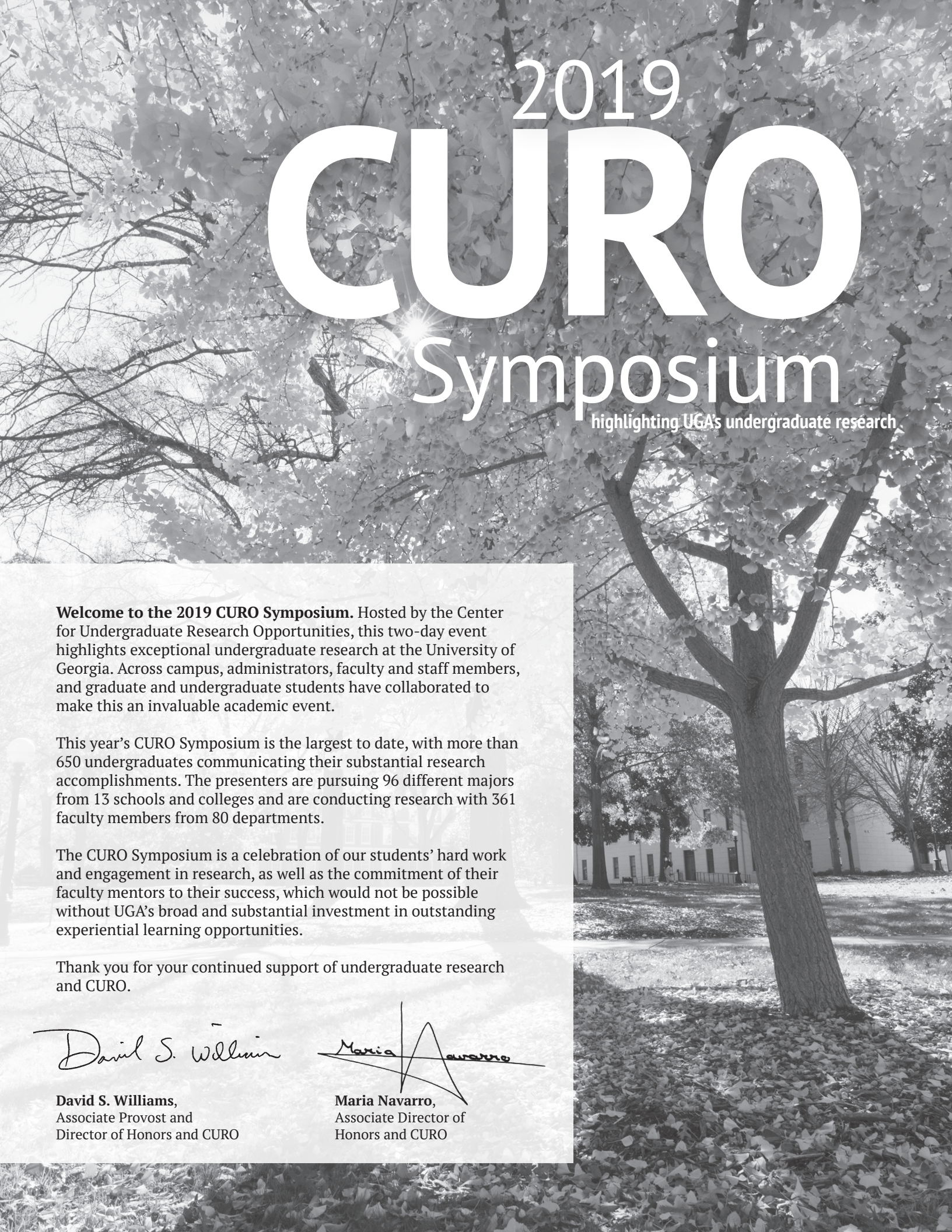
UNIVERSITY OF GEORGIA
Center for Undergraduate Research Opportunities

# 2019 CURO Symposium

highlighting UGA's undergraduate research

**April 8-9 • Classic Center • Athens, GA**

# Program & Book of Abstracts



# 2019 CURO Symposium

highlighting UGA's undergraduate research

**Welcome to the 2019 CURO Symposium.** Hosted by the Center for Undergraduate Research Opportunities, this two-day event highlights exceptional undergraduate research at the University of Georgia. Across campus, administrators, faculty and staff members, and graduate and undergraduate students have collaborated to make this an invaluable academic event.

This year's CURO Symposium is the largest to date, with more than 650 undergraduates communicating their substantial research accomplishments. The presenters are pursuing 96 different majors from 13 schools and colleges and are conducting research with 361 faculty members from 80 departments.

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

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

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

**Maria Navarro**,
Associate Director of
Honors and CURO

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# Schedule

## Monday / April 8, 2019

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

11:15 a.m.-12:05 p.m.
**Oral Session 1**

12:20-1:10 p.m.
**Oral Session 2**

1:25-2:15 p.m.
**Oral Session 3**

2:30-3:20 p.m.
**Oral Session 4**

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

4:30-6:30 p.m.
**Poster Session and Reception**
*Grand Hall South*

## Tuesday / April 9, 2019

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

9:30 a.m.-10:45 a.m.
**Oral Session 5**

11:00 a.m.-12:15 p.m.
**Oral Session 6**

12:30-1:45 p.m.
**Oral Session 7**

2:00-3:15 p.m.
**Oral Session 8**

3:30-4:45 p.m.
**Oral Session 9**

# CURO Research Mentoring Awards

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

The 2019 recipients are **Dr. Vanessa Ezenwa**, left, *Professor, Odum School of Ecology, and Department of Infectious Diseases, College of Veterinary Medicine*, and **Dr. Michelle vanDellen**, right, *Associate Professor, Department of Psychology.*

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

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

2017 recipients
- **Dr. Kevin McCully**, *Professor of Kinesiology, Director of the Exercise Muscle Physiology Laboratory, College of Education*
- **Dr. Brenda Cude**, *Professor, Financial Planning, Housing and Consumer Economics, College of Family and Consumer Sciences*

2016 recipients
- **Dr. Mable Fok**, *Assistant Professor, Electrical and Electronics Engineering, College of Engineering*
- **Dr. Richard Lewis**, *UGA Foundation Professor in Family and Consumer Sciences, Foods and Nutrition, College of Family and Consumer Sciences*

2015 recipients
- **Dr. Jeb Byers**, *Professor, Odum School of Ecology*
- **Dr. Erik Hofmeister**, *Associate Professor of Anesthesiology, Chief of Small Animal Surgery and Anesthesia, College of Veterinary Medicine*

# CURO Symposium Best Paper Awards

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

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

Each recipient is recognized at the Symposium's Awards and Keynote Session, and each award carries $100 in financial support. Recipients for the 2019 CURO Symposium are listed below, along with their research topics.

Arts, Humanities and Media
**Leah Dudley**
*Communicative Methods and Impact of Learning English in Refugee Communities*

Business
**Adam Kunis**
*An Examination of the Impact of the Tourist Economy on Small Cities and Villages*

Life Sciences
**Landon Clark**
*Elucidating Cis-Acting Sequences Required for DNA Uptake at* Pyrococcus furiosus *CRISPR Loci*

Physical and Environmental Sciences
**Elyssa Junio**
*The Effect of Light on the Growth and Development of the Painted Lady Butterfly (V*anessa cardui*)*

Public and International Affairs
**Madisen Ree Fuller**
*Did Millennium Development Goals Reduce Inequality? Lessons for the Sustainable Development Goals*

Social Sciences
**Jeri Sasser**
*A Longitudinal Investigation of Protective Factors for Bereaved Maltreated Youth*

# Monday, April 8, 2019

## Oral Session 1

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

*Athena Breakout Rooms*

| | | | |
|---|---|---|---|
| Room A | **Madisen Ree Fuller** | Ascertaining Inequality in the Millennium Development Goals at the Global Level | *Dr. Puneet Dwivedi* |
| | **Kaitlin Hocker** | Evaluating the Constitutionality of the Death Penalty and Lethal Injection | *Dr. Jonathan Peters* |
| | **Sydney Kenna Mattox** | A Policy Analysis of the Nagoya Protocol | *Dr. J. Peter Brosius* |
| Room B | **Adam Kunis** | An Examination of the Impact of the Tourist Economy on Small Cities and Villages | *Dr. Hua Chen* |
| | **Lauren Boyd** | Behind the Scenes of Mexican Paradise: An Exploration into Neoliberalism and Tourism in Mexico Using Qualitative Feminist Methods | *Dr. Patricia Richards* |
| | **Elizabeth Cowen Carter** | Making Water Work: A Public-Private Partnership for Water Security in Karachi, Pakistan | *Dr. Amanda Murdie* |
| Room C | **Stephanie Cannon** | Cooperation Among and Between Religious and Non-Religious Non-Governmental Organizations | *Dr. Amanda Murdie* |
| | **Arden Farr** | An Analysis of the Symbolic Use of U.S. Sanctions: The Influence of Domestic Public Opinion | *Dr. Andy Owsiak* |
| | **Sam Daly** | Military Deterrence Decision Making | *Dr. Jeffrey Berejikian* |
| Room D | **Riya Gohil** | Elucidating the Role of Cas2 in CRISPR DNA Uptake of *Streptococcus thermophilus* | *Dr. Michael Terns* |
| | **Tristan Horton** | Molecular Steps Involved in Bacterial Colonization and Biofilm Formation on Maize Aerial Roots | *Dr. Maor Bar-Peled* |
| | **Felicia Williams** | The Roles of Induced Genes in *Fusarium verticillioides* Resistance to *Streptomyces* Bacteria | *Dr. Scott Gold* |
| Room G | **Ross Uhlar** | Butting Heads: Competition and Posturing in a Paired Programming Team | *Dr. Nicola Sochacka* |
| | **James H. Roach** | Implementing Fault Tolerance and Radiation Hardening for an Accelerated Computing Platform in Low Earth Orbit | *Dr. David L. Cotten* |
| | **Hamza S. Naqawe** | Fiber Optic Sensors for Soft Robotics | *Dr. Mable Fok* |

## Oral Session 2

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

*Athena Breakout Rooms*

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| Room H | **Tj Venkata Pothuraju** | Effect of Hormone-Ligated Toxins and Endosomal Disruptive Agents on Prostate and Pituitary Cancer Cells | *Dr. Ramesh Selvaraj* |
| | **Kenna Frierson** | Native Wildlife Species as Hosts of the Exotic Invasive Asian Longhorned Tick, *Haemaphysalis longicornis* | *Dr. Michael Yabsley* |
| | **Caroline Finn** | Potato Resistant Starch Supplementation Improves Satiety Signaling and Neuroinflammation in High-Fat Fed Rats | *Dr. Claire de La Serre* |
| Room I | **Alexeia Garnett** | Psychophysiological Effects of Yoga | *Dr. Patrick O'Connor* |
| | **Fiachra Rottinghaus** | The Effect of In-Group/Out-Group Bias on the Perception of Robots | *Dr. Adam Goodie* |
| | **Parker Hinson** | Kinematics of the Canine Forelimb | *Dr. Tim Foutz* |
| Room A | **Katie Lech** | Private Performance: Passion Devotion and Accessory Prayers in Medieval Books of Hours | *Dr. Cynthia Turner Camp* |
| | **Johanna Hoover** | Playing God: Creature/Creator Relationships in *Frankenstein* and *Paradise Lost* | *Dr. Richard Menke* |
| | **Anthony Gagliardi** | A Language of Your Own: Developing Personal Iconography in Poetry | *Dr. Ed Pavlic* |
| Room B | **Johanna Mercurio** | Improving Health Care Experiences for Cambodian Refugees Through Bridging Western and Traditional Medicine | *Dr. Denise Clark Lewis* |
| | **Lauren Lewis** | Analysis of Bereavement Programs for Children in the United States | *Dr. Melissa Landers-Potts* |
| | **Leah Dudley** | Communicative Methods and Impact of Learning English in Refugee Communities | *Dr. Bill Kretzschmar* |
| Room C | **Lily Kathryn Houston** | Shakespeare's Storm: A Look at Renaissance Meteorology | *Dr. Frances N. Teague* |
| | **Katherine Haire** | Let's Talk About Literacy: A Study of Margaret Mautby Paston and Medieval Laywomen's Literacy | *Dr. Cynthia Turner Camp* |
| | **Lorena Limongi** | Maria Firmina Dos Reis' *Ursula* in 19th Century Brazilian Abolitionism | *Dr. Robert Henry Moser* |

# Monday, April 8, 2019

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|---|---|---|---|
| **Room D** | **Tina Nguyen** | The Correlations Between Core Self-Evaluations and Demographic Characteristics Among Agricultural Opinion Leaders | *Dr. Kevan Lamm* |
| | **Ivan Campbell** | Personality Stereotypes of College Majors | *Dr. Brian Haas* |
| | **Nick Riley Findley** | Effects of Undergraduate Employment on Graduate School and Post-Graduate School Outcomes | *Dr. Bill Vogt* |
| **Room G** | **Manya Kothapalli** | Vocal Exchanges and Effects on Dominance and Group Cohesion in Western Gorillas | *Dr. Roberta Salmi* |
| | **Tyus D. Williams** | Using Camera Traps to Estimate Proportional Territory Overlap of Jaguars | *Dr. Nate Nibbelink* |
| | **Mischa K. Schultz** | Comparison of Methods for Estimating White Shark Abundance | *Dr. Steven B. Castleberry* |
| **Room H** | **Kelsey Frandsen** | Electronic Absorption Spectroscopy Measurements of Low-Temperature Combustion Intermediates | *Dr. Brandon Rotavera* |
| | **Dylan Brown** | Defining Uncertainty Bounds for Measurements of Gas Flow | *Dr. Brandon Rotavera* |
| | **Leigh Anne Lloveras** | Carbon Emissions Model of Athens-Clarke County, GA | *Dr. John R. Schramski* |
| **Room I** | **Anna Jewell Davidson** | Realpolitik and Post-2008 Russian National Security and Defense Policy: Strategic Defensive Assertion | *Dr. Andy Owsiak* |
| | **Ashley Soriano** | The Dialectic Between the First and Sixth Amendments | *Dr. Jonathan Peters* |
| | **Rebecca Buechler** | Sequencing in Vasquez' Steps to War Thesis | *Dr. Andy Owsiak* |
| **Room J** | **Aarati Shah** | Intragroup Conflict and Formation of Student Networks in the Biology 1108 Undergraduate Labs | *Dr. Peggy Brickman* |
| | **Josh Thedford** | Isolation of Microbial Cultures from Different Carbon Sources to Assess Organic Matter Stability in Soil | *Dr. Aaron Thompson* |
| | **Lexi Kenna** | Foliar Nitrogen and Carbon Content in Four Tree Species in Response to Soil Warming | *Dr. Jacqueline E. Mohan* |

## Oral Session 3

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

*Athena Breakout Rooms*

| | | | |
|---|---|---|---|
| Room A | **Aysha Jerald** | Exploring the Typology of Generation Z Activists in Relation to Dystopian Literature | *Dr. Elizabeth Kraft* |
| | **Teddy Vincent** | Climate Fiction as a Response to Climate Change: A Genre Analysis | *Dr. James Hamilton* |
| | **Thomas Michael May** | Analyzing the Peabody Archive | *Dr. Taylor Cole Miller* |
| Room B | **Zach Weingarten** | The Effects of Intergenerational Transmission on the Gender Gap in STEM | *Dr. Christopher Cornwell* |
| | **Sebastian Puerta** | The Makeup of Gifted and Talented in Georgia | *Dr. Josh Kinsler* |
| | **Luke Joseph Armao, Emmett Thomas Allen** | The Effect of the HOPE Scholarship on Inequality in Georgia | *Dr. David B. Mustard* |
| Room C | **Julianne Miao** | Félix González-Torres's *Portrait of Ross* in L.A.: Unmaking Binary Laws | *Dr. Nell Andrew* |
| | **Sarah Mendes** | Anything but Ironic: Robert Schumann's *Drei Fantasiestucke* | *Dr. Emily Gertsch* |
| | **Emma McMorran** | The Changing Definition of the Readymade | *Dr. Isabelle Wallace* |
| Room D | **Zachary T. Jones** | Superresolution Analysis of Meiotic Chromosome Synapsis in the Domestic Cat | *Dr. Rabindranath De La Fuente* |
| | **Hannah Kemelmakher** | Large Animal Model of Acute Arthritis for Stem Cell-Based Regenerative Medicine | *Dr. John Peroni* |
| | **Ana Lorton** | Threats by *Acinetobacter* spp. in Domestic and Exotic Animals: Occurrence and Resistance Trends in the United States, 2013-2018 | *Dr. Susan Sanchez* |
| Room G | **Taimoor Aslam** | The Efficient Use of Serum as a Nutritional Source for Bacterial Respiratory Pathogens | *Dr. Eric T. Harvill* |
| | **William Antoniades** | Optimization of Inhibitory Peptides Designed to Block the Progression of Inflammation-Induced Angiogenesis | *Dr. Neil J. Grimsey* |
| | **Austin Gaines Leach** | Surveillance: Swine Influenza Virus in Nasal Washes | *Dr. Ralph A. Tripp* |
| Room H | **Elizabeth Goggin** | The Development of Nonprofits in West Africa: An Examination of Habitat for Humanity | *Dr. Oscar Chamosa* |
| | **Sarah Henning** | The Appeal of Poverty | *Dr. Maryann Gallagher* |

# Monday, April 8, 2019

## Oral Session 4

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

*Athena Breakout Rooms*

| | | | |
|---|---|---|---|
| Room I | **Tarun Daniel** | Countermanding Task Performance in College Students | *Dr. Jennifer McDowell* |
| | **Josh Clifford** | Assessing Georgia Housing Quality Using a Participatory Geographic Information Systems (PGIS) Approach | *Dr. Jerry Shannon* |
| | **Patrick Brothers** | Constructing 4D Manifolds with Euler's Formula | *Dr. David Gay* |
| Room J | **Amanda Nicole Richards, Nikita Tallapally** | The Role of Intensive Parenting Beliefs in the Transition to Parenthood | *Dr. Anne Shaffer* |
| | **Chelsea Ho Lila Mitchell** | Lazos Hispanos: Bridging Community Partners and Promotoras as Agents of Change | *Dr. J. Maria Bermudez* |
| | **Cameron Holsomback** | Social Media as a Behavior Disorder | *Dr. W. Keith Campbell* |
| Room A | **Tarun Ramesh, Teddy Vincent, Emma Tucker** | Mission Emission: Increasing Accountability Through Carbon Cost Evaluation | *Dr. Quint Newcomer* |
| | **Grace Anne Ingham** | Collaborating Towards Coastal Resilience in the Southeast | *Shana Jones* |
| | **Becca Parsons** | Ignorance Is Bliss: The Current State of Septic Systems in the U.S. and the Risks They Pose to Freshwater Systems | *Dr. Krista Capps* |
| Room B | **Hallie Kielb** | The Development of International Law in Cyberspace | *Dr. Andy Owsiak* |
| | **Austin Apt** | The Significance of Bitcoin Through Neural Networks | *Dr. John A. Miller* |
| | **Mason Thomas Jones** | The Future's Inevitable Change: Effects of Blockchain and Cryptocurrency | *Dr. Margaret Christ* |
| Room C | **Grant Sublette-Urry** | Afro-Pessimism in Colson Whitehead's *The Underground Railroad* | *Dr. Peter Desmond O'Neill* |
| | **Kaela Yamini, Dominique Harry** | Who Am I?: The Intersection Between Racial and Emotional Socialization in the Development of Black Ethnic Identity | *Dr. Anne Shaffer* |
| | **Alyssia Mitchell** | *Scandal*: The Hyper-Sexualization of Black Women in Network Television | *Dr. Mari Erigha* |

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| Room D | **Debbie Mekonnen, Shemar Little** | Male Domain: Digital Game-Based Learning for HPV Vaccination Among Young Males | *Dr. Gabrielle Darville* |
| | **Mansi Mehta** | The Relationship Between Pregnancy Associated Malaria to Adverse Pregnancy Outcomes and Maternal Antibodies: A Systematic Review and Meta-Analysis | *Dr. Jose Cordero* |
| | **Lauren Schermerhorn** | Resilience and Wellbeing Among Young Adults from Mixed-Documented Status Families | *Dr. J. Maria Bermudez* |
| Room G | **Hannah Grace Harper, Jun Choe** | When Does Mindset Matter? Relationships Between Mindset, Attributions, and Coping with Failure | *Dr. Erin Dolan* |
| | **Alex Waugh** | Randomization in the Classroom: Understanding Instructor Thinking Related to Random Call | *Dr. Tessa Andrews* |
| | **Chandler Lee Cubbedge** | Association of Cognitive Control with STEM Majors | *Dr. Jennifer McDowell* |
| Room H | **Jacob Sparks** | Comparing Classical Christian Views of Salvation Among Catholicism, Protestantism, and Orthodoxy | *Dr. Jason Roberts* |
| | **Will Drosos** | The Death of Ananias and Sapphira | *Dr. Wayne Coppins* |
| | **Miles Morgan** | A Deleuzian Interpretation of Biosemiotics | *Dr. O. Bradley Bassler* |
| | **Spencer Caro** | Knowledge, Probability, and Legal Proof | *Dr. Sarah Wright* |
| Room I | **Lauren Marie Wilson** | The Computational Investigation of the Novel Anticancer Drug GH501, and its Potential Protein Target: AKR1C3 | *Dr. Paul Xie* |
| | **Arianna Petersen** | Zinc Oxide Nanoparticles Topcoated on Nitric Oxide Donors to Increase Antimicrobial Properties | *Dr. Hitesh Handa* |
| | **Richard English Dolder III, Xena Mansoura** | Synthesis of MOF for the Purpose of Photactivated Drug Delivery | *Dr. Richard Morrison* |
| Room J | **Thomas Spoerer** | Designing and Fabrication of a Biological Photo-Voltaic Cell for Electricity Generation Using Photosynthesis | *Dr. Ramaraja P Ramasamy* |
| | **Huzefa Husain** | Fighting Hospital Acquired UTIs with Antimicrobial Urinary Catheters | *Dr. Hitesh Handa* |
| | **Samuel G. Latzsch** | Physiological Mechanisms Regulating Metabolic Efficiency in Ross Broilers | *Dr. Laura Ellestad* |

