform will allow researchers to attach different moieties to the drug that may reduce this toxicity and overcome resistance. Cisplatin, with all coordination sites occupied by –amine and –chloro ligands to perform its anticancer activity, does not offer any vacant site to perform such attachment. However, octahedral Pt(IV) analogues can provide an additional two axial sites for such kind of reactivity. Pt(IV) compounds are known as prodrugs because of their ability to undergo reduction by biological reducing agents to produce cisplatin, the active drug. One type of chemistry that can be very useful in introducing new functionality onto platinum is "click chemistry." These types of reactions are usually 100% efficient and leave very few by-products. In this poster, we will discuss copper(I)-catalyzed azide-alkyne cycloaddition chemistry for axial functionalization of Pt(IV) prodrugs.

Generation of Transgenic Plants Carrying Promoter: Reporter-Gene Constructs to Investigate Transcriptional Expression of GAUT Genes in Arabidopsis

Swayamdipto Misra, Ramsey Scholar
Dr. Debra Mohnen, Biochemistry & Molecular Biology, Franklin College of Arts & Sciences

Pectin is a family of highly complex polysaccharides that serve as important substituents of the plant cell wall and have important functions in cell-to-cell adhesion and plant development and defense. A comprehensive understanding of how pectin is synthesized will have important potential applications in crop enhancement and in better utilization of biomass for biofuels. It is known that the GAUT gene family, with 15 members in Arabidopsis, is involved in pectin synthesis, yet the function of these genes is not yet fully understood. This project aims to investigate the transcriptional expression of individual GAUT genes in different tissues or developmental stages of Arabidopsis plants by using reporter gene constructs driven by GAUT gene promoters. Over the past two semesters, β-glucuronidase (GUS) reporter gene constructs were created for several of the GAUT genes, including GAUTs 3, 5, 9, 10, 13, and 15. The promoter regions of the GAUT genes were amplified by Polymerase Chain Reaction (PCR), inserted into cloning vector pGEM-T, and verified by DNA sequencing. These promoter sequences were subsequently moved into the plant expression vector pBI101 in front of the GUS gene. The resulting constructs were introduced into Arabidopsis plants through *Agrobacterium*-mediated transformation. The seeds from the plants were grown and screened for positively transformed plants. The second generation resulting from these plants will be analyzed and stained in order to study the expression of the respective GAUT genes. Using a similar procedure, a Green Fluorescent Protein

(GFP) reporter-gene construct was also generated for GAUT 1.

Fiber Isotype Post-Injury in Secondary Dystroglycanopathies

Jill Modi, CURO Graduation Distinction
Dr. Aaron Beedle, Pharmaceutical & Biomedical Sciences, College of Pharmacy

Loss of α-dystroglycan (αDG) glycosylation by mutations in *Fktn* causes muscular dystrophy. As severe *Fktn* deficiency has been linked to abnormal skeletal muscle regeneration and differentiation processes, we hypothesized that differentiated skeletal muscle fiber isotypes may arise at different proportions in *Fktn*-muscular dystrophy (KO, *Fktn* knockout mice) compared to normal controls. Cardiotoxin was injected into *Fktn* KO and littermate mice to create acute muscle damage. The resulting muscle fiber differentiation was analyzed 14 days after injury by measuring the proportion of immature and mature isotypes of the myosin heavy chain protein (MyHC) using immunofluorescent microscopy. We found that KO muscles retain more immature MyHC than littermates 14 days after injury, suggesting that regeneration/differentiation is slower in *Fktn* muscular dystrophy. Additional analysis of mature fiber types is ongoing. Overall, changes in KO muscle regeneration and differentiation may provide clues about the molecular events underlying muscle pathology in *Fktn* muscular dystrophy.

VacSIM, a New Vaccine Delivery Method, Improves Cellular Recruitment to Local Draining Lymph Nodes

Joshika Money
Dr. Donald Harn, Infectious Diseases, College of Veterinary Medicine

Although vaccines are a highly effective method of disease prevention, more effective vaccines are needed to increase vaccine efficacy in immune-compromised populations, such as the elderly and very young children. The Harn Laboratory developed an improved method of vaccine delivery, VacSIM (Vaccine Self-Assembling Immune Matrix) that increases vaccine efficacy. The goal of this research project is to gain a better understanding of the method of vaccine delivery used by VacSIM. Three groups of mice were utilized in this experiment; one group was injected subcutaneously with VacSIM, one group was injected with VacSIM and CpG adjuvant, and the last group was unvaccinated. Draining and non-draining lymph nodes were analyzed 24 and 48 hours after injection. Upon analysis, it was found that with VacSIM alone, cell numbers in draining lymph nodes do not increase significantly, but with the addition of CpG adjuvant, cell numbers do increase in the draining lymph nodes. This demonstrates that VacSIM does not create an immune response, allowing the CpG to activate the immune system normally. Thus, VacSIM has been shown to be a viable method of vaccine delivery that does not activate an immune response on its own. VacSIM can therefore be used to safely administer vaccines more efficiently, especially in immune-compromised populations.

Balancing Carbon and Phosphorus for Consumers: Does Nutrient Enrichment Tip the Scale?

Timothy Montgomery
Dr. Amy Rosemond, Odum School of Ecology

Forest stream food webs are based on organisms that can photosynthesize (autotrophs) as well as those that break down terrestrially-derived detritus (heterotrophs). Heterotrophic processes dominate carbon flow in forested streams; however, autotrophic processes may become more important in response to human activities such as nutrient loading. Nutrient loading can affect growth and nutrient

content (lower carbon: nutrient ratios) of autotrophs, which can affect growth of consumers and ecosystem nutrient retention. However, few studies have quantified the effects of nitrogen (N) and phosphorus (P) in changing nutrient content of autotrophic biofilms in streams or assessed how much biofilms change on natural substrates (rocks) vs. standardized substrates (tiles). We compared biofilms on standardized and natural substrates in five headwater streams that were enriched with five concentrations and ratios of N to P for two years (N:P = 2:1, 8:1, 16:1, 32:1, and 128:1). Biofilm ash-free dry mass (AFDM) and C:N:P stoichiometry were quantified and compared. Our results suggest that nutrient enrichment increased cobble biofilm AFDM by 47%. The cobble C:P decreased by 30% respectively across all streams, possibly shifting the limiting nutrient of the streams from P. Tile biofilms were 1.5-2x higher in C:P and N:P compared to cobble biofilms, while cobble biofilms were 8x higher in terms of AFDM. Overall, these results suggest that nutrient enrichment increases biofilm AFDM and nutrient content, but the degree to which was underestimated with standardized substrates.

Analysis of International Media Coverage of Key North Korean Military Events

Cecilia Moore, Holly Boggs
Dr. Brock Tessman, International Affairs, School of Public & International Affairs

Ultimately, the foreign policy behavior of a state is based on its subjective judgments about the intentions and behavior of another state. Often, media coverage can drive these subjective judgments. In this paper, we analyze international media coverage of key military events in the Democratic People's Republic of Korea (DPRK) in order to better understand the impact of media outlets on the major countries involved. We conduct a thorough content analysis of editorials from major newspapers in the People's Republic of China (PRC), Republic of Korea (ROK), Japan, and the United States (US) on two rocket and two nuclear tests conducted by the DPRK from 2009-2013. We analyze editorials immediately preceding and following the tests and draw from newspapers that represent a diversity of political ideology within each country. Using statistical means of analysis, we will test our hypotheses, which are that the nuclear tests will be covered more frequently and more negatively than the rocket tests, all right-leaning newspapers will cover the events more frequently and more negatively than the left-leaning papers, and newspapers in the ROK and Japan will have significantly more frequent and negative coverage than newspapers in the US or PRC. Our findings can be applied to future research concerning these four countries' foreign policy decisions regarding the DPRK. This might indicate a correlation between the tone and frequency of the countries' media coverage and their foreign policy decisions.

EnVISIONeD: Examining VISion among Inpatients with Diabetes

Victoria Moreira
Dr. Valerie Press, University of Chicago Medical Center

Diabetes Mellitus (DM) is the leading cause of blindness among adults in the US. However, patients often fail to obtain vision screening in the outpatient setting due to a myriad of patient and provider factors. There are also limited data for analyzing the hospital inpatient setting as a place to provide guideline recommended care to patients before discharge. Therefore, the present pilot study aimed to evaluate the prevalence of poor vision among inpatients with DM compared to the general medicine population. The study also sought to understand how to catch missed opportunities and to improve inpatient access to guideline recommended diabetic vision care. It was hypothesized that patients with DM would have a significantly

higher prevalence of poor vision. Vision was measured by a bedside Snellen eye chart test and data assessing characteristics of poor vision were also collected. It was found that participants with diabetes were more likely than those without diabetes to have insufficient vision (74/239, 31% vs. 101/466, 22%; p=0.007). As this is a pilot study, data collection is ongoing. However, these findings highlight the importance of utilizing other settings to catch missed opportunities for patients – especially those with DM at risk for developing severe comorbidities. Future studies should continue to evaluate this topic in a multi-site study to enhance the generalizability of results.

Investigation of Hand-Tool Mastery in Tufted Capuchins Using a Multiple-Jointed Tool

Jake Moskowitz, Amanda Heaton, Joshua Lukemire, Stephanie Villarreal
Dr. Kathy Simpson, Kinesiology, College of Education
Dr. Dorothy Fragaszy, Psychology, Franklin College of Arts & Sciences

Using a hand tool effectively requires positioning it and applying appropriate force with it on the target object or substrate. The motor control strategies and spatial reasoning supporting tool use by nonhuman primates likely differ from those of humans, but the nature of the differences is unknown. Capuchin monkeys are the only genus of New World monkeys that spontaneously and regularly use hand tools. We report on an ongoing comparative investigation into how capuchins and chimpanzees use hand tools. Four individual capuchins in the Fragaszy laboratory at UGA were recorded individually using a rake tool to retrieve a token. Monkeys used the tool for 100 trials with a rigid handle, then 100 trials with one joint in it, and finally 100 trials with two joints (in orthogonal planes). In a second phase, they used the tool with the order of tool conditions varied randomly, and a new position for the blade of the rake included randomly. Four cameras placed at different angles recorded the monkey's actions with the tool. We are analyzing the monkeys' actions using ethological and kinematic methods. The findings will help us to understand how monkeys manage variable numbers of degrees of freedom in the tool and also contribute to resolving the theoretical debate surrounding the basis for variability across species in tool use. Supported by grant HD-060563 from the NIH.

Evidence for Indirect Effects of a Predatory Fish on the Size Distribution and Behavior of a Larval Caddisfly Species in Trinidadian Streams

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Dr. Catherine Pringle, Odum School of Ecology

It is important to understand both the direct and *indirect* effects of predators on their prey, given the cascading effects that can result from predator-prey interactions. Previous studies in Trinidadian streams indicate that an important prey item of killifish (*Anablepsoides hartii*) is larvae of the leaf-shredding caddisfly, *Phylloicus hansoni* (Trichoptera: Calamoceratidae). Since larval *Phylloicus* have been found to play a key role in controlling rates of leaf decomposition in Trinidadian streams, predator-mediated effects on *Phylloicus* are important to understand. *Phylloicus* occurs at significantly lower abundances in headwater streams dominated by high densities of killifish, relative to downstream reaches (below barrier waterfalls), where killifish are at lower densities and co-occur with guppies (*Poecilia reticulata*). These previous findings strongly suggest that high densities of killifish in upstream reaches exert *direct* top-down control on *Phylloicus* abundance. In this study, we examine potential *indirect* effects of killifish on *Phylloicus* size frequency distribution and behavior.

Analysis of size frequency distributions of larval *Phylloicus* from both killifish only (KO) reaches and killifish+guppy (KG) reaches (n=5 of each reach type) confirmed our prediction that different predation pressure by killifish alter the size structure of *Phylloicus* larvae: KO reaches exhibited a size frequency peak at a smaller size than in KG reaches. When exposed to killifish cues in *ex situ* laboratory studies, the leaf-shredding activity of larval *Phylloicus* from KO reaches was much greater than that of larvae from KG reaches. Therefore, predation pressure is likely important in shaping behavior and population characteristics of a dominant shredder species.

Analysis of Cancer Mutations in Protein Kinases Using Semantic Web Technologies

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Protein kinases are critical cell regulators, serving as initiators of signal transduction pathways and coordinators of cellular processes through the phosphorylation of target molecules. Given the importance of kinases in ensuring proper cell growth and development, the analysis of misregulatory kinase mutations is a hot target of cancer research. Despite the wealth of online kinase data compiled from various high throughput studies, previous computational approaches were limited due to the specialized nature of databases such as UniProt, COSMIC, and Reactome. To solve this daunting challenge of data integrability, our lab designed the Protein Kinase Ontology (ProKinO). This study utilizes ProKinO's unique sequence alignment of kinase mutations to PKA to generate heatmaps which identify mutation cooccurrence events. Oncogenic cooccurrences were found to be prevalent between two essential kinase subdomains: the glycine-rich loop that coordinates with ATP and the activation loop that interacts with the substrate. The biological effect of these tandem mutations was then evaluated by employing a data-mining approach. Applying natural language processing to the literature from Pubmed's Open Access Subset, mutations were labeled as having positive, negative, or neutral impact. Additionally, the type of impact was curated as either affecting phosphorylation activity, modulating resistance to kinase inhibitors, or altering substrate binding efficiency given computer-identified impact statements. This technique, in conjunction with crystal structure data, will be extended to develop a machine learning approach that accurately predicts the effects of novel kinase mutations. This will be of tremendous value in identifying personalized cancer treatments given patient genomes.

The DIY Phenomenon: Why We "Do It Ourselves"

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The phenomenon of "DIY" or "do it yourself" refers to the lifestyle trend of self-sufficiency. This trend has had an effect on many industries, including the apparel industry. My paper investigates the economic, political, social, and psychological factors that have created the current DIY culture and its effects on dress production globally and locally. My research concluded that DIY tends to be popular in times of low economic prosperity and political unrest. The analysis of the social and psychological underpinnings of this trend also revealed that the main demographic that currently controls this trend is predominately upper-middle class white Americans, mostly women ages 15-50, who have a lot of leisure time and resources to look "different" and make things for themselves at their own pace. These

characteristics of the DIY trend are important for apparel companies, especially for local businesses. However, unless there are serious resource shortages, the global market will continue to be a mass merchandise market and DIY will likely have little effect on it. Despite this, DIY is a significant current trend; therefore, fashion industry leaders who are eager to predict the actions and preferences of consumers are closely watching it.

ChuW as a Class C Radical SAM Methyl Transferase

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Iron is an essential metal for both pathogenic and symbiotic bacteria, and acquisition of iron can become a challenge during host colonization. Organisms can utilize heme and heme-containing proteins of the host as a source for iron. Located on a heme utilization operon and expressed under iron duress, ChuW from *Escherichia coli* O157:H7 is currently annotated as an oxygen-independent coproporphyrinogen III oxidase due to its additional "HemN-like" domain located on the C-terminus. However, HutW, a ChuW homologue, does not rescue a HemN mutant from *S. enterica*, and sequence analysis suggests similarities to class C radical SAM methyl transferases (RSMTs). Like HemN, ChuW may contain two SAM binding sites along with a [4Fe-4S]2+/+, which aids in radical generation and methylation. The structure and mechanism for Class C RSMTs have yet to be elucidated. In this work, we show ChuW contains an Iron-sulfur cluster and produces equivalent amounts of 5'-deoxyadenosine and S-adenosylhomocysteine, in the presence of an electron source, SAM, and Fe(II)-Deuteroporphyrin IX. In attempts to disrupt ligand binding and/or trap an intermediate, a predicted model of ChuW, derived from HemN, was generated to provide us with the amino acid targets for site-directed mutagenesis. By using EPR, UV-vis spectroscopies, and HPLC, we have characterized the variants Y61R and F76A, both of which displayed a bound iron-sulfur cluster; however, only the F76A expressed activity. ChuW is the first class C RSMT reported, hence, this research will help further our understanding of the mechanism of this subfamily of radical SAM enzymes.

"Please Excuse Me as I Am in Need:" Bondage and Freedom in Civil War-Era Athens

Laura Nelson
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Studying the lives of slaves challenges outmoded, monolithic mythologies of the past and instead recognizes the enormous struggles and equal contributions of both black and white Americans. This research does so by reconstructing and examining the life of Aggy Mills (1827-1900), an Athenian woman enslaved by the elite Cobb family. She was remarkably literate, and through several extraordinary letters that she wrote to her owners, aspects of her life in slavery and freedom, like her role in her master's home and her place in the multicultural Athenian community, become apparent. Trace details of her life were first seen in these letters, but these only recount a portion of her life. To see Aggy as more than a servant, these letters are examined in conjunction with sources in the Athens-Clarke County Heritage Room, property deeds at the courthouse, census records, and various other local sources. Studying Aggy's life helps to give a more multifaceted version of the antebellum South, one where slaves' and whites' lives were intertwined, and slaves managed to define their own lives outside of the realm of their bondage. This research has been transformed into a digital sketch of Aggy's life as a part of

the Georgia Virtual History Project. Viewers can hear Aggy's story and see the places connected to her life via a downloadable app for smartphone or tablet. Additionally, this research will be presented at the annual conference of the Georgia Association of Historians.