# Monday, April 8, 2019

## Awards and Keynote Session

Monday, 3:30 to 4:30 p.m.
*Athena Room E*

### Welcome and Introductions
Dr. David S. Williams
*Associate Provost and Director of Honors and CURO*

### Remarks
Jere W. Morehead
*UGA President*

### Awards Introduction
Dr. Maria Navarro
*Associate Director of CURO and Honors*

### CURO Research Mentoring Awards
Dr. David Lee
*Vice President for Research*

### CURO Symposium Best Paper Awards
Dr. Rahul Shrivastav
*UGA Vice President for Instruction*

### UGA Libraries' Research Awards
M. Kathleen Kern
*Director of Miller Learning Center Library Commons, UGA Libraries*

### Introduction of Keynote Speaker
Jennifer Annette Brown
*Class of 2019, Department of Psychology, Franklin College of Arts and Sciences*

### Keynote Address
Dr. Jennifer McDowell, "Minding Your Brain"
*Professor, Department of Psychology*
*Chair, Behavioral and Brain Sciences Program*

### Closing Comments
Dr. David S. Williams

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

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

| | | | |
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| *Poster 1* | **Lauren Tolbert** | Hybrid Texts of Literature and Photography: The Modern Civil Rights Movement | *Dr. Barbara McCaskill* |
| *Poster 2* | **Alexandra Ibarra** | The Woman as Resistance: Female Characters in the U.S. Black Film Community | *Dr. Ed Pavlic* |
| *Poster 3* | **Alexandra Ibarra** | Women of the Revolution: A Feminist Analysis of Third Cinema via the Work of Tomás G. Alea | *Dr. Eric Morales-Franceschini* |
| *Poster 4* | **Talia Locarnini** | Rhetoric in the Political Sphere: Georgia's 2018 Gubernatorial Election | *Dr. Elizabeth Davis* |
| *Poster 5* | **Sara Pauline McCracken** | Vashti and a Rejected Narrative in Charlotte Bronte's *Villette* | *Dr. Richard Menke* |
| *Poster 6* | **Georgia Earley** | Prayerbooks of René d'Anjou: Royal Devotion in Late Medieval France | *Dr. Cynthia Turner Camp* |
| *Poster 7* | **Will Drosos, Swapnil Agrawal** | The Worth of All Life: A Comparative Study of Genesis and the *Bhagavad Gita* | *Dr. David S. Williams* |
| *Poster 8* | **Jessica Pasquarello** | A Search for Truth | *Dr. David S. Williams* |
| *Poster 9* | **Sarah Kathryn Thompson** | Theosis and Sanctification: Christian Paradigms of the East and West | *Dr. Sandy Dwayne Martin* |
| *Poster 10* | **Morgan Frederick Geiser** | Reformation and Violence in Sixteenth-Century France | *Dr. Sandy Dwayne Martin* |
| *Poster 11* | **Mary Frances Kitchens** | Athens Music Communities and Their Societal Impact | *Christian Lopez* |
| *Poster 12* | **Olivia Silva** | The Impact of Personality Type as Measured by the Myers-Briggs Type Indicator (MBTI) on Response to Music in Music Majors | *Dr. Alison Farley* |
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| *Poster 16* | **Connor Grady** | Vaccine Refusers and Acceptors: The Influence of Health Belief Model Factors and Media Selectivity on Vaccination Uptake | *Dr. Michael A. Cacciatore* |
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# Monday, April 8, 2019

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| *Poster 21* | **Jan Joho** | Relationship Between Socially Responsible Corporations and Financial Performance | *Dr. Daniel Rettl* |
| *Poster 22* | **Cameron J. DiLoreto** | Financial Literacy, Risk Tolerance, and the Utilization of Robo-Advisor Platforms | *Dr. Swarn Chatterjee* |
| *Poster 23* | **Tony Thawanyarat** | How Canadian Leave Policies Change Overtime with Regards to Labor Market Opportunities | *Dr. R. Vincent Pohl* |
| *Poster 24* | **Gavin Frame** | The Cost Savings of Health Insurance Networks | *Dr. Eli Liebman* |
| *Poster 25* | **Vineet Raman** | Bridging the Gap: Improving Health Status by Facilitating Client-Provider Connections | *Dr. Rebecca Ann Matthew* |
| *Poster 26* | **Heather Pieper** | Sex-Trafficking and Peacekeeping in Post-Conflict Countries | *Dr. Danny Hill* |
| *Poster 27* | **Mennah Abdelwahab** | Human Rights in Tamil Nadu: Analyzing the Presence and Reporting of Physical Integrity Rights Abuses | *Dr. K.C. Clay* |
| *Poster 28* | **Ashlyn Webb** | Reclassifying Rape as Discrimination: The Risks of Applying Title IX and Post-Secondary Education Policies to the Military's Response to Sexual Assault | *Dr. Maryann Gallagher* |
| *Poster 29* | **Erin Hogan** | Reclaiming Sex in International Law: The Ability to Self-Select Sex as a Human Right | *Dr. Maryann Gallagher* |
| *Poster 30* | **Ayah Abdelwahab, Kate Foral** | Health Outcomes and Electoral Data in Central America | *Dr. Micah Gell-Redman* |
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| *Poster 32* | **Vaibhav Kumar** | Why has the Democratization Process for India Looked so Different for Pakistan? | *Dr. Jennifer Joelle White* |
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| *Poster 35* | **Emily Rose Bumgarner** | Statistical and Graphical Analysis of Sex Trafficking within Atlanta, Georgia | *Dr. David O. Okech* |
| *Poster 36* | **Alyssa Kiss** | Data Compilation on Sex Trafficking in Atlanta, GA Focusing on Significant Determining Variables | *Dr. David O. Okech* |
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| *Poster 386* | **Mohammed Rezwan Racin** | PLGA Nanoparticle Encapsulated DM-1 Prodrug for Enhanced Radiosensitization in Lung Cancer Cells | *Dr. Jin Xie* |
| *Poster 387* | **Joshua Courtney** | Bringing Light from the Infrared to the Ultraviolet: Third Harmonic Generation with Ultrafast Lasers | *Dr. Melanie Reber* |
| *Poster 388* | **Christina Cortes** | Chemistry in the Arts: An Interdisciplinary Look at Student-Synthesized Azo Dyes | *Dr. Richard Morrison* |
| *Poster 389* | **Xena Mansoura, Richard Dolder** | Design and Synthesis of Novel Drug Delivery Metal Organic Frameworks (MOFs) | *Dr. Richard Morrison* |
| *Poster 390* | **Michael Timothy Conners** | Synthesis of Biological Inhibitors for use in Catalytic Enzyme-Based Reactions | *Dr. Robert S. Phillips* |
| *Poster 391* | **Juni Dasgupta** | Design of Selective Chromium Catalysts for Ethylene Trimerization | *Dr. Steven Edge Wheeler* |
| *Poster 392* | **Lauren Kim** | Stacking Interactions of BN-hetereocycles | *Dr. Steven Edge Wheeler* |
| *Poster 393* | **Andrew Baker Austin** | Investigating Control of Flowering Time Under Different Environmental Conditions in *Mimulus guttatus* and *M. nasutus* | *Dr. Andrea Sweigart* |
| *Poster 394* | **Tylanna Baker** | Investigating the Developmental Basis of Hybrid Seed Lethality in *Mimulus* Species | *Dr. Andrea Sweigart* |
| *Poster 395* | **Sydney Beatrice Rowell** | The Genetic Basis of Reproductive Isolation via Drought Adaptation in *Mimulus* | *Dr. Andrea Sweigart* |

# Tuesday, April 9, 2019

## Oral Session 5

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

*Athena Breakout Rooms*

| | | | |
|---|---|---|---|
| Room A | **Omowunmi Oni** | Identifying the Community Cultural Wealth of Academically-Successful Black Science Students | *Dr. Julie Dangremond Stanton* |
| | **Erika Allen, Mitchell Peters** | Responsive Support: A Critical Review of the Literature and Application to Mentoring | *Dr. Lillian T. Eby* |
| | **Benjamin Henry Taylor Bridges** | Where is My Mentor? A Taxonomy of Negative Mentoring in Undergraduate Research Experiences in the Life Sciences | *Dr. Erin Dolan* |
| | **Davis Faircloth Ray** | Exploring the Relationships Between Resilience and Student Performance in an Engineering Statics Class | *Dr. Peter Carnell* |
| Room B | **Taylor Potter** | Physical Disability Representation in Theater, Film, and Television | *Dr. Anne Gilbert* |
| | **Zachary Pareizs** | Developing a Queer Sensibility and Artistic Identity | *Prof. George Contini* |
| | **Michaela Danielle Wilkins** | Site-Specific Theatre v. Traditional Theatre | *Dr. John Patrick Bray* |
| | **Olivia Babuka Black** | Adrian Piper: Synthesis of the Body and Space in Performance Art | *Dr. Marla Carlson* |
| Room C | **Arthur Miller** | Characterizing NET Release Stimulated by Cystic Fibrosis Clinical Isolates of *Staphylococcus aureus* | *Dr. Balazs Rada* |
| | **Simran Rajput** | A Novel Regulator of Muscle Function and Myoblast Differentiation | *Dr. Takahiro Ito* |
| | **Sabrena Rutledge** | Role of AGMAT Pathway in Myeloid Leukemia Cells | *Dr. Takahiro Ito* |
| | **Sam Skye Summers** | Searching for Causality in Suspected Case of Malignancy-Induced Lymphedema | *Dr. Mandi M. Murph* |
| Room D | **Connor M. Lawhead** | Analyzing Associations Between Social Functioning, Cognition, and Resting State Connectivity Among Schizophrenia Biotypes | *Dr. Brett Clementz* |
| | **Robert Petcu** | Cognitive Reserve as a Potential Mediator of the Relationship between Physical Activity and Short-Term Memory in Older Adults | *Dr. Steve Miller* |
| | **Sydney Chummar** | Phosphorylated Tau Levels Moderate the Relationship Between Cognitive Status and Depression | *Dr. Steve Miller* |
| | **Jennifer Annette Brown** | Relationship Between Positive Symptoms and White Matter Structure in Psychosis | *Dr. Jennifer McDowell* |

## Oral Session 6

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

*Athena Breakout Rooms*

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| Room G | **Landon Clark** | Trans-Acting Factors that Regulate CRISPR DNA Uptake in *Pyrococcus furiosus* | *Dr. Michael Terns* |
| | **Fayhaa Doja** | Investigating the Role of Antiviral Hypothiocyanite in Binding of Influenza Virus to Host Cells | *Dr. Balazs Rada* |
| | **Noor Hillou** | Gene Knockouts in Vero Cell Genes *EMX2* and *FGF2* to Increase Viral Antigen Production | *Dr. Ralph A. Tripp* |
| | **Isabelle Lynn Williams** | Ubiquitin and Species' ISG15 Specificity of the vOTU from the Kupe Virus | *Dr. Scott Pegan* |
| Room H | **Alexis Manson** | Pathways to Redress: Case Studies on the Inclusion of SVIC Provisions in Post-Conflict Resolutions | *Dr. Maryann Gallagher* |
| | **Taylor Withrow** | The Intersection of Disability and Poverty: Social Security Administration Appeals in the Federal Trial Courts | *Dr. Christina Boyd* |
| | **Sofiya Payne** | An Economic Analysis of Drug Crime and Policy in America | *Dr. David B. Mustard* |
| | **Elina Acosta** | A Comparative Analysis of the Top Human Trafficking Cities in the United States | *Dr. Alexander Kaufman* |
| Room I | **Madeline Grace Young** | Changes in Gene Expression in Equine DSLD as Determined by Next Generation Sequencing | *Dr. Jaroslava Halper* |
| | **Alicia May** | Identification of New Glial Markers in Planarians | *Dr. Rachel Roberts-Galbraith* |
| | **Drea Sotelo** | The Genetics of Parallel Evolution of Hybrid Male Sterility in *Mimulus* | *Dr. Andrea Sweigart* |
| Room A | **Fransuave Moore** | Job Satisfaction in an East African Medical Research Center | *Dr. Malissa Clark* |
| | **Raquel Hazzard** | Physicians and Fatigue: Understanding the Boundaries of Human Performance | *Dr. Jim Coverdill* |
| | **Jon Cooper** | A Comparative Analysis of the Impacts of Medicaid Policy on Rural Health Care | *Dr. Lesley Anetra Clack* |
| | **Faeez Juneja** | Efficacy of Nutrition and/or Physical Activity with Alternative Pain Management Methods Among Patients with Chronic Conditions | *Dr. Janani Rajbhandari-Thapa* |

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| Room B | **Emeline McClellan** | Spoken Thoughts: The Roles of Understanding and Language According to Augustine | *Dr. Erika Hermanowicz* |
| | **Zachary Pareizs** | The Impact of Translation on Theatrical Performance | *Prof. George Contini* |
| | **Kristen Nicole Gragg** | 'To Kill a Wife with Kindness': Contextualizing Shakespeare's *The Taming of the Shrew* | *Dr. Frances N. Teague* |
| | **Leah Dudley** | Analyzing LAMSAS: Charting Regional Dialects in the Middle and South Atlantic | *Dr. Bill Kretzschmar* |
| Room C | **Delaney Metcalf** | Neural Morphometry Impacting Sexual Risk Decision-Making in Young Adult Gemales: A Pilot Study | *Dr. Lawrence Sweet* |
| | **Jessica Liebich** | The Interaction Between Environmental Exposures and Infectious Disease | *Dr. José F. Cordero* |
| | **Bennett Rissier, Rushan Momin, Arohi Patel, Mehar Anand** | Examining the Role of Gestational Hypertension and Eclampsia on Preterm Birth in Georgia | *Dr. José F. Cordero* |
| | **Sunny Abdelmageed** | Psychosis and Repeated Exposure to Emotional Stimuli: Findings from the Bipolar-Schizophrenia Network for Intermediate Phenotypes (B-SNIP 2) | *Dr. Brett Clementz* |
| Room D | **Skyler Magnus Kerr** | Evaluation of Larval Medium in the Controlled Current Toxicity Test | *Dr. Marianne Shockley* |
| | **Yamini Chavan, Lauren Thompson** | The Role of Transcription Factor Ftz-F1 in Planarian Regeneration | *Dr. Rachel Roberts-Galbraith* |
| | **Kelly Tims** | Effect of RNAi Control on *Diachasmimorpha longicaudata* Entomopoxvirus in Parasitoid Wasps | *Dr. Gaelen Burke* |
| | **Steven Carroll** | Effect of Topoisomerase Inhibitors on Growth of a Mitochondrial DNA Network in a Trypanosome | *Dr. Kojo Mensa-Wilmot* |
| Room G | **Roland Francis Seim** | Saharan Dust Alters the Microbial Community Structure of Near Surface Marine Aerosols Following Trans-Atlantic Transport | *Dr. Erin K. Lipp* |
| | **Patrick Trent** | Petrographic Analysis of Altered Units in the Bishop Tuff, Bishop, CA | *Dr. Christian Klimczak* |

## Oral Session 7

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

*Athena Breakout Rooms*

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| | **Kate Ganas** | The Search for the Nuestra Señora de la Consolación: A Look at the Fate of the Smaller Vessels of the 1622 Tierra Firme Shipwrecks | *Dr. Scott Noakes* |
| | **Jared Conner** | Removal of Nutrients from Agricultural Wastewater by Modified Biochar | *Dr. Valentine A. Nzengung* |
| Room H | **Aliya Othman** | Dual-Task Performance in Children with and Without Cerebral Palsy | *Dr. Christopher Modlesky* |
| | **Maria Colon** | The Effects of the Dual Oxidase (DUOX1) Microbial System on Influenza A | *Dr. Balazs Rada* |
| | **Madelyn Hansen** | Maternal Intake of Lutein and Omega 3 Fatty Acids on Cognitive Development in an Infant Piglet Model | *Dr. Hea Jin Park* |
| | **Hadi Zaki** | Investigating Cognitive Impairments with Inhibition and Impulsivity | *Dr. Jennifer McDowell* |
| Room A | **Emmett Thomas Allen, Luke Armao** | An Analysis of the Effects of the HOPE and Zell Miller Scholarships on County Inequality in Georgia | *Dr. David B. Mustard* |
| | **Evan Barnard** | The MEDEA Legacy: Can Darkened Data Shed Light on a Changing Planet? | *Dr. Loch Johnson* |
| | **Noble Jacob** | Weaponizing Dynamic Decision-Making Models: The Principle of a Trusted Autonomous Governor | *Dr. Christian Turner* |
| | **Brett Daniel Morrison** | State Influence in Presidential Primaries | *Dr. James E. Monogan III* |
| Room B | **Garrett Winston Cooper** | Catch Me If You Can: Identifying Fast-Evolving Genes in the Genus *Cryptosporidium* | *Dr. Jessie C. Kissinger* |
| | **Matthew McMillin** | The Effects of DHA on Blood Plasma Triglyceride and Cholesterol Concentrations in Piglets | *Dr. Hea Jin Park* |
| | **Emma Hope** | Role of Hedgehog Signaling on Splitting of the Eye Field and Gene Expression | *Dr. Jonathan Eggenschwiler* |
| | **Mira Bookman, Anya Cieszewski** | Effect of a High-Fat Diet on Gut Morphology | *Dr. Krzysztof Czaja* |

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| Room C | **Jeri Sasser** | A Longitudinal Investigation of Protective Factors for Bereaved Maltreated Youth | *Dr. Assaf Oshri* |
| | **Savannah Farr, Jessica Liebich, Jaymie Bromfield, Anna Juliao, Slisha Shrestha, Elexis Price** | A Systematic Review on the Effect of Mobile Device Prenatal Care Reminders on Prenatal Care Utilization | *Dr. José F. Cordero* |
| | **Alma Angelina Lepiz Madrigal, Brenda Gavidia** | Resilience Among Youth Within Mixed-Legal Status Families | *Dr. J. Maria Bermudez* |
| | **Scott Eisenberg** | The Effect of Socioeconomic Status on White Matter Structure in Individuals with Psychosis | *Dr. Jennifer McDowell* |
| Room D | **Isabelle Olivia Riddle** | Thymic Epithelial Cell Reprogramming and Co-Culture with T-Cell Progenitors | *Dr. Nancy Manley* |
| | **Rebecca Maitski** | PAD4 and Citrullinated Histone Markers in NET Formation | *Dr. Balazs Rada* |
| | **HaeYeun Byun** | Cellular Effects of Chemotherapeutic Agent Doxorubicin on the Corpus Luteum | *Dr. Xiaoqin Ye* |
| | **Lui Suzuki-Williams** | The Characterization of Antibody Binding to the Swine 2015 North Carolina Influenza Virus (H1N2) | *Dr. Ted M. Ross* |
| Room G | **Christian Michael Sullivan** | The Rituals of Great Peace: Popular Religious Practices' Influence on Taiping Christianity | *Dr. Ari Levine* |
| | **Tom Lennon Russell** | Crime and Punishment in the Papal States | *Dr. Steven Soper* |
| | **Dylan Jeffrey Bridges** | Anthropological Impact of Spirituality in Religion | *Dr. David S. Williams* |
| | **Chelsea Blayne Batchelder** | Difference in Diet Norms Between Christian and Pagan Poland | *Dr. Laurie Reitsema* |
| Room H | **Austin Stack** | Undergraduate Biology Student Ideas About Biochemical Pathway Dynamics | *Dr. Paula Lemons* |
| | **Lauryn Waters** | Autonomy in Collaboration: The Role of Task Cards on the Success of Collaborative Interaction | *Dr. Paula J. Mellom* |
| | **Alyssa Powell** | Goal Orientation and Individual Characteristics | *Dr. Kevan Lamm* |
| | **Jenny Park** | The Correlation Between College GPA and Eye Tracking Task Performance | *Dr. Jennifer McDowell* |

## Oral Session 8

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

*Athena Breakout Rooms*

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| Room A | **Rara Reines** | Gender and China-Africa Relations: How Female Migrants Navigate Changing Gender Norms Within Chinese and African Societies | *Dr. David O. Okech* |
| | **Stephanie A. Stewart** | Implications for Cultural Similarities and Female-Inclusive Peace Processes | *Dr. Andy Owsiak* |
| | **Jessica Bailey Thompson** | The Methodological Issues Associated with Studying Gender in a Society Focused on Gender as a Salient Identity | *Dr. Jody Clay-Warner* |
| | **Lydia Michael DelRossi** | The Threshold of Happiness: Role of Gender Identity as a Moderator Between Income, Career Satisfaction and Marital Satisfaction | *Dr. Kristen Shockley* |
| Room B | **Rachel Nicole Carlyle** | The Role of the Nervous System in Bone Homeostasis and Creating an Atlas of Mouse Bone Innervation | *Dr. Luke Mortensen* |
| | **Sergio Alcantar** | The Effects of BPA on Embryonic Development of Birds | *Dr. Kristen Navara* |
| | **Micayla Marie Kane** | Preliminary Evaluation of Equine Forelimb Kinematic Response to Commonly Used Head and Neck Positions | *Dr. Kylee Duberstein* |
| | **Grace Boothby** | The Impact of Genetic Selection on Skeletal Health and Development in Broilers | *Dr. Laura Ellestad* |
| Room C | **Richard Hull** | The Lampyrids of Cherokee County, GA | *Dr. Kathrin F. Stanger-Hall* |
| | **Cody Prouty** | Does Exposure to Low Doses of Neonicotinoids Reduce Monarch Butterfly Flight Performance? | *Dr. Sonia Altizer* |
| | **Juan Angulo** | A Genetic Analysis of Functional Redundancy of the MAP Kinase Kinase (MKK) Gene Family in Arabidopsis | *Dr. Wolfgang Lukowitz* |
| | **Catlyn Victoria Chapman** | Growth Rates of Juvenile Atlantic Sturgeon in the Altamaha River, Georgia | *Dr. Adam Fox* |
| Room D | **Lily Rubin** | Determining Key Immune Components in the Clearance of *Bordetella* spp. | *Dr. Eric T. Harvill* |
| | **Christian Nam** | Antimicrobial Resistance Prediction Using Plasmid and Total Bacterial DNA Sequencing by Oxford Nanopore MinION | *Dr. Susan Sanchez* |
| | **Estie Toth** | Antimicrobial Effects of Hypothiocyanite Against *Streptococcus pneumoniae* | *Dr. Balazs Rada* |
| | **Isabel M. Ott** | *Bunyamwera Orthobunyaviruses* of the Americas: A Comprehensive Review | *Dr. Daniel Mead* |

# Tuesday, April 9, 2019

## Oral Session 9

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

*Athena Breakout Rooms*

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| Room G | **Catriona Geddes** | An Examination of Gender Differences in Occupational Physical Activity | *Dr. Jennifer L. Gay* |
| | **Arohi Patel, Mehar Anand, Bennett Rissier, Rushan Momin** | Examining the Role of Gestational Hypertension and Eclampsia on the Birth Weight of Babies Born in Georgia | *Dr. José F. Cordero* |
| | **Kristin Nzerue** | Crisis Pregnancy Centers In Alabama | *Dr. Andrea Swartzendruber* |
| | **Taylor Walker** | The Relationship Between Substance Use and Depression Among College Students | *Dr. Thomas L. McNulty* |
| Room H | **Amelia Grace Reid** | Synthesis and Properties of an $H_2$ Evolving Hydrogenase Mimic | *Dr. Todd Christopher Harrop* |
| | **Nikita Vantsev** | Adapting a CRISPR-Cas System into a Novel Gene Expression Knockdown Platform | *Dr. Michael Terns* |
| | **Duncan Lindsey** | Developing a Genetic Transformation Protocol for the *Mimulus guttatus* Species Complex | *Dr. Andrea Sweigart* |
| | **Jada Summerville** | Characterizing Planarian Laminin G Domain-Containing Proteins and Their Role(s) in Planarian Regeneration | *Dr. Rachel Roberts-Galbraith* |
| Room A | **Abraham Johnson** | Fostering Explosion: Decentralizing Paths to New Play Development | *Prof. George Contini* |
| | **Camilla Barrow** | The Effect of Motown Record's Image Making in the 1960s | *Dr. Monica Sklar* |
| | **Sharon Lillie Autry, Caroline Helfgott** | Exploring Punk Symbols, Cycles, and Lifestyle Learning Through Clothing Merchandising | *Dr. Monica Sklar* |
| | **Madison Caroline Werner** | Women's Rights Activism in the Indonesian Music Industry | *Dr. J. Peter Brosius* |
| Room B | **Kevin Charles Williams III** | The Effect of Gut Microbiota on Appetitive Motivation via the Mesolimbic Dopamine System | *Dr. Claire de La Serre* |
| | **Julie Dean** | Is the Rise in Gluten Intolerance Due to the Variety of Wheat Consumed or Modern Chemical Processing? | *Dr. Alex Kojo Anderson* |
| | **Anne Whatley** | To Eat or Not to Eat: Athens Community's Willingness to Try Edible Insects Based on Prior Knowledge, Preferences, and Biases. | *Dr. Marianne Shockley* |
| | **Juliann Hoda Marmal** | Grow It Know It: Mapping the Critical Network of Sustainable Farm to School Programs | *Dr. Jennifer Jo Thompson* |

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| Room C | **Richard Hull** | The Vascular Flora of Cherokee County, Georgia | *Dr. Wendy B. Zomlefer* |
| | **Isabel Evelyn** | One Fish, Two Fish, Low Stream... Full Fish? An Exploration of the Effects of Drought on Stream Darters and Their Prey | *Dr. Amy D. Rosemond* |
| | **Natalie Perkins** | Aquaponics: A Survey of Georgia County Extension Agents | *Dr. Kris M. Irwin* |
| | **Jessica Wilson** | Copepod Survival in Water Dishes Exposed to Average Ambient Temperatures of Chad, Africa | *Dr. Michael Yabsley* |
| Room D | **Clint Granros** | Psychological Response to Environmental Design Factors Experienced in Virtual Landscapes | *Prof. Brian Orland* |
| | **Anton Eduard Franzluebbers** | Remote Robotic Arm Teleoperation Through Virtual Reality | *Dr. Kyle Johnsen* |
| | **Matthew Jacob Warren** | Development of Weigh-In-Motion Algorithms and Procedures | *Dr. Mi Geum Chorzepa* |
| | **Cameron Shadmehry** | Building Smartphone/Tablet-Based Engineering, Science, Math, Art, and Technology Modules | *Dr. Yiping Zhao* |
| Room G | **Aman Luthra** | Improving the Overall Efficiency of Electric Vehicles By Harvesting Drag Energy | *Dr. Tom Lawrence* |
| | **Sam William Hartness** | Chemical Kinetics Modeling of Biofuel Combustion | *Dr. Brandon Rotavera* |
| | **David Allen** | The Global Nuclear Energy Cycle: Production and Trade | *Dr. David Gattie* |
| | **Galilea Najera Garcia** | Alternatives for Atlanta Municipal Peak Water Demands | *Dr. Bill Tollner* |
| Room H | **Rachel Anne Fricker** | Superoxide Production of Human Neutrophils in Response to Cystic Fibrosis Clinical Isolates of *Staphylococcus aureus* | *Dr. Balazs Rada* |
| | **Sachi Shastri** | Development of a Digital PCR Method for Highly Precise Determination of *var2csa* Gene Copy Number in *Plasmodium falciparum* | *Dr. David Peterson* |
| | **Stephanie Agudelo** | Characterization of Ferredoxin (HP0277) in *Helicobacter pylori* | *Dr. Stéphane Benoit* |
| | **Tiffany Yee** | Developing Proximity-Based Biotin Ligation Methods for Protein Interaction Studies in *Neurospora crassa* | *Dr. Zachary A. Lewis* |

# Abstracts

**Psychosis and Repeated Exposure to Emotional Stimuli: Findings from the Bipolar-Schizophrenia Network for Intermediate Phenotypes (B-SNIP 2)**
Sunny Abdelmageed, CURO Research Assistant
*Dr. Brett Clementz, Psychology, Franklin College of Arts and Sciences*

The International Affective Picture System (IAPS) is used to study emotional response and attention, and contains pleasant, unpleasant, and neutral stimuli. Previous research shows there is an effect of repeated exposure on the neural response to emotional stimuli at these components; however, the effect of psychosis on this response has not been studied. In this study, we examine the effect of psychosis on repeated exposure to stimuli in the IAPS paradigm. We expect that people with psychosis will not exhibit the same effect of repeated scene exposure as healthy controls. This study uses electroencephalography (EEG) to monitor participants' neural response to stimuli during the IAPS task. Participants view 60 pictures in the chosen IAPS set three times. Neural response to neutral and emotional images at the Late Positive Potential (LPP) and Early Posterior Negativity (EPN) were compared between presentations and between groups. We expect the LPP and EPN to decrease in amplitude over consecutive presentations, and that these responses will be different among psychoses groups. Findings can provide insight into how psychosis impacts emotional processing and attention.

**Health Outcomes and Electoral Data in Central America**
Ayah Abdelwahab, CURO Honors Scholar
Kate Foral
*Dr. Micah Gell-Redman, International Affairs, School of Public and International Affairs*

The countries of Guatemala, Nicaragua, Honduras, and El Salvador have been engulfed in civil unrest, with violence and displacement marring the transition towards a stable, competitive democracy over the past decade. This transition has brought to light questions over whether these countries, and more broadly the region of Central America, have political systems able to withstand current tensions. By examining the association between political competition, health outcomes, and electoral data in these countries, we hope to better understand this aspect of the region's political development. Our results will aim to provide a better understanding of democratic theory, which asserts that competition leads to improvements in social welfare.

**Human Rights in Tamil Nadu: Analyzing the Presence and Reporting of Physical Integrity Rights Abuses**
Mennah Abdelwahab, CURO Honors Scholar
*Dr. K.C. Clay, International Affairs, School of Public and International Affairs*

What explains the variation in international reporting on human rights abuses at the sub-national level? The abuse of physical integrity rights, or human rights that protect people from physical harm, have traditionally been studied at the national level. A focus on only this level, however, fails to recognize the disparities in abuse across various regions or the influence of sub-national actors on those disparities. The Sub-National Analysis of Repression Project (SNARP) offers data on reports of physical integrity rights abuses at the sub-national level between 1999 and 2016. An analysis of these data shows that the Indian state of Tamil Nadu experienced a limited amount of repression in 1999, none in 2004, and a great deal of repression in 2010. Is this variation due to changes in reporting or changes in the actual level of human rights abuse? Combining an analysis of SNARP data with evaluations from sources both internal and external to SNARP's data collection process, my findings provide insight into patterns of repression in India as well as changes in human rights reporting.

**Transcriptional Analysis of Alternative Sigma Factors in *Pseudomonas aeruginosa***
Fathma Abdulkhader, CURO Research Assistant
*Dr. Cory Momany, Pharmaceutical and Biomedical Sciences, College of Pharmacy*

The pathogenic bacterium, *Pseudomonas aeruginosa*, is known to cause deadly infections in patients who have compromised immune systems. The high ability of the bacterium to withstand and adjust to harsh environmental conditions has been attributed to its complex network of transcriptional regulators. Among these transcriptional regulators are alternative sigma factors that contribute to the functionality and specificity of the RNA polymerase complex during gene transcription. Many of the sigma factors in *P. aeruginosa* regulate the expression of virulence and virulence-associated genes. The focus of this project is to analyze the regulation of transcription by the alternate sigma factors in *P. aeruginosa* and to obtain an understanding of how these proteins can be targeted for antibiotic drug discovery. This study aimed to test and confirm the transcriptional activities of sigma factors with genes they are predicted to regulate and test the regulatory effects of these sigma factors on the expression of CysB, a global transcriptional regulator in *P. aeruginosa* . The sigma factors were purified and the DNA templates for transcription were PCR amplified. Transcription assays were done with purified *P. aeruginosa* RNA polymerase complex assembled with the respective sigma factors. The results suggest that potential CysB ligands have inhibitory action on transcription of potential CysB-regulated genes. Future studies will investigate the role of different sigma factors on CysB regulation and the regulation of virulence in *P. aeruginosa*. Ultimately, findings from the study will make significant contributions to efforts to develop more effective antibacterial drugs against *P. aeruginosa*.

**A Comparative Analysis of the Top Human Trafficking Cities in the United States**
Elina Acosta, CURO Research Assistant
*Dr. Alexander Kaufman, Political Science, School of Public and International Affairs*

Human trafficking is the world's modern-day slavery, most times hidden in plain sight. According to the US State Department, an annual estimate of 600,000 to 800,000 people are globally trafficked and the United States is not immune to its reaches. I will be focusing on areas in the US with high volumes of this crime in order to understand what makes these states so vulnerable. Legislative action is necessary for

combating and preventing human trafficking in the US, thus I will be conducting a policy analysis of current anti-trafficking legislation in these cities to determine whether they are providing effective guidelines for prosecuting traffickers, investing in the training of law enforcement and providing proper protections and rehabilitation methods for victims. I will also be researching the states that manage this crime well, in order to offer a comparative light in what works, what does not and what characteristics contribute to the growth of this crime. I intend to find that geography and location will have tremendous effects on the volume of this crime, as well as finding a positive increase in preventive laws against human trafficking. However, I also suspect to encounter gaps in policy and state action that may create unintended consequences, thus the final intention of this research is to propose a federal, nationwide plan that addresses the issues found. This crime exploits vulnerabilities for commercial gain and violates victim's rights, thus legislative effectiveness and uniform cooperation is necessary for combating this heinous crime.

**A 17-Year Overview of the Opioid Epidemic in Georgia**
Leslie Adams
Laura Rush
*Dr. Ming Zhang, Epidemiology and Biostatistics, College of Public Health*

The opioid epidemic, which is currently ongoing in the United States, has affected many lives. This reality along with the most recent calls for further investigation into the opioid epidemic has led to an increased effort to learn how the propagation of the epidemic can be stopped. In this presented research, we assessed the magnitude of effect that the opioid epidemic has had on the state of Georgia. We performed a retrospective cohort study of opioid overdoses with data collected between the years 1999 to 2015 in Georgia. We determined demographic characteristics through stratified analyses. We also incorporated population health data with community data to further define underlying factors which may contribute to opioid overdose deaths. We observed a drastic increase in the number of adult opioid related fatalities, from 122 in 1999 to 908 in 2015, a 644% increase between the two years. Additionally, we found that the male group has experienced a higher number of opioid related fatalities along with individuals living in nonrural areas. We also investigated how past legislative policy decisions regarding the manner in which opioids were prescribed contributed to a certain degree the previously mentioned rise in opioid overdose deaths. Our study presented for the first time an overview of opioid epidemic in Georgia within the last 17 years, which would lend a reference for future epidemic surveillance and specific policy decisions pertaining to the opioid epidemic in the state.

**Characterization of Ferredoxin (HP0277) in *Helicobacter pylori***
Stephanie Agudelo, CURO Research Assistant
*Dr. Stéphane Benoit, Microbiology, Franklin College of Arts and Sciences*

Iron-sulfur (Fe-S) clusters are ubiquitous in all domains of life and constitute essential protein cofactors. Three bacterial systems have been shown to incorporate Fe-S clusters in proteins: ISC, SUF and NIF; the latter is found in nitrogen-fixing bacteria. Surprisingly, the gastric pathogen *Helicobacter pylori* relies exclusively on an incomplete NIF system, even though it does not fix nitrogen. Previous studies in our lab have identified the following NIF components in *H. pylori*: HP0220 or NifS (cysteine desulfurase); HP0221 or NifU (main Fe-S scaffold protein); HP0207 or ApbC (Fe-S carrier protein); and HP1492 or Nfu (also a Fe-S carrier protein). Another protein, HP0277 is a putative ferredoxin that could play a role in Fe-S transfer. We used a bacterial adenylate cyclase two-hybrid (BACTH) system to identify protein-protein interactions between HP0277 and each of the 39 other (Fe-S)-containing proteins in *H. pylori*. Our results reveal new, previously unidentified interactions that suggest HP0277 plays an important role in Fe-S maturation in *H. pylori*. Identification of these interactions is crucial for understanding *H. pylori*'s partial NIF system and the specific mechanisms by which these proteins interact. Furthermore, attempting to construct a viable Δhp0277 mutant in future experiments could allow for better characterization of this protein.

**Investigating the Effects of Daytime and Nighttime Warming on an Insect-Microbe Mutualism**
Chris Akin, CURO Research Assistant
*Dr. Kerry Oliver, Entomology, College of Agricultural and Environmental Sciences*

Insects form symbiotic associations with microbes that mediate important biological interactions. The rise in global temperatures threatens these associations critical for species survival and ecosystem health. The pea aphid, *Acyrthosiphon pisum*, is a model for studying defensive symbiosis with multiple bacterial symbionts providing protection against biotic and abiotic threats. The heritable facultative symbiont, *Hamiltonella defensa*, along with its bacteriophage APSE, protects *A. pisum* against the parasitoid, *Aphidius ervi*. Previous studies show that *H. defensa*-based protection fails at higher temperatures. However, these studies used increases in daytime temperatures, despite evidence that average nighttime temperatures are increasing faster than daytime temperatures. Nighttime warming potentially aids insect symbioses by maintaining optimal temperature ranges for longer periods than daytime warming, while also avoiding temperature extremes. To assess the impact of daytime vs. nighttime warming on this protective mutualism, aphids infected either with a highly protective *H. defensa* strain (APSE-3), moderately protective strain (APSE-8 or APSE-2), or no symbiont infection are exposed to one of four warming scenarios (no warming, even warming, daytime warming, nighttime warming). Parasitism rates of *A. ervi* will be measured to compare how symbiotic protective capabilities are affected. Aphid development time and cumulative fecundity in the absence of parasitism will also be measured to evaluate aphid fitness under varying warming scenarios. It is hypothesized that daytime warming will be more detrimental to aphid fitness and the defensive symbiosis compared to nighttime warming. This study will provide insight into whether nighttime warming impacts insect-microbial mutualisms differently from daytime warming.

# Abstracts

**The Persecution of the Yazidis: An International Law Disaster**
Monique Sholeh Alavi, CURO Research Assistant
*Dr. Leah Carmichael, International Affairs, School of Public and International Affairs*

The purpose of this study was to examine the international law violations committed against the Yazidis and to determine what international sources of law should be utilized in a prosecution of Daesh. This study was conducted due to the lack of studies on the Yazidis. The methodology of this study included the employment of qualitative, secondary data. Additionally, a systematic review of literature was utilized. The research question guiding this paper is the following: What were the factors driving Daesh, and how can Daesh be properly prosecuted? For this study, the origin and rise of Daesh was investigated. The background of the Yazidis was explored. The United Nation's role and response to this crisis was evaluated. The international sources of law that apply to this case were determined. Furthermore, the movement pioneered by Amal Clooney and Nadia Murad to establish a special tribunal to prosecute Daesh was addressed in this paper.

**Analysis of Magnetic Resonance Imaging and Spatiotemporal Gait Parameters in Response to Tanshinone-IIA Loaded Nanoparticle Treatment in a Pig Model of Ischemic Stroke**
Nanda Alcalde, CURO Research Assistant
*Dr. Franklin Delano West, Animal and Dairy Science, College of Agricultural and Environmental Sciences*

Stroke is a leading cause of death and long-term disability in the United States. Currently, tissue plasminogen activator (tPA) is the only drug approved by the Food and Drug Administration to treat ischemic stroke. Patients have a limited time window to receive tPA and often remain disabled after treatment. Recent studies suggest that Tanshinone-IIA possesses anti-inflammatory properties and when loaded into nanoparticles can be delivered slowly over time. The objective of this study was to determine if Tanshinone-IIA loaded-nanoparticles (Tan-NPs) can mitigate acute inflammatory responses in a pig ischemic stroke model. Castrated, male pigs underwent middle cerebral artery occlusion surgery to induce stroke and received an intracisternal injection of Tan-NPs (n=2) or PBS (n=2) 1 hour post-stroke. White matter integrity and water molecule diffusivity was assessed 24 hours post-stroke by diffusion tensor images (DTI) and diffusion weighted imaging (DWI), respectively. In addition, the spatiotemporal gait parameters velocity, cadence, stride length, swing percent of cycle, cycle time, swing time, and mean pressure were assessed pre- and 2 days post-stroke. Tan-NP treatment is expected to reduce inflammation and oxidative stress, thereby making the environment less cytotoxic post-stroke resulting in preserved white matter integrity and increased diffusivity and a greater recovery in gait compared to PBS control pigs. If Tan-NPs are found to mitigate inflammatory responses post-stroke this may lead to both structural and functional improvements. In future studies, administration of Tan-NPs with a cell therapy such as neural stem cells may lead to better survival and long-term integration and ultimately, increased recovery.

**The Effects of BPA on Embryonic Development of Birds**
Sergio Alcantar, CURO Research Assistant
*Dr. Kristen Navara, Poultry Science, College of Agricultural and Environmental Sciences*

The influences of BPA on development in mammals has been an increasing focus of research lately due to the increase in use and production of plastics by humans. BPA is a common contaminant found in water and the environment that has been linked to disruption in the endocrine system in developing organisms. Although the influences of BPA have been studied particularly on mammals, more work needs to be conducted on development of wildlife, particularly birds which have received little to no attention. We can use the egg laying chicken as a model organism to predict what wild birds may experience when their developing offspring are exposed to BPA. We hypothesized that BPA will have effects on the growth and gonadal development of developing embryos. To test this, we injected BPA into live chicken eggs and studied the influences at different stages of development on embryonic growth and gonad size. We then tested the influences of BPA exposure on embryonic adrenal activity by quantifying corticosterone levels in embryos. This work will shed light on whether exposure of bird embryos to BPA in egg yolk may influence their overall development and survival.

**The Global Nuclear Energy Cycle: Production and Trade**
David Allen, CURO Research Assistant
*Dr. David Gattie, Environmental, Civil, Agricultural, and Mechanical Engineering, College of Engineering*

At present, the United States is building its first nuclear power reactors in 30 years, Russia leads the world in nuclear technology exports, and China has roughly 15 nuclear reactors under construction, with more planned and proposed. At the same time, other countries around the world, both developed and developing economies, are deciding to build nuclear reactors for various reasons. Currently, detailed information on the status of international nuclear energy is not accessible from a single source, but rather spread over numerous governmental departments, international agencies, and corporations. This lack of centrality creates difficulty in collecting and distilling data needed for an informed understanding of some of the complex issues permeating nuclear energy. The goal of this research is to compile nuclear energy production, exports/imports, and research status of nations globally. By working with experts from both the College of Engineering and UGA's Center for International Trade and Security (CITS), we will create a base of foundational information on domestic nuclear investments and international ties of various nations. This central database will allow significant time savings for research and increase the visibility of nuclear energy connections between nations. By tracking this information, future researchers will have a reference to see how nations are expanding their nuclear footprint, illuminating important information such as the spread of technology, nuclear proliferation, and international nuclear policy.

**An Analysis of the Effects of the HOPE and Zell Miller Scholarships on County Inequality in Georgia**

Emmett Thomas Allen, CURO Research Assistant
Luke Joseph Armao
*Dr. David B. Mustard, Economics, Terry College of Business*

This study quantifies the degree to which the HOPE and Zell Miller Scholarship programs increase inequality within Georgia by analyzing data from the US Census Bureau and Georgia Lottery Corporation. By establishing a correlation between lottery spending per capita by county and mean/median income by county, we can determine whether or not lower-income counties pay more into the lottery system. Our hypothesis is that there is a negative correlation between the average income of a county and per capita county lottery spending. We will also establish a correlation between the number of HOPE/Zell Scholarship recipients per capita of people age 15-24, as well as the net HOPE/Zell Scholarship money received by county per capita of people age 15-24, and the mean/median income of each county. Our goal in establishing this correlation is to see whether lower-income counties benefit less from the HOPE and Zell Miller Scholarships than higher-income counties. Our hypothesis is that we will see a negative correlation between the benefits a county receives from HOPE/Zell Scholarship and the mean/median income of that county. If lower-income counties pay more into these scholarships through lottery revenue and reap fewer benefits from the scholarships, then we can conclude that the HOPE/Zell Scholarship and its lottery funding increase county inequality in Georgia. Additionally, we will compare these data from 2010-2017 to see how these correlations and the resulting effect on inequality have changed over time.

**Responsive Support: A Critical Review of the Literature and Application to Mentoring**

Erika Allen, CURO Research Assistant
Mitchell Peters
*Dr. Lillian T. Eby, Psychology, Franklin College of Arts and Sciences*

Mentoring relationships in the workplace are related to positive attitudinal, behavioral, and career-related outcomes for mentors and proteges. A key feature of effective mentoring relationships is the social support that mentors provide to proteges. However, existing mentoring research has focused on the types of mentoring support provided rather than on how mentoring support is provided. This is an important omission because interdisciplinary perspectives suggest that the benefits of social support are more likely to be realized when it is provided in a way that is responsive to the needs to the recipient. However, because responsive support has been defined and measured in a wide variety of ways, the meaning of this construct is unclear. Consensus regarding responsive support is needed in order to determine whether and how it can be applied to mentoring relationships. Following published guidelines for creating better concept definitions, we conducted a review of the interdisciplinary literature on responsive support. Based on this review, we present findings regarding how responsive support has been conceptualized and operationalized. We then present a unified definition of responsive support, and provide guidance to researchers interested in studying this construct. We conclude by demonstrating the potential applicability of responsive support to understanding effective workplace mentoring relationships. This work creates an interdisciplinary perspective on mentoring support at work and identifies new areas of research on the benefits of workplace mentoring.