Work-Sites with Physical Exercise Facilities and Their Effect on Employee BMI and Waist Circumference

Christina Nguyen
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Work-sites that provide employees with places to be physically active and allot a longer break period for physical activity may see an increase in the overall health of employees. We hypothesize that work-sites that offer onsite fitness centers and fitness rooms and have policies that support physical activities will be associated with a decrease in BMI and waist circumference of employees. Information was gathered about the work-sites using the Environmental Assessment Tool (EAT), such as offered time for physical activity during work hours, the presence of fitness equipment and walking routes and trails at work sites. Approximately two hundred employees had their weight and height measured to calculate their BMIs and waist circumferences. Average BMIs, average waist circumferences and frequency of employees that have access to physical activity programs will be calculated. T-tests will be calculated for BMIs and waist circumferences comparing employees at work-sites that have physical activities programs versus work-sites that do not have these programs. The importance of this research is to provide employers with data that would increase the overall health and productivity of their employees. Additionally, it would allow employers to determine if existing or planned exercise facilities are cost effective.

Metaphors of Color: The Linguistics of Internalized Racism

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This study proposes a history of the English word *whitewashed* based on quantitative and qualitative evidence from historical and modern language corpora. Analyzing the change from the word's original meaning to its racially imbued meanings, the paper also examines *whitewashed* as it pertains to the Vietnamese-American community in the context of other racially charged words and phrases (i.e. FOB, *fobby, fresh off the boat, acting white*). Based on the qualitative analysis, the data suggest that *whitewashed*, while particularly similar to the phrase *acting white*, retains a negative racial connotation that differs from the other expressions. This study explores the evolution of social meaning through the intersection of racial stereotypes and lexical semantic change.

Mitogen Activated Protein Kinase Flanking C-Terminal Tail: Structure and Function

Tuan Nguyen, CURO Honors Scholar, Ramsey Scholar, CURO Summer Fellow
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Living cells use networks of mitogen activated protein kinase (MAPK), a key cellular component of signal transduction, to respond to environmental signals. MAPK's cellular significance is underscored by its having been implicated in among the most prevalent aberrant signalling pathways in cancer. Although members of MAPK family have been extensively characterized at the biochemical, cellular, and structural level, an integrated evolutionary understanding of MAPK's functional divergence from a sequence level has been inadequate. Here, I

discuss how using genomic sequence comparison tools has shed light upon MAPK's structural evolution. I present evidence for co-evolution between MAPK's catalytic domain and MAPK's unique flanking C-terminal segment. Further implications of this work will be made in the talk.

Effects of Patellar Tendon Strapping on Lower-Extremity Kinematics

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Patellar tendinopathy is a musculoskeletal overuse injury, and treatments attempt to reduce pain by applying strap devices around the tendon. The mechanism causing pain reduction is not known, but using strapping may alter lower extremity kinematics of the ankle, knee, and hip in the sagittal plane. The purpose of this study is to determine the acute effect of patellar tendon straps on ankle, knee, and hip peak flexion angle during a drop jump with and without a Matt strap. We hypothesized that knee joint flexion would increase with strapping. Twenty-three recreationally active participants (14 females, 9 males, age=21.6 ± 3.5 years, height=174.2 ± 8.3 cm, mass=70.8 ± 10.9 kg) who experienced patellar tendon pain were fitted with 16 retro reflective markers, and data were collected via a 7-camera Vicon motion capture system. Participants performed a two-legged drop jump (DJ) off a 40cm box, landed on a force plate, and immediately jumped 50% of their maximum vertical jump. Five trials were performed with and without the Matt strap in a counterbalanced order. Paired sample t-tests ($p < .05$) were used to compare differences in peak flexion angles of the hip, knee, and ankle between strapping conditions. There were no significant differences in strap versus no-strap conditions, respectively, at the ankle (35.5 ± 10.1°, 34.6±8.6°, $p=0.52$), knee (76.3±13.3°, 74.0±13.6°, $p = .10$), or hip (58.1±11.7, 57.7±14.1°, $p=.74$). Acutely applying a strap appeared to have no influence on peak flexion angle in any lower extremity joint. Pain reduction may be caused by another mechanism.

***In Vitro* Protease Digestion and Reduction of Tropomyosin using Shrimp and Tropomyosin-Enriched Samples**

Kristyn Nock
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Of the vast range of foods responsible for adverse allergic reactions, crustaceans have been and continue to be a growing concern. The reaction caused by the consumption of crustaceans is IgE mediated, as IgE antibodies bind to the food allergen and induce a release of potent compounds, triggering symptoms of allergic reactions such as anaphylaxis, angioedema and morbilliform rashes. This study focuses on determining the most effective protease and conditions for reduction of the allergenicity of tropomyosin, the primary allergen responsible for adverse reactions from the ingestion of crustaceans. To reduce its allergenic activity, the goal of this study was to degrade tropomyosin into peptide fragments through protease digestion. Tropomyosin enriched samples and masticated shrimp samples were treated with either trypsin or α-chymotrypsin in simulated gastric fluid. Two methods of digestion were performed using a water bath and a gastrointestinal simulator. Hydrolysates were collected at various digestion times and samples were subjected to sulfate polyacrylamide gel electrophoresis (SDS-PAGE) to analyze alterations in the molecular weight of tropomyosin. The western blot method was additionally performed for further analysis of the degree of allergen reduction for particular digested samples. From multiple variable alterations throughout successive trials, the proteolytic ability of trypsin on tropomyosin at a 1:25 enzyme-

protein ratio was indicated. Upon expansion of this knowledge, it may be possible to incorporate the protease into crustacean-containing foods so that they may be nonallergenic and safe for consumption.

Hydrothermal Synthesis and Particle Size Study of Ancient Pigments

Isaiah Norris
Dr. Tina Salguero, Chemistry, Franklin College of Arts & Sciences

Egyptian Blue, $CaCuSi_4O_{10}$, and Han Blue, $BaCuSi_4O_{10}$, are among the first synthetically manufactured inorganic pigments from the ancient world. These two pigments are most notable for their vibrant blue hues that were used to color paintings. Modern interest in these pigments is due to their strong emission in the near infrared. Conventional solid state reactions for these pigments need extremely high temperatures of 950-1050 °C. We are developing two new ways to synthesize both pigments: hydrothermal and solid state with nanomaterials. The hydrothermal synthesis takes place in a Teflon-lined autoclave using water as a solvent and reduces the reaction temperature to 250 ºC. Future work with this method will be a time study of crystal size. We are also working on a study of what effect the size of starting materials has on the size, reaction temperature, and morphology of the product in solid state reactions of these two pigments by using scanning electronic microscopy to confirm particle size. We have found that when two of the starting materials are nanoparticles and the third micoparticles, the resulting product is reduced in size compared to the bulk synthesis using non-nanomaterials and has a decreased reaction temperature. Future work for this project will be to use all nanosize starting materials to see how small the product will be and how much of a reduction in reaction temperature we can obtain.

Proteomic Analysis of Erythrocyte Ghosts: The Effects of Zinc Supplementation

Kathleen Norris, CURO Graduation Distinction
Dr. Arthur Grider, Foods & Nutrition, College of Family & Consumer Sciences

Measuring plasma/serum zinc concentrations is used as a biomarker for assessing zinc status in human populations, but is neither sensitive nor specific for assessing individual zinc status. The purpose of this research is to identify zinc-responsive proteins within the erythrocyte membrane. Blood was collected as part of a larger study assessing the effects of 24 mg zinc supplementation for 4 weeks on bone growth biomarkers in Caucasian early adolescent females (9-13 years old) (PI: Richard Lewis). Samples were collected at baseline ($n=21$) and at 4 weeks ($n=20$), and plasma and erythrocyte ghosts (EG) prepared. Plasma zinc concentrations were measured by atomic absorption spectroscopy. EG proteins were separated by two-dimensional gel electrophoresis (2DE; isoelectric focusing (pH 3-10) and 10% denaturing polyacrylamide electrophoresis). The gels were stained with colloidal Coomassie blue, the images digitized, and densitometry was performed. Significance ($p \leq 0.05$) was determined using Student t-test. The plasma zinc concentration increased 1.2-fold $\pm$ 0.4(SD) after the four-week period of supplementation ($p<0.05$). Two EG samples from baseline and 5 EG samples from 4-week zinc supplementation were separated by 2DE. Three proteins exhibited zinc-dependent differential expression: 81.3 kDa, ~ pH 10 (1.7-fold increase); 45.7 kDa, ~ pH 7 (2.7-fold increase); and 134.9 kDa, ~ pH 6 (3.6-fold increase). These data support the up-regulation of certain proteins within the erythrocyte membrane in response to zinc supplementation. These proteins may ultimately serve as biomarkers for assessing individual zinc status following further validation.

Abstracts

Economic Transition and Psychological Distress as it Relates to Risk Factors for Cardiovascular Disease in St. Lucia

Mary Elizabeth Nuttall, CURO Honors Scholar
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St. Lucia, a small island country in the Caribbean, has transitioned from an agrarian to a tourism-based economy. This economic transition has caused many socio-cultural changes, including an increase in psychological distress for much of the population as livelihoods change and the cost of living increases. Psychological distress is hypothesized to shape lifestyle behaviors, such as over-eating and alcohol consumption, both of which increase the risk for cardiovascular disease (CVD). Our research focuses on understanding the causes and outcomes of psychological distress and its effect on risk factors for heart disease in St. Lucia. After obtaining informed consent, we conducted informal one-on-one interviews with 25 participants concerning their cultural perceptions of CVD and its lifestyle risk factors. Using the themes uncovered in these interviews, we conducted 4 focus groups using photovoice, a method in which participants explained photographs reflecting their perceptions of health. An in-depth analysis of the interviews and focus groups is underway using NVivo software. Preliminary analysis indicates that economic pressures and family responsibilities are the two major causes of psychological distress that participants face. Additionally, we found that many participants cope with psychological distress by over-eating and drinking to excess. Few projects focus on the association between the risk factors for heart disease and psychological distress in St. Lucia and other middle-income countries undergoing similar economic transitions. Our research will provide a unique perspective on a growing global issue and ultimately could be used to stage culturally relevant CVD intervention programs focused on managing psychological distress.

Max Contracts: Savings or Reallocation?

Thomas Oliver
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This essay argues that the maximum limit imposed on individual player salaries by the National Basketball Association's collective bargaining agreement in 1999 created an environment in the free agent market that led organizations to adopt a more inefficient spending style than the one employed in the era before the policy was in place. Specifically, the individual player salary cap resulted, in the first years after its imposition, in a transfer of salary from the best players to intermediate skill players, and, in more recent years, from the best players to lower skill players. Skill was measured with win shares, a standard basketball player performance metric. Data on contracts and win shares were collected for the 1995/6 through 2013/14 seasons. Since player contracts are typically multi-year and since aging has large effects on performance, it was necessary to forecast each player's future performance over the life of his contract based on age and past performance. This projected win share was the key player quality measure. Contract values were plotted against projected win shares both before and after the imposition of the individual salary cap policy and loess regression was run to confirm the graphical results. These results show that the relationship between salary and player quality became noticeably less steep and less convex immediately after the imposition of the cap, with intermediate quality players benefiting from the change. In more recent years, lower quality players appear to have benefited more from the salary cap, as a more convex relationship reasserts itself.

Abstracts

Analysis of P1 Function in *Mycoplasma pneumoniae* Adherence and Gliding

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This study focuses on *Mycoplasma pneumoniae*, a human pathogen causing bronchitis and primary atypical, or "walking" pneumonia. Mycoplasma adherence to respiratory epithelium is mediated by a differentiated terminal organelle. Located on the surface of the terminal organelle is the P1 protein, which functions directly in both cell adherence and motility. There is evidence from recent studies to indicate that P1 repeatedly catches and releases sialic acids, present on airway cell surfaces, to thrust the mycoplasma cell forward. Furthermore, P1 is believed to exist in conformationally distinct subpopulations that shift when mycoplasma cells glide. Little is known about the specific mechanism by which the bacterium exhibits motility via the P1 protein. Learning about this unique form of movement can lead to new strategies for treatment of infections and a greater understanding of bacterial motility. By means of immunofluorescence microscopy with monoclonal antibodies specific for P1, mAB1 and mAB2, we sought to define quantitatively the location and relative amounts of P1 subpopulations. The antibodies mAB1 and mAB2 consistently yielded distinct labelling patterns, which were not the result of background or "noise." Furthermore, mAB1 appeared to bind only to a subset of P1 proteins and only at specific times, as opposed to mAB2, which appeared to bind to all P1 at all times.

Use of Synthetic AKAP Peptides to Assess the Importance of the Protein Kinase A Signaling in the African Trypanosome

Nina Paletta
Prof. Kojo Mensa-Wilmot, Cellular Biology, Franklin College of Arts & Sciences

Human African Trypanosomiasis (HAT) is a tropical disease caused by the protozoan parasite *Trypanosoma brucei*. Over 70 million people are at risk of contracting HAT, and current drug treatments can be highly toxic. Evolutionarily diverged cell cycle regulators may be promising targets for anti-trypanosome discovery. A-Kinase Anchoring Proteins (AKAPs) contribute specificity to cyclic-AMP signaling by protein kinase A (PKA) through binding the enzyme and its substrate targets. We are testing the efficacy of human AKAP-inhibitor peptides against *T. brucei*. These peptides are hypothesized to disrupt AKAP scaffolding, thus perturbing PKA signaling. We are taking three approaches to achieve our goals: 1) identify AKAP binding proteins, by immunoprecipitation, 2) localize AKAP binding proteins by fluorescence microscopy, and 3) determine antitrypanosomal properties of the AKAP inhibitor by flow cytometry. We treated trypanosomes with an AKAP inhibitor modified with a biotin label. After treatment, trypanosomes were lysed and passed through a streptavidin-coated bead column. A set of trypanosome proteins bound the AKAP peptide (as determined by SDS-PAGE). These proteins will be isolated from the gel and identified by mass spectrometry. The microscopy and flow cytometry experiments are currently underway. By analyzing the data from all three assays, we can better understand the contributions of AKAP scaffolding and PKA signaling in the trypanosome.

Abstracts

Bioluminescent Color Shifts in North American Fireflies

Jennifer Pallansch, CURO Summer Fellow
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A frequently overlooked feature of firefly light signaling is the natural color variation observed across species. This project documented extensive bioluminescent color variation among North American fireflies to expand upon current field data and to elucidate possible correlations between color shifts and environmental factors. Firefly emission spectra were recorded for over 600 individuals at 52 field sites. The use of a portable spectrometer minimized potentially modulating factors such as age and the effects of chemically induced flashing by capturing emission spectra in a natural setting. With this data, we tested environmental factors for associations. Because it has been theorized that color shifts are influenced by ambient light, each population was categorized by habitat and activity time to estimate the amount of background light in the environment. Habitat and activity time designations were compared with color shifts across all species data as well as population data collected from two main species, *Photinus pyralis* and *Photinus scintillans*. Statistically significant associations were not observed with activity times, but habitat showed significant correlations with both species and *P. scintillans* spectral data. By collecting comprehensive field data, we were able to examine several environmental factors possibly involved in the evolution of color shifts and provide an in-depth assessment of naturally occurring color variation in fireflies.

Exploring the Variable Weaning Strategies of Female Rhesus Macaques through Stable Isotope Biochemistry

Katherine Partrick, CURO Summer Fellow
Dr. Laurie Reitsema, Anthropology, Franklin College of Arts & Sciences

Weaning is an important life history phase because it directly affects a mother's fitness and infant development. Observational data traditionally used to assess weaning age can be imprecise due to the problems of comfort nursing and nursing at night. We employ an isotopic approach to more objectively assess age-at-weaning of captive rhesus macaques (*Macaca mulatta)*. We also examine factors thought to influence weaning strategies, including mother's rank, infant sex, and infant growth rate. We test two alternate hypotheses: (1) Infants are weaned at age 5 months (based on previous observations on captive *M. mulatta*) and (2) infants are weaned upon reaching 2/3 adult body size: ages X-Y months (the threshold weight hypothesis). Stable carbon and nitrogen isotope data were assayed from blood plasma of 8 mother-infant pairs of known age, rank, parity and weight housed at the Yerkes Primate Research Center. Mothers were sampled at ages 2 and 5 months. Infants were sampled at ages 2, 5-8, and 10 months. Mean values of the mothers over 10 months were δ13C=-19.3$\pm$0.37‰ and δ15N=6.9$\pm$0.3‰. Between 2 and 10 months, infant δ15N values dropped from 7.7$\pm$0.3‰ to 6.8$\pm$0.3‰, and δ13C values dropped from -18.0$\pm$0.28‰ to -19.9$\pm$0.44‰. Males were weaned earlier than females (age 6 months versus age 8 months). No relationship was found between isotopic values and infant growth rate or maternal rank, although the lowest ranking mother weaned her offspring earliest. The refined snapshots of weaning status obtained through isotopic analysis permit previously impossible hypothesis testing in primate weaning ecology.

Recombinant Protein Therapy: Generation and Purification of Various Fukutins

Niraj Patel
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Protein therapy is a method of delivering therapeutic amounts of protein that would be otherwise absent or insufficient in individuals that have a disease. Because the loss of functional fukutin (Fktn) causes Fukuyama Congenital Muscular Dystrophy (FCMD), we seek to determine whether protein therapy can alleviate the disease temporarily. To test this question, we designed and generated various fukutin inserts (Tat-mini-Fktn, full-length Fktn, and Tat-full-length-Fktn) in the pET29a expression plasmid for recombinant protein expression. The Tat (Trans-Activator of Transcription) sequence was fused to several of the fukutin inserts because it has cell penetrating peptide properties, to promote cell entry. We then induced synthesis of the fukutin recombinant proteins in bacteria. Recombinant protein is purified and then tested in mice with fukutin-deficient muscular dystrophy. We aim to determine the localization, stability and potential therapeutic activity of the different fukutin protein variants in mouse skeletal muscle. Overall, these studies will help us to understand the function and activity of fukutin and its potential for therapeutic benefit.