**The Effects of DNMT1 Knockdown in Large Milkweed Bug (*Oncopeltus fasciatus*) Nymphs**

Ashley Uchenna Amukamara, Foundation Fellow
*Dr. Trish Moore, Entomology, College of Agricultural and Environmental Sciences*

The complex operation of epigenetics has led to a burgeoning interest in the subject. DNA methylation is an intensively studied form of epigenetic regulation, but historically is not as studied in insects. Research on DNA methylation has shown variable results between species, and the majority of these studies are observational or correlational. Thus, I sought to establish causation between DNA methylation and phenotypic expression, specifically in the species *Oncopeltus fasciatus* (the large milkweed bug). Using RNA interference, I knocked down DNA methyltransferase 1 (*DNMT1*) in *O. fasciatus* nymphs to assess the importance of DNA methylation in developing insects. I predicted nymphs injected with double-stranded *DNMT1* (ds-*DNMT1*) would experience high mortality compared to control nymphs. While preliminary data showed similar rates of survival, resulting ds-*DNMT1* females produced no eggs. Given these observations, I began focusing on how *DNMT1* knockdown in nymphs later affects their fertility and fecundity. If DNA methylation is necessary for gamete development, I predicted ds-*DNMT1* female nymphs would be unable to produce and lay eggs. Additionally, *DNMT1* male nymphs would be unable to produce sperm; thus, their female mates would lay eggs, but these eggs would fail to develop. Knockdown of *DNMT1* in female nymphs prevented egg production in adulthood but did not significantly reduced fertility in males. While the role of DNA methylation in insects still remains enigmatic, the results of this study are hopefully a useful addition to existing literature and lead to greater understanding of the purpose of DNA methylation in invertebrates.

**The Effect of Tanshinone-IIa-Loaded Nanoparticles on Tissue-Level Recovery in a Pig Ischemic Stroke Model**

Wahenoor Anand, CURO Research Assistant
*Dr. Franklin Delano West, Animal and Dairy Science, College of Agricultural and Environmental Sciences*

Although stroke is the leading cause of long-term disability and 2nd leading cause of death worldwide there is no restorative, long-term treatment available. A possibility for future treatment involves the use of Tanshinone-IIa loaded nanoparticles (Tan-IIa NP), which could contribute as a regenerative therapy for affected cells. Most treatments are focused on reducing damage caused by the initial ischemic event by eliminating blood clots via tissue plasminogen activator (tPA) or thrombectomies. In comparison, Tan-IIa is a steroid that has been shown to mitigate the cytotoxicity of the ischemic event by limiting the activation of microglia and suppressing the production

of pro-inflammatory cytokines in rodent stroke studies. To further test Tan-IIa NPs efficacy in a large animal stroke model, a permanent middle cerebral artery occlusion (MCAO) was performed to induce ischemic stroke in 22 sexually mature, castrated male Landrace pigs. 1 hour post-MCAO, 15 mL of Tan-IIa NP treatment was administered intercisternally. Standard multiplanar magnetic resonance imaging (MRI) T2 Weighted (T2W) sequences were acquired to assess hemispheric and lesion volumes post-Tan-IIa NP administration. Decreased ipsilateral hemispheric swelling and lesion volume are expected as a result of Tan-IIa NP administration 1 day post-MCAO. Results may suggest the ideal effects of NP treatment prevent acute tissue damage by protecting cells from ischemic injury. For patients specifically, Tan-IIa NPs may have the potential to restore and repair neural processes and cognitive pathways that were damaged through the effects of stroke.

**Ultrasound Analysis of Effects of Excess Adipose Tissue on Muscle Acceleration**

Karen Andrawes, CURO Research Assistant
*Dr. Kevin McCully, Kinesiology, College of Education*

Our laboratory has developed a muscle specific endurance test that uses electrical stimulation and an accelerometer placed over the muscle of interest. In the spring of 2018, we evaluated the role of subcutaneous fat this muscle endurance test. While our study showed externally placed 'fat' did not influence the endurance test, we need a more direct way of evaluating the potential impact of subcutaneous fat. The purpose of my study is to directly evaluate muscle endurance using ultrasound videos of skeletal muscle. I will test the hypothesis that directly measured muscle endurance with ultrasound will correlate with surface measurements of endurance with accelerometry. I have stimulated and measured five people with increasingly large (~2cm) and small (<1cm) levels of adipose tissue. The ultrasound images will be analyzed using autocorrelation to measure the speed of movement of the muscle (movement declining with fatigue). Through the comparison of the data sets provided by each machine, I will determine the correlation between the data sets provided by each device. Future studies may find that measuring muscle endurance using autocorrelation of ultrasound images to be a more accurate way of studying fatigue in people with large amounts of subcutaneous fat.

**Assessment of Neuroendocrine Stress Response in Prenatally Conditioned Rats Following a Severe Traumatic Brain Injury**

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

Bisphenol-A (BPA) and bis(2-ethylhexyl) phthalate (DEHP) are endocrine disrupting chemicals (EDCs) that are present in everyday household plastics. These chemicals have been commonly used in household plastics since the 1940's and 93% of the population born post-1940 has been exposed to them from infancy. Mounting evidence indicates that BPA and DEHP disrupt endocrine function and prolonged exposure could result in significant increases in psychosocial stress due to altered hypothalamic-pituitary-adrenal (HPA) signaling. We hypothesized that EDC induced alterations in HPA signaling could contribute to heightened stress responses leading to adverse outcomes after severe traumatic brain injuries (sTBIs). In order to test this hypothesis, we will measure changes in stress hormones and brain tissue-specific biomarkers in rats prenatally conditioned with EDCs and subject to sTBIs. Prenatally conditioned 32-week old adult male and female rats were subject to controlled cortical impactor (CCI) induced injuries of the motor cortex and monitored for behavioral recovery using a battery of weekly behavioral assessments for four weeks post-sTBI. Animals were sacrificed at the end of four weeks and brain tissue extracted and prepared for terminal immunohistochemical assessments. Ongoing studies will evaluate stress hormone dysregulation and cortisol production in blood samples; and tissue-specific changes in neuronal cell death (absence of NeuN), neural stem cells, and glial cells. We expect to observe increased tissue damage, impaired endogenous repair mechanisms, and increased stress response in prenatally conditioned rats in comparison to controls following sTBI. If successful in these studies, our findings could facilitate the clinical translation of more informed measures of predicting stress-induced adverse sTBI outcomes in warfighters and civilians alike.

**A Genetic Analysis of Functional Redundancy of the MAP Kinase Kinase (MKK) Gene Family in *Arabidopsis***

Juan Angulo
*Dr. Wolfgang Lukowitz, Plant Biology, Franklin College of Arts and Sciences*

Mitogen-activated protein (MAP) signals are found in all eukaryotes, and have a variety of functions ranging from cell growth/development to cell differentiation in zygotes. Plant zygotes elongate into a small apical daughter cell, the progenitor of the embryo, and the larger basal daughter cell, the progenitor of the suspensor. MAP signaling is required for this elongation and unequal first division of the zygote. Previously, we have shown that loss of the two *Arabidopsis* MAP kinase kinase genes, MKK4 and MKK5, results in slightly shorter zygotes and moderate defects in suspensor formation. These effects are similar but less severe when compared to the loss of the MAP kinase genes MPK3 and MPK5, which essentially blocks zygote elongation and results in suspensor-less embryos. Are other MKK genes involved in this cascade? By systematically expressing the other eight MKK genes in the family under the control of the MKK4 promoter in a double mutant background we aim to observe partial or full rescue of the MKK4/MKK5 mutant phenotype; implying functional similarity between MKK4/MKK5 and the transgene.

**Using Digitized Herbarium Data to Analyze Species-Area Relationships Within Georgia Counties**

Juan Angulo
*Dr. Wendy B. Zomlefer, Plant Biology, Franklin College of Arts and Sciences*

Herbarium collections serve as centers for physical and digital documentation of collected plant specimens. It is important for the collection to have accurate representation of the plant

species in its state in order to provide researchers with high quality data to use. The University of Georgia's herbarium representational accuracy can be analyzed by using the species-area relationship as a model for comparing the documented vs. predicted species richness in Georgia's 159 counties. The species-area relationship describes the relation between the area or habitat, and the number of species found within it. As the area size increases, the species richness found in it will also increase. The species richness of each county in Georgia will be calculated by organizing the UGA herbarium's database into usable values. We will assume that the top ten percent of counties with the highest species richness will be the most accurate, and use these as our metric for constructing a predicted species richness in relation to area size for the state of Georgia. Values from this method will be used to analyze predicted/documented species richness against a number of variables such as geographic area (county size), physiographic regions, and number of herbarium specimens per county. This will be repeated with the herbarium databases of Valdosta State College and Georgia Southern University to yield insight on the accuracy of the representation that each herbarium has in its collection, and the optimal sampling effort needed to eliminate data gaps in herbarium collections.

**Optimization of Inhibitory Peptides Designed to Block the Progression of Inflammation-Induced Angiogenesis**

William Antoniades, CURO Research Assistant
*Dr. Neil J. Grimsey, Pharmaceutical and Biomedical Sciences, College of Pharmacy*

A key mediator of angiogenesis and inflammatory response in chronic lung disease is the mitogen-activated kinase (MAP), p38α. The typical activation pathway for p38α uses MAP kinase kinase 3 (MKK3), and MKK6 to phosphorylate and activate p38α. However, there is an atypical pathway to p38α activation that was discovered in a family of inflammatory G-protein coupled receptors (GPCRs). The atypical pathway involves transforming growth factor β activated kinase 1 binding protein-1 (TAB1) as opposed to MKK3/6. The binding of TAB1 to p38α induces the autophosphorylation of p38α which leads to increased angiogenesis and vascular remodeling. Recent studies have highlighted the use of cell-penetrating inhibitors that specifically block atypical p38 signaling, while the classical pathway of activation remains intact. Initially, the peptide inhibitor will be tagged with a red fluorescent protein to visualize and confirm expression of the peptide through microscopy. We will then assess the ability of the (mRFP) inhibitor to block GPCR induced p38 activation by immunoblotting and through the use of a live cell fluorescent biosensor. From there, the peptide sequence will be modified to target subcellular locations, including the nucleus, plasma membrane, cytoplasm, lipid rafts, and endosomes. Subcellular targeting of inhibitor peptides has been shown to significantly improve their specificity and efficacy. These studies will directly lead to new tools to assess the regulation of p38 activity when targeting inhibitor peptides to subcellular locations. This is significant because these tools can be used to enhance the efficacy of chronic lung disease treatments.

**The Significance of Bitcoin Through Neural Networks**

Austin Apt
*Dr. John A. Miller, Computer Science, Franklin College of Arts and Sciences*

Cryptocurrencies are a recent invention with many interesting properties. "Cryptos" such as Bitcoin are decentralized currencies which are regulated by little more than strong cryptography and a blockchain which acts as a distributed ledger among participants. While both the U.S. Dollar and Bitcoin have zero intrinsic value (they have value due to the collective consensuses of their marketplace actors), there is a much larger power behind the Dollar which acts to upkeep its value and thus, keep its price volatility controlled. This paper analyzes and explores the set of factors which work to affect the BTC/USD exchange price. Much more so than the Dollar, the price of Bitcoin depends on how public sentiment regards it. This can be expressed in one of two ways. The first would be to literally scan and parse text across sites such as Reddit, Twitter and wsj.com, and extract the overall emotion or sentiment of the article towards Bitcoin (or cryptos in general). The second interesting aspect of the data, which is often a reflection of movement in the first, are the overall volumes of long and short options for Bitcoin purchased through Bitfinex. Recurrent neural networks such as LSTM and/or NARX will be utilized in order to capture short and/or long term dependencies between Bitcoin price, long/short position volumes indicators and public sentiment. The results given will allow for greater significance to be extracted from price movements, and ideally the model will more accurately calculate near-term price predictions.

**The Effect of the HOPE Scholarship on Inequality in Georgia**

Luke Joseph Armao, Foundation Fellow
Emmett Thomas Allen

*Dr. David B. Mustard, Economics, Terry College of Business*

This study quantifies the degree to which the HOPE and Zell Miller Scholarship programs increase inequality within Georgia by analyzing data from the US Census Bureau and Georgia Lottery Corporation. By establishing a correlation between lottery spending per capita by county and mean/median income by county, we can determine whether or not lower-income counties pay more into the lottery system. Our hypothesis is that there is a negative correlation between the average income of a county and per capita county lottery spending. We will also establish a correlation between the number of HOPE/Zell Scholarship recipients per capita of people age 15-24, as well as the net HOPE/Zell Scholarship money received by county per capita of people age 15-24, and the mean/median income of each county. Our goal in establishing this correlation is to see whether lower-income counties benefit less from the HOPE and Zell Miller Scholarships than higher-income counties. Our hypothesis is that we will see a negative correlation between the benefits a county receives from HOPE/Zell Scholarship and the mean/median income of that county. If lower-income counties pay more into these scholarships through lottery revenue and reap fewer benefits from the scholarships, then we can conclude that the HOPE/Zell Scholarship and its lottery funding increase county inequality in

Georgia. Additionally, we will compare these data from 2010-2017 to see how these correlations and the resulting effect on inequality have changed over time.

**The Efficient Use of Serum as a Nutritional Source for Bacterial Respiratory Pathogens**

Taimoor Aslam, CURO Research Assistant
*Dr. Eric T. Harvill, Infectious Diseases, College of Veterinary Medicine*

Bacteria require complex nutritional supplements for growth yet grow rapidly after infecting a host. Among the first environments that bacteria are likely to encounter during an infection would be a nutritionally rich mucosa possibly including blood/serum and its components, induced by inflammation. Here we investigated the contributions of Fetal Bovine Serum (FBS) to the *in vitro* growth of *Bordetella* spp, which are known to grow efficiently within the first few days of infecting a host. In order to do this, we grew *Bordetella bronchiseptica* and *Bordetella pertussis* in either eukaryotic cell growth media or bacterial growth media with or without serum and monitored the growth of *Bordetella* in each media over time. Our results showed that FBS promotes significant growth of the bacteria in the eukaryotic media in a dose dependent manner but not in bacterial growth media. Further investigations using Bovine Serum Albumin (BSA) revealed that BSA itself could support this growth and that *Bordetella* likely utilize this abundant serum protein as a nutritional source. Future studies could be conducted to identify potential inhibitors that prevent *Bordetella* from using albumin as a growth factor.

**Identifying Target Genes Responsible for Increasing GSC Division Frequency in Response to Mating**

Heath Aston, CURO Research Assistant
*Dr. Cordula Schulz, Cellular Biology, Franklin College of Arts and Sciences*

Stem cells continuously make and replace specialized cells that are lost due to death or usage. In addition, if an injury occurs, stem cells work to recover the resulting loss of these specialized cells. For this project, I worked with Germline stem cells (GSCs) in *Drosophila melanogaster*. These are responsible for producing gametes, male sperm and female eggs. Previously, the lab discovered a signaling pathway that regulates the frequency at which GSCs divide under mating conditions, G-protein signaling. The lab showed that mating created a deficiency of sperm and resulted in increased GSC divisions. The purpose of my project was to investigate if potential target genes of G-protein signaling also promote the increase in division frequency. For this, I used the tissue-specific UAS-GAL4 expression system in combination with RNA-Interference to knockdown targets only in germline cells. The males were then heavily mated with virgin females across a span of three days and dividing GSCs in non-mated control and mated experimental males were investigated using immunofluorescent staining. Utilizing this methodology, I showed that specific genes indeed play a role in regulating GSC division frequency.

**A Mediation Analysis: Adverse Childhood Experiences, Self-Regulation, and Depression**

Sara Atamna, CURO Research Assistant
Orobosa Idehen
*Dr. Katherine B. Ehrlich, Psychology, Franklin College of Arts and Sciences*

There is compelling evidence to suggest that adverse childhood experience (ACE) is a risk factor for negative future physical and mental health outcomes. This study seeks to explore the possible association between ACE and adulthood depression. There is evidence suggesting that depression is a byproduct of improper self-regulation; therefore, this study will explore the mediating role of self-regulation in the association between ACE and depression. We had 200 adults fill out self-reported measures of ACE, depression (measured by the Center for Epidemiological Studies-Depression Scale; CES-D), and self-regulation (measured by the Self-Regulation Questionnaire; SRQ). We will run a mediation analysis to examine the association between these variables. We predict that adverse childhood experiences will have a direct effect on depression, such that higher ACE score will lead to higher CES-D score. We also predict that self-regulation will mediate the association between adverse childhood experiences and depression. Specifically, higher ACE score will lead to lower SRQ scores, and lower SRQ scores will lead to higher CES-D scores. Depression is one of the most prevalent mental illness in the United States. By clarifying the predictors of depression, such as ACE and self-regulation, we could contribute to prevention for those who may be more susceptible to depression.

**Tissue-Level and Behavioral Impact of Synthetic Biomimetic Scaffold Implantation in Rodent Model of Traumatic Brain Injury**

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

Severe Traumatic Brain Injury (sTBI) results in important tissue damage and atrophy that might lead to significant chronic functional impairments. Our lab's previous works, among others, demonstrated that the implantation of a brain-mimetic scaffold at the lesion site can mitigate tissue loss and promote healthier recovery. Despite these previous efforts, the functional impact of artificial scaffold implantation on functional recovery and its correspondence to tissue changes is poorly understood. We hypothesized that rats implanted with scaffold will show increased behavioral recovery as well as lesser tissue loss or deterioration. For this reason, we will train rats to behavior assays designed to quantify the extent of forelimb coordination and control (Skilled Reach task) and subject them to a TBI using a biopsy-based brain resection on the Rostral Forelimb Area (RFA, M1 cortex), to induce an impairment of the forelimb motor control. We will then compare performance in forelimb control recovery in rats treated with various types of scaffold to control-TBI animals. At the 5-week mark, the rats will be sacrificed and their brain will be cryosectioned and stained for markers, identifying tissue changes such as neurogenesis (NeuN, BrdU, Double Cortin DCX, Neurofilament-H), neural stem cell migration (Nestin, Sox1/2), synaptic plasticity changes

(Synaptophysin, PSD95) and neuro-astroglial composition (Map2/B3T, GFAP and Olig2). Using both behavioral and tissue level quantified changes, we will establish the correspondence between factors that might impact recovery following scaffold implantation.

**Investigating Control of Flowering Time Under Different Environmental Conditions in *Mimulus guttatus* and *M. nasutus***
Andrew Baker Austin, CURO Research Assistant
*Dr. Andrea Sweigart, Genetics, Franklin College of Arts and Sciences*

Divergent adaptation to environmental conditions, including photoperiod and drought, allows closely related plant species to exist in distinct habitats and can also contribute to reproductive isolation. Flowering time has often been a key trait in adaptation to abiotic conditions, and divergence in flowering phenology is a common barrier to gene flow. In two closely related wildflower species, *Mimulus guttatus* and *M. nasutus*, flowering time in response to photoperiod differs. Furthermore, two genetic loci associated with species divergence in photoperiod response have been identified. Still, other genetic loci might also contribute to differences in flowering time when plants are exposed to different environmental conditions. Here we investigate the effects of both photoperiod and drought on flowering time in *M. guttatus* and *M. nasutus* derived from sympatric populations at the Catherine Creek site. Using a custom mapping population including much of the variation found within and between *M. guttatus* and *M. nasutus* at this sympatric site, we scored the flowering time of each plant under two different light and two different moisture conditions. We will perform a Quantitative Trait Locus analysis to investigate areas of the genome already implicated in photoperiod response, as well as identify new regions associated with the flowering response to drought. Determining the genetic basis of traits related to phenological divergence between these species will provide insight into the maintenance of boundaries between species.

**Exploring Punk Symbols, Cycles, and Lifestyle Learning Through Clothing Merchandising**
Sharon Lillie Autry, CURO Research Assistant
Caroline Helfgott
*Dr. Monica Sklar, Textiles, Merchandising, and Interiors, College of Family and Consumer Sciences*

This research explores the relationship of punk merchandising to punk lifestyle. This relationship is manifested in scene learning, socialization, production, and consumption. Qualitative mixed methods included data collection taken by self-identified United States and Canadian subculture members via an online survey, social media discussion groups, in-person interviews, archival work, and site visits to retail locations. Our roles included mining survey data for trends, pulling citations, and organizing literature and images. Punks go through a learning process of the lifestyle through their merchandising practices. Cultural Historical Activity theory explores how and why individuals learn the way they do about culture and life. Its elements include the subject, artifacts, object, rules, and division of labor and community, which we explored under the lens of punk merchandising. Data indicated influence from passive experiences such as personal research, daily factors such as peers, as well as significant influence from active experiences like attending concerts and visiting punk retail locations. Punks' perceptions of their items change as those garments move through their fashion cycles and disseminate into mainstream society. Findings indicate that few original wearers object to punk silhouettes following bell curve fashion cycles. Punk symbols, however, do not retain the same flexibility. Many punks are selective about symbols being adopted by mainstream fashion and believe that the imagery should remain internal to their community, causing them to feel appropriated by the widespread adoption of their symbols. This project explores intersections of aesthetics, fashion cycles, and life cycles.

**Primary Outcome of Youth Obesity Undergraduate Research and Extension (YOURE) Fellowship**
Julie Bacon, CURO Summer Fellow
*Dr. Silvia Giraudo, Foods and Nutrition, College of Family and Consumer Sciences*

The Youth Obesity Undergraduate Research and Extension (YOURE) Fellowship was designed as an intervention to teach undergraduate students how to conduct research through a nontraditional, nonacademic model. The study conducted for the Youth Obesity Undergraduate Research and Extension (YOURE) Fellowship this past summer of 2018 was to observe the thoughts of young 4-H campers on the meals they were served during their week of camp. A series of three survey questions were asked periodically over a six-week span to determine thoughts on one dinner meal, one lunch meal, and one breakfast meal provided to campers ranging from 4th - 6th grades. The meals used for surveys were Tuesday night dinner, Wednesday lunch, and Friday morning breakfast. These meals were used because of their diversity and periods given to children. Each of these meals occurred following a time when campers would have taken part in the Health is Our Pledge (HOP) class at Rock Eagle 4-H Center during summer camp. This class focuses on teaching campers how to eat healthy and use MyPlate guidelines during mealtimes. The survey questions consisted of asking campers to rate their satisfaction of the meal, their knowledge of whether it was healthy or not, and lastly their rate of fullness after completion of the meal. Answers varied throughout the survey from very satisfied to not and some campers feeling full after a meal, while others were not. Overall, most campers were satisfied with their meals, believing they were healthy, and feeling full by the end. Results revealed that the majority of campers were satisfied with their meals; believing they were healthy meals and in align with the MyPlate, as well as being full upon completion of their meal. Future studies could looking into whether campers are more inclined to purchase unhealthy items such as candy and slushies from the Canteen Store if they are not feeling full or were uninterested in meals provided.