Role of Salicylic Acid in Oxidative Stress Responses in *Arabidopsis thaliana*

Shreya Patel
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Plants are sessile organisms and face biotic and abiotic stress during their life cycles. As such, they have developed an inherent ability to survive unfavorable conditions through defense mechanisms. Salicylic acid (SA) is a phytohormone that is ubiquitously expressed in plants and is thought to play an important role in oxidative stress responses. We used transgenic *Arabidopsis thaliana* lines that exhibit varying levels of salicylic acid to assess its effects on oxidative heat response. Oxidative damage in plants involves oxidation of polyunsaturated fatty acid molecules in the lipid bilayer of the cell membrane and can be measured by the thiobarbituric acid-reactive substances (TBARS) assay, using malondialdehyde as the substrate. Known as the secondary end product of polyunsaturated fatty acid oxidation pathway, malondialdehyde reacts with thiobarbituric acid and generates an adduct, which can be measured spectrophotometrically. The FDIrp9 transgenic line engineered to accumulate high levels of SA showed drastically reduced MDA levels compared to the wild type. Interestingly, the NahG transgenic line with depleted levels of SA also showed a slight decrease of MDA. In response to heat stress, the wild type MDA levels were reduced, while those of the FDIrp9 and NahG plants were increased, with the NahG plant exhibiting the greatest increase in MDA content. Thus, the effects of SA on oxidative stress response appear to be complex and can be explained by differing mechanisms that might be directly or indirectly involved in maintaining plant homeostasis.

The Double Knockout of the Haptoglobin-Hemoglobin Receptor in Bloodstream-Form *Trypanasoma brucei brucei* Lister 427-Single Marker Clone

Hayes Patrick
Dr. Stephen Hajduk, Biochemistry & Molecular Biology, Franklin College of Arts & Sciences

Trypanosome Lytic Factor (TLF-1) is a primate-specific subclass of high-density lipoprotein that is critical for immunity against certain species of parasites called African trypanosomes. The primary mechanism of trypanosome susceptibility to TLF-1 begins at

the haptoglobin-hemoglin receptor (HpHbR) in the flagellar pocket of trypanosomes. The flagellar pocket is a specialized region of the trypanosome cell surface. TLF-1 binds to this receptor, initiating a lytic pathway that leads to TLF-1 endocytosis into the lysosome of the cell. We show here that through the double knockout of the HpHbR in *Trypanosoma brucei brucei* (*T.b.brucei*), there is a significant increase in trypanosome resistance to TLF-1. The knockout of the HpHbR was visualized through a combination of qualitative and quantitative analyses. These data are consistent with the claim that the HpHbR is the primary source for TLF-1 binding and uptake. With the elimination of the HpHbR in our *T.b.brucei* cell line, we are now able to explore additional contributors to TLF-1 resistance. Through RNA-interference screening of a candidate construct into these cell lines, we can identify target proteins and begin to see what other factors contribute to trypanosome susceptibility to TLF-1. RNAi of candidates will allow us to knockdown target proteins and test for changes in sensitivity to TLF-1. If measurable changes are found, we can ectopically express tagged versions of those proteins in order to assess their functions, which could be shown through colocalization with TLF-1 or other steps along the TLF-1 lytic pathway.

Association between Body Composition and Serum Folate Concentrations in Women of Childbearing Age: Secondary Analysis across Three Studies

Meagan Patterson
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Sufficient folate status is important before conception in reducing the risk of neural tube defects (NTDs). As maternal obesity is also a risk factor for NTDs, this study asked the question: "Is there a relationship between serum folate and body composition in women of childbearing age?" A secondary analysis was performed in normal weight and obese women using data from three previous studies in our laboratory (n=94; average age=24.3, range=18-40; average BMI=28.2, range=18.3–56.8), for which serum folate (microbiological assay) and body composition including total mass, fat mass and fat-free soft tissue measures (dual energy X-ray absorptiometry (DXA)) were available. Bivariate and partial correlations were determined using SAS. Across these three studies, fasting serum folate concentrations were lower in the obese as compared with the normal weight women (16.34±1.03 ng/mL versus 21.04±0.87 ng/mL, $p<0.001$) and inversely correlated with both BMI ($r=-0.366$, $p<0.0001$) and total body mass ($r=-0.374$, $p=0.0002$). The association between serum folate and total body mass remained significant after correction for age, diet, oral contraceptive use and parity ($r=-0.396$, $p=0.0003$); was attenuated by further correction for fat mass ($r=-0.247$, $p=0.028$); and eliminated by alternatively correcting for fat-free soft tissue ($r=-0.059$, $p=0.605$). This suggests that the lower serum folate concentrations in obese women of childbearing age may be explained, in part, by an increased amount of metabolically active fat-free soft tissue. These findings provide additional evidence for consideration of body composition in intake recommendations for improving folate status and reducing the risk of birth defects in women of childbearing age.

Issues in the Therapy Experience for the LGBT Community and Their Implications

Kinsey Pebley
Dr. Patricia Richards, Sociology, Franklin College of Arts & Sciences

Little work has been done to acknowledge or address the shortcomings of the therapeutic experience for lesbian, gay, bisexual, or transgender (LGBT) identified individuals. This topic is of particular importance given

that members of the LGBT community are at a higher risk for mental health difficulties, as they face unique stressors concomitant with heterosexism (Bos et al., 2008). While many therapists resolve to remain objective, they may inadvertently disrespect or display limited knowledge about the experiences and preferences of these individuals. Sixteen LGBT persons who had been to therapy participated in interviews in which they were asked to speak to their experiences, specifically if the experience was beneficial for them and what could have made it better. Salient themes that emerged from qualitative analysis of these interviews included use of sensitive language (such as use of gender-neutral pronouns), a desire for community, agency in seeking support outside of a traditional setting, and the challenges of identifying safe spaces. Psychologists are ethically bound to practice cultural competency ("Ethical principles of," 2014) and be sensitive towards the identities of their clients. These findings can help to fill the gaps of knowledge relating to issues prevalent in the LGBT community and provide a greater sense of safety within the therapeutic setting, thereby reducing the risk of mental health problems affecting these communities.

New Aid for Africa

Anne Pellegrino, Jonah Driggers, Elijah Scott, Meili Swanson, Luke Thompson, Patrick Wheat
Dr. Brock Tessman, International Affairs, School of Public & International Affairs

The nations of the Great Lakes region in Africa are struggling under the dual challenges of corruption within state governments and economic underdevelopment, which have both limited the effectiveness of foreign aid and foreign investment within the region. These issues spring from a combination of ineffectiveness and redundancy of current regional organizations, a lack of proper physical and institutional infrastructures, and a lack of current local incentive or regulation to limit corruptive influences within the nations themselves. To best combat these issues, USAID should employ a three-pronged economic approach: the creation of a micro-lending program to allow for allocations to be spent directly by citizens to grow their national economy, a focus on distributing aid towards public-private partnerships to increase domestic growth, and the reinforcement of funds to support pre-existing Regional Economic Communities within the African Union. These three approaches create the opportunity to broadly address these issues of corruption by removing corruptive factors from the distribution process, while creating the opportunity to stabilize the economies of the Great Lakes region. To demonstrate the effectiveness of this three-pronged policy approach, we will evaluate similar attempts in the Great Lakes region, and evaluate the success of such programs when applied to our three-pronged policy solution. Nations included in this evaluation will include the United Republic of Tanzania, the Republic of Kenya, the Republic of Uganda, the Federal Democratic Republic of Ethiopia and the Democratic Republic of the Congo.

Football Facemask Mass Influences Head Impact Location

Tracy Phan
Dr. Julianne Schmidt, Kinesiology, College of Education

Objectives: 1) To determine whether players with heavy facemasks have increased odds of sustaining impacts to the top of the head. 2) To determine whether there is a significant difference in head impact severity between players with heavy versus light facemasks. *Participants:* Twenty-five collegiate football players. *Interventions:* Facemask type and mass were determined. Head impact location and severity were captured for 7,135 head impacts using the Head Impact Telemetry System. *Main Outcome Measures:* 1) We categorized

facemasks as either heavy (>484g) or light (<=484g) using a median split. We computed the odds ratios for sustaining top of the head impacts between facemask groups using a random intercepts proportional odds model. 2) We compared head impact severity (linear and rotational acceleration) between groups using a random intercepts general linear model (α=0.05). Player position was included in all models. *Results:* Players with heavier facemasks had reduced odds of sustaining frontal (OR:0.42, 95%CI:0.22,0.81) and right side (OR:0.47, 95%CI:0.26,0.83) rather than top of the head impacts. Head impact severity did not significantly differ between groups. *Conclusions:* Players with heavier facemasks may have increased odds of sustaining impacts to the top of the head because they adopt a head-down tackling technique. Decreased odds of sustaining right side hits may be due to variable aspects such as player location or play. Other factors such as a player's tackling technique, physical fitness, and neck strength may also play a role in head protection.

Transferrin-Crosslinked Liposomes for Targeted Drug Delivery to *Trypanosoma brucei*

Aparna Philip
Dr. Stephen Hajduk, Biochemistry & Molecular Biology, Franklin College of Arts & Sciences

Trypanosoma brucei is a protozoan parasite that causes African sleeping sickness in humans and nagana in cattle. Without treatment, both sleeping sickness and nagana are fatal, leading to thousands of human and millions of cattle deaths annually. Available therapeutics are fraught with severe side effects, difficult to deliver and prone to the development of resistance. Our laboratory has developed a small hydrophobic peptide (SDLGAVISLLLWGRQLFA) (SHP) that is uniquely toxic to the mammalian bloodstream developmental stages of *T. brucei*. Bloodstream form of *T. brucei* showed a LD50 (median lethal dose) of ~8 μM for SHP *in vitro*; however, the limited solubility of the peptide led us to investigate the development of drug delivery platforms that would increase the efficacy of SHP. Here we describe recent efforts to deliver SHP to these parasites via liposomes crosslinked to bovine-transferrin, using an N-linked lipid conjugate (cyanur-PEG), for receptor mediated endocytosis. First, we utilized liposomes loaded with the fluorescent dye calcein to monitor the binding of transferrin (an iron transporter) to its receptor in the flagellar pocket, the site of all endo- and exocytosis in *T. brucei*. Fluorescence microscopy was used to visualize the binding of calcein-loaded liposomes to the flagellar pocket of the trypanosomes at 3°C. Our data indicates that transferrin-crosslinked, but not the uncrosslinked, liposomes bind to the flagellar pocket. The efficiency of SHP binding and toxicity is currently under investigation.

Investigating Missense Mutations in O-GlcNAc Transferase that Lead to Human X-Linked Intellectual Disability

Sindhu Prabakaran
Dr. Lance Wells, Biochemistry & Molecular Biology, Franklin College of Arts & Sciences

O-GlcNAc modification is a distinct form of protein glycosylation that occurs on serine and threonine residues of cytoplasmic and nuclear proteins. This form of protein glycosylation is an abundant and inducible modification found in all higher eukaryotes, and is facilitated by two enzymes, *O*-GlcNAc transferase (OGT) and *O*-GlcNAcase (OGA). Recently, the Schwartz group identified mutations in OGT in three X-linked intellectual disability patients in a family that also displayed a short stature, small head circumference and fifth finger Clinodactyly. Additionally, two of the three had hypospadia. This linked a missense mutation, L254F, in OGT to a human disease for the first time.

The aim of our work is to elucidate the impact of L254F on the OGT enzyme. Using a combination of work with patient lymphoblasts and *in vitro* recombinant OGT enzyme we have determined that the mutant enzyme appears to be active but unstable. Also, we have uncovered a compensation mechanism, albeit imperfect given the patient phenotypes, by which a reduction in OGT levels leads to a reduction in OGA levels in an effort to maintain global O-GlcNAc levels. We are currently exploring both the stability and kinetic parameters of recombinant OGT, as well as the impact of this mutant on global transcriptional regulation.

A Yeast-based Screen for Drugs That Can Inhibit Human *Cdc6*

Ojaswa Prasad, Dennis Dwan
Dr. Edward Kipreos, Cellular Biology, Franklin College of Arts & Sciences

Cdc6 is a highly conserved protein that is required for the initiation of DNA replication in humans and most eukaryotes. We are using the fission yeast *Schizosaccharomyces pombe* for our studies. In fission yeast, the *cdc18+* gene encodes the *Cdc6* ortholog. Fission yeast cells are rod shaped and divide by medial fission. Their division cycle is quite rapid which, in addition to being inexpensive and easily manipulated, makes them easier to use in the laboratory. Cells lacking the *cdc18+* gene fail to enter S phase and undergo DNA replication, although the cells still undergo nuclear division according to Nurse and Kelly. Nurse and Kelly also found that overexpression of *cdc18+* results in cells arresting in S phase and increasing their DNA content to levels much greater than 2C through the aberrant process of re-replication. We want to screen for compounds that inhibit the overexpressed *Cdc18* protein, which will reduce the level of *Cdc18* activity so that cells do not arrest in S phase and undergo re-replication, and instead are able to proliferate. After optimizing growing conditions for the yeast, we successfully transformed three different plasmids containing the *cdc18+* gene into the fission yeast. We also successfully induced the overexpression of the *cdc18+* gene and saw the expected re-replication phenotype. Our goal is to clone the human *Cdc6* gene into a fission yeast expression construct. We want to introduce the human *Cdc6* gene into fission yeast and induce overexpression of the gene. If the overexpression of human *Cdc6* induces re-replication of the genome and an S-phase arrest then we can use this yeast in a screen for compounds that inactivate the human *Cdc6*, and thereby allow the yeast to proliferate normally. The yeast cells with overexpressed human *Cdc6* will be tested with numerous compounds from a small molecule library in Dr. Kipreos' lab to decrease or eliminate DNA re-replication and rescue the human *Cdc6* overexpression phenotype. This screen can identify lead compounds that specifically target human *Cdc6* and inhibit its function in DNA replication.

Suboptimal Time in Therapeutic Range (TTR) for International Normalized Ratio (INR) Measurements Observed in an Outpatient Cardiology Clinic: Impact of Gender, Ethnicity, Disease Etiology, CHADSVasc score, Physicians and Clinic Site

Sarah Premji
Dr. Karl Espelie, Biological Sciences, Franklin College of Arts & Sciences

TTR correlates inversely with ischemic stroke risk. Variations in TTR are common with a range of between 55-60% being normal and > 70% being optimal. It was previously unknown which factors impact TTR most in the community cardiology setting. Retrospective chart review was conducted of all patients (pts) being treated with warfarin in a single, multi-site suburban, outpatient cardiology practice for one year. Hypertension and hyperlipidemia were common, while diabetes, smoking, alcohol and aspirin use

were less. Atrial fibrillation was the most common reason for treatment followed by mechanical valves, venous system disease, and arterial system disease. An average of 12+5 INR readings/pt were done over the year. Average time on warfarin was 35+18 months. TTR for the overall group was 44.5 + 22.3%. TTR varied significantly among ethnicity, the seven individual physicians managing INR and the four clinic sites. Clinics and physicians having a higher proportion of African American pts tended to have lower TTR. TTR was worse in pts with arterial and venous disease vs. atrial fibrillation and mechanical valves. Our findings suggest that TTR may be substantially worse in clinical practice than previously published literature would suggest. Patient ethnicity, ordering physicians, clinic site, and disease etiology all affect TTR. Duration on therapy is the most significant factor and ethnicity is second contributing to TTR. Novel anticoagulants should be discussed more often with patients at higher risk of poor TTR. Confirmation of these findings in a broader population could have significant implications for future anticoagulation management and stroke prevention.

Validating *In Vitro* Cell Culture Models for Molecular Pathogenesis Studies in *Fktn*-deficient Muscular Dystrophy

Vedika Rajasekaran
Dr. Aaron Beedle, Pharmaceutical & Biomedical Sciences, College of Pharmacy

Muscular dystrophies may be associated with a change in activity in the PI3K/Akt/mTOR signaling pathway that is important for cell survival and growth. Therefore, our objectives are to establish an experimental protocol to study this pathway using *in vitro* cultures of normal mouse skeletal muscle C2C12 cells, establish primary muscle cultures from inducible *Fktn* knockout mice, and evaluate changes in the pathway due to muscular dystrophy defects. We differentiated C2C12 cells into myotubes, then successfully inhibited and/or stimulated the PI3K pathway in serum starved cells as demonstrated by histological and biochemical analysis. In addition, we developed conditions for isolation and cultured skeletal muscle cells from *Fktn* muscular dystrophy mice and normal mice. Analysis of the PI3K/Akt/mTOR pathway in this model is ongoing. Overall, our *in vitro* studies offer the ability to complement our *in vivo* work in the role of the PI3K/Akt/mTOR signaling pathway in the pathogenesis of *Fktn*-deficient muscular dystrophy.

Purification of Xyloglucan-Specific Endo-β-1, 4 -Glucanase after Expression in *Escherichia coli*

Ramon Reddick
Dr. William York, Biochemistry & Molecular Biology, Franklin College of Arts & Sciences

A protein consisting of xyloglucan-specific endo-β-1, 4-glucanase (XEG) and enhanced Green Fluorescent Protein (eGFP) was prepared by heterologous expression of a genetically engineered plasmid in *Escherichia coli*. Initial experiments indicated that an eGFP-pET28a vector is efficiently expressed in *E. coli* to generate eGFPi. Another pET28a vector containing DNA encoding XEG fused to eGFP was then generated and transfected into *E. coli*, which expressed the desired chimeric protein. Conditions for optimizing the production of soluble forms of the fusion proteins were identified and the soluble proteins were purified. Mutagenesis of the XEG component of the protein inactivates the catalytic mechanism of XEG on xyloglucan, but still enables the protein to attach to the polysaccharide. Attachment to the polysaccharide without catalysis allows for the fusion protein to be administered in living plant tissue for further observation. These proteins are potentially powerful new tools for studying the chemical structure and physical properties of plant cell walls. For

example, they can be used to visualize and quantify xyloglucan in different cells as the plant develops. Such information may have important implications for technologies aimed at the economical production of biofuels from non-food sources.