**Investigating the Developmental Basis of Hybrid Seed Lethality in *Mimulus* Species**

Tylanna Baker, CURO Research Assistant
*Dr. Andrea Sweigart, Genetics, Franklin College of Arts and Sciences*

A major goal in evolutionary biology is understanding how species diverge and give rise to barriers that cause reproductive isolation. In flowering plants, hybrid seed lethality is a common reproductive barrier thought to be caused by a defective endosperm, a tissue that provides nutrients to the developing embryo. To explore the developmental basis of hybrid seed lethality at different stages in species divergence, we are focusing on two diploid, yellow monkeyflower species pairs: closely related subspecies within *Mimulus tilingii* (*M. t. tilingii* and *M. t. caespitosa*) and more distantly related species *M. t. tilingii* and *M. guttatus*. We will be visualizing the endosperm and embryo development of seeds from pure species and hybrids up to twelve days post-fertilization (the number of days to fruit maturation). For our study, we first performed crosses within pure species and reciprocally between species. Then, using a histological approach, we embedded fruits in wax and sectioned them using a microtome. Next, we placed these sections onto slides and stained them to visualize and compare pure and hybrid seed development using an optical microscope. Our preliminary data show that the endosperm in hybrid seeds is severely disrupted in crosses between *M. guttatus* and *M. t. tilingii*. By comparing the developmental basis of hybrid seed lethality between the two species pairs, we will begin to understand how this reproductive barrier evolves and contributes to speciation.

**The MEDEA Legacy: Can Darkened Data Shed Light on a Changing Planet?**

Evan Barnard, Ramsey Scholar
*Dr. Loch Johnson, International Affairs, School of Public and International Affairs*

Can declassified Cold War satellite images documenting changes to the Earth's surface benefit environmental research? Initiated in the 1990s, MEDEA was a joint program between the United States intelligence and scientific communities in which the nation's top Earth scientists reviewed classified reconnaissance satellite imagery from the Cold War to determine environmental applications and advocated for declassification of vast amounts of Earth monitoring data for scientific purposes. MEDEA's accomplishments included declassification of two major data sets: the Cold War reconnaissance satellite programs and the Global Fiducials Program, which acquires long-term imagery of environmentally sensitive sites worldwide. MEDEA collaborated with the intelligence and defense communities to analyze global environmental changes and climate effects on populations, then published classified reports and public recommendations with their findings, including the initial research, evidence, and reporting of global warming. Their research utilizing data from environmental monitoring of particular regions over time highlighted areas experiencing physical changes due to global warming and potential national security implications. Much of MEDEA's work remains classified, but research uncovered uncirculated MEDEA reports and declassified archival documents relating to the program, providing documentation of research projects, critical environmental research areas, and proposed guidelines to mitigate effects of climate change. Former MEDEA members were contacted for personal interviews about the program's history and its long-term impact on environmental research and security. Although the program ended in 2015, MEDEA's research will continue to contribute to the global understanding of accelerating climate change and its impacts on environmental security worldwide.

**Afraid of the Dark: Do African Ungulates Alter Their Habitat Use in Response to Predation?**

Annabelle Barr
*Dr. Ricardo Holdo, Ecology, Odum School of Ecology*

Predation can have profound impacts on a prey population beyond direct consumption and mortality. The non-lethal effects of predation include changes in animal behavior based on the threat of predation. Prey may alter behavior by avoiding high-risk areas or by showing increased vigilance. While it is clear that non-lethal effects exist, the generality and strength of these effects are yet to be fully understood. Many factors can influence predation risk, such as light availability and habitat type. Understanding how animals respond to predation risk can help to inform management decisions, especially as predator populations decrease across Africa. In this project, we used camera trap data to investigate how three African ungulates—blue wildebeest, zebra, and impala—alter their habitat use through the diel cycle. Sixteen motion-activated camera traps were deployed in paired woodland and grassland habitats at eight sites in Serengeti National Park, Tanzania. Woodlands provide cover for predators and are considered high-risk environments, whereas open grasslands are considered low-risk. Additionally, the risk of predation increases at night. These cameras took photos of large mammals in 2017 and 2018, and we have classified the images by recording the presence/absence of species. Generalized linear mixed-effects models show that while all three species shift their habitat use from day to night, but not always as we expected. Wildebeest and impala moved towards grasslands at night, while zebra moved towards woodlands. In the future, we hope to combine this analysis with predator data to investigate if prey movement is due to predation risk.

**You'll Never Believe How These Clickbait Links Affect Your Attention!**

Hannah Barron, CURO Research Assistant
*Dr. Bart Wojdynski, Journalism, Grady College of Journalism and Mass Communication*

As sponsored recommendation links to third-party content on news and entertainment sites continues to become an important revenue stream for publishers, we still know relatively little about how the presence of recommended stories on news articles affects consumers' credibility judgments, or even the extent to which consumer pay attention to these ads. Recent public concern about "fake news" and other misinformation has only made it more imperative to

examine the effects of these recommendations links. In an eye-tracking laboratory experiment, participants will view several news articles from local news websites on which the presence, images and text, of sponsored recommendation links varied. While participants view the article pages, the duration and location of their visual gaze will be unobtrusively recorded by eye-tracking hardware. After reading the articles, participants will answer questions about their perceptions of the credibility of the publisher and the story content, as well as their awareness and perceptions of the stories linked in the recommendation blocks. The goal of the study is to contribute to the literature on what characteristics of this content draws readers' attention, and the extent to which certain types of images and headlines can have negative effects on attitudes toward the publisher and content.

**The Effect of Motown Record's Image Making in the 1960s**
Camilla Barrow, CURO Research Assistant
*Dr. Monica Sklar, Textiles, Merchandising, and Interiors, College of Family and Consumer Sciences*

The dress styles of the record label Motown were a symbol of the shifting American Dream of the 1960s. The research project on Motown records focuses on the Detroit portion of their existence. Motown record label was headquartered in Detroit Michigan from 1959-1972 and later was moved to Los Angeles, California from 1972-1998. This paper focuses on the Detroit portion of their existence, which was also when they first made their mark on the international landscape, which influenced not only African Americans but Caucasians as well. The study uses both primary and secondary resources, including but not limited to literature reviews, interviews with musicians and historians, as well as discussions with curators and collection managers across the United States. This research documents the way Motown's fashion was chosen as well as the influence it had on people during this time. The first draft of this manuscript was sent to one of the most esteemed journals in the field of fashion history and received a revise and resubmit designation. Our second submission will be an improved version of the manuscript with more data and knowledge on the securing of clothing for the artist as well as a better explanation of how this research is different from other projects that have covered this topic. As a CURO student, I will do the projects deemed necessary by the editors to enhance the study and the manuscript.

***In vitro* Characterization and Quantification of Collagen Fibers Using Second Harmonic Generation Microscopy**
Ruth Pentlarge Barrow, CURO Honors Scholar
*Dr. Luke Mortensen, Animal and Dairy Science, College of Agricultural and Environmental Sciences*

Osteogenesis, the creation of bone, is measured by mineralization, however mineralization is the final step in the creation of bone. Collagen creates the structure of bone prior to the buildup of mineralization. Currently, there are no metrics to describe the quality of collagen produced by cells. We hypothesize that because collagen provides an integral structure of bone early on in the stages of osteoblast differentiation, a proper characterization of collagen itself can be extremely indicative of overall bone health. In this study, we are attempting to develop a new method to analyze and quantify collagen *in vitro*. Using two photon microscopy to generate linearly and circularly polarized light, we produced second harmonic generation (SHG) images to analyze collagen. Here, we quantify collagen in terms of fibril alignment, orientation, and quantity. By properly characterizing the quantity and quality of collagen secretions from osteoblasts, we can better understand how to use osteoblasts to our advantage in treating bone diseases such as osteoporosis. This research proves extremely useful in gauging future treatments for diseases of the bone by developing a new method to first characterize an extremely important stage of bone growth, the secretion of healthy collagen.

**A Concept Framework for Improving Metacognition**
Ibrahima Barry, CURO Research Assistant
*Dr. Jennifer Walker, Microbiology, Franklin College of Arts and Sciences*

A concept framework is tool for both instructors and students, created to promote meaningful learning for students across two microbiology courses, face-to-face and online. This tool was developed to be used by both faculty and students. For faculty, the framework is proposed as a course guide for instructors when approaching new courses or in aligning content with other instructors. For students, concept frameworks provide key course concepts for learning and understanding. Assessments investigate student achievement of learning objectives and metacognitive development while surveys will gain insight into how faculty perceive the application of a concept framework. The proposed benefits of a concept framework to assess will include 1) improved learning, 2) understand the development and implementation process of key concepts, and 3) provide an example for other faculty and departments to craft concept frameworks on their own.

**Difference in Diet Norms Between Christian and Pagan Poland**
Chelsea Blayne Batchelder, CURO Research Assistant
*Dr. Laurie Reitsema, Anthropology, Franklin College of Arts and Sciences*

During the medieval period in Poland changes related to the introduction of Christianity occurred that altered the culture and daily lives of those living there. Here, stable carbon and nitrogen isotopes from bone collagen are used to indicate the diet and thus potential differences in daily life between individuals from two different sites: Ostrowite, an $11^{th}$-$14^{th}$ century rural and pagan village, and Toruń, a $14^{th}$-$18^{th}$ century urban and Christian city. At Ostrowite individuals exhibited mean $\delta^{13}C$ values of -19.3±0.8 and $\delta^{15}N$ values of 10.2±0.8, while at Toruń individuals exhibited $\delta^{13}C$ values of -19.4±0.5 and $\delta^{15}N$ values of 12.1±1.8. Individuals from Toruń had statistically significantly higher nitrogen values (Kruskal Wallis; $p<0.001$) than those at Ostrowite, suggesting a diet consisting of more fish, likely anadromous. This supports that individuals at Toruń may have been eating fish as a way to adhere to Christian fasting practices. The higher nitrogen values may

have also resulted from Toruń citizens eating more livestock raised in their yards or land management practices such as fire-clearing or manuring, food production strategies that allowed populations to grow larger. No sex differences were found at either site. The greater variability in carbon and nitrogen at Toruń indicates more pronounced differential access to foods. However, isotopic variability also exists at Ostrowite, meaning diet at Ostrowite was not homogeneous either. Overall, the data suggest that a change in diet may have accompanied urbanization and the introduction of Christianity to medieval Poland.

**Foraging Persistence of Wild Tufted Capuchin Monkeys *Sapajus libidinosus* in Fazenda Boa Vista, Brazil**

Michelle Belikova, Foundation Fellow, CURO Research Assistant
*Dr. Dorothy Fragaszy, Psychology, Franklin College of Arts and Sciences*

Capuchin monkeys from the Americas are well-known for their persistent extractive foraging. Wild tufted capuchin monkeys have even been documented using tools (tooling) in foraging. Does tooling influence foraging persistence? This study seeks to quantify persistence as a feature of behavior in capuchins and compare persistent foraging efforts across three foods commonly found in capuchin diet: palm nuts (extractive, percussive, and require tooling), sapucaya fruit (extractive, percussive, and do not require tooling), and tubers (extractive, non-percussive, and do not require tooling). We hypothesize that extractive foraging efforts which require tooling will be longer in duration and utilize a greater variety of foraging behaviors—indicative of greater persistence—than those extractive foraging efforts which do not require tooling. Foraging bouts of wild tufted capuchin monkeys (*Sapajus libidinosus*) at Fazenda Boa Vista, Brazil were opportunistically recorded from May to July 2017 (40 hours, 18 capuchins). Each foraging bout will be coded for key behaviors using Noldus Technology's The Observer™ software in order to compare behavioral variability across food types. Results gleaned from this study have potential to inform about features of behavior (i.e. persistence) which may have supported the evolution of tooling in capuchins and in distantly related primates from Africa and Asia, including humans.

**Does Effort Predict Computerized Neurocognitive Testing Performance?**

Derek Hamilton Bell
*Dr. Julianne D. Schmidt, Kinesiology, College of Education*

To determine if self-reported effort predicts valid computerized neurocognitive concussion testing battery domain scores in healthy college-aged individuals. Participants (n = 25; age=20.7±1.0 years; male=52%) completed demographic and health history as well as a graded symptom checklist via online survey (Qualtrics). Participants were then asked to complete the computerized neurocognitive assessment (CNS Vital Signs). After completion of the neurocognitive testing battery, participants self-reported their effort on a 10-centimeter continuous Visual Analog Scale ranging from 0 (least effort possible) to 10 (most effort possible). Multiple logistic regression models were used to examine if self-reported effort predicted the odds of valid or invalid performance across psychometric domains. Self-reported effort did not significantly predict the odds of having a valid domain score across any of the 10 psychometric domains ($p \geq 0.22$). These data suggest that effort does not significantly predict validity on computerized neurocognitive testing. It is important to note that this sample was limited to a single university in the state of Georgia and may not be generalizable to a national sample. In addition, individuals may have a hard time perceiving the amount of effort they put forth during the study. Results indicates that clinicians should inspect other aspects instead of effort to predict the likelihood of individuals scoring valid on their neurocognitive testing baseline such factors could include sex, bilingualism, and even college GPA.

**Identification and Distribution of Greenbreast (*Etheostoma jordani*) and Etowah Darters (*Etheostoma etowahae*) in the Etowah River System in Georgia**

Jared Bennett, CURO Research Assistant
*Dr. Bud Freeman, Ecology, Odum School of Ecology*

The Green Breast Darter (*Etheostoma jordani*) and Etowah Darter (*Etheostoma etowahae*) are two cryptic species of darter (morphologically identical but distinct species) that are both of the family *Percidae* and the subgenus *Nothonotus*. Both species inhabit the Etowah River System, but were not believed to exist in the same range. However, recent collections in the main stem of the river identified what were presumed to be Etowah Darters, but could actually be Green Breast Darters or a hybrid of the two. This classification is important as Etowah Darters are a federally endangered species with a limited range, and therefore their presence in the area could have major management and conservation implications. In order to determine which species are present in the area, we are genotyping samples collected in recent years, and comparing the data to historical information about their distributions and normal range.

**Enhancing Human Norovirus Replication in Vero Cells**

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

Human norovirus (HuNoV) is ubiquitous across the globe and is widely considered to be the leading cause of acute gastroenteritis in people. Today, research into HuNoV vaccine development is crucial because of the tremendous impact it has on society from both public health and economic standpoints. Traditionally, viral vaccines have been created using attenuated or inactivated viruses. However, an inability to culture HuNoV *in vitro* has stymied efforts to develop a whole-virus vaccine. As such, a robust cell culture system that can readily allow for HuNoV replication is critical for advancing HuNoV vaccine development efforts. Vero cells are a vaccine-approved cell line that have been used to generate a number of viral vaccines. Vero cells lack the ability to produce antiviral interferons, allowing them to support a wide range of viruses. The usefulness of this cell line for viral vaccine

production can be enhanced by identifying host genes that restrict virus replication, and then removing them by genetic engineering. Initial screening to identify antiviral host genes can be performed by using small interfering RNAs (siRNAs). Theoretically, silencing host genes that restrict viral replication should allow for increased HuNoV replication. Once antiviral host genes have been identified by siRNA studies, gene editing using CRISPR-Cas9 can permanently knockout these host genes allowing for greater HuNoV replication. With that in mind, the goal of this research is to develop an enhanced vaccine cell line that demonstrates robust HuNoV replication.

**Picking Priorities: When My Goals Compete with Our Goals**

Tanisha A. Bhavnani, CURO Research Assistant
*Dr. Michelle R. vanDellen, Psychology, Franklin College of Arts and Sciences*

This study examines whether servicing an explicit focal goal reflects the tendency to fulfill implicit background goals, specifically goals belonging to a partner. Participants were recruited via a research participant pool and randomly assigned to 1 of 3 conditions: helpful, competitive, or information-control. Participants in the helpful and competitive condition completed a sentence unscrambling task containing 10 priming and 20 neutral sentences. Afterwards, participants in those conditions read a scenario of a married couple, Jane and Brian. The scenario described each partner's individual goals. Participants then prioritized a list of tasks for one partner of the couple. Participants in the information condition were instead asked to rate the effectiveness of each task in respect to achieving each partner's individual goals. All participants also completed questionnaires about their trait self-control and competitiveness. We hypothesized that participants in the competitive condition would be less likely to prioritize Brian's goals (implicit background goals) and would instead solely focus on Jane's individual goals in comparison to participants in the helpful condition. We found no effect of condition on prioritizing Jane's goals, Brian's goals, and multifinal goals (i.e., goals that helped both Jane and Brian). A future study will examine how choosing to pursue goals that promote multifinality relates to their relationship satisfaction.

**Effects of Adaptive Lighting Systems on Ornamental Seedling Production**

Ruqayah H. Bhuiyan
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The first weeks of a plant's life are critical for good growth up to maturity. Supplemental light (in the form of LEDs) during the seedling stage can shorten the production cycle and is often necessary for high-quality ornamental plants. We studied the growth responses of two crops under various light treatments. *Digitalis purperea* 'Dalmation Peach' and *Rudbeckia fulgida* 'Goldsturm,' were grown in a greenhouse and exposed to five different daily light integrals (DLI, total daily amount of light received by the plants) over an eight-week period. The five treatments were a control (sunlight only), DLIs of 8, 12, and 16 mol/$m^2$/day, and 16 hours of supplemental light at 96 µmol/$m^2$/sec, representative of commercial greenhouse practices. Plants of both species grown under sunlight only grew very slow. Those exposed to a DLI of 8 mols/$m^2$/day or 96 µmol/$m^2$/sec grew more slowly than those in higher light treatments. Plants of both species exposed to 12 or 16 mol/$m^2$/day had a low specific leaf area, while the control plants (sunlight only) had the highest specific leaf area; indicative of thin leaves, a typical shade avoidance response in plants. For both species, providing a DLI of 16 mol/$m^2$/day provided little or no additional benefits compared to 12 mol/$m^2$/day, meaning the extra energy required to power the light bars is not necessary to stimulate more growth in these crops. The supplemental lighting during seedling growth greatly shortened the production cycle and increased the quality of the seedlings. This can have great financial benefits for growers.

**Exploring the Association Between Health and Neighborhood Characteristics Among Older Hispanic Adults in the United States**

Grace H. Bick, CURO Research Assistant
*Dr. Kerstin Gerst Emerson, Gerontology, College of Public Health*

The number of older adults is growing rapidly in the United States. At the same time, the older population is becoming more ethnically as well as racially diverse. Among older adults, the fastest growing minority group is older Hispanics. While life expectancy is relatively high for this group, chronic conditions such as diabetes are prevalent. Previous research suggests that neighborhoods with high immigrant density may be associated with chronic conditions. The purpose of this project was to describe chronic conditions of Hispanic elders, by neighborhood characteristics. We used data from the Hispanic Established Populations for the Epidemiologic Study of the Elderly (HEPESE) Wave 5 in 2004-2005. The survey included 2,069 respondents aged 75 and older, who were from the Southwest region of the United States (Arizona, California, Colorado, New Mexico, and Texas). The average age of the respondents was 81.93 (± 5.15) years old. Health outcomes were measured by BMI (obese, overweight, normal and underweight), and chronic conditions (e.g., diabetes, arthritis, stroke, cancer, high blood pressure). Neighborhoods were divided by Hispanic and immigrant density (cut into tertiles: high, medium, and low). Research on the associations of neighborhoods and health behaviors can provide a more in-depth understanding of older Hispanic adults living in the United States.

**Protein and Antibody Expression and Purification for Creation of a Novel Influenza Vaccine**

Cayman Anderson Bickerstaff, CURO Research Assistant
*Dr. Ted M. Ross, Infectious Diseases, College of Veterinary Medicine*

Influenza poses vaccination challenges considering the rapid mutation rate of its most important surface glycoprotein, hemagglutinin, the fusion protein responsible for viral infection. Our research focuses on the head region (HA1) of the hemagglutinin protein, cloning of HA1 proteins from different strains, and both the creation of purified, recombinant HA1 proteins and the modification of seasonal influenza HA1s for immunizations against influenza viruses, with the aim of

creating an effective universal influenza vaccine. First, we clone H1 and H3 proteins into acceptor plasmids and strataclone vectors to create novel protein subunits. Candidate HA subunits, including COBRA (computationally optimized broadly reactive antigen) recombinant HA subunits, are transfected and purified from Expi293 cells before being inserted into viral backbones for immunization. Protein purification requires significant production of HA1 along with a highly maintained buffer system. Resulting antibodies (IgG), purified from mouse serum, are characterized and used for challenges to test for vaccine efficacy. In our UGA Cohort Study, IgA and IgG are purified from human serum for characterization and quantification after immunization for comparison to current seasonal vaccine data. COBRA HA vaccines are expected to have a more broadly reactive immune response than the current influenza vaccine because the COBRA vaccine contains reactive components of many more strains than the current vaccine does. The creation of a more broadly protective vaccine is important for lessening the mortality of seasonal influenza (approximately 400,000 deaths per year) and decreasing the amount of vaccinations required from one per year to, approximately, one every five years.

**Adrian Piper: Synthesis of the Body and Space in Performance Art**

Olivia Babuka Black
*Dr. Marla Carlson, Theatre and Film Studies, Franklin College of Arts and Sciences*

How can a performance spur its viewers to confront and face their own prejudices? After the performance and confrontation conclude, what's next? Ultimately, what is the responsibility of the artist to incite this confrontation? Conceptual artist and Kantian philosopher Adrian Piper's performance art sees this confrontation as catalytic and therapeutic. This artistic performance-turned-confrontation forces viewers to remain present; to not look away from that which makes them uncomfortable. My research centers around this momentary exchange between artist and spectator and how this exchange can act as a disruptor to normativity--when allowed the space to do so. Piper's work is largely concerned with the body in relation to space—especially when considering politicized bodies within space. Her work is rooted in Kantian philosophy, critical race theory, performance theory, and cultural analysis. Through an exploration of Piper's recent MOMA retrospective, specifically her *Everything* series (2003-ongoing), *Black Box/White Box* (1992), *The Humming Room* (2012), and 2013's *Imagine (Trayvon Martin)*, as well as affect theory, race theory, queer theory, and performance theory, this project examines Piper's desire to confront the viewer's preconceived notions of race, class, gender, and what it means to have a body that has been politicized.