Neonatal Mortality in Uttar Pradesh, India and Possible Policy Solutions

Hannah Reiss, Foundation Fellow
Dr. Richard Schuster, Health Policy & Management, College of Public Health

Neonatal death is defined as death within the first four weeks of an infant's life. According to a 2009 study published in the International Journal of Obstetrics and Gynaecology, nearly four million neonates die annually, and over one million of these die in India. The high neonatal mortality rate (NMR) in Uttar Pradesh, India drives up the national NMR. Because neonatal death comprises over 40% of death before the age of five, it also hinders the achievement of the fourth United Nations Millennium Development Goal, which is to reduce global child mortality by two-thirds by 2015. In addition to mortality, high NMR causes morbidity in the survivors. Low neonatal survival rates are associated with negative economic impacts and unsustainable population growth. Possible policy solutions to address high NMR in Uttar Pradesh include a home checklist for midwives, increased payment to Accredited Social Health Activists (ASHAs) to incentivize postnatal visits, and a tetanus immunization campaign. These three alternatives were evaluated through a multi-goal analysis to evaluate their impact, cost, and feasibility. Of the three alternatives, a home checklist for midwives best meets these criteria. This alternative would modify the World Health Organization's Safe Childbirth Checklist, which is currently undergoing efficacy trials in 120 hospitals in Uttar Pradesh.

Creating a Chimeric Chicken Resistant to Newcastle's Disease Virus

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

Newcastle's Disease Virus (NDV) is a contagious disease that affects avian species. NDV causes respiratory symptoms in many birds, but it is especially virulent in chickens and often results in death. The Center for Food Security & Public Health reported in 2011 that NDV is the most economically detrimental virus in poultry worldwide. Because of its severe effect on chickens, NDV is also the largest pathological constraint in raising village chickens throughout Africa, according to a study conducted by J.G. Bell in 1991. Vaccine delivery to immunize village chickens is generally financially impractical because of the long distances between villages. Because vaccination is not feasible, genetic modification to improve the chicken immune system is now underway. The RIG-I gene begins a cascade immune response by signaling the mitochondrial antiviral signaling (MAVS) pathway and is thought necessary in staging an antiviral response to NDV. Chickens lack RIG-I, which is believed to account for their weak immune response to NDV. We hypothesized that transfecting human RIG-I into the chicken genome would allow the chicken a stronger immune response against the virus. We injected primordial germ cells (PGCs) that had been transfected with RIG-I into chicken embryos. We then dissected the embryos to see whether the PGCs had migrated to the gonads of the embryo seven days post-injection. Following dissection, we saw minimal integration of RIG-I into the gonads of the injected embryos.

Abstracts

College Credit Experience and Financial Literacy

Anthony Reyna, CURO Honors Scholar
Dr. Brenda Cude, Housing & Consumer Economics, College of Family & Consumer Sciences

The purpose of this research is to identify a correlation between college students' credit experience and their financial literacy. For this project, financial literacy was measured by financial knowledge based on percentage scores on a 30 question financial knowledge test. The test was administered at the beginning of the semester to University of Georgia students enrolled in the "Money Skills for Life" course (HACE 3110) from 2008-2012. Credit experience was measured in four ways – whether the student used credit (binary variable measured as 1 if the student's credit report consisted of any accounts attached to their name, zero otherwise), the ownership of the credit (a binary variable measured as 1 if the student had individual ownership of at least one credit account, zero otherwise), the debt-utilization ratio (the ratio of a student's total current balances to his/her total available credit), and a student's total number of open credit accounts. The credit experience data come from credit reports submitted as student assignments in HACE 3110 from 2008-2012. We used Microsoft Excel to build the dataset and the statistical analysis program SPSS to calculate the four correlation coefficients. By identifying the connection between financial literacy and certain aspects college students' credit experience, UGA will be better equipped to financially educate its students and assist them in improving their financial behaviors.

Searching for Noise-Induced Phase Transitions in Ecological Systems

Giovanni Righi, Foundation Fellow
Dr. John Drake, Odum School of Ecology

This project develops a model to represent photoinhibition of a phytoplankton population in a light-limited chemostat. Photoinhibition is the decrease in photosynthesis with an increase in light, which occurs at levels of light incidence that are "too high" for the species. This gives rise to an allee effect by which, in a mixed system, phytoplankton in the upper layer will shade the lower layer to prevent photoinhibition. As irradiance continues to increase, it will arrive at a threshold where the irradiance causes the self-shading to be insufficient and the population collapses. After that point, because the phytoplankton can no longer self-shade, it cannot survive in the higher levels of light incidence that it could prior to the collapse. The identification begins with a series of simulations in R. As in Veraart et al. (2012), we want to show that this model exhibits the properties of catastrophic collapse, but in this case due to a noise-induced phase transition. In this type of regime shift, a population is caused to collapse by a change [increase] in the variance of some stochastic environmental parameter rather than its mean or mode values. These have been shown to occur in other natural systems but not in ecological systems. Noise-induced phase transitions are a potentially transformative topic because environmental ("exogenous") variation is increasing in many systems and is recognized as the chief source of variation in systems; it could present a different cause of critical transitions that has not previously been studied.

Abstracts

Addressing Droughts and Water Overuse in the Flint River

Giovanni Righi, Foundation Fellow
Dr. Rob McDowell, Environmental Policy, Carl Vinson Institute of Government

Without further action to address low flows in the Flint River Basin (FRB), streams used primarily for agriculture and by many municipalities for wastewater discharge could increasingly run dry, particularly in drought years. These water limitations could threaten the Georgia agricultural heartland and its billion dollar revenues, further reduce habitat for the four endangered mussels, thirteen endangered plants, and other endangered species in the basin, and aggravate downstream users. Certain sections of the Flint River tributaries were already observed to be dry in 2012, but the Environmental Protection Division (EPD) had few regulatory tools available to sufficiently address the drought. The only strategy used to increase water flow in the FRB were the irrigation reduction auctions of 2001-2002, which have not been implemented since then because the state has not been willing or able to finance them. This demands that a new water management plan be developed for the FRB. This project explores the possibility for an expansion of irrigation efficiency projects, pricing water to fund an insurance program that can be used to compensate farmer losses during drought, and allowing for the trading of permits under certain conditions as tools for the state to reduce water demand. It makes a case for the necessity of water pricing using limited cost-benefit analysis.

1970s Czechoslovakia: A Foundation for the Study of International Human Rights Law

Marco Roca, CURO Honors Scholar
Dr. Daniel Hill, International Affairs, School of Public & International Affairs

1970s Czechoslovakia, the heart of the Eastern bloc during the Cold War, was one of the most interesting times and places in history. Soviet politics, the forced consolidation of the Czech Republic and Slovakia, and several other factors all sowed the seeds of rebellion during this period in Czechoslovakia's history. However, what sets 1970s Czechoslovakia apart from other dissident movements throughout the Eastern bloc is the dissident groups' distinct intensity, abnormally good documentation, and their success with the peaceful Velvet Revolution regime change. For all of the given background reasons, Dr. Hill and I decided to test our hypothesis that dissident groups use international law as a rallying point to raise support among a repressed population. My methodology was combing through various court cases, constitutions, primary sources, and historical analysis in an effort to synthesize evidence in favor of (or in opposition to) our hypothesis. Our findings indicate that dissident groups such as Charter 77 and VONS often cited international laws such as the ICCCPR and the Helsinki Accords. The implications are enormous, because we now have a well-documented case study in which international laws affected the domestic policies and human rights of people around the world. Using the research on 1970s Czechoslovakia as a foundation, I will use the second part of the presentation to demonstrate the additional research we have conducted with international law and its effects on human rights. Emphasis will be placed on recent research with human rights law and its effect on economic inequality worldwide.

Abstracts

An Integrated Approach for Verification of Rapid Focused Recharge Zones in the Arabian Peninsula Using Thermal and VNIR Remote Sensing

Rachel Rotz, CURO Graduation Distinction
Dr. Adam Milewski, Geology, Franklin College of Arts & Sciences

In the Arabian Peninsula, freshwater recharge is typically focused in small depressions that fill with seasonal runoff to form freshwater lenses. This study will substantiate previously hypothesized lens locations and detect water in the subsurface by using remote sensing techniques. We hypothesize, due to the unique heat capacity of water, recharge zones can be detected by identifying areas with lower diurnal changes in surface radiance values than neighboring dry areas after peak or sustained rainfall. We collected images in the visible near-infrared and thermal infrared wavelengths over the Arabian Peninsula. Overlapping diurnal images were subtracted to show surface radiance fluctuations and then compared with existing rainfall data. Results demonstrate the potential for groundwater detection through the presence of ephemeral water bodies in hyper-arid regions en masse. Several recharge zones, runoff channels, agricultural regions, and wetlands were detected in areas where radiance values change between 0.067 - 2.25 $w/m^2/sr/\mu m$ from day to night scenes. Additionally, two seasonal peak rainfall (~35mm/day) events correlate well with the surface radiance difference values. Surface radiance values for dry areas adjacent to the postulated lens locations range between 2.25 – 12.2 $w/m^2/sr/\mu m$. Radiance values in areas where small relative change occurred were compared to corresponding surface reflectance values and ranked. Highly ranked locations were interpreted as best candidates for recharge zones and freshwater lens locations.

Lester Moody: A Man, a River, and a Quest for Industry in the Twentieth Century South

Anthony Sadler, CURO Summer Fellow
Dr. Brian Drake, History, Franklin College of Arts & Sciences

Lester Moody brought great change to Augusta, the Savannah River, and the South during his tenure as the Secretary of the Augusta Chamber of Commerce. His campaigns for the development of the South's natural resources are barely mentioned in current historiography. Historians tend to group boosters into homogenized categories of environmental, racial, and agricultural villains or progressive, idealistic, and rational heroes of the "New South." The story of Lester Moody, the city of Augusta, and the Savannah River is more complicated. Moody is neither a hero nor villain, he is unique and typical of his status, time, place, and race—all of which were distinctly Southern. The environmental factor of Southern twentieth-century history is viewed as a side-note. The people of Augusta were devastated by a history of floods long before the boll weevil passed through cotton fields. Their environment, altered by centuries of intense farming was unforgiving and needed to be controlled, regulated. Within this psychological framework, Augusta's business leaders gave power to unelected leaders like Lester Moody to solve economic and environmental problems. He took that power, and with the help of more powerful allies such as Richard B. Russell, Jr., Walter F. George, and Strom Thurmond among others, secured three federally-funded dams, the Savannah River Plant, and the expansion of Camp Gordon into a Fort. He did much but was greatly empowered by the citizens of Augusta to do so, which explains the endurance of a positive legacy, one mired by contradictions, broken promises, and environmental disaster.

Abstracts

A Unique Mechanism in *Staphylococcus aureus* Ketopantoate Reductase

Joseph Sanchez
Dr. Zachary Wood, Biochemistry & Molecular Biology, Franklin College of Arts & Sciences

Methicillin-resistant *Staphylococcus aureus* (MRSA) is a difficult-to-treat pathogen that is responsible for more than 11,000 deaths each year in the United States. There is an urgent need to develop new targets for discovery of drugs to treat *S. aureus* infections. Here we have examined the mechanism of *S. aureus* ketopantoate reductase (KPR), which produces the essential metabolite pantoate. It has been reported that KPR exists as a monomer and follows a sequential ordered mechanism of substrate binding in which NADPH binds before ketopantoate (KP). Here we show that the mechanism of *S. aureus* KPR is distinct from previously studied homologs. Combining analytical ultracentrifugation (AUC) with two new crystal structures, we show that KPR forms a dimer in solution. Furthermore, steady-state kinetics reveals that KPR displays kinetic cooperativity. This is a rare phenomenon in which KPR follows a kinetically preferred but not absolute order of binding substrate and cofactor. We confirm this result using equilibrium binding assays based on intrinsic protein fluorescence and fluorescent resonance energy transfer (FRET). Finally, we have solved a new 1.8 Å resolution crystal structure, which shows that KP binding to the large active site partially occludes NADPH from the cleft. This is consistent with our kinetic data showing that saturating concentrations of KP can inhibit the enzyme. The unique mechanism of *S. aureus* KPR suggests that it may be possible to specifically target this enzyme in rational drug design efforts.

Lesbian Dress: Recognizing and Being Recognized

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

The lesbian community's use of dress should be of interest to the fashion industry because lesbian women interact with the industry differently than heterosexual women. Because lesbian women, just like every other social group, rely on fashion as a means of communication, a personal and political agenda exists in their use of fashion. My research focuses on three groups within the lesbian community. I start with the politics and influence of 2nd wave feminism on the butch lesbian community. Butch lesbians use dress as an in-your-face expression of their sexual orientation and to express the rejection of heteronormative values of mainstream society. The politics and dress practices of butch lesbians have created a demand for gender-neutral fashion and opened up the industry to androgyny, even in high fashion. Unlike butch lesbians, lipstick lesbians do not adhere to the values of 2nd wave feminism and wish to be perceived as fashionable and trendy. The lipstick lesbian aesthetic rejects the notion that women must discard traditional femininity to be recognized and accepted in the lesbian community. Finally, I examine how lesbian parenting couples assess their physical appearance when it influences the daily life of their children. I argue that these couples are conscious of their dress and manipulate their presentation in different situations for the sake of their children rather than their allegiance to the lesbian community.

Abstracts

Issues of Economic Efficiency in the Domestic Conservation Easement System

Mariana Satterly, Ramsey Scholar
Dr. Tianwei Zhang, Economics, Terry College of Business

Until the passage of federal legislation in the early 1980s incentivizing conservation easements, perpetual property contracts that prohibit building and other environmentally harmful actions on designated parcels, contracted private conservation efforts were rare. Today, however, the Land Trust Alliance estimates that well over 100,000 easements protect nearly 47 million acres of domestic land. While the current high rate of easement establishment is laudable for the sake of environmental stewardship, the incentive system tied to the easement process might be doing more harm than good. This literature review and quest for viable databases on conservation easement records illustrates that an inadequate amount of time and effort is currently devoted to monitoring easement establishment and the distribution of tax credits following the subsequent reappraisal of burdened lands. While legal papers and IRS statements have stressed more robust attention to the economic efficiency and possible exploitation of easements in the past decade, the non-uniformity of contracts and the difficulty of tracking community effects after easement establishment have limited research into the economic efficiency of the system, and studies specific to the tax effects of easement establishment are largely absent from the present literature. With the belief that *social* environmental benefits are the foremost concerns of easement establishment, this research attempts to outline the economic issues that should begin any discussion of easement efficiency, prompted by both nonexistent and present studies, before proposing several reform measures that could alleviate exploitation of the system and net social costs.

A Mechanistic Explanation of How Regional Winter Climate Differences Influence Lyme Disease Distribution

Scott Saunders
Dr. Andrew Park, Odum School of Ecology

Lyme borreliosis is the most prevalent vector borne disease in North America and affects more than 20,000 people every year. Why are there few cases of Lyme disease in the Southeast when compared with the Midwest, and Northeast United States? All three regions have populations of the required tick vector, vertebrate hosts and the *Borrelia burgdorferi* pathogen. One explanation for the dramatic difference in prevalence is that *B. burgdorferi* is not maintained at high levels in *Ixodes scapularis* (black legged tick) populations due to an interrupted transmission cycle. A model has been created to test the theory that winter duration and temperature structure the life cycle of ticks, so Northern ticks follow a strict two-year life cycle and Southern ticks are more variable. The consistency and timing of the tick development pattern can favor horizontal transmission of the bacteria through vertebrate hosts when infected nymphs and uninfected larva are abundant at similar times of year. Using only temperature data, and basic information on tick phenology the model stochastically simulates a population developing through the four life stages (egg, larva, nymph, adult), and records how the population grows. Varying the duration of winter in the model shows the population developing differently, and notes if significant transmission is likely to occur between nymphal and larval ticks. This model seeks to explain the distribution of Lyme disease and other tick borne diseases around the world, and contribute to our understanding of how Lyme disease could change in the future.

Abstracts

Investigations of a Protease (Ste24p) Associated with Progeroid Disease

William Saunders, CURO Summer Fellow, CURO Graduation Distinction
Dr. Walter Schmidt, Biochemistry & Molecular Biology, Franklin College of Arts & Sciences

Ste24p is a metalloprotease that is involved in the processing of prelamin A in humans. The most relevant human disease associated with Ste24p mutation is Hutchinson-Gilford Progeria Syndrome (HGPS). Ste24 is very well conserved across species. Much of what is known about Ste24p comes from its role in production of the **a-**factor mating pheromone in yeast and the work associated with this research takes advantage of **a**-factor as a reporter. The Schmidt lab is actively collaborating with a research group at UVA that was the first to determine the X-ray crystal structure of Ste24. The structure of Ste24p is interesting because it is a membrane bound protein that resembles an oil drum embedded in the membrane bilayer with no apparent point of entry to a central cavity that contains the proteolytic active site. This study used the crystal structure and selective mutation to change specific residues in the protein and genetic methods to test the mutant protein's activity level in order to establish a possible mechanism for the protein. We have confirmed the importance of residues proposed to be part of the active site, including residues that have functional overlap with those found in bacterial thermolysin. We have investigated several hinge points in the structure as possible mobile domains that would allow access to the active site. Results from this study reveal that residues are critical to the proper functioning of the protein and the implications of these findings will be discussed.