**Effect of a High-Fat Diet on Gut Morphology**

Mira Bookman, CURO Research Assistant
Anya Cieszewski
*Dr. Krzysztof Czaja, Veterinary Biosciences and Diagnostic Imaging, College of Veterinary Medicine*

Obesity is a chronic inflammatory disease characterized by excessive accumulation of adipose tissue. Since 1975, worldwide obesity rates have nearly tripled, and the threat of obesity continues to rise in prevalence. The global obesity epidemic is largely attributed to increases in the intake of high-fat, energy-dense foods, a shift further propagated by commercial marketing practices and institutionally-driven reductions in physical activity. Research literature has substantiated the finding that diets high in fat or sugar content induce chronic, low-grade inflammation in the body, ultimately leading to decreased health outcomes over the long-term. From a clinical perspective, obesity has been linked to several adverse health conditions including gastroesophageal reflux disease (GERD), which is known to cause inflammatory-mediated damage in the esophagus. In order to better understand the relationship between high-fat diets (HFDs) and GERD, this experiment observed the gut morphological changes of the esophagus and duodenum induced by a high-fat diet in germ-free mice and Sprague-Dawley rats. In accordance with past experimental literature, it was hypothesized that greater inflammation and tissue damage would be triggered in rats and mice placed on high-fat diets than on low-fat diets (LFDs) and that animals exposed to the HFD for longer time intervals would exhibit greater tissue damage. In this experiment, groups of Sprague-Dawley rats were randomly allocated into four treatment groups: 72-hour HFD, 48-hour HFD, 24-hour HFD, and a LFD which served as the control. The mice were randomly allocated into two-week diet groups: HFD, sucrose-diet, and pico-diet which served as the control.

**The Impact of Genetic Selection on Skeletal Health and Development in Broilers**

Grace Boothby, CURO Research Assistant
*Dr. Laura Ellestad, Poultry Science, College of Agricultural and Environmental Sciences*

In the poultry industry, genetic selection has resulted in broilers with a faster growth rate. However, modern broilers have increased skeletal problems, particularly leg weakness. Vitamin D plays an important role in calcium and phosphorous homeostasis and is essential for proper bone development. Despite this, no research has been conducted to determine if there is a connection between genetic selection and proper metabolism of vitamin D. The UGA Poultry Science department maintains a flock of Athens Canadian Random Bred (ACRB) birds representing meat-type birds before intensive commercial genetic selection began. Using them, comparisons can be made with modern broilers to determine impacts of genetic selection. Preliminary results using one line of commercial broilers at one age indicate that genetic selection may have compromised vitamin D metabolism. The purpose of this study is to determine impacts of genetic selection on hormonal systems regulating skeletal health in two commercial broiler lines during different phases of growth. We have collected liver, kidney, and intestinal tissue from birds at different ages and are examining expression of genes involved in the conversion and activity of vitamin D, as well as levels of mRNA for hormone receptors involved in calcium and phosphorus homeostasis. Based on the results of a prior study, we expect the commercial broiler lines to have lower levels of mRNA for genes involved in

the proper activation of vitamin D and the proper homeostasis of calcium and phosphorus. This decreased gene expression could be the cause of skeletal weakness in modern broilers.

**Behind the Scenes of Mexican Paradise: An Exploration into Neoliberalism and Tourism in Mexico Using Qualitative Feminist Methods**

Lauren Boyd, CURO Research Assistant
*Dr. Patricia Richards, Sociology, Franklin College of Arts and Sciences*

This semester I will work under Dr. Richards in preparation for ethnographic research on tourism and neoliberalism in Todos Santos, Mexico, during summer 2019. The research I will conduct this semester is multi-faceted and will prepare me for my fieldwork. I will read methods books describing how to conduct ethnographic research as well as several exemplars in the field, in an effort to gain methodological background before I enter the field. Secondly, I will address the content of my research by answering the following questions: 1) What specific neoliberal policies have been implemented in Mexico?, 2) Which groups of people have these policies affected positively and negatively, and to what extent?, and 3) How has neoliberalism molded tourism in Mexico? Finally, I will investigate the political landscape of the town in which I hope to research by accessing notes from political gatherings, policy implementations, and historical records of general events. I intend to focus on tourism and restrictions on industries that might impede tourism, as well as ascertaining the official discourse on tourism. I will later compare my findings from spring and summer regarding the discourses and practices of both Mexican and non-Mexican residents related to the questions above.

**Comparison of Blood Lipid Responses from Diets with and Without Pecans**

Meghan Katherine Brennan, CURO Research Assistant
*Dr. Jamie A. Cooper, Foods and Nutrition, College of Family and Consumer Sciences*

Pecan consumption has been shown to decrease cholesterol without causing weight gain in healthy adults, but this effect hasn't been studied in a population at risk for chronic disease. To compare effects of daily pecan consumption for an 8-week period on body weight and blood lipids in a population with either hypercholesterolemia or a body mass index >28kg/m2. Subjects are randomized into one of three groups: a control group that abstains from nuts (n=2), a pecan ADD group that consumes pecans as part of their free-living diet (n=1), and a pecan SUB group that substitutes pecans for isocaloric foods (n=1). Anthropometrics and fasting blood lipids are measured at baseline, week 4, and week 8. To date, 4 participants have completed the full study, and participant testing is on-going. There was an average 1kg weight loss in the control group, 2kg weight gain in the ADD group, and no weight change in the SUB group. In the control, ADD, and SUB groups, changes in cholesterol from baseline were: total cholesterol (15.5,-2, -2, respectively); low density lipoprotein (LDL) cholesterol (16, 0, -9, respectively); and high density lipoprotein cholesterol (0.5,-2, 9, respectively). In the ADD group, LDL cholesterol decreased by 31mg/dL at week four but returned to baseline levels by week 8. Isocaloric substitution with pecans appears to be effective for preventing weight gain. Although there may be some positive effects on blood lipids with daily pecan consumption, additional testing is needed before conclusions can be made.

**Where is My Mentor? A Taxonomy of Negative Mentoring in Undergraduate Research Experiences in the Life Sciences**

Benjamin Henry Taylor Bridges
*Dr. Erin Dolan, Biochemistry and Molecular Biology, Franklin College of Arts and Sciences*

Undergraduate research has been advocated for its potential to promote students' personal and professional growth. Multiple studies have shown that effective mentorship helps to maximize the benefits undergraduates realize from participating in research. Few, if any studies have focused on cases in which the mentoring of undergraduate researchers is less effective or even overtly problematic, despite prior research suggesting that as many as 50% of students report having at least one negative mentoring experience. We set out to define negative mentoring in the context of undergraduate research experiences in life sciences. We conducted semi-structured interviews with undergraduate life science researchers to document their experiences with negative mentoring and then analyzed their responses inductively and deductively using standard content analysis procedures. Undergraduate researchers in our study reported negative mentoring that we characterized as actively harmful behaviors (e.g., discrimination, sabotage) or an absence of positive behaviors (e.g., neglect, insufficient challenge), with psychosocial and/or vocational dimensions. We present these results as a taxonomy of negative mentoring in undergraduate life science research. This taxonomy provides a foundation for future research to quantify the prevalence and impact of negative mentoring in undergraduate research.

**Anthropological Impact of Spirituality in Religion**

Dylan Jeffrey Bridges, CURO Research Assistant
*Dr. David S. Williams, Religion, Franklin College of Arts and Sciences*

All major religions across the history of the world have had a spiritual component to them. That component, which others may view as illogical, has had a significant cultural impact on those who believe in it. This spiritual aspect, whether it be faith-healing, meditation, or spiritualism, has been a part of religion since before the beginning of recorded history. The purpose of this project is to dive into the spiritual phenomenon of religion in order to better understand (1) what exactly these beliefs are, (2) why people choose to believe in them, and (3) what impact these beliefs have on both the lives of the individuals and the cultures to which they belong. This is accomplished by compiling a literature collection pertaining to spiritual topics and analyzing this collection in order to make anthropological connections where they exist. My findings consist of anthropological research across many major religions including the spiritual practices of Christianity, Judaism, Islam,

Hinduism, Buddhism, traditional African religions, Native American religions, and Wicca. By better understanding the spiritual beliefs of these cultures and how they relate to one another, we may more effectively connect and communicate with them.

**Resurrecting Researcher Engagement: An Innovative Approach to Survey Data Collection**
Lucas William Brock, CURO Research Assistant
*Dr. Ashley M. Yopp, Agricultural Leadership, Education, and Communication, College of Agricultural and Environmental Sciences*

The difficult process of face-to-face survey data collection is usually a pain-staking experience for many novice researchers. Historically in data collection, researchers have focused on characteristics associated with external participants: how the participant engages, perceives the study, and ultimately how and if they decide to respond. However, this study sought to improve internal components of validity by increasing the researchers' engagement in the data collection process itself. In October 2018, a group of undergraduate researchers collected consumer data utilizing face-to-face intercept survey methods at two major state events, an agricultural exposition and a state fair. In an effort to incentive student researchers and appeal to their competitive nature, the lead faculty researcher designed a tiered strategy to increase their engagement in collecting high-quality data utilizing the context of a zombie apocalypse. With game theory in tow, the design enlisted a set of criterion, zones of safety, and a host of "zombie-specific" characteristics to keep in mind during this event-wide zombie outbreak. Survey participants were required to meet a predetermined set of qualifications, reducing bias by limiting participants from being heavily collected. By facilitating data collection as a game or overall experience, we observed a shift in undergraduate engagement; students either met or exceeded the quota set through the design of the zombie apocalypse and viewed the experience as favorable overall.

**Human Disturbance and Soil Instability in Driftmier Woods**
Savannah Brock
*Dr. Lizzie King, Ecology, Odum School of Ecology*

Driftmier is a small, old-growth forest with substantial soil erosion and fallen trees. The overall soil stability in this campus landmark is endangered and worthy of assessing. Our research will address questions that ask how much soil is eroding from storm water runoff and whether there is a correlation between soil compaction from the trails and fallen trees. We have two subsections of our research: one will utilize erosion gates to compare the erosion between areas with different levels of storm water runoff. We plan to monitor eroded areas from different storm water drains that runoff from the Driftmier parking lot, noting which gullies are eroding the most over the course of the semester. The other will map the trees in the forest using a global positioning system, noting the distance between fallen trees and the trail to determine whether trees that fell may have been affected by the soil compaction from the trail. Our tree and trail map will help assess whether the trail led to more fallen trees and soil instability. The hypotheses we are testing relate to trail impacts and soil erosion rates in Driftmier woods, and results are forthcoming. This research will help inform future conservation and restoration efforts that will protect the forest soil from further degradation.

**Constructing 4D Manifolds with Euler's Formula**
Patrick Brothers, CURO Research Assistant
*Dr. David Gay, Mathematics, Franklin College of Arts and Sciences*

One of the most valuable results in Algebraic Topology is the topological invariant called the Euler characteristic: for a given graph inscribed on a 2Dimensional surface such as a torus or double torus, the Euler characteristic is a linear combination of the number of edges, faces, and vertices of that graph. Euler's Formula, which states that the Euler characteristic of a given graph on a surface is two minus twice the genus of the surface. This gives us a computational tool to analyze topological properties, but how do we construct surfaces to analyze? One way is to examine the crossings of alpha, beta, and gamma curves on 2Dimensional surfaces in 3Dimensional space; we can imagine each intersection between two curves as the center of a quadrilateral. By this method, we can construct a surface using only a given list of curves and the ways they intersect with the other. Therefore, the goal of this project is to write a program that utilizes these crossing patterns to calculate the genus of the surface by counting the number of faces, edges, and most challengingly, vertices in the graph created by this process to find the genus of the surface by applying Euler's Formula. And to use this program to analyze different interesting examples of sets of curve intersections that describe 2Dimensional surfaces placed in 3Dimensional space, and ultimately, to use the information that this process obtains to construct different examples of manifolds in 4Dimensional space.

**Defining Uncertainty Bounds for Measurements of Gas Flow**
Dylan Brown, CURO Research Assistant
*Dr. Brandon Rotavera, Environmental, Civil, Agricultural, and Mechanical Engineering, College of Engineering*

In scientific experiments, measurement accuracy is of central importance. Inaccuracy can lead to false readings from measurement devices and introduce error into experimental results. Combustion experiments rely heavily on the accuracy of flow controllers, which deliver oxygen, nitrogen, and other gases to chemical reactors at specific flow rates. Bounds of uncertainty within flow controllers can lead to inaccurate control of gas flow and can introduce bias error. Using 10 different calibrated flow controllers, a gas manifold, pressure sensors, and a vacuum system, uncertainty analysis of flow controllers will be conducted to determine a fitting equation of actual flow rate vs. programmed flow rate. 12 measurements will be conducted for each flow controller in order to perform statistical analysis of collected data including hysteresis error. Experiments will involve a sample delivered from a gas cylinder to a flow controller then into a defined controlled volume where pressure measurements will be recorded. In some cases, flow controllers can have non-linear behavior near

upper and lower limits. Determining the bounds of uncertainty of the flow controllers will create the foundation for in-house calibration and future experiments.

**The Relationship Between Positive Symptoms and White Matter Structure in Psychosis**
Jennifer Annette Brown, CURO Research Assistant
*Dr. Jennifer McDowell, Psychology, Franklin College of Arts and Sciences*

The brain is composed of functional subunits that rely on interunit connections, formed by white matter tracts, to communicate and coordinate complex tasks. White matter alterations are implicated in the etiology of psychotic disorders, but few studies have investigated these changes alongside clinical symptomatology. A subset of clinical symptoms characterized by hallucinations and delusions, called the positive symptoms group, are thought to present on a continuum of severity spanning schizophrenia (SZ), schizoaffective disorder (SA) and bipolar disorder with psychosis (BPP) in order of decreasing severity. In SZ, positive symptom severity is correlated with white matter structure. This project will investigate the relationship between positive symptom severity and white matter structure, and make comparisons between SZ, SZA, and BPP studied together. Diffusion magnetic resonance imaging was acquired from probands with these three disorders, as confirmed with the Structured Clinical Interview for Diagnosis, and positive symptom severity was measured using the positive subscale of the Positive and Negative Syndrome Scale (PANSS). Diffusion tensors were calculated for fiber tractography, and resultant fractional anisotropy (FA) values indicating white matter organization and structure were compared tract-wise. We expect a negative relationship between positive PANSS score and FA across all diagnoses in fiber tracts implicated in past SZ studies including the left uncinate fasciculus, right inferior fronto-occipital fasciculus, and bilateral inferior longitudinal fasciculus, however we expect this relationship will differ significantly between groups. Investigating this relationship could provide important insight into the boundaries between psychotic disorders and how underlying structural changes relate to clinical prognosis.

**#AdsAsAdvocacy: Exploring the Relationship Between Brands' Pro-LGBTQ Social Media Posts and Consumer Behavior**
Sierra Brown, CURO Research Assistant
*Dr. Glenna Read, Advertising, Grady College of Journalism and Mass Communication*

This study is inspired by the growing desire from the millennial generation for brands to express socially conscious messages. With this demand, brands are increasingly incorporating social consciousness into their digital marketing strategies, with many polarizing media movements beginning with major brands such as Cheerios incorporating their first mixed-race family in 2013 and CoverGirl, showcasing their first male CoverGirl in 2016. In this study, we will examine the effect of brand's advertising using LGBTQ positive content on consumers' attitudes toward the brand and the ad. To determine these effects, we will expose half of our participants to ads with LGBTQ-related social media ads and the other half will be exposed to matching ads with non-LGBTQ-related content. The matching ads will be similar in tone, clothing, and content, and race, in order to control for potential variability related to those factors. After the presentation of the ads, we will ask college student participants about their attitudes toward the brand and ad. Due to the millennial consumer's desire to see socially conscious messages reflected in brand messages, we expect the ads with LGBTQ-related content to elicit more positive responses than the ads without such content. With the results of this study, we will be able to identify how LGBTQ-related brand messages affect consumer attitudes in the target population. We will also be able to begin to identify methods for brands express pro-social attitudes in a manner that is perceived authentically by consumers.

**Mercury Cycling in a Coastal Georgia Salt Marsh**
Austin Thomas Bryan, CURO Research Assistant
*Dr. Kat Loftis, Vice President for Research Services, Research Units*

Coastal salt marshes have a unique set of environmental properties that may affect mercury cycling—the processes by which mercury enters, leaves, is transported, and changes within a system. Salt marshes exist at the interface of land, freshwater, and ocean systems, and play an important role as a buffer zone between these environments. These marshes are highly ecologically productive and useful for both humans and wildlife, meaning that the mercury cycling within them has the potential to impact both human and ecological health. Here, mercury cycling is controlled by a complex series of variables that affect the extent to which mercury is accumulated and released from the marsh. In this study, we surveyed surface sediment (0 - 0.5 cm) samples from a salt marsh tidal creek near Meridian, Georgia. Located within the intertidal zone of the salt marsh, the study site undergoes tidal inundation and is also subject to the deposition of allochthonous sediments. Sediment samples were collected on a monthly timescale over a period of 19 months and analyzed for total mercury. These observations result in a timeline of sediment mercury concentrations over the study period, showing fluctuation from winter lows to spring peaks. Current research is focused on identifying driving factors for the observed fluctuation, which may offer insights into mercury cycling within the larger coastal ecosystem.

**Utilization of Zebrafish to Investigate the Role of Progesterone Receptor Membrane Component 1 and 2 in the Mitochondrial Heme Metabolon**
Willow C. Bryan
*Dr. Amy E. Medlock, Biochemistry and Molecular Biology, Franklin College of Arts and Sciences*

Heme is a biologically ubiquitous molecule with a wide range of physiological functions. Dysfunction in the biosynthetic pathway of heme results in a variety of clinically salient phenotypes, which makes heme biosynthesis an area of active scientific inquiry. Evidence for the putative mitochondrial heme metabolon has been accruing for years, and the hypothesis has recently been bolstered by an affinity purification study

of ferrochelatase, which showed that this terminal enzyme of heme biosynthesis interacts with a variety of protein partners, including the newly implicated progesterone receptor membrane components 1 and 2 (PGRMC1 and PGRMC2). PGRMC1 and 2 are relatively poorly characterized proteins, with seemingly unrelated reported functions including progesterone cell signaling, cytochrome P450 binding, de novo cholesterol synthesis, and cellular protection from oxidative damage. Based on known functions of PGRMC1 and 2 and data suggesting their involvement in the heme metabolon, it is thought that these protein partners are likely implicated in the heme biosynthetic pathway as heme binding proteins, chaperone proteins, or heme sensors. The research to be presented describes efforts to generate lines of CRISPR-cas9 genetically modified zebrafish, one which has PGRMC1 disrupted, and another with PGRMC2 disrupted. Once these lines are established, any phenotypes that arise will be characterized. Following this characterization, mRNA rescue experimentation will begin to assess the effect of full protein knockouts on whole organismal systems and establish the true nature of these proteins in the metabolon.

**Sequencing in Vasquez' Steps to War Thesis**
Rebecca Buechler, Foundation Fellow
*Dr. Andy Owsiak, International Affairs, School of Public and International Affairs*

Vasquez's Steps to War theory posits a clearly defined sequence of events that result in war: territorial claim, rivalry, alliance formations, arms race, and then war. However, in empirical tests of his theory, scholars have so far only used additive models that demonstrate that more factors present is associated with a higher likelihood of war. Thus, the sequence itself has not yet been tested. We test the crucial sequence element of the Steps to War theory in two ways. First, we examine the dyad-year histories of each dyad and record the order in which these factors appear, yielding descriptive statistics that show how often we actually observe the sequence occurring since 1816. Second, we use a Structural Equation Model to examine the direct and indirect effect of each factor on the likelihood of war.

**Disease Vectors and Biodigesters**
Tommy Bui, CURO Research Assistant
*Dr. Amanda T. Rugenski, Ecology, Odum School of Ecology*

The use of anaerobic biodigesters is currently promoted for small farms in Costa Rica to create biogas and fertilizer from treatment of human and animal wastewater. Although this practice is beneficial in terms of energy and agriculture sustainability, the open-air effluent ponds pose a risk of creating environments for disease carrying mosquitoes, such as *Aedes aegypti*, a competent vector for Dengue and Zika. In the animal waste biodigester ponds at the UGA Costa Rica campus, we detected the presence of *Aedes aegypti* through sampling and rearing larvae from the effluent. Furthermore, we used a multi-probe to characterize abiotic factors of the effluent in each lagoon and compared them to the density of mosquito populations. Finally, we explored the use of a screen and introduction of natural predators to control the mosquito population. Our results indicated a higher density of mosquito larvae at transects with median values for dissolved oxygen, ammonium, and total dissolved solids. The use of net screens showed no significant effect in preventing mosquito oviposition, however the introduction of dragonfly larvae to effluent ponds resulted in a significant decrease in mosquito larvae. This project identifies and presents potential solutions to a previously unknown problem that requires further investigation.

**Statistical and Graphical Analysis of Sex Trafficking Within Atlanta, Georgia**
Emily Rose Bumgarner, CURO Research Assistant
*Dr. David O. Okech, Social Work, School of Social Work*

An estimated 4.8 million people are trafficked in the commercial sex trade every year worldwide. This is a multi-faceted issue that exists within unique and extenuating circumstances throughout the world. Atlanta, GA has been named by the FBI as one of the 14 U.S. cities with the highest levels of sex trafficking of children and is known to be one of the largest and most active transportation hubs of victims of sex trafficking in the nation. Although sex trafficking is such a prevalent issue within Atlanta, GA, there is marked lack of understanding and knowledge of the issue. I believe the greatest contributing factor to the commercial sex trade within the city of Atlanta, GA is a lack of transparency and public knowledge. I believe a greater awareness of the commercial sex trade and the contributing factors aiding in the continuation of this trade would allow for a decrease in the prevalence of it. I hypothesize that the dissemination and use of effective and easily digestible data visualizations that present key factors in the continuation of the commercial sex trade within Atlanta, GA will cause a decrease in the prevalence of this trade. Utilizing high level data management and visualization tools, the vast amount of research and data that has been gathered and that will be gathered can be scaled down and made more useful. I anticipate that this will allow for the raw and undigestible data to become easily dispersed and useful.

**Work-Supportive Family Effects in Work-Family Conflict Decisions: Emotional Impacts**
Claire Burnett, CURO Research Assistant
*Dr. Kristen Shockley, Psychology, Franklin College of Arts and Sciences*

This study investigated the effect of having a work-supportive family on emotional reactions to work-family conflict in which work interferes with family. Participants were 78 working individuals (50% female) with at least one child. Participants first completed a pre-survey looking at work-support within their families in which questions were posed with a five-point Likert scale for response. Participants then reviewed two vignettes that described time-based work-family conflict decision-making scenarios and the decision that was subsequently made. They were told to visualize themselves in the situation where work interfered with family life and paused for 20 seconds after reading the vignette to do so. We then posed, "If you were in the previous situation, describe your likely reaction in terms of the following adjectives…" The list of presented emotions included anger, disappointment, and

repentance. Response scales were set on a five-point Likert scale ("not at all" to "a lot"). It was predicted that participants who indicated a strongly work-supportive family would respond more strongly to the presented emotions of anger, disappointment, and repentance. This was largely supported by the data. Understanding emotional reactions to work-family conflict of those with or without work-supportive families will clarify the dyadic relationship between emotions at home and in the workplace.

**Induction of Fluridone Resistance in *Plasmodium falciparum* (*Pf*)**
Allie Busbee, CURO Research Assistant
*Dr. Dennis Kyle, Cellular Biology, Franklin College of Arts and Sciences*

Malaria is a global health problem with over 216 million new cases a year. Of the species infecting humans, *Plasmodium falciparum* is the most lethal. Although a variety of anti-malarial treatments are available, the issue of drug resistance has become common. Because of this, it is imperative to discover new curative drugs with novel mechanisms of action. *Plasmodium* is an apicomplexan organism, and contains a plant-like apicoplast that is absent from host cells, and thus is an attractive target for drug discovery. Not much is known about the apicoplast; however, we can utilize work done in other apicomplexan parasites (such as *Toxoplasma gondii*) to further understand *Plasmodium*. In *T. gondii*, plant hormones, such as abscisic acid, play roles in calcium-dependent egress. Furthermore, fluridone, an herbicide inhibitor of abscisic acid (ABA), has previously shown to increase the period of dihydroartemisinin (DHA)-induced dormancy in *Plasmodium* parasites. Our goal is to identify the target for fluridone in the parasite and induce resistance in a line of parasites. We previously attempted to induce fluridone resistance by utilizing constant drug pressure at 1mM which was unsuccessful. Thus, we are reattempting to induce resistance with a "pulse" method that consists of exposing parasites with a low concentration of fluridone and then allowing them to recover from the drug pressure before slowly increasing the drug pressure until the line can resume growth above the sensitive line's IC50. Once a stable resistant line is obtained, we will sequence the parent line and the resistant progeny to identify putative targets of fluridone.

**The Effect of BCKDHB Mutation on Viability in Mice**
Lizabeth Grace Buzzelli
*Dr. Takahiro Ito, Biochemistry and Molecular Biology, Franklin College of Arts and Sciences*

Branched chain amino acids (BCAAs) are essential amino acids in mammals which consist of leucine, valine, and isoleucine. The branched chain keto-acid dehydrogenase (BCKDH) enzyme complex plays the role in BCAA metabolism of catalyzing the oxidative decarboxylation of the branched-chain alpha keto-acids (BCKAs). *BCKDHB* is the gene that encodes for the beta subunit in BCKDH. Defects in the BCKDH enzyme are caused by mutations in the beta subunit and are linked to Maple Syrup Urine Disease (MSUD). We used a mouse model of MSUD by the deletion of thirteen amino acids in mouse *Bckdhb*, resulting in a dysfunctional or 'knocked out' (KO) gene. In seven heterozygous intercrosses, no KO mice were observed alive among 37 mice at four weeks of age. To determine whether the homozygous loss of *Bckdhb* is lethal at embryonic or perinatal stages, we analyzed the genotype distribution at two embryonic stages and when the pups were born. At embryonic days 13.5 and 17.5, KOs were present at the frequency of 21% overall between the two embryonic stages. In contrast, twelve deceased pups were discovered among 47 pups and collected within the first three days post-birth for analysis. These results suggest the BCKDHB mutation is not functional in either embryonic or post birth but is fatal within the first three days after birth. These results can contribute to the understanding of the mutated BCKDH enzyme viability and the role of BCAA metabolism, and dysfunctional metabolism, in MSUD and cancer cell growth.

**Cellular Effects of Chemotherapeutic Agent Doxorubicin on the Corpus Luteum**
HaeYeun Byun, CURO Honors Scholar
*Dr. Xiaoqin Ye, Physiology and Pharmacology, College of Veterinary Medicine*

For many premenopausal female cancer patients, fertility impairment is an inevitable outcome due to gonadotoxic chemotherapeutics such as doxorubicin (DOX). The female gonad, ovary, has several structures important for fertility, such as follicles, oocytes, and corpora lutea. DOX has known adverse effects on follicle development and oocyte maturation; however, any potential effect of DOX on the corpus luteum is unknown. Corpus luteum is the main site for producing progesterone to support early pregnancy in mammals. Our preliminary data indicate that a single injection of DOX (10 mg/kg, a human chemotherapeutic dose) on gestation day 0.5 (D0.5) in mice leads to different levels of cell degeneration in D4.5 corpora lutea. We hypothesize that DOX disrupts corpus luteum function by increasing cell apoptosis and/or decreasing cell proliferation. We will inject female mice on D0.5 with either DOX (10 mg/kg DOX in PBS, N=6) or 100 µl of PBS (vehicle control, N=6), then collect serum and ovarian tissues on D3.5 prior to embryo implantation. D3.5 ovarian sections will be stained for PCNA to reveal proliferating cells, and detected for apoptotic cells using TUNEL assay. PCNA staining and TUNEL staining in the corpus luteum will be analyzed by ImageJ. Serum progesterone levels will be determined using an outside source. Cell proliferation and apoptosis data from ImageJ analysis and the progesterone levels will be compared between PBS and DOX groups to understand cellular effects of DOX on the corpus luteum for progesterone synthesis. Our study will contribute novel information to the field of oncofertility.

**Chimpanzees (*Pan troglodytes*) Fishing for Termites: Behavior and Tool Properties**
Katy Callaghan
Maggie Miller
*Dr. Dorothy Fragaszy, Psychology, Franklin College of Arts and Sciences*

Chimpanzees (*Pan troglodytes*) in the wild have been documented using plant parts to "fish" for termites. This form

of using tools in feeding is thought to be challenging for chimpanzees. We aim to document the details of this behavior to illuminate what aspects of the activity are challenging. Previously we analyzed the behavior of chimpanzees in the rainforest of Goualougo, Republic of the Congo. We focus here on 17 adult male, 31 adult female, and 15 juvenile chimpanzees living in the savanna woodland of Gombe, Tanzania, using video footage collected by R. O'Malley. We are interested in age differences in behavior and outcomes, variations in properties of the probes, such as length or stiffness, and modifications of probes, such as by shortening. After establishing reliability of coding among observers, we coded 58 video clips. Analysis is ongoing. Ultimately, we will compare the behavior of the chimpanzees in the Congo and in Tanzania to understand the extent to which termite-fishing is a locally-adapted skill, the extent to which it is challenging for young chimpanzees, and how skill develops in each population.

**Terminal Die-Back, The Result of a New *Neofusicoccum* Species**
Courtney Cameron, CURO Honors Scholar
*Dr. Marin Talbot Brewer, Plant Pathology, College of Agricultural and Environmental Sciences*

*Neofusicoccum* sp., a member of the *Botryosphaeriaceae* family, is a fungal pathogen of woody hosts. It is a threat to pecans (*Carya illinoinensis*) throughout the South as it damages the above-ground parts of plants. Terminal die-back is the most common symptom, resulting in dying or browning of terminal leaflets, and eventually entire compound leaves, scattered throughout a tree. The pathogen often remains dormant until the host's defense responses are suppressed by environmental factors such as drought. Some orchards in Georgia have begun displaying terminal die-back. The causal fungus has been identified as a member of the genus *Neofusicoccum*, but the species identity was previously unknown. Additionally, the disease has become more prevalent in Texas, so we were interested in determining if the casual fungus is the same as the species in Georgia. To determine the species of the fungus causing the disease, we studied the morphology and phylogenetic relationship of samples to those of known species such as *Neofusicoccum ribis*. Isolates of the fungus causing terminal die-back of pecan were grown, DNA extracted and 4 genes were sequenced, which were used for phylogenetic analysis. For morphological analysis, the isolates were sub-cultured onto water agar along with a piece of sterilized pecan material. Isolates were then kept at a stable temperature with alternating light. Results indicated the isolates collected from Georgia and Texas are phylogenetically and morphologically similar to each other but distinct from other *Neofusicoccum* species. These results show terminal die-back is caused by a new fungal species that needs to be fully described and named. We propose the name *Neofusicoccum caryigenum*.

**Personality Stereotypes of College Majors**
Ivan Campbell
*Dr. Brian Haas, Psychology, Franklin College of Arts and Sciences*

As identity develops through youth into adulthood in the United States, much of a person's identity becomes a product of their personal decisions. One of the most important decisions a young adult has to make is their college major (or lack thereof.) Their major impacts them by setting them on a track in life, grouping them together in an environment with like-minded individuals, and exposing them to a worldview through the lense of that major. Because of this, it is typically believed that differing majors share personality traits. Stereotypes of college majors' personalities exist, and on many college campuses the first question asked when getting to know someone is "what's your major," as that can be used to gauge their personality and interests. In this study we will ask at least 100 participants to answer a personality questionnaire based on the Five Factor Model of Personality as though they were a student of that major. For example, it could be found that people tend to view Business majors as more extroverted, and Psychology majors as more introverted, and therefore participants will answer according to their stereotype of that major. The majors examined are Psychology, Business, Engineering, Art, and Biochemistry. This study aims to determine if there are strong differences in how people view the personalities of differing majors vs. one another.

**Photosynthetic Efficiency of *Rudbeckia* and *Digitalis* and Implications for Supplemental Lighting**
Pia Campbell
*Dr. Marc van Iersel, Horticulture, College of Agricultural and Environmental Sciences*

Supplemental lighting is needed for growing high-quality ornamental greenhouse crops in wintertime. Supplemental lighting is expensive which makes it important to provide the optimal amount of supplemental light. Plants do not use all the light they receive, so it is important to know how efficiently plants use the provided light. We used two popular ornamental species, *Digitalis purperea* 'Dalmation Peach' and *Rudbeckia fulgida* 'Goldsturm', grown in greenhouse using normal production procedures. Chlorophyll fluorescence measurements with light levels ranging from 20 to 950 $\mu mol \times m^{-2} \times s^{-1}$ were used to determine the quantum yield of photosystem II, a measure of how efficiently plants use light. The rate of electron transport, indicative of the speed of the light reactions of photosynthesis, was calculated from quantum yield. The quantum yield of *Rudbeckia* and *Digitalis* decreased from 0.77 to 0.42 and 0.76 to 0.30, respectively, as the light level increased from 20 to 940 $\mu mol \times m^{-2} \times s^{-1}$. At high light levels *Rudbeckia* used light 40% more efficiently than *Digitalis*. The differences in quantum yield between two species were reflected in the rate of electron transport rate, which reached 170 and 130 $\mu mol \times m^{-2} \times s^{-1}$ for rudbeckia for digitalis, respectively, at a light level of 940 $\mu mol \times m^{-2} \times s^{-1}$. Since *Rudbeckia* uses light more efficiently than *Digitalis* it suggests that *Rudbeckia* would benefit from higher levels of supplemental light. These results can be used to develop optimal supplemental lighting for these two crops to ensure growers do not spend more money on electricity than needed.

**Petrography of the Gneisses from the Mary Lou Quarry in Clinton, SC: Implications for Quantifying Mineral Compositions in the Critical Zone Stage 2**

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

The environment between tree tops and deep bedrock are influenced by meteoric waters in called the critical zone. Critical zone observatories (CZO) are sites that are designed to study biogeochemical interactions that occur in time scales from seconds to geological millennia and spatial scales from microns to kilometers. The CZ is important to many terrestrial life (including humans), however the physical and chemical properties and their function are not always well characterized. In particular, CZ science is challenged to accurately quantify mineral assemblages that occur in the subsurface. Soil quality in terms of nutrient capacity and water availability are closely related to the parent rock material, which weathering process act upon. Stage 1 implemented X-ray powder diffraction and thin section analysis as approaches to quantifying minerals. Although the techniques are based on different principles, the quantitative result should agree. It is hypothesized that the two methods will agree in outcome, given assumptions about mineral stoichiometry. To test this hypothesis, thin sections were analyzed using energy dispersive X-ray spectroscopy (EDS) to conduct composition analysis. Three samples were collected from the deep Mary Lou aggregate quarry to provide a basis to evaluate unaltered parent rock. In these slides, K-feldspar was of interest due to it being an indicator of weathering. Results are intended to highlight the differences in each approach and reconcile the inadequacies between the techniques. Reconciling these differences can lead to understanding the range of feldspar mineral composition variation in both small and large landscape scales.

**Cooperation Among and Between Religious and Non-Religious Non-Governmental Organizations**

Stephanie Cannon
*Dr. Amanda Murdie, International Affairs, School of Public and International Affairs*

Non-governmental organizations play a significant, yet often overlooked, role in international politics. These organizations have the power to bring attention to an issue, influence policy, and even use public support as leverage against governments. As I reviewed the research conducted by Dr. Amanda Murdie on the cooperation of non-governmental organizations based on their interactions with other organizations, I became interested in the role religion plays in deciding which other organizations a non-governmental organization would work with. My hypotheses stated that (a) religious non-governmental organizations are more likely to work with other religious non-governmental organizations, (b) non-religious non-governmental organizations are more likely to work with other non-religious non-governmental organizations, and (c) religious non-governmental organizations are more likely to work with another religious non-governmental organization with the same religious affiliation. After I coded 1,200 non-governmental organizations as religious or non-religious, my two co-authors and I used the R program igraph to determine whether the cooperation among religious and non-religious non-governmental organizations would be statistically different. Our analysis shows that the connections between religious non-governmental organizations, specifically those of the same religion, are statistically more likely to cooperate, especially when compared to non-religious non-governmental organizations.

**The Role of the Nervous System in Bone Homeostasis and Creating an Atlas of Mouse Bone Innervation**

Rachel Nicole Carlyle, CURO Research Assistant
*Dr. Luke Mortensen, Animal and Dairy Science, College of Agricultural and Environmental Sciences*

A healthy bone continuously undergoes the physiological process of bone regeneration by keeping a balance between bone resorption and formation: a process called homeostasis. Several regenerative properties have a significant role in maintaining the homeostasis, which could be used as a therapy for degenerative bone diseases. This experiment is interested in studying the role of the nervous system in bone homeostasis. To do this, a transgenic mouse model (Thy1-YFP) is used, which expresses yellow fluorescent protein at high levels in motor and sensory neurons. This allows better observation of the nervous system in relation to bone formation. The overall goal of this project is to produce an atlas of mouse bone innervation, specifically in the skulls of newborn Thy1-YFP transgenic mice since it will be easier to map their neurons that already exhibit fluorescence. This will be done by slicing the skull of the newborn mice before they are 7 days old by cryosectioning. The slices will further be stained using CD63 antibody conjugated to the fluorescent dye Alexa Fluor 647. After perfecting this method, cryosectioning will be performed on tissue cleared adult Thy1-YFP mice, allowing for easier sectioning and imaging.

**Knowledge, Probability, and Legal Proof**

Spencer Caro
*Dr. Sarah Wright, Philosophy, Franklin College of Arts and Sciences*

Absolute certainty of guilt is an unrealistically high standard for legal proof. Accordingly, the standards for legal proof should be probabilistic, in that they come in degrees and leave a margin for error. The state of having legal proof is also factive, i.e. what is legally proven must be true, and factive states require knowledge. So, given that legal proof requires knowledge, in what sense can it have probabilistic standards? The literature affords two categories for competing answers to this question. Traditional answers develop probabilistic standards in terms of evidential probability, defined as the probability of guilt conditional on the available evidence. To establish the requisite knowledge for legal proof, the evidential probability must exceed a particular threshold set by the relevant legal standard. Call this the evidential probability approach. However, Moss 2018 provides a second kind of answer, according to which the content of the knowledge itself is probabilistic. Moss claims that the content of knowledge is a probability space, which contains a set of possibilities and a probability function

defined over them. On this view, the requisite knowledge for legal proof must take as its content a particular probability space, as determined by the relevant legal standard. Call this the probabilistic content approach. In this paper, I will critically compare the evidential probability and probabilistic content approaches. Doing so will yield insight into the relationship between knowledge and probability, and how this relationship can inform the law of evidence.

**Effect of Topoisomerase Inhibitors on Growth of a Mitochondrial DNA Network in a Trypanosome**

Steven Carroll
*Dr. Kojo Mensa-Wilmot, Cellular Biology, Franklin College of Arts and Sciences*

*Trypanosoma brucei* is a protist that causes fatal diseases in cattle (*nagana*) and humans (Human African Trypanosomiasis). In *T. brucei*, a mitochondrial nucleoid, called the kinetoplast, contains mitochondrial DNA (mtDNA) consisting of concatenated maxicircles and minicircles (kDNA network). In the current model for kDNA expansion, topoisomerase II (topo II) mediates decatenation of minicircles from the kDNA network into a "kinetoflagellar zone" inside the mitochondrion, where mtDNA synthesis occurs. Newly synthesized mtDNA is detected at "antipodal sites" flanking the kDNA network, from where they are hypothesized to be reattached to the kDNA network by a topoisomerase II. Direct evidence for this model is not available, since intramitochondrial movement of mtDNA *in vivo* has not been reported. We have developed an assay that tracks the location and movement of newly synthesized mtDNA. To advance our work, we will treat trypanosomes with topo II inhibitors, and observe their effects on possible movement of mtDNA from antipodal sites to the interior of a kDNA network. These studies are likely to reveal a previously unknown roles of DNA topoisomerases in kinetoplast biology.

**Making Water Work: A Public-Private Partnership for Water Security in Karachi, Pakistan**

Elizabeth Cowen Carter, CURO Research Assistant
*Dr. Amanda Murdie, International Affairs, School of Public and International Affairs*

United Nations' Resolution 64/292 states that access to water is a basic human right; despite this, 40% of Karachi, Pakistan suffers from acute water scarcity due to outdated infrastructure, ineffective government initiatives, and the emergence of a "water mafia" which siphons water routed to residential areas, only to resell the water to those same people. The corruption that facilitates this black-market resale of the water highlights institutional insecurity and resource scarcity facing Karachi. Here we demonstrate the promise of an international public-private partnership (PPP) to alleviate the health and monetary impacts of these issues. After studying best practice in the development industry, this partnership will follow the pattern of those designed by USAID and the US Department of State and would involve the local water administration, local NGOs, and the UPS Foundation. Agencies engaged in foreign aid are increasingly opting for public-private partnerships to not only address the problem at hand, but to also more effectively engage local stakeholders and offset the cost of the project through private financing. By studying PPPs used for comparable issues of resource scarcity, we identified key attributes of successful PPPs, incorporating these attributes to create a hybrid model in Karachi, taking into account the current situation.

**Associations Between Personality and Barriers to Medication Adherence in Adolescent Transplant Recipients**

Shannon Kathleen Casleton, CURO Research Assistant
*Dr. Ronald L. Blount, Psychology, Franklin College of Arts and Sciences*

Solid organ transplantation is the primary treatment for adolescents with end-stage organ failure. Failure to adhere to strict medical regimens following these procedures can lead to serious consequences for transplant recipients, including organ rejection, graft loss, or even death. For adults, the personality factor conscientiousness is often associated with positive health outcomes, whereas neuroticism is associated with worse health outcomes. Less research has examined how agreeableness relates to health. Further, little research has addressed the association between personality and health outcomes in pediatric patients. In this investigation, the NEO-Five Factor Inventory (NEO-FFI) measure of adolescent personality (i.e., neuroticism, conscientiousness, and agreeableness) and the Adolescent Medication Barriers Scale (AMBS), which assesses patients' perceived barriers to medication adherence (e.g., forgetting, doesn't like taste), were administered. The sample includes 93 adolescents (M=17.29 years, SD= 2.04) who had received a kidney, liver, or heart transplant. Greater levels of neuroticism were associated with greater barriers to medication adherence (i.e., ingestion issues, regimen adaptation, and disease frustration; r= .32 to .53, $p < .01$). On the other hand, higher levels of agreeableness (r= -.31 to -.49, $p<.01$) and conscientiousness (r= -.32 to -.49, $p<.01$) were correlated with fewer barriers to medication adherence (i.e., ingestion issues, regimen adaptation, and disease frustration). Age was not related to barriers ($p>.05$). Assessing personality may help identify adolescents at greater risk for experiencing barriers to medication adherence. They may benefit from additional resources and/or support from their healthcare team or family to address these barriers and increase medication adherence.

**The Effects of the Corazonin Gene on the Lifestyle Behavior of Sunflower Fed *Oncopeltus fasciatus* Males**

Katie Cavender
*Dr. Trish Moore, Entomology, College of Agricultural and Environmental Sciences*

Dr. Moore's lab has previously discovered that a male milkweed bug *Oncopeltus fasciatus*'s diet has an effect on his lifestyle behavior. When males are fed on milkweed, their natural diet, they live with a 'live fast, die young lifestyle'. They mate often. Contrariwise, males fed solely on sunflower seeds have a life style that is much more relaxed and focused on longevity. They are less focused on mating frequently. These differences in

lifestyle have been linked to the up and down regulation of the corazonin gene. The research at hand will knock out the corazonin gene with double stranded RNA injections. It will then assess if this knockdown causes sunflower fed males to live more like milkweed fed males. This will be evaluated by analyzing the mating behavior of both control and corazonin knockdowns. When males are 7-10 days, a virgin female will be added their petri dishes. The time to copulation will be measured for each pair of bugs. They will also be checked at random within the 48 hours of their time together. These checks will assess if they are in that moment mating or not. These measurements will be used to determine the mating rates of control vs. corazonin knock down. It is predicted that knocking out the corazonin gene in sunflower fed males will incite a milkweed fed lifestyle, stimulating them to mate more quickly and more often.