Vocal Repertoire of Red and Green Macaws

Natalie Schwob, CURO Summer Fellow
Dr. Dorothy Fragaszy, Psychology, Franklin College of Arts & Sciences
Dr. Roberta Salmi, Anthropology, Franklin College of Arts & Sciences

Red and Green Macaws (*Ara chloropterus*) are highly encephalized, socially complex birds that form long-term pair bonds, often flying wingtip to wingtip with their mate. Despite abiding interest in Psattacids, limited research has been done on wild macaws, and basic features of their biology and behavior remain unknown. Here, we provide the first quantitative description of the vocal repertoire of the Red and Green Macaws living in the *Cerrado* (Brazilian savannah) landscape in northeastern Brazil. We digitally recorded 327 calls collected over 9 weeks of fieldwork. From those calls we selected 78 calls/notes based on acoustic quality for further analysis. We used discriminate functional analysis to determine how calls can be categorized by only their acoustic structure. The vocal repertoire of these macaws includes 10 different calls and 5 different notes, with 87.8% of original grouped cases correctly classified (83.8% cross-validation). Calls were used independently and notes are combined into longer sequences. Additionally, we describe the presence of non-linear phenomena in some of those calls including sunharmonics, biphonation, and non-random chaos. This study will provide the first description of the Red and Green Macaw's acoustic repertoire, which will assist in future macaw communication research.

Abstracts

Incidence of Anesthesia-Related Fatality in Birds

Amanda Seamon
Dr. Erik Hofmeister, Small Animal Medicine & Surgery, College of Veterinary Medicine

Anesthesia related fatality rates in dogs and cats are .17% and .24% respectively. Anesthesia related fatality rates in people are even lower at .02-.005%. The anesthesia related fatality rate in birds is unknown. The purpose of this project is to determine what the fatality rate is in birds due to general anesthesia. Our hypothesis is that birds will have a higher fatality rate due to anesthetics than the rates of dogs, cats, and humans. Cases were identified by searching the electronic medical records database at the University of Georgia's Veterinary Teaching Hospital for 'avian' and any anesthesia-related charge. Data collected from the record includes species, age, gender, wildlife status, weight, BCS, diagnosis, procedure, ASA status, premedication, analgesic technique, induction and maintenance medication, fluid type and route, anesthesia duration, surgery duration, recovery duration, crystalloid volume, colloid volume, HR nadir and peak, EtCO2 nadir and peak, inhalant nadir and peak, temperature nadir and peak, cost, estimated blood loss, and intraoperative events. Of the 120 files already completed, 15 fatalities have occurred, with 2 fatalities associated with anesthesia. This data will be later analyzed for correlations in different variables.

Parasite Selective-Pressure Alters Reproductive Strategy in *Littorina saxatilis*, an Intertidal Snail

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Dr. James Byers, Odum School of Ecology

Many organisms are known to alter life history strategies in the presence of parasites with strong fitness effects. *Littorina saxatilis*, the rough periwinkle snail, has a complex co-evolutionary relationship with the castrating trematode parasites that infect it. In European sites, Granovitch et al. (2009) found populations of *L. saxatilis* under high trematode pressure were more likely to have higher fecundity at smaller sizes which allowed them to successfully reproduce before infection castrates the snail. Our study focuses on whether there is also an effect of trematodes on brood quality in addition to timing. We will count and measure the embryos in brood pouches of snails collected along the New England shore. The size of ready-to-crawl embryos is a proxy for brood quality and correlated against trematode prevalence in the snails' susceptibility to infection, which has been quantified in previous studies. We expect to see similar results to Granovitch, with higher brood amounts in snails from high prevalence sites, but we also expect to see lower brood quality in these sites as well because these progeny are rushed before the host is properly prepared to allocate to reproduction. This study is part of a larger project aimed at understanding the impact of spatially heterogeneous parasite infection risk on host defense, as well as potential life history trade-offs that result from the host's response to the threat of infection.

Abstracts

Decreasing HIV Incidence in Russia through Needle & Syringe Programs

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While the global HIV incidence rate has significantly declined within the last decade, it has been rising at an alarming pace in Eastern Europe and Central Asia since the late 2000s, with some estimates putting the increase at over 25%. Injection drug equipment is one of the most common ways through which HIV is transmitted, and in Russia in particular, injection drug users (IDUs) are disproportionately driving the country's HIV epidemic with approximately 37% of Russian IDUs currently infected with HIV. The rate of HIV incidence in Russia will likely continue to rise, as current HIV-prevention measures are not centered on the IDU population. Providing access to sterile needles and syringes is a highly effective method of reducing HIV infections among injection drug users. Needle & syringe programs (NSPs) provide injection drug users with access to sterile drug equipment in order to reduce the transmission of HIV by decreasing the sharing of contaminated needles among IDUs. Since a high HIV prevalence in IDUs can spread rapidly through sexual transmission to the general population, preventing the spread of HIV among IDUs will help to address the growing epidemic in Russia. NSPs are not only cost-effective, they are also cost-saving, with implementation costs of NSPs being offset with savings in healthcare. In order for Russia to significantly reduce the rate of new HIV infections, there needs to be strong governmental support in addressing the HIV epidemic among IDUs by supporting and funding a large-scale implementation of needle and syringe programs.

Reducing Vitamin D Deficiency among Individuals Aged 50 and Older in Georgia

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In Georgia, men and women aged 50 and older are often unaware that they are vitamin D deficient until they are diagnosed with osteoporosis or have a fracture. Georgia's population of individuals above the age of 50 is rising rapidly over the next few years, and the economic and social toll fractures have on society will rise proportionately. It is projected that there will be about 49,500 osteoporotic fractures and $570 million spent on caring for those with osteoporotic fractures in Georgia hospitals by year 2025. In Georgia, current policies do not address the need to educate patients on vitamin D intake, and current programs addressing osteoporosis prevention are underfunded. A literature review was conducted to investigate symptoms and causes of vitamin D deficiency, and stakeholders and successful policies addressing the issue or analogous issues in different contexts were examined. After analysis of the efficacy, cost-effectiveness, and feasibility of three different policy alternatives and the status quo, it was determined that issuing vitamin D guidelines through the Medical Association of Georgia for Georgia's providers to follow and incorporate into practice is the best alternative. By having providers address vitamin D deficiency in patients before fractures, patients will have one less risk factor for osteoporosis, and the medical costs associated with fractures should decrease.

Characterization of Proteoglycans in Prostate Cancer Cell Growth

Sheela Sheth
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Glypicans (GPC) and syndecans (SDC) are heparan sulphate proteoglycans involved in cell-cell and cell-matrix signaling at the plasma membrane of animal cells; however, increased expression of these proteoglycans is associated with carcinogenesis. Recent studies reveal that glypican-1 and syndecan-1 are enhanced in tumour stroma while reduced in epithelial cells in prostate cancer tissue compared to normal prostate tissue. There are six identified glypican isoforms (GPC-1 to 6) in animal cells; however, little is understood of their expression in non-cancerous and cancerous prostate cells. The goal of this research is to determine the role of glypicans and syndecans in cellular proliferation and metastasis in prostate cancer. Reverse transcriptase PCR (RT-PCR) showed that GPC-1, GPC-4, and SDC-1 were expressed differently in non-cancerous (PCS-440-010) and cancerous prostate cell lines (LNCaP, DU-145 and PC-3 cells), but RT-PCR did not detect GPC-2, 3, 5, and 6 mRNA expressions in these cells. Both GPC-1 and SDC-1 mRNA levels are downregulated in benign cancer cells (LNCaP) and increased in metastatic cell lines (DU-145 and PC-3). Interestingly, GPC-4 mRNA level is highly expressed in PC-3 while there is no difference in PCS-440-010, LNCaP and DU-145. These findings indicate that GPC-1, GPC-4, and SDC-1 are differentially expressed during neoplastic transformation in prostate cancer. These proteoglycans may be involved in cellular proliferation and metastasis of prostate cancer. To test this hypothesis, the expression of GPC-1, GPC-4, and SDC-1 will be knocked down by siRNA in PC-3 cells. Cellular proliferation and metastasis will be assessed by MTT and trans-well assays, respectively.

Genetic Assessment of the Role of TNF and its Receptors (RI and RII) in Placental Malaria Pathogenesis

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Placental malaria (PM) is characterized by sequestration of malaria-parasite infected red blood cells and accumulation of mononuclear cells, mainly macrophages, in the intervillous space of a woman's placenta. Macrophages are the main producers of TNF, a pro-inflammatory cytokine. Previous experiments involving pregnant C57BL/6J mice infected with *Plasmodium chabaudi* AS- showed that TNF-neutralization could rescue pregnancy loss at mid-gestation. This suggests that TNF is associated with poor pregnancy outcomes during PM. TNF exerts its role through its receptors, TNFR1 and TNFR2, and induces inflammation and/or cell death. To understand more about the role of TNF in the immunopathology of PM, TNF and TNF receptors (R1 and R2) null mutants and wild-type B6 (C57BL/6J) mice were infected with *Plasmodium chabaudi* AS at day 0 of pregnancy. Mice were followed up and sacrificed at gestation day 10. Clinical metrics were measured at gestation day 0 and from day 6 to day 10. At sacrifice, the placenta was collected and fresh frozen in liquid nitrogen for RNA and protein isolation or fixed in neutral buffered formalin for histology. Preliminary data indicate that TNF and TNFR2 null mutants reach high parasitemia more quickly than TNFR1 null mutant and B6 mice. In addition, weight loss was most severe in infected pregnant (IP) TNF null mutant. However, IP TNFR2 null mutant did not have significant weight loss compared to uninfected mice. Almost all IP mice have anemia by day 9 except for TNFR2 null mutant. This study is ongoing and markers for oxidative stress and apoptosis will be assessed by ELISA, Real time PCR, and immunohistochemistry. Comparative analysis

may reveal a mechanistic role for TNF in the pathogenesis of PM.

The Lines are Drawn: Christian Apologies in Late Antiquity

Ryan Slauer
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Early Christian apologies provide a unique lens through which we can glimpse the relationship between early Christianity and the "outside" (non-Christian) world. The reading of these texts is complicated, however, by the existence of multiple motives for the writers. Though often addressed to Roman authorities, the apologies were intended for Christian audiences as well, and interpretation of the portrayal of Christian communities is made problematic by the recognition of this Christian audience. More specifically, it means that we can only glimpse the relationship between Christianity and the outside world as through a lens, darkly. This research explores the development of the relationship between Christianity and the outside world through these texts, understanding the difficulties inherent in this analysis. The writings of Tertullian, Arnobius, Lactantius, and Augustine are considered, with particular attention given to these authors' political and legal philosophy. It will be seen that these apologies were not merely responses to persecution and to social and intellectual stigma, rather they were also the drawing of ideological lines in an attempt to differentiate Christianity from the Roman milieu and to instruct Christian communities regarding proper behavior. With these conclusions, this research aims to add food for thought to the historical analysis of early Christianity and its niche in Roman society.

Nut-Cracking Skill in Wild Capuchin Monkeys

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Dr. Michael Haslam, Oxford University

Skill, defined as fluid, effective performance under variable circumstances, is characteristic of humans' use of hand tools. The skilled features of tool use by nonhuman animals are relatively unexplored. We aim to contribute to knowledge regarding skillful tool use by nonhuman primates. Wild bearded capuchin monkeys habitually crack hard palm nuts by placing them on an anvil and striking them with stone hammers. Previous studies at the EthoCebus field site in Brazil have shown that monkeys are skillful in aspects of nut-cracking including nut positioning, hammer stone selection, and appropriate striking force. We asked if monkeys at this site handled the hammer stone skillfully prior to and during striking, and conducted a field experiment to investigate. Four adult monkeys voluntarily cracked nuts while we videotaped. Nuts and four stones, individually presented, were provided for the monkeys to use. Two stones (1100 g and 534 g) were symmetrical, and two were asymmetrical (1042 g and 455 g). From slow motion video (120 fps), we are coding when the monkey flipped or spun the stone, and how it positioned its hands on the stone. For each stone, at least 10 and up to 20 strikes by each subject will be analyzed. Evidence for skillful handling of stones will be found if monkeys increase spins and flips, and use more or different hand positions during striking with asymmetric stones while maintaining equal nut-cracking efficiency with both stone types. Supported by UGA, National Geographic Society, and the PRIMARCH project, European Research Council.

Abstracts

Genetic Analysis of the Role of *SMAX7* in Regulating Shoot Architecture

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We can significantly impact crop yield by understanding how strigolactone, an endogenous plant hormone, controls tillering or branching in crops. MORE AXILLARY BRANCHING2 (MAX2) is an important regulator of strigolactone signaling, but its signaling pathway is not understood. The *max2* mutant displays multiple developmental defects. *SUPPRESSOR OF MAX2 (SMAX1)* controls some of these MAX2-dependent phenotypes. *SMAX1* and its seven homologs compose an uncharacterized protein family in *Arabidopsis thaliana*. We hypothesized that *SMAX1* homologs could control other *max2* phenotypes. We found that artificial microRNA suppression of *SMAX6, SMAX7,* and *SMAX8* reduces the increased branching phenotype of *max2*. In agreement with our findings, other researchers have shown that a dominant mutation in the *SMAX7* ortholog in rice produces an increased branching phenotype. This mutation is a five amino acid deletion and contributes to increased protein stability. To test the effect of this mutation in *A. thaliana*, and particularly which amino acids are responsible, we are conducting site-directed mutagenesis on *SMAX7*. We are also interested in determining if an EAR motif, which is highly conserved in the *SMAX1* homologs, is necessary for gene function. To further this structure-function study, we will create and transform various constructs of *SMAX7* with deleted domains into wildtype and *max2* backgrounds. An observation of the resulting branching phenotypes from the various constructs can elucidate the mechanism by which this gene and others in the family operate.

Native American Traditional Dress: Drawing the Line between Celebrating a Culture and Making a Mockery of It

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The fashion industry has a long history of borrowing from a vast array of cultures and religions when creating new collections. My research suggests that using the conventional image of the Native American in the world of pop culture not only promotes harmful stereotypes, but is also a contributing factor in preventing them from overcoming consistently low socioeconomic conditions. By studying several academic journals, blogs, and news articles on the subject, I have discovered the historical importance of Native American dress, its misuse in the global fashion industry, and the devastating side effects of its misappropriations in fashion and culture today. Among Native Americans, traditional dress is closely tied to the wearer's dignity and sense of self. The headdress in particular holds deep spiritual meanings and is reserved for sacred ceremonies. Therefore, it is offensive when major retailers take this apparel item out of context and market it as just another trendy fashion accessory. Attempts by companies like Urban Outfitters and Victoria's Secret to do so in recent years has resulted in public backlash. The American sporting industry has also been guilty of using the American Indian image in a way that is reprehensible. With education rates lower than the national average and poverty rates that are much higher, it is evident that Native Americans are severely underprivileged. The practice of abusing and misappropriating their sacred symbols erases their current problems from the American consciousness, which in turn makes it difficult to bring about change.

Abstracts

Increasing Physical Education in American High Schools

Karishma Sriram, Foundation Fellow
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High schools across the nation are not meeting the appropriate physical education requirements to provide students with quality physical education. Studies have shown that states do not mandate the time requirement – 225 minutes per week for physical education classes at the high school level – suggested by the National Association for Sport and Physical Education (NASPE). As a result, nearly half of high school students do not receive the necessary physical education each week. Inadequate facilities, insufficient time during the school day, budget cuts, and poorly-written legislation are the main culprits behind the lack of acceptable levels of physical education, causing reduced physical activity, diminished quality of life, and increased economic costs to society, among other impacts. Furthermore, an increase in physical activity significantly improves individuals' mental and physical health. Physical education in schools is one of the most effective ways to encourage future physical activity participation, as every child has access to school and spends nearly eight hours a day in his or her school. When taught by a trained specialist, physical education classes in schools can effectively build a set of motor skills and a level of confidence to engage in physical activity. To address the lack of adequate physical education in high schools, literature concerning physical education was reviewed and policy solutions were created. After evaluating the proposed policy alternatives using a multi-goal analysis, the policy that prevents the use of substitutions for physical education requirements was determined to be the most effective way of increasing physical education among the high school students.

Bone Fracture Putty: A Combined Stem Cell and Lentiviral Approach

Karishma Sriram, Foundation Fellow
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Large bone defects require months of rehabilitation and often end with limb amputation. Mesenchymal stem cells (MSCs) accelerate bone fracture repair via mechanisms complimentary to bone morphogenic protein 2 (BMP2), which induces bone healing. We hypothesized that lentiviral BMP2-transduced MSCs will generate enough exogenous BMP2 to produce heterotopic ossification (HO) in a mouse model, and the MSC will release trophic factors, enhancing the effects of BMP2. First, *in vitro* studies were performed with human bone marrow-derived MSC and human umbilical cord-derived MSC. Cells were transduced with lentiviral red fluorescent protein (RFP) to determine transduction efficiency at 48, 72, and 96-hour time points. Multiplicity of infection (MOI) corresponding to greatest levels of fluorescence was used with cells transduced with lentiviral BMP2 and expression levels were measured with an ELISA at same time points. At 96 hours bone marrow MSC expressed 51,515 pg/mL BMP2 at 10 MOI and 94,940 pg/mL at 50 MOI, while umbilical MSC expressed more BMP2, with 69,958 pg/ml at 10 MOI and 174,592 pg/mL at 50 MOI. Therefore, umbilical MSCs will be used in future *in vivo* studies. Next, a non-obese diabetic/severely compromised immunodeficient (NOD/SCID) mouse model was utilized to test HO by injecting umbilical MSC transduced with lentiviral BMP2 into a leg muscle. HO was evaluated at 1 and 2 weeks post-injection via x-ray, showing circular soft tissue forming after one week and palpable bone after two. We expect to conclude – after further studies using HO, fracture injuries, and large animal models – that Lentiviral

BMP2 in MSC is effective at rapid bone healing.

The Effect of Telomere Dysfunction on Non-Allelic Recombination in the Subtelomere of *Kluyveromyces lactis*

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The subtelomeric region in eukaryotes has a complex repetitive structure, is rapidly evolving, and is under epigenetic regulation. Though this region lacks essential genes, it is enriched for genes critical for rapid adaptation to novel environments. However, the mechanism through which genetic variation is introduced is poorly understood. The adaptive telomere failure hypothesis proposes that, in times of stress, telomere capping can be relaxed in a way that promotes subtelomeric evolution. While functional telomeres are meant to protect chromosome ends, dysfunctional telomeres can be inappropriately repaired by mechanisms such as homologous recombination (HR). Subsequent genetic modifications could have a beneficial effect on the organism's fitness. In the yeast *Kluyveromyces lactis*, the flocculation (*FLO*) genes are thought to be responsible for cell adhesion and contain imperfect internal repeat sequences. It is believed that repeat number is directly correlated with cellular adhesion phenotype. Using the motif finding program MEME, internal repeats within the *FLO* genes found in the subtelomere of *K. lactis* have been identified. These repeats could provide a region of homology for which homologous recombination can undergo. To determine the rate of recombination, *URA3* will be inserted within a *FLO* gene and the rate of loop-out of *URA3* will be measured in wild-type and telomere dysfunction strains. Evidence that recombination is increased in strains with mild genetic telomere dysfunction would support the idea that environmentally-induced telomere function could modulate homologous recombination of subtelomeric genes and ultimately effect the cell's ability to adapt to stressful environments.

The Influence of Neuroticism, Openness, and Conscientiousness on Executive Functioning in Older Adults

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Executive functioning (EF) refers to one's ability to organize thoughts in a goal-directed manner, to plan ahead, and subsequently carry out goal-directed strategies. Several studies suggest that community-dwelling older adults employ EF abilities in order to perform activities of daily living. Declines in EF due to the aging process, therefore, place older adults at greater risk for errors in daily living activities and may compromise their ability to live independently. Research suggests personality traits may significantly predict EF performance in older adults; however, findings have been inconsistent. The purpose of the present study was to examine the relationship between EF and three of the Big Five personality traits: Neuroticism (N), Openness (O), and Conscientiousness (C), in a sample of 46 community-dwelling older adults. It was hypothesized that a) these three traits would carry combined predictive value on EF performance, and b) N, O, and C would each significantly account for unique variance in EF performance. Simultaneous regression revealed a significant combined predictive value of N, O, and C, over and beyond age and education ($R2 = .313$, $p=.023$). Three independent regressions, with an adjusted p-value of .017, revealed that N significantly predicted EF ($R2= .249$, $p=.014$), but O did not ($R2= .136$, $p=.619$). As hypothesized, but contrary to some findings in the literature, C had the largest predictive power on EF ($R2= .284$, $p=.005$). Results suggest that personality may be indicative of EF decline, also suggesting that C is a more

important predictor of EF than previously recognized.

The Linguistics of Artistic Language: Poetry, Complexity, and Mass-Market Novels

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Using the methodologies of complexity science as proposed by William Kretzschmar in his book *The Linguistics of Speech* (2009) – which addresses the statistical characteristics of emergent order in language – we can define stylistic distinctiveness in artistic texts by comparing the shapes and values of their word distributions to a general corpus of linguistic data (i.e. "normal" speech). This study offers a three-way comparison of "Language Poetry" from Ron Silliman's *In the American Tree* (1986), Peter Benchley's novel *Jaws* (1974), and the Brown Corpus (Kucera & Francis, 1961). Using the AntConc corpus program, this study found several parallels between the word distribution patterns in all three texts, despite the Language Poets' aesthetic claim to the distinctiveness of poetic language: the most frequent items were function words, and the word count and frequency of frequencies distributions formed asymptotic, hyperbolic curves characteristic of all language data of sufficient size (Kretzschmar 2009). On the other hand, this study found that unique words comprise about twice the percentage of total words in Language Poetry as opposed to *Jaws* (10.72% versus 5.73%, respectively), and comprise only 1.4% of the Brown corpus. Thus, while the general shape of the distributions are similar – as we would expect for all forms of speech – this data suggests a hierarchy of distinctiveness from "normal" speech patterns in works of language art. This study offers a generally unexplored method of analyzing artistic data and literary style, connecting language as a science and language as an art – a valuable interest for both fields.

Characterization of the *rsr-rtcBA* operon in *Salmonella typhimurium*

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The *rtcBA* operon, a conserved set of genes in many bacteria, encodes proteins whose homologues in metazoans and archaea are known to function in RNA repair, but have no known physiological role in bacteria. *In vitro* characterization of *E. coli* RtcA and RtcB demonstrated RNA 2'3' phosphate cyclase and RNA ligase activities, respectively. In *Salmonella typhimurium*, the *rtcBA* operon encodes an additional gene, *rsr* (Ro-sixty related ribonucleoprotein), and two non-coding RNAs. The goal of this research is to characterize the *S. typhimurium rsr-rtcBA* operon, which is controlled by a sigma54-dependent promoter and the activator, RtcR. To determine the environmental stressor that activates RtcR, allowing expression of the *rsr-rtcBA* operon, the promoter region of *rsr-rtcBA* was introduced upstream of *lacZ* on a plasmid. After exposure to stress conditions, promoter activity was monitored using β-galactosidase assays. Stressors investigated thus far include, cold shock, DNA damage via UV light, and exposure to antibiotics, such as chloramphenicol and cefotaxime, to test disruption of translation and cell wall synthesis, respectively. None of these conditions induced *lacZ* expression from the *rsr-rtcBA* promoter. To address a second project goal – identification of gene products that interact with RtcB – we are setting up a synthetic lethal assay. We created a *rtcB-lacZ* transcriptional fusion on an unstable plasmid that will be used to screen a transposon-mutant library of *S. typhimurium*. Mutants requiring maintenance of the *rtcB-lacZ* plasmid will point to genes whose products may interact with RtcB.

Abstracts

The Monkey Saddle
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In mathematics, a critical point of a function is a specific point where the function is level or unchanging. A monkey saddle graph is a three-dimensional surface, often studied in multivariable calculus courses, with an unusual type of critical point. The monkey saddle itself is similar to a normal saddle, but with three depressions instead of two, for the monkey's tail. The interesting feature of this saddle is that its critical point is always an inflection point and never a local minimum or maximum regardless of the intersecting plane. We wish to study the monkey saddle to better understand its unusual fixed point and how it changes and creates more fixed points as the parameters of the function change. My research concerns creating a short movie using Sage, an open-source Python-based mathematics software, to generate three-dimensional pictures of the monkey saddle changing as its parameters change. Other methods include using the Tachyon ray-tracing system that works on top of Sage to generate more realistic images.

Solution to Allworthy: The Magisterial Roles of Henry Fielding and Allworthy in *Tom Jones*
Lisa Ye Suh
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The character of Allworthy in Henry Fielding's novel, *Tom Jones, a Foundling,* has proven problematic for both readers and critics who question Allworthy's true motives. Despite his social standing as a wealthy landowner and local magistrate, Allworthy shows unparalleled benevolence to his less exceptional, sometimes undeserving, counterparts. His altruism extends to his magisterial position in which Allworthy imposes lighter sentences on the accused, favoring redemption over punishment and thereby blurring the line between legal jurisdiction and moral judgment. The character's questionable exercise of authority is no accident as Fielding himself served as chief magistrate of Westminster and Middlesex for several years. Why then, does the author allow his most admirable character to demonstrate such deliberate disregard for English law? In examining Fielding's own legal career, comparisons may be drawn between the magisterial conduct of the author and his character – but what, exactly, is the significance of these parallels? Through a close reading of *Tom Jones* and *A Clear State of the Case of Elizabeth Canning,* Fielding's own account of his involvement in the famous 1753 criminal case, I attempt to answer these questions. Additionally, a biographical study of Fielding's days as magistrate as well as an examination of the 18th century legal system in England may support findings in the close readings. By exploring the function of the character of Allworthy, readers of *Tom Jones* may dispel what critics have dubbed "the problem of Allworthy," gaining insight into the author's literary motivations and juridical contributions in the process.

Fabrication of Hinged Nano-Motors Utilizing Metal Assisted Chemical Etching, Nano-Sphere Lithography, and Physical Vapor Deposition
Mehreen Sultana
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Catalytic nano-motors are synthetic structures that carry an on-board catalyst and move autonomously using the chemical fuel from the environment by a catalytic reaction. Manipulation of their movement at such a small scale requires understanding of low Reynolds number hydrodynamics, where the viscous force dominates. In such an environment, the geometry of nanomotors

determines the motion and its efficiency. Therefore, investigating how novel geometries affect the motion by simple methods is desirable for the advancement of nanomotors. Here we focus on the design of hinged nanomotors. These structures contain two nano arms linked by a flexible joint, with one arm composed of Si and the other of TiO2. The Pt catalyst will be coated on the TiO2 arm that shall be free to move/rotate. Since the structure has multiple components, each component is fabricated using different strategies. The Si nano arm is fabricated using a 'top-down' approach by metal assisted directional chemical etching of crystalline Si substrate. This step is achieved by a combination of nanofabrication techniques such as metal-assisted wet chemical etching, nano-sphere lithography, and physical vapor deposition. The quality of metal assisted etching is determined using a scanning electron microscopy. The next phase of the fabrication includes creating 'ball-in-socket' joint, and the second arm using oblique angle deposition and glancing angle deposition. The speeds of catalytic micromotors can be measured and used for many biomedical and industrial applications such as DNA sensing, selective isolation of nucleic acids, oil spill cleanup, degrading organic water pollutants etc.

Ecology and Genetic Characteristics of Haemogregarines in Fresh Water Turtles

Scarlett Sumner, CURO Summer Fellow, CURO Graduation Distinction
Dr. Michael Yabsley, Warnell School of Forestry & Natural Resources

Haemogregarines are common intracellular parasites of freshwater turtles and aquatic leeches (the vector). Higher leech loads should be associated with higher prevalence rates and parasitemias; therefore, this study was conducted to assess differences in haemogregarine infections among various aquatic turtles with variable behaviors that impact leech burdens. During 2011-2012, 132 turtles of 10 species were sampled at numerous locations in Georgia, USA. Giemsa-stained blood smears were analyzed to determine prevalence of haemogregarines and parasitemias based on number of infected cells per 7,000 cells examined. To date, significantly higher prevalences were noted for nonbasking species (81%) compared with basking species (56%). Similarly, nonbasking species (0.26%) had significantly higher parasitemias compared with basking species (0.03%). These results indicate that basking behavior has a significant impact on the haemogregarine prevalence and parasitemia levels in turtles. Among the four most commonly sampled species, there was no difference in prevalence between the two nonbasking species (common snappers (*Chelydra serpentina)* [0.12%] and musk turtles (*Sternotherus odoratus*) [0.39%]) but parasitemias of the two basking species were different with sliders (*Trachemys scripta*) [0.05%] having significantly higher parasitemias compared with painted turtles (*Chrysemys picta*) [0.01%]. Lower parasitemias in basking species could be attributed to a reduction in leech exposure, an increase in the host immune response, biology of different haemogregarine species, or another unknown factor. Sequence analysis of partial 18S rRNA sequences from haemogregarines in turtles from Georgia, Canada, and Costa Rica suggests there are at least two parasite species that have little host- or geographic-specificity.

Improving Access to Screening for Post-Traumatic Stress Disorder in Operation Enduring Freedom and Operation Iraqi Freedom Veterans

Meili Swanson
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The high prevalence of post-traumatic stress disorder (PTSD) in Operation Enduring Freedom and Operation Iraqi Freedom

(OEF/OIF) veterans makes it difficult for veterans to integrate successfully back into society. PTSD in veterans has been linked to suicide, unemployment, substance abuse, homelessness, as well as domestic violence. There are limited policies currently in place that support the re-integration of OEF/OIF veterans back into society. The few current policies in place fail to identify many of the veterans who need treatment for PTSD. Three different policy alternatives were analyzed, evaluated, and compared to the current policy based on three criteria – effectiveness, cost, and political feasibility. According to the conducted research, telehealth is a mechanism that increases veteran access to PTSD screening and can facilitate their further treatment if needed. Telehealth involves using a Skype-like system to connect patients to their providers, face-to-face online. Telehealth applications are also a cost-efficient and politically feasible alternative to the current policies. By integrating telehealth into all VA medical centers, OEF/OIF veterans can be provided with not only more efficient access to care, but can also increase PTSD screening rates by their providers.

Assessing Mitochondrial Function and Fatigue in the Human Gastrocnemius with Near Infrared Spectroscopy (NIRS)

Stephanie Tan, CURO Graduation Distinction, Hannah Bossie, John Hann
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Fatigue is known to be the number one symptom in all diseases. By using the NIRS device and the force transducer, assessment of muscle metabolism can be evaluated to assess the correlation between mitochondrial function and fatigue. Each participant was tested three times over the course of two days. The experiment focused on tetanic contractions and 35 Hz was used. The tests were done in the extended (relaxed) and flexed (stretched) positions with the foot at an angle of 70° and 90°, respectfully, with a 10-minute break in-between. During the test, we measured the amount of fatigue with a force transducer and the oxygen saturation consumption using a NIRS device. After the test, we measured the rate of recovery of oxygen saturation using MatLab. Significant inverse correlation was seen between mitochondrial capacity and the amount of fatigue. Stretched positions resulted in lower oxygen levels and slower rates of recovery of oxygen saturation than relaxed positions. This supports the cause of fatigue as impaired oxygen delivery. NIRS studies of muscle are either ongoing or planned for people with SCI, ALS, COPD, PAD, and heart failure. This study will be the first step towards validating a muscle fatigue test that represents muscle oxidative metabolism.

Oxidative Stress within the Placenta during Malaria Infection

Max Tarica
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The pathology of placental malaria contributes to intrauterine growth restriction and premature birth, leading to low birth weight. In severe cases, abortion and stillbirth occur. These outcomes result from a lack of blood flow that brings the fetus its nutrients. A major cause of this problem in humans comes from the malaria parasites that specifically present with the VAR2CSA antigen, which allows its binding to glycoproteins within the placental intervillous space obstructing blood flow. Other factors, such as inflammatory responses and syncytiotrophoblast damage, are believed to contribute as well. The focus of this study revolves around the production of reactive oxygen species (ROS), which are known to cause cell damage and death. Since mice share a common immunological response with humans to malaria, a mouse model with four

groups of distinct genotypes was used. Mice were either null mutants for TNF (tumor necrosis factor) Receptor 1, Receptor 2, or both receptors of an intact genotype (B6 mice). The TNF family of receptors has been shown to promote cell death through the participation of ROS. For this study, the magnitude of ROS present was indirectly assessed by evaluating the expression of specific genes that are up-regulated during times of oxidative stress via real-time quantitative PCR. Associating the fetal outcome with the extent to which certain ROS are induced within the groups of mice can offer potential targets of interest for intervention that will improve and maintain cell health and function which could protect against malaria-induced fetal complications.

Examining the Function of O-GlcNAc in Regulating Inter- and Intracellular Signaling Pathways during Drosophila Development

Korry Tauber, CURO Summer Fellow, CURO Graduation Distinction
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The addition and removal of O-linked N-acetylglucosamine (O-GlcNAc) at serine and threonine residues is an essential regulator of intracellular signaling pathways. Like phosphorylation, O-GlcNAc modification acts to significantly alter the function of the protein to which it is attached. There has been considerable research documenting the functional implications of phosphorylation; such as acting as a regulator of cell growth and differentiation. However, the functions of O-GlcNAc are still being discovered and relatively little attention has been paid to the involvement of O-GlcNAc in cell processes. As with kinases and phosphatases, O-GlcNAc modification is controlled by regulated and compartmentalized enzymes; O-GlcNAc transferase (OGT) and O-GlcNAcase (OGA). Currently, it is impractical to study the function of O-GlcNAc in mammalian species because the loss of O-GlcNAc is lethal. However, the genetic tools provided by Drosophila allow us to examine the effects of increasing and decreasing O-GlcNAc levels in selected tissues. This project aims to better understand the function of O-GlcNAc by altering the expression of OGT within specific cells of *Drosophila melanogaster*. Our results indicate that diminishing the attachment of O-GlcNAc to intracellular proteins in engrailed-expressing cells reduces wingless protein secretion. In wing discs, decreased O-GlcNAc in the engrailed component results in the loss of the entire posterior wing section. Additional study has investigated the changes of O-GlcNAcylation in *Sugar Free Frosting (sff)* mutant flies. This project also aims to discuss how a change in expression of O-GlcNAc transferase can limit the effect of repressors that may promote *sff* expression. Further research will aim to examine downstream effects of O-GlcNAcylation in the insulin signaling pathway that may regulate the *sff* phenotype.

Differences in Children's Physical Fitness by Rural or Urban Location

Natalie Taylor
Dr. Jennifer Gay, Health Promotion & Behavior, College of Public Health

Past research reveals that obesity rates among children living in rural areas tend to be higher than those living in urban areas, with the lack of infrastructure (e.g. sidewalks, bike paths, recreational facilities, parks) being a likely determinant. This study aims to investigate whether school children residing in rural areas of Georgia report lower fitness levels compared to urban areas. If the claim holds true, it may suggest some association between the built environment and active living. Using the U.S. Census Bureau definition, towns and cities of Georgia were defined as an urban area (UA), urban cluster (UC), or rural area.

FitnessGram data was provided by 1,473 schools in Georgia to measure physical fitness levels by assessing aerobic capacity, muscular strength, muscular endurance, flexibility, and body composition. Frequencies were calculated for grade level, gender, and geographic location. One-way ANOVA was used to examine differences in the fitness categories by UA, UC, or rural area. Maps were generated using ArcGIS. The sample consisted of 50.1% boys and 55.8% elementary school students. UAs have a higher proportion of students in the healthy fitness zone compared to UC and RA students in cardiorespiratory endurance, body composition, and muscular strength and endurance part 2. Also, UCs were generally less fit than rural areas. All schools may benefit from more physical activity programs, particularly in UC areas. By collaborating with local government officials and businesses, school systems can create environments that are conducive to good health for all students.

Reexamining a Little-Known Aphrodite Anadyomene Statue from Ancient Stabiae
Chiara Tondi Resta
Dr. Mark Abbe, Lamar Dodd School of Art

An over life-size Roman, marble statue of Aphrodite Anadyomene (Greek: "rising from the sea") in the North Carolina Museum of Art is a little-known, but important sculpture. Reported to be from ancient Stabiae near Pompeii, it appears to have been buried in the eruption of Vesuvius, providing it a *terminus ante quem* of 79 A.D. The Aphrodite Anadyomene type was particularly important in central Italy and the Bay of Naples due to her associations with water and bathing which were valued especially by merchants and sailors. But what additional associations might this statue have had in Stabiae in the late republican and early imperial periods? The Roman general Sulla, who conquered the area in 89 B.C., credited Aphrodite for his victories, and the Julio-Claudian rulers of the first century A.D. claimed descent from the goddess herself. As one of the largest and best quality statues of the Aphrodite Anadyomene type known to date, the North Carolina statue is a critical example in understanding how the goddess of love was employed to convey particular political meanings. Using comparative material and some scientific analyses, this presentation will examine these issues as well as the date and probable ancient coloration of this high quality product of Greek craftsmanship.

Variables Affecting Attitudes toward Police
Tiffany Toteno
Dr. Natasha Ganem, Sociology, Franklin College of Arts & Sciences

Police officers have a very important job; protect and serve the community. Yet police can develop a bad reputation on college campuses. This paper seeks to determine what affects students' perceptions about police. There are two research questions presented in this paper: 1) does someone's past experiences with Athens-Clarke County police officers affect how they view the officers of the department and 2) do criminal justice (CJ) students have a more positive attitude toward police officers than students in other majors. This research is noteworthy because little literature is available that studies how CJ students view police, and only students of the University of Georgia were allowed to participate. A convenience sample method was used and each participant was given a link to an online survey in order to collect data. The two independent variables studied are 1) whether or not someone has had any interactions with an Athens-Clarke County police officer and 2) whether they are a CJ major or not. The dependent variable used a Likert scale consisting of five questions about perceptions of police and a Chi square was used for data analysis. The results of both of these studies were significant and proved that

past experiences with police and a student's major do affect how positively they view police officers. Lastly, an additional study was conducted using the first research question and controlling for CJ majors. The results of this study were not significant.

The Five-Fold Division: Shadow Personalities in Beckett's Three Novels
Julian Traas
Dr. Adam Parkes, English, Franklin College of Arts & Sciences

Samuel Beckett's often minimalist, confusing or downright contradictory descriptions of setting, character and situation problematize any plot sketch. Various scholarly articles have posited that the supporting characters in *The Unnamable* are facets of the titular character. Bearing in mind Beckett's interest in Freudian psychology, this paper investigates that notion to its logical conclusion, claiming that Moran, Molloy, Malone, et al., are all merely figments – shadow personalities – of the Unnamable's tortured mind, generated by the Unnamable itself in order to process a deeply embedded and poisonous psychological trauma. This paper's focused analysis of Beckett's *Three Novels* exposes the blatant similarities between each principal character – not limited to maddeningly similar names, fragile teeth, and relative immobility – and links these traits to the respective role each of these shadow personalities plays in the preservation of the Unnamable's psyche. Through scrutiny of each shadow personality's contribution to the Unnamable whole, it proposes a radical approach to Beckett's trilogy which embraces the narrative's scattered nature as part of the solution to its interpretation, rather than part of the problem.

Against All Reason: Rousseau and the Counter-Enlightenment
Brian Underwood, CURO Summer Fellow, CURO Graduation Distinction
Dr. Jennifer Palmer, History, Franklin College of Arts & Sciences

Scholars often count Swiss philosopher Jean-Jacques Rousseau as a chief proponent of Enlightenment thought, a movement at the heart of western intellectual tradition. It is surprising, however, that they consider Rousseau a member of that movement when he himself explicitly challenged Enlightenment tenets at their most fundamental levels. I demonstrate through this project that Jean-Jacques Rousseau was in fact an early figure in a burgeoning Counter-Enlightenment – a direct ideological confrontation of the reason-based philosophy of the Enlightenment, one that began in the eighteenth century and later heavily influenced the dominant continental philosophies of the nineteenth century. This project identifies those central ideas that make Rousseau's ideology distinct from Enlightenment philosophy as a whole, placing his ideology outside of that intellectual tradition. Examining the philosophy of Rousseau in this context offers insight into direct and immediate reactions to the Enlightenment while it was still in progress. In turn, the writings of Rousseau exhibit that the Enlightenment itself was not a monolithic intellectual entity, but instead was a contentious movement even at its height.

Nitrogen Resorption in *Helianthus* Species
Chinyere Uzoigwe
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Nutrient resorption describes a plant's ability to re-absorb nutrients from senescing leaves. This ability is beneficial because such recycling increases available nutrient for

growth and reproduction. Nitrogen is typically the nutrient most limiting to plant growth and nitrogen resorption can be measured by the nitrogen content difference between green and senesced leaves. Nitrogen resorption efficiency and proficiency were measured in 2-3 populations each of 16 species of wild *Helianthus* grown in a common garden. The levels of resorped nitrogen across populations and species were compared with respect to growth form and life history, home habitat environmental factors, and relative placement along the leaf economics spectrum. First, it is hypothesized that annuals and erect deciduous perennials would have lower resorption ability than basal rosette perennials, which use rosettes of leaves as storage organs for overwintering. Second, it is hypothesized that species from more fertile habitats would have lower resorption ability than species from less fertile habitats, as resorption is costly and would not be favored where soil nitrogen is abundant. Third, it is hypothesized that higher nitrogen resorption would be favored in species with a more "conservative" leaf economics spectrum, as these species are typically found in infertile environments, often use leaves as storage organs, and have a longer leaf lifespan that allows more time for nutrients to be re-absorbed prior to leaf senescence.

A Proteomic Study of the *Botrytis cinerea*-Tomato Interaction

Jerin Varghese
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Botrytis cinerea is a model necrotrophic fungus that infects more than 200 plant species, one of which is the tomato. Significant protein-protein interactions occur as *B. cinerea* attempts to colonize its host plant. In this study, shotgun proteomics is used to identify the proteins solubilized in the *B. cinerea*-tomato (*Solanum lycopersicum*) interaction. Previous studies have indicated that ripening induces changes in the composition of the fruit cell wall, ultimately resulting in increased pathogen susceptibility. This hypothesis was tested through the use of tomato strains in various stages of ripening, as well as with strains in which ripening was inhibited. AcMG, CnrMG, and CnrRR mutant tomato fruit were infected with *B. cinerea* B05.10, and fungal and fruit proteins were identified post-infection. A total of 30 *B. cinerea* and 152 tomato proteins were identified. Following identification, two master lists (one each for *B. cinerea* proteins and tomato proteins) were compiled. The lists provided information on the function, gene ontology, pfam, CAZy, signal P, secrotome P, and TMHMM for each of the proteins. The identified proteins were then regrouped and analyzed based on which mutant fruit (AcMG, CnrMG, and CnrRR) the respective proteins were found in. Fungal and tomato proteins were found in the greatest frequency in the CnrRR variety. Over 36% of all fungal proteins and 19% of tomato proteins identified were unique to the CnrRR strand supporting previous research that indicated pathogen susceptibility in the *B. cinerea*-tomato interaction increases with ripening.

An Investigation of the Metabolic Changes Associated with Feeding a High-Fat/High-Sugar Diet in Swine

Emily Vermillion, CURO Honors Scholar
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The bio-medical community has expressed interest as to what types of changes might be seen in pigs fed high-fat, high-sugar diets. A pilot study was conducted to determine the metabolic changes in pigs fed high fat/high sugar diets. A total of 9 pigs were assigned to the study, with 6 pigs assigned to the experimental diet (2 pens), and 3 pigs assigned to a control diet (1 pen). The experimental

diet contained 20% fat, and 20% sugar and the control diet was formulated to meet NRC guidelines. Pigs were fed the diets for 12-16 weeks in amounts equal to approximately 70% of ad libitum intake. Pigs were weighed weekly and bled via a jugular stick on days 1, 28, 56, 84, 98, and 112. Blood samples were analyzed for glucose, triglycerides and insulin. Week 6 weights indicate that the pigs fed the experimental diet exhibited the expected weight gain, averaging 9 pounds heavier than pigs fed control diet. Triglyceride and glucose levels showed little variation between groups. On weeks 12, 14, and 16, one pig from each pen was harvested, and the heart, liver, kidney, and pancreas were collected for analysis. Livers of the experimental pigs weighed an average 300g more than the livers of the control pigs. Additionally, some liver streaking was noted in pigs fed the experimental diet, indicating possible early onset of fatty liver disease. Results of slaughter may indicate early onset of metabolic syndrome-type symptoms, however triglyceride levels show little evidence of this.

Mutations Impacting Copy Number Control and Host Cofactor Involvement in Retrotransposition of Ty1

Lucas Wachsmuth
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Ty1 is an LTR retrotransposon found in the yeast genus *Saccharomyces* that replicates via a process similar to that observed in retroviruses. Ty1 is comprised of two open reading frames: *GAG*, which encodes the structural capsid-like protein, and *POL*, which codes for the Ty1 protease (PR), integrase (IN), and reverse transcriptase (RT). Ty1 proteins along with Ty1 mRNA assemble into virus-like particles (VLPs), where the Ty1 mRNA is reverse transcribed into cDNA for insertion into the genome. Ty1 replication in the budding yeast host exhibits a phenomenon where transposition decreases as the number of Ty1 genomic copies increases, a process called copy-number control (CNC). In order to learn more about the mechanism of CNC we performed a mutant screen using error-prone PCR to identify CNC-resistant Ty1 *POL* mutants. In the mutants we identified, PR V115A and IN D391G/RT R288G, we measured transposition frequency and examined steady state protein levels. Additionally, to learn more about host factor involvement in Ty1 retrotransposition, we conducted a screen using a GAL1-regulated yeast cDNA expression library to identify host cofactor genes that are involved in the life cycle of Ty1. From these experiments we isolated two host cofactors, YRB1 and BMH2, that, when overexpressed, inhibit Ty1 retrotransposition. As the Ty1 proteins are homologs of retroviral Gag and Pol, by studying Ty1 transposition we can expand our understanding of the replication of other retroelements, an area that has important implications for human disease.

Ectopic Endodermal Expression of Foxn1 in a Murine Model

Lucas Wachsmuth
Dr. Nancy Manley, Genetics, Franklin College of Arts & Sciences

Foxn1 is a forkhead transcription factor that drives differentiation of the epithelial cell lines in the thymus, the organ responsible for maturation and selection of T cells. Normal expression of Foxn1 is crucial for proper thymic development and postnatal upkeep of thymic cellular organization, and expression defects lead to severe immunodeficiency due to impaired T cell colonization and maturation. Foxn1 has been described as a master regulator of thymic epithelial cell lineage due to its role in thymic epithelial cell patterning as an activator of downstream epithelial differentiation genes. The thymus arises from endoderm in the third pharyngeal

pouch, so it follows that Foxn1 expression in other endodermal tissues could have the potential to alter cell fates. However, Foxn1 expression is primarily localized to the pre-thymic areas, and the potential for Foxn1 to function as an endodermal transcription factor outside of the pharyngeal pouch has yet to be analyzed. Here we show that ectopic Foxn1 expression can be induced through the FoxA2CreER system and an inducible Foxn1 transgene in a murine model. Using this genetic approach we induce Foxn1 expression under the control of the FoxA2 gene, resulting in ectopic endodermal Foxn1 expression. Studying the development of these Foxn1-expressing cells located in endodermal tissues outside of the thymic primordium will further our understanding of the scope of Foxn1's effects on endodermal tissues. With more knowledge of Foxn1's involvement in cellular differentiation we can expand our understanding of its role in aspects of health such as age-related immune decline and immunodificiencies.

Cell Cycle Regulation of BMP Signal Transduction

Akshey Walia
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Bone morphogenetic proteins (BMPs), belonging to the transforming growth factor beta (TGF-β) family of ligands, are thought to be responsible for a variety of developmental processes within the mammalian central nervous system, including neurulation, dorsal-ventral patterning, cellular differentiation, survival, and proliferation. Although BMP signaling plays an important role in cell cycle regulation, it is unclear whether the opposite relationship, in which the BMP pathway is active in only a specific phase of the cell cycle, also exists. To investigate this possibility, I have developed a quantitative assay using qPCR to detect unspliced pre-mRNA messages from direct target genes. Pharmacological inhibition of transcription will be used to determine the half-life of these messages. Next, cells will be sorted according to cycle phase using flow cytometry. I will then assess real time transcription of target genes as a function of cycle phase using housekeeping gene expression as an internal control. The possibility that cell cycle phase is differentially correlated with BMP target gene expression would argue that the BMP pathway both regulates and is regulated by the cell cycle. Insight regarding the BMP pathway with respect to cell cycle phase would have important implications with respect to the etiology and treatment of developmental and oncological pathologies associated with BMP signaling.

The Effect of the Protein Ras2 on the Biological Clock of the Fungus *Neurospora crassa*

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The biological clock of most organisms is a complex interactome of many proteins that can control the various pathways and functions within an organism that relate to circadian rhythms. It is already known that a defect in the Ras2 gene in *Neurospora c.* causes conidal and cell wall growth defects, but it is not known if the gene has any effect on its biological clock. We utilized viability tests and growth tube tests of Ras2 knockout strains compared to wild type strains to analyze the defects caused by the absence of the Ras2 on the life span of individual conidia and core functions seen in other knockout strains, such as the banding seen in growth tube tests of Ras1 mutants. We also performed real-time PCR on aged and unaged cultures of Ras2 knockout and wild type strains to determine if the low expression in Ras2 knockout strains of Ras2 affects the expression levels of another key clock gene, frq, which could implicate Ras2 in being part of the clock

interactome. So far, the viability and growth tube tests remain inconclusive, but the upcoming real-time PCR tests could give more concrete results on whether or not Ras2 is a key gene in the clock regulation of *Neurospora crassa.*

Concussions from the Past Continue to Predict Present Symptomology Above and Beyond Mood Symptoms

Tiffany Washington
Doug Terry, Graduate student
Dr. L. Stephen Miller, Psychology, Franklin College of Arts & Sciences

Objective: Much research has been done in order to understand the consequences and impact concussions can have on professional football players such as the chronicity of symptoms associated with a concussion. However, there is limited research that assesses the long lasting impacts of a concussion on individuals who played football solely during their adolescence. Studies suggest that mood symptomology may be associated with history of concussions. Thus, we examined the relationship between depression and anxiety and concussion-like symptoms in individuals who have not had a concussion in many years. Moreover, we examined the addition of a third variable, number of past concussions, to see if it could further predict concussive-like symptoms. *Methods:* Twenty-eight community-dwelling former high school football players ages 40-65 participated in this study. The Beck Depression Inventory-II and Beck Anxiety Inventory as well as a measure of current concussive symptoms were completed. Participants also underwent the Acute Concussion Evaluation (ACE), semi-structured interview to assess how many previous concussions they endured. To find an association between the independent and dependent variables a hierarchical linear regression model was used in order to analyze the scores. *Results:* As expected, depression and anxiety contributed to explaining a significant amount of variance of self-reported concussion-like symptoms. Depression explained 30% of current concussive-like symptoms. Also, as predicted, the number of past concussions further predicts current concussion-like symptoms above and beyond mood symptomology. Adding the number of past concussions into the model explained a total of 39% of that variance in concussion-like symptoms. *Conclusion:* Predictably, an individual's current mood contributes to explaining variance in concussion-like symptoms. However, the number of past concussions was significantly related to concussive-like symptoms above and beyond one's mood symptomology in individuals who do not currently have a concussion. This study suggests that getting a concussion in one's adolescent years may have long lasting effects in one's adult years.

Mimicking the EGFR Dimerization Arm Using Triazolyl-Bridged Peptides: An Alternative Approach to EGFR Inhibition

Christopher Watkins
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EGFR is a transmembrane receptor tyrosine kinase whose overexpression contributes to oncogenic phenotypes in multiple cancers, making it a candidate of choice for therapeutic treatments. Previous attempts have mostly relied on tyrosine kinase inhibitors (TKIs) and monoclonal antibodies, but these have had significant drawbacks, such as the development of secondary resistance and infusion reactions, making an alternative targeting strategy necessary. Our work has been to develop a library of triazolyl-bridged peptides that inhibit EGFR activity by mimicking the dimerization arm of its extracellular domain. The dimerization arm was chosen because blocking its interaction prevents dimerization of the receptor and the activation of the cytoplasmic tyrosine kinase

domain of EGFR, thus inhibiting downstream signaling. Our peptides were stabilized by locking the termini together into a β loop by formation of a triazolyl bridge. The lengths of the azido-amino acid side chains required for triazole formation were varied to identify the optimal cross-link length. Liquid chromatography-mass spectrometry (LC/MS) confirmed formation of the cyclized product, and reverse-phase high-pressure liquid chromatography (HPLC) was used to purify the peptides. The peptide with the shortest bridge, EDA2, showed the greatest decrease in the amount of phosphorylated EGFR and Akt in cell-based assays. Co-immunoprecipitation of fluorescein-labeled peptides revealed that our EDA2 peptide bound EGFR. The Duolink assay identified a decrease in EGFR dimers after incubation with EDA2. Our results show that EDA2 inhibits the dimerization of EGFR and subsequent downstream signaling, demonstrating that dimerization arm mimicking peptides may be a promising alternative targeting strategy for EGFR inhibition.

Polio Eradication: What's Still Needed?
Amelia Watson
Dr. Richard Schuster, Health Policy & Management, College of Public Health

Poliomyelitis is a devastating disease that attacks the central nervous system and often causes paralysis. About 2 to 5% of children and 15-30% of adults with paralyzing infection die, and the survivors' lives are irrevocably changed. The World Health Assembly sought to eradicate poliomyelitis in 1988, when the disease paralyzed more than 350,000 people each year. The most recent deadline of polio eradication, one of the many set, was missed in 2012. Unfortunately, polio is still endemic in three countries despite continual efforts towards eradication. The current state of control would cost more than ten billion dollars over the next 20 years with approximately 200 cases of paralytic polio each year, and circulating polio will threaten to have even larger outbreaks, affecting the health of the world. Because of vaccination refusals and security problems as well as the need for a new vaccination schedule, the policies put in place must be reassessed. Introducing IPV into every vaccination schedule is an important step in polio eradication's future. The challenges of this policy are that implementation is expensive and requires the intensive training of vaccination workers compared to OPV. However, this solution will increase demand for the vaccine, be more politically accepted, and prevent the most cases of polio.

Breaking Mendel's Laws: How Abnormal Chromosome 10 Causes Meiotic Drive
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In *Zea mays*, abnormal chromosome 10 (Ab10) exhibits meiotic drive by segregating into approximately 80% of progeny instead of the Mendelian 50%. In addition to preferentially segregating itself, the presence of Ab10 causes the preferential segregation of certain knobs present on other chromosomes. These knobs are heterochromatic regions of tandem repeats composed of two sequences called Knob 180 and TR-1. Three haplotype variants of Ab10 have been found across subspecies of *Zea mays*, called teosintes, the wild progenitor of domesticated maize. They are denoted types I, II, and III and vary in knob content, but all exhibit meiotic drive. My goal was to determine which lines of teosinte have Ab10, which variant of Ab10 is present in each, and which genes are important for the meiotic drive phenotype. To do this, I found six lines of teosinte that have Ab10 present in at least one plant. I used fluorescent *in situ* hybridization (FISH) to probe for centromeres, TR-1 knob, and Knob180 on the chromosomes of teosinte lines, and

determined the type of Ab10 present in three plants positive for Ab10 using fluorescent microscopy. I genotyped *Zea mays* for the presence of ten genes on the distal tip of Ab10 to determine if they are present across teosintes and used qRT-PCR to compare expression levels of plants with functioning versus mutant Ab10. Through these experiments, I found one gene that is not important for meiotic drive and two genes that have significant changes in expression and are of interest for further study.

The Justification for Ethnic War
Patrick Wheat
Dr. Daniel Hill, International Affairs, School of Public & International Affairs

With a strong increase in ethnically focused conflicts in the past twenty years, the root of these conflicts remains a confounded issue in many respects. Through the use of analysis of case studies, along with dynamic and structural theories on the foundation of ethnic identity, I attempted to form a conclusion as to the core cause of ethnic conflict. While in many cases it appears that the actions of individuals who participate in ethnic conflicts appear to be the result of long-standing grievances, violence is more likely to be the result of manipulation of ethnically-based political cleavages by individuals in leadership positions, who engage in such behavior for the advancement of their own personal agenda or that of their ethnic or political bloc. Furthermore, these efforts are more successful when the leadership is able to manipulate ethnically-based cleavages characterized by a history of grievances. In this presentation, I will use the real world examples of the events leading up to the Rwandan Genocide, the Bosnian Civil War and the Sri Lankan Civil War alongside theoretical analysis of different theories on Ethnic Conflict to demonstrate the cause of this type of conflict as more likely to be the result of leadership manipulation rather than other factors, including Ethnic strife and "Ancient Hatreds" arguments.

The Rationality of Peacekeeping
Patrick Wheat
Dr. Andrea Everett, International Affairs, College of Public & International Affairs

The United Nations Department of Peacekeeping Operations has acted as one of the most well-known international organizations for the past sixty years, taking part in 67 operations aimed at stabilizing regional conflict and alleviating humanitarian concerns across the globe. Peacekeeping missions organized by the DPKO are comprised entirely of voluntary contributions of soldiers from individual nations. Because these contributions play such an important role in the DPKO's continued operations, understanding the factors that are likely to encourage or discourage states from participating in UN missions is of paramount importance. One of the most interesting aspects of this contribution question is understanding the factors that cause states with fewer military resources (personal, weapons, equipment, etc.) to contribute more than states with a large amount of resources. Most of this motivation appears to come from political will within the nation and from the financial compensation given from the UN to states who contribute forces to peacekeeping mission. If either of these factors is either lacking or unnecessary to the government of a state, the state is less likely to contribute based on this model. To demonstrate this, I will use case studies from nations such as Bangladesh, Ethiopia, Cambodia and Thailand.

Abstracts

The Utilization of Genetic Manipulation to Better Understand Kinative Function of CK1.2 in *Trypanosoma brucei*

Zachary Whitt, CURO Graduation Distinction
Prof. Kojo Mensa-Wilmot, Cellular Biology, Franklin College of Arts & Sciences

Human African Trypanosomiasis (HAT) is a disease caused by two subspecies: *Trypanosoma brucei gambiense* and *rhodesiense*. The drugs Pentamidine, Suramin and Melarsoprol have all been used for over 60 years to treat Trypanosomiasis; however, each has undesired, potentially fatal side effects. Over the past few decades, governments and international agencies have been pushing for safer and more effective treatments for HAT. To this end, the Mensa-Wilmot lab has identified AEE788, an epidermal growth factor receptor (EGFR) inhibitor, as a lead for anti-trypanosome drug discovery. Trypanosomes lack EGFR but AEE788 binds Casein kinase 1.2 (TbCK1.2) in the parasite. The biological functions of TbCK1.2 are not known. One approach to address the issue is to overexpress TbCK1.2 in *T. brucei*, and examine the genetically modified trypanosomes for new phenotypes. We are interested in learning whether the effects of AEE788 treatment of *T. brucei* is similar to overexpression of TbCK1.2. Overexpression of TbCK1.2 leads to a defect in segregation of a specific organelle, the kinetoplast which contains mitochondrial DNA in the parasite. We anticipate that elucidation of these pathways may lead to discovery of new targets for hit discovery in anti-trypanosome drug discovery.

The Expression of the Bile Acid Receptor TGR5 in Prostate Cancer Cells and its Role in Bile Acid-Induced Cell Death

Stephanie Wilding, CURO Summer Fellow, CURO Graduation Distinction
Dr. Brian Cummings, Pharmaceutical & Biomedical Sciences, College of Pharmacy

Bile acids mediate the digestion and absorption of fats and fat-soluble vitamins; however, pathological increases are associated with choleostasis and cell death. Recent studies show that high concentrations of bile acids can induce apoptosis in several cells, including cancer cells, by mechanisms that are not fully understood. Previous data in our lab demonstrated the novel finding that bile acids can induce cell death in three prostate cancer cell lines (PC-3, DU-145, and LNCaP); however, they do not determine the mechanisms involved. Bile acids are transported into cells by receptors, one of which is TGR5. Thus, we hypothesized that bile acid-induced cell death was mediated by TGR5; however, the expression of TGR5 in prostate cancer cells has not been reported. We used RT-PCR and immunoblot analysis to show that TGR5 is expressed in all three prostate cancer cell lines as well as a non-cancerous prostate cell line (RWPE-1). In general, the expression of TGR5 was highest in prostate cancer cells, and lowest in non-cancerous prostate cells. Transfection of PC-3 cells with plasmids encoding for shRNA against TGR5 decreased TGR5 mRNA and protein expression, as compared to cells transfected with scrambled shRNA. Analysis of MTT staining, a marker of cytotoxicity, showed that bile acids induced similar levels of cell death in wild-type cells as in TGR5 knockdown cells. These data show the novel finding that TGR5 is expressed in prostate cancer cells, but also suggest that TGR5 does not mediate the toxicity of bile acids.

The Role of Notch Signaling in Astrocyte and Oligodendrocyte Derivation

Elizabeth Wilkins, CURO Honors Scholar, CURO Summer Fellow
Dr. Steven Stice, Animal & Dairy Science, College of Agricultural & Environmental Sciences

Astrocytes and oligodendrocytes are macroglial cell subtypes which play supporting roles for neurons in the central nervous system. During development, the ventral neural tube is spatially patterned into five specific domains by a gradient of Sonic Hedgehog from the floor plate and notochord. Temporally, the p2 progenitors sequentially generate interneurons followed by astrocytes, while the pMN progenitors produce motor neurons then oligodendrocytes in a process known as the glial switch. Notch-Delta signaling is a well-studied means of juxtacrine communication between cells and its downregulation has been implicated in this process, but its mechanism is poorly understood. We plan to investigate the role of Notch signaling in the glial switch. Embryoid bodies composed of mouse embryonic stem cells will be patterned using a SHH agonist to mimic the neural tube. At different time points, a global Notch inhibitor, DAPT, will be added to the media. We will use immunocytochemistry to image for astrocytic and oligodendritic markers. We hypothesize that Notch inhibition will yield greater amounts of secondary cell types, including astrocytes and oligodendrocytes. By understanding how progenitor populations are able to produce multiple cell types, we will better understand the developing neural tube and spinal cord, with implications for motor control diseases like amyotrophic lateral sclerosis and spinal cord injury. Moreover, understanding how progenitor populations generate post-mitotic cell types is highly translatable to other stem and progenitor cell niches which persist into adulthood. The knowledge gained could allow us to harness the capacity of these intrinsic progenitors for potential therapies.

Sigma-54 Promoter Activity and Gene Regulation in *Salmonella*

Leah Williams
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Sigma factors interact with RNA Polymerase for recognition of promoters and initiation of transcription in prokaryotic organisms. Sigma-54 (RpoN) is an alternative sigma factor that regulates a subset of transcripts and functions in a mechanistically different manner than other known sigma factors, requiring an activator and ATP hydrolysis. To characterize the RpoN-dependent regulon of *Salmonella typhimurium*, we previously utilized chromatin Immunoprecipitation coupled with high-density tiled microarray and RNA microarray assays, defining >250 RpoN chromosomal binding sites and 22 RpoN-dependent transcripts, respectively. In addition, several operons were found to be down-regulated in the presence of RpoN and had adjacent or internal RpoN-binding sites. We are currently addressing the mechanism by which the RpoN binding sites may be negatively regulating the associated operon. Promoter activity for these sites is being assessed by transcriptional fusion to *phoA,* an alkaline phosphatase, in the presence of DctD250. We have adapted a protocol to assay production of PhoA and confirmed that the assay could be performed in *Salmonella.* Transcription fusions to *phoA* are being generated for five of the identified regulatory RpoN binding sites. PhoA activity is being assessed in wild-type and ⊿*rpoN* 14028s strains to ensure PhoA production is RpoN-dependent. Evaluation of these potential promoters will offer insight into possible alternative methods of RpoN-dependent transcriptional and post-transcriptional control of gene expression in *Salmonella.*

Abstracts

Fermentation of Cull Peaches Using a Pectinase Producing *Saccharomyces cerevisiae* Strain

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Cull or spoiled peaches, normally a waste product, can be fermented to produce ethanol due to their high concentration of sugars in monomeric and in polymeric form. The sugar polymers in the peach biomass require enzymes for cleavage into available monomers. This set of experiments compared the fermentation performance of a pectinase producing yeast, *Saccharomyces cerevisiae* 09448, to the commonly used corn ethanol production yeast, *Saccharomyces cerevisiae* XR122N, and the engineered ethanologenic bacterium, *Escherichia coli* LY40A. First, *S. cerevisiae* XR122N fermentations were compared to fermentations with *E. coli* LY40A. Due to the high number of six carbon sugars in peaches, the biomass was best fermented by the *S. cerevisiae* XR122N. Next, the optimal enzyme loading for *S. cerevisiae* XR122N fermentations was studied using 15% w/v peach pomace and varying amounts of commercial enzymes. The lowest enzyme loading which produced the maximum amount of ethanol was 1.88 FPU of cellulase/g dw, 7.50 PGU of pectinase/g dw, and 6.25 CBU of cellobiase/g dw. *S. cerevisiae* XR122N fermentations with the same enzyme loading minus the pectinase yielded significantly less ethanol than the fermentation with pectinase. Finally, two sets of fermentations with *S. cerevisiae* 09448 were performed just as they were with the *S. cerevisiae* XR122N in the previous experiment. *S. cerevisiae* 09448 produced the same amount of ethanol in experiments with and without pectinase, indicating that the pectinase produced by *S. cerevisiae* 09448 was sufficient to completely replace commercial pectinase and maintain maximum ethanol yield in peach fermentations.

Interactions between Neutrophils and *Pseudomonas aeruginosa* Flagellum

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Neutrophil granulocytes are professional phagocytes providing the first line of defense against invading bacterial pathogens. Recently, a novel antimicrobial mechanism of neutrophils has been described: formation of neutrophil extracellular traps (NETs) composed of a DNA backbone decorated with granule enzymes. NET formation is an innate immune mechanism, but uncontrolled NET release can cause tissue damage associated with inflammatory diseases including cystic fibrosis (CF). CF airways are characterized by mucus hypersecretion, chronic bacterial infections and infiltration of neutrophils incapable of fighting bacteria, instead causing airway tissue damage. We seek to elucidate the interactions between neutrophils and *Pseudomonas aeruginosa*, an opportunistic gram-negative bacterium found in CF airways. Specifically, we focus on the role of *P. aeruginosa* flagellum, an organelle responsible for swimming motility and virulence. Interactions of neutrophils with flagellum are studied using the PAO1 laboratory strain, comparing response to wild-type PAO1 with response to flagellum-deficient DfliC PAO1. Compared to wild-type PAO1, DfliC PAO1 induces less activation of microbicidal pathways, such as phagocytosis and superoxide production, and induces decreased release of two neutrophil granule proteins, myeloperoxidase (MPO) and human neutrophil elastase (HNE). DfliC PAO1 induces less NET formation measured as release of extracellular DNA, MPO-DNA and HNE-DNA complexes. Interestingly, blocking Toll-like receptor 5, the main receptor for flagellin, does not seriously affect PAO1-induced neutrophil response, and purified flagellin does not elicit NET generation. These data indicate that the bacterial flagellum is vital for efficient human

neutrophil response to *Pseudomonas aeruginosa,* and interactions are mediated by mechanisms other than TLR5.

TLF2 Synthesis from Oxidized Lipids in TLF1

Christopher Witt
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Trypanosome Lytic Factor-1 (TLF1) and the more recently discovered TLF2 are both High Density Lipoproteins (HDLs) found in human serum. Each of these particles functions independently as part of innate human immunity through lysis of the bloodstream form of the protozoan parasite, *Trypanasoma brucei brucei*. TLF1 is the most highly characterized of these two HDLs and is distinguished from non-lytic HDLs by the presence of apolipoprotein L-1 (ApoL-1) and Haptoglobin related protein (Hpr). TLF2 also has ApoL-1 and Hpr but is twice as dense due mainly to the presence of bound IgM molecules which are not found in TLF1. Via Hpr, both TLF1 and TLF2 bind Hemoglobin (Hb). The mechanism of synthesis for TLF2 is unknown. Innate IgM molecules have been shown to bind oxidized phospholipids. Our model proposes that the lipids in Hb bound TLF1 (TLF1-Hb) are oxidized in the bloodstream, inducing recruitment of IgM, ultimately resulting in TLF2 synthesis. The purpose of these experiments was to use the TBAR assay method to demonstrate in vitro lipid peroxidation in TLF1-Hb. TLF1-Hb was shown to self-peroxidize in a time dependent manner at physiological pH in the presence of H2O2. The next step in providing evidence for our model was to demonstrate binding of innate IgM to peroxidized TLF1-Hb via immunoprecipitation. Further characterization of TLF2 synthesis may provide insight into the dynamics of HDLs and oxidized lipids and the role they play in our innate immune response.

Swath Size in Boa Vista's Bearded Capuchin Monkeys

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Primate social groups are often considered to be either fission-fusion or cohesive in their social structure. Recent work has shown, however, that primate social structure should be interpreted along a continuum of cohesiveness with fission-fusion and cohesive social groups representing extremes of that continuum. This study analyzed one aspect of the social cohesion of a group of bearded capuchin monkeys (*Sapajus libidinosus*): the spatial spread of the group throughout its home range. Swaths of the capuchin group were observed using a high resolution satellite image and a GPS enabled iPhone with Avenza PDF Maps application. Spatial measures of group cohesiveness, including swatch area, inter-individual distance and group density, were calculated using ArcGIS geographic information systems software. On average, 14 individuals were observed representing 59% of the group. The average swath was 613 square meters and average front-to-back distance was 50.2 meters. This front-to-back distance is similar to that of capuchin monkeys in a rainforest habitat. Spatial cohesion may be consistent across regions for capuchin monkeys, although further testing is necessary to confirm these measurements.

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