**Isoflavonoid Biosynthesis Pathway May Be Involved in Soybean Insect Resistance**

Ted Chambers
*Dr. Wayne Parrott, Crop and Soil Sciences, College of Agricultural and Environmental Sciences*

Soybean (*Glycine max*) is one of the world's most important agricultural products. Methods that improve resistance of the soybean leaf against insect feeding are beneficial by preventing yield losses. An allele of QTL-M, originally found in an old soybean variety, confers resistance against caterpillars, presumably by altering flavonoid biosynthesis in response to insect attack. Based on mapping and complementation studies, it is hypothesized that the gene underlying QTL-M encodes for a putative isoflavone glucosyltransferase. Loss-of-function and the resultant flux to other branches of the flavonoid biosynthesis pathway lead to resistance. However, the compound(s) normally glucosylated by the functional version of QTL-M is not known. Therefore, an important aspect of resolving the mechanism by which this defense operates is profiling the flavonoid differences between resistant and susceptible lines that differ only in the allele of QTL-M they carry. Profiling will measure levels of key flavonoids via LC-MS before and after insect feeding. Based on preliminary results, the profiling will focus on genistein derivatives and precursors to condensed tannins. Understanding the role of isoflavones and other flavonoids in resistance can help design strategies to deploy insect resistance in soybean and other legume breeding programs.

**Individual Differences in Responding to Increase Work Responsibilities**

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

People experience a great deal of stress. One apparent source of stress is in the workplace. Although some of that stress likely comes from individual responsibilities, we suggest that stress will increase if others' responsibilities are added. We suggest that varying levels of responsibility will affect how a person views their work. The present study investigates how people think about their work based on the amount of responsibilities they are given. Using an online survey, we asked participants to describe their personality, including self control, conscientiousness, commitment, and openness to experience. We also measured how people think about their work when they are given additional responsibilities. We asked participants to consider how they might feel if a colleague gets transferred to a different position in another department and their boss has temporarily transferred that colleagues' responsibilities to them. We then asked how the added responsibilities might affect their experiences of stress and thoughts about their work. We expect that individuals with high self control and work-commitment will view work positively but more challenging (i.e., stressful) in the time period of added responsibility, and individuals low in self control and commitment will view work negatively and more challenging during that time.

**Growth Rates of Juvenile Atlantic Sturgeon in the Altamaha River, Georgia**

Catlyn Victoria Chapman
*Dr. Adam Fox, Forestry, Warnell School of Forestry and Natural Resources*

Over the last century, Atlantic Sturgeon have suffered major population declines as a result of human activities including dam construction and unsustainable fisheries. These actions led to the listing of Atlantic Sturgeon as endangered. Despite their status, relatively little is known about southern sturgeon populations. Many sturgeon life history traits, including growth, are understudied, especially in the south. This led to the assessment of river-resident age-1 juvenile growth rates from 2006-2018. In addition, in order to assess juvenile growth rates in the Altamaha River, GA, we used anchored gill and trammel nets to catch sturgeon. For each captured sturgeon, we measured fork length (FL) and scanned for a passive integrated transponder (PIT) tag. If no tag was present, we inserted a PIT tag under the 4th dorsal scute. All capture data from 2006-2018 was analyzed, and any fish that was recaptured more than a week of initial capture was included in the data set. Growth rate was calculated by the difference in FL between initial captures and the number of weeks between captures. We found the median growth rate across all years to be 3.60 mm/wk and the overall standard error to be 0.077. The years of 2011 and 2018 showed significant differences in growth rate when compared to other years. An analysis of growth rate vs. river discharge showed no correlation. A better understanding of juvenile growth can help inform management actions to help protect juveniles of this endangered species.

**The Role of Transcription Factor Ftz-F1 in Planarian Regeneration**

Yamini Chavan, CURO Research Assistant
Lauren Thompson
*Dr. Rachel Roberts-Galbraith, Cellular Biology, Franklin College of Arts and Sciences*

Regeneration and tissue repair are crucial to an organism's survival, especially after injury. Unlike humans and many other species, freshwater flatworms called planarians completely

regenerate after injury or amputation. Our laboratory aims to identify and characterize new factors that regulate regeneration in planarians. We have recently identified the transcription factor encoding gene, *ftz-f1*, as a regulator of regeneration in planarians. In organisms like *Drosophila* and mice, *ftz-f1* homologs are crucial for proper development. Our goal is to understand how Ftz-F1 influences regeneration in planarians, using techniques such as RNA interference, quantitative polymerase chain reaction (PCR), colorimetric and fluorescent in-situ hybridization, and immunofluorescence. Our initial experiments suggest that a potential target of Ftz-F1 is stem cells, because long term knockdown of *ftz-f1* prevents normal growth and reproduction by fissioning. We are currently testing this hypothesis directly by observing stem cell maintenance and division. We are also investigating other potential roles for *ftz-f1* including regulation of stem cell progenitors and effects on differentiated cell types (e.g. muscle). Understanding the role of Ftz-F1 in regeneration will, in turn, allow us to better understand the mechanisms through which planarians regenerate.

**Effects of Gaga Intervention on Dancers**
Ryan Chen, CURO Research Assistant
*Dr. Tarkesh Singh, Kinesiology, College of Education*

Dance is a form of expression using the body as medium. In this expression, the performed sequences of actions and movements must be flexible yet precise, leading to difficulties in instruction due to misinterpretation and difficulties in communication. The Gaga pedagogy, a novel movement language developed by Batsehva Dance Company choreographer Ohad Naharin, attempts to solve this problem. The effects of the Gaga intervention, which has been rapidly gaining popularity across the world, have not been carefully studied, but are thought to include increased enjoyment and passion for dance and exercise, increased confidence, and increased body awareness. This study will attempt to examine and quantify the effects of the Gaga pedagogy and explore its possible applications to both clinical and healthy populations. 19 college dancers were instructed to perform 3 cycles of the Penché ballet technique. After instruction via Gaga techniques, participants were then instructed to perform another set of Penché movements. Movements were tracked via markers worn by the participants for comparisons pre-intervention to post-intervention.

**Psychological Aspects of Objective Measures of Stair Climbing**
Sarah Cherof, CURO Research Assistant
*Dr. Patrick O'Connor, Kinesiology, College of Education*

The association between physical activity and mental health is of great interest. While there is ample information on this subject, there is much less regarding the relationship between stair climbing and mental health. The purpose of this presentation is to analyze and discuss the current literature on stair climbing and mental health. Specifically, we will be discussing experiments in which stair climbing was objectively measured and used as the independent variable. To better understand the existing information, a systematic review was done, following standardized guidelines of the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA). A search was done in PubMed, PsychInfo, and Web of Science using keywords related to stair-climbing and mental health. Further sources were then found using citations from relevant papers. These articles were then sorted and included or excluded based on standardized criteria. Within the studies found, objective measures included stair climbing time, stair height, and number of stairs traversed. Ten studies were found through this literature review. Of these studies, eight showed an association between positive mental health outcomes and faster stair climbing. Among medical patient samples, four studies have found those with poor mental health tended to be slower in stair navigation time. There is an insufficient amount of information on the relationship between mental health outcomes and stair navigation when stair height is manipulated. More research is needed to learn if these findings to extend to the general population.

**Correlating Stroke Risk and Sub-Clinical Deficits in Executive Functioning via the CHA2DS2-VASc Score**
Harrison Chong, CURO Research Assistant
*Dr. Lawrence Sweet, Psychology, Franklin College of Arts and Sciences*

Recently, various clinicopathologic features associated with cardiovascular risk factors seen in mid to late-life cerebrovascular disease have received estimable attention due to rising mortality rates caused by heart disease. More specifically, cardiovascular risk factors mediate the relationship between late-onset cerebrovascular disease (CVD) and cognitive impairment. Risk factors such as chronic hypertension, resultant atherosclerosis, and history of ischemia and infarction have been shown to manifest deleteriously in cognitive functioning. Late-life CVD runs the gamut in terms of clinical presentation; myriad factors weigh into one's prognosis and isolating specific sources of cognitive dysfunction can be a nebulous process. Thus, there has been recent interest in forecasting these complications in later life. A simple test, the CHADSDS2-VASc score is a tool with recently realized prognostic capability regarding later-life cognitive functioning. Although originally intended to predict stroke risk, these tests provide quick, informative summaries of a patient's clinical presentation, motivating interest in potential applications elsewhere. With respect to cognitive functioning, these scores have only been applied to populations characterized by severe disease as opposed to sub-clinical symptomatology. To this end, we administered the CHA2DS2-VASc test and a battery of neuropsychological assessments to a group of relatively healthy controls to analyze correlations between stroke risk and sub-clinical deficits in executive functioning in hopes of elucidating the potential utility of the CHA2DS2-VASc score in gauging individual risk of developing cerebrovascular-related pathologies.

**Longitudinal Spatial Proximity May Predict Copulatory Events in a Zoologically-Housed Western Lowland Gorilla (*Gorilla gorilla gorilla*) Pair**

Katherine Fredrica Christie, Foundation Fellow, CURO Research Assistant
*Dr. Dorothy Fragaszy, Psychology, Franklin College of Arts and Sciences*

Sustainable captive breeding is at the foundation of the Association of Zoos and Aquariums' Ape Taxon Advisory Group mission. The complex nature of gorilla sociality and reproduction can cause low efficiency and breeding success rates in captive populations. In this study, we examine under-utilized factors in captive gorilla reproduction: exhibit space use and inter-individual proximity. Data was collected on a Species Survival Plan-recommended breeding pair of western lowland gorillas (*Gorilla gorilla gorilla*), housed at Zoo Atlanta (Atlanta, GA). Using spatial and behavioral data collected between June 2017 and December 2018, we calculated inter-individual distances from approximately 1800 scans. This time period included months before and after cessation of contraceptive drug administration to the female. Inter-individual distance will also be analyzed in connection to observed copulation events. We will use this information to determine whether inter-individual distance decreases over mutually-fertile exposure time and whether distance is consistently lower on copulation days than non-copulation days. We hypothesize that both of these predictions will be supported. These results could provide zoos and regulatory organizations with another metric with which to monitor the success of captive breeding attempts and make recommendations for the future regarding reproductive pairs, habitat design, and group demography.

**Phosphorylated Tau Levels Moderate the Relationship Between Cognitive Status and Depression**

Sydney Chummar, CURO Research Assistant
*Dr. Steve Miller, Psychology, Franklin College of Arts and Sciences*

Research suggests a significant relationship between Alzheimer's Disease (AD) and development of depression in older adults. However, possible biological factors impacting this relationship are understudied. The purpose of this study was to examine the relationship between AD and depression, and whether phosphorylated-tau levels, a biomarker of AD that has been found to be related to depression in some populations, moderates this relationship. The sample consisted of participants from the Alzheimer's Disease Neuroimaging Initiative (ADNI) and included 716 older adults with an average age of 74. The population consisted of 40.5% female and 90.1% Caucasian individuals. Based on neuropsychological assessments, each participant was classified by cognitive status (i.e., cognitively normal (CN) or having AD). Depression was based on the total score of the Geriatric Depression Scale (GDS). A hierarchical multiple regression was utilized to analyze the amount of variance explained in depression scores. Results indicated that there was a significant effect of cognitive status on GDS, with cognitive status explaining 10% of the variance ($R^2$=.100, p<.001). Phosphorylated-tau levels explained .2% of the variance above and beyond what was explained by cognitive status ($R^2$=.002, p=.133). The interaction term explained significant variance, $R^2$=.005, p=.038, one-tailed. The interaction revealed that phosphorylated-tau levels were correlated to depression in individuals with AD (p=.025, one-tailed). However, for those who were CN, phosphorylated-tau was not related to depression (p=.221, one-tailed). Further research should be done on tau levels, as it could be very important in the prediction and diagnosis of depression in individuals with AD.

**Trans-Acting Factors that Regulate CRISPR DNA Uptake in *Pyrococcus furiosus***

Landon Clark, CURO Honors Scholar, CURO Summer Fellow
*Dr. Michael Terns, Biochemistry and Molecular Biology, Franklin College of Arts and Sciences*

Viruses outnumber bacteria and archaea in a ten to one ratio; therefore, prokaryotes need defense systems to combat this discrepancy. One of these defense systems utilized in bacteria and archaea is the Clustered Regularly Interspaced Short Palindromic Repeats (CRISPR) along with CRISPR associated proteins (Cas). Recently, this prokaryotic adaptive immune system was exploited as a powerful genomic editing tool, including editing genes for malaria in mosquitoes and treating diseases such as HIV and hemophilia. The function of these CRISPR-Cas systems follow three basis steps. First, in adaptation, invading DNA is integrated into the host genome at the CRISPR locus. Then, in crRNA biogenesis, the CRISPR locus is transcribed and processed to form mature CRISPR RNAs (crRNA). Finally, in invader silencing, mature crRNAs are associated with Cas protein nucleases that silence future foreign invaders. This research focuses on the first step in the CRISPR-Cas system, adaptation. It is known that two proteins, Cas1 and Cas2, are universally conserved among all CRISPR-Cas systems and involved in adaptation by acting as a complex to integrate foreign DNA into the CRISPR locus. By using the hyperthermophilic archaeon *Pyrococcus furiosus* , this research tests the role for candidate proteins, specifically DNA binding proteins, which are hypothesized to regulate DNA acquisition or modulate uptake of properly sized and oriented DNA fragments into the CRISPR genome in a polarized manner. Understanding underlying mechanisms of CRISPR-Cas systems are important for a wide range of basic research, biotechnology and biomedical applications.

**Diminished Hedonic Response in Youth at Clinical High-Risk for Psychosis**

Kendall Clay, CURO Research Assistant
*Dr. Gregory P. Strauss, Psychology, Franklin College of Arts and Sciences*

Anhedonia, defined as the diminished capacity to experience pleasure, has long been considered a core symptom of schizophrenia. Although this symptom has been proposed to increase liability for developing the disorder, few empirical studies have actually examined hedonic response in youth at clinical high risk (CHR) for developing a psychotic disorder. Schizophrenia is typically proceeded by a prodromal (i.e.,

pre-illness) period characterized by attenuated psychosis and functional decline, which serves as a window for detecting mechanisms that predate illness onset. The current study examined whether CHR youth (n = 40) and demographically matched healthy controls (n = 40) differed in emotional response to a laboratory-based task that required them to rate how positive, how negative, and how arousing they found a series of evocative and neutral stimuli. Results indicated that the CHR youth reported less positive emotion to pleasant stimuli, as well as less negative emotion to unpleasant stimuli compared to controls. Furthermore, depressive and anxiety symptoms predicted the degree of affective blunting to both pleasant and unpleasant stimuli. These findings suggest that deficits in emotional response in both the positive and negative reactivity systems are present in individuals at CHR and may thus contribute to liability for schizophrenia.

**Assessing Georgia Housing Quality Using a Participatory Geographic Information Systems (PGIS) Approach**

Josh Clifford, CURO Research Assistant
*Dr. Jerry Shannon, Geography, Franklin College of Arts and Sciences*

Participatory GIS (PGIS) is an approach to using Geographic Information Systems (GIS) by empowering communities to be the driving force behind their own geospatial decision making. PGIS oftentimes relies on low cost and open source tools for community members to combine their local knowledge with the expertise of GIS technology. By making it accessible for community members to actively participate in GIS creation and analysis, they are then able to have more ownership, investment and say in what and how decisions are made in and for their community. This research focuses on how PGIS plays a part in communities enrolled in the Georgia Initiative for Community Housing (GICH) program. GICH is a three-year program that helps Georgia communities develop strategies to identify and improve upon their overall housing quality. The Community Mapping Lab has assisted in developing a digital housing assessment survey that GICH community members are able to use for collecting housing data. Once this data is uploaded into a digital repository, the lab is then able to project it onto a map as a R Shiny Web Application. This map, which allows users to identify patterns and isolate various housing issues at a parcel level, is then given to its respective community partner. The goal is for these maps to assist communities in developing a strategy to improve their housing quality. This research showcases the benefits and processes of such a relationship between community partners and outside technology as it relates to participatory GIS.

**Low-Level CH Emission at the Edges of the Interstellar Cloud, MBM 40**

Jessica Lynn Cmiel
*Dr. Loris Magnani, Physics and Astronomy, Franklin College of Arts and Sciences*

We aim to determine whether or not the CH ground state, lambda-doubled, hyperfine, main-line transition at 3335 MHz is able to trace molecular gas in the outermost regions of a nearby interstellar molecular cloud, MBM 40. Low-level molecular gas at cloud edges is important for determining how a molecular cloud forms from its surrounding atomic environment, but tracing this molecular gas is difficult. The CO J=1-0 rotational line at 115 GHz and the OH 18 cm lines have been used with mixed results. We will use CH 3335 MHz data that was obtained about thirteen years ago to see if this transition may work as a molecular gas tracer in these regions. Our method will be to re-examine the data by adding nearby spectra together in an effort to improve the signal-to-noise. In effect, we are trading spatial resolution for greater sensitivity. If low-level emission is present, then CH will prove to be a viable tracer of molecular hydrogen in low-density, low-opacity cloud regions.

**Changes in Financial Distress and Relationship Quality Following a Couples' Relationship and Financial Literacy Program**

Hayley A. Cohen, CURO Research Assistant
*Dr. Ted Futris, Human Development and Family Science, College of Family and Consumer Sciences*

According to the Family Stress Model, economic hardship negatively impacts couple relationship quality and stability. Moreover, economically driven problems affect each partner's psychological well-being and the couple's ability to navigate through economic difficulties together. Research evaluating couples and relationship education (CRE) interventions with couples in general, as well as economically disadvantaged participants specifically, have been shown to positively improve couple functioning and relationship quality over time. However, research is limited on whether these interventions also help reduce couple's sense of financial distress, and how improvements in couple functioning and relationship quality are linked to changes in financial distress. The current study aims to explore these changes and associations. Supported by a federal grant, Project F.R.E.E. (www.ugaprojectfree.com) offers CRE and financial literacy programming to low-resource parents engaged in child welfare services in order to improve couple and family functioning. This presentation will share results examining changes in financial distress and relationship quality before and after the CRE intervention, and whether a subsample of couples who receive a supplemental financial literacy program after the CRE intervention report additional positive effects on financial and relationship well-being.

**How Informed are UGA Students on Voter Suppression?**

Syd Cohen
*Dr. Brittany Bramlett, Political Science, School of Public and International Affairs*

With the recent election of ex-Secretary of State Brian Kemp to the position of Georgia's governor, a new light has been shed on voter suppression. During the 2018 midterm election season, thousands of voters in Georgia had their registrations flagged, which hindered their ability to vote in the election. Due to this unique situation in which a Secretary of State is also running for governor's office, many questions about whether or not Kemp should have stepped down from office while campaigning arose. Past research discovered that voter

fraud is essentially nonexistent, yet many politicians still use this phrase, along with the "exact match" law, as a method to crack down on legally registered voters. By surveying almost 1,500 University of Georgia POLS 1101 students in November 2018, we were able to gain insight into their awareness about topics such as voter suppression and the "exact match" law. We will evaluate the students' attitudes on these issues based on certain demographics, such as gender, race, or political party affiliation. In addition, we plan to explore these responses in context with the most recent midterm election.

**The Effects of the Dual Oxidase (DUOX1) Microbial System on Influenza A**

Maria Colon
*Dr. Balazs Rada, Infectious Diseases, College of Veterinary Medicine*

Dual oxidase 1 (DUOX1) is a protein found in respiratory epithelium. DUOX1 has been shown to have antimicrobial effects *in vitro*. In the laboratory we tested whether the absence of *Duox1* gene in mice using *Duox1* knockout has any effect in influenza infection. Additionally, we verified if the number and location of neutrophils, which are critical to innate immune response against influenza infection, are impacted by the lack of *Duox1* in flu-infected vs. uninfected. In the experiment, we genotyped mice to decipher which ones were wild type (*Duox1*-expressing) and which were DUOX knock out (*Duox1*-deficient). Then, mice were intranasally infected with the PR8 strain of the Influenza A virus and were taken down at days 3 and 5 to see neutrophil staining in the lung tissue using Immunohistochemistry. Our staining data indicated that neutrophils could be higher in the DUOX knockout when compared to the wild type mice. Viral nucleoprotein staining was also performed within the trachea to detect the presence of virus in infected mice with different volumes of the virus. Our results showed that the nucleoprotein showed presence in the 40ul volume and therefore this virus reached deep into the respiratory system. Overall, my results indicate a higher viral load and inflammation in the absence of *Duox1* in influenza infection.

**Removal of Nutrients from Agricultural Wastewater by Modified Biochar**

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

The pollution of freshwater by agricultural wastewater is a threat to humans and ecosystems worldwide. Nutrients such as nitrogen and phosphorus enter waterways in runoff from fields where animal wastes have been over-applied. This can be mitigated by treating agricultural wastewater before application to fields, as well as preventing the leaching of nutrients from soil. Biochar is a low-cost, charcoal-like product made from waste biomass that can remove nutrients from wastewater and retain nutrients in soils. However, most biochars are poor at removing phosphate ions. Recently, biochars modified with metals have been shown to be effective for removing phosphate ions from wastewater. Little is known about the relative effectiveness of biochars modified with different metals for phosphate removal. Also, the simultaneous removal of phosphate and ammonium-nitrogen by metal modified biochars is not understood. The goal of this study was to evaluate the relative effectiveness of metal modified biochars for removing ammonium and phosphate from agricultural wastewater. Solutions of Aluminum, Calcium, Iron, and Magnesium salts were used to modify peanut shell biochar. Batch sorption tests and adsorption isotherms were used to compare the abilities of the unmodified and modified biochars for removal of ammonium and total phosphorus from swine wastewater and pure solutions of the contaminant. The magnesium biochar showed increased ammonium and phosphorus removal, while the other metal modifications only increased phosphorus removal. After wastewater treatment, spent biochar could be applied to fields as an amendment that retains nutrients in soil, thus reducing the need for fertilizing.

**Synthesis of Biological Inhibitors for use in Catalytic Enzyme-Based Reactions**

Michael Timothy Conners
*Dr. Robert S. Phillips, Chemistry, Franklin College of Arts and Sciences*

Dr. Phillip's research strives to discover the chemical basis for how enzymes, the catalysts driving biochemical reactions, influence such dramatic rates of reaction acceleration. Enzymes are activated by substrates in an interaction requiring unique region specificity. In order to quantitate the effectiveness of an enzyme one must first determine its general chemical structure and how its properties change under differing conditions. Two groups of key bodily enzymes are currently being studied in Dr. Phillip's lab: Vitamin B6 dependent enzyme (used to cleave specific amino acids) and alcohol dehydrogenase (used in the breakdown of alcohols). To discover this, several techniques may be implemented such as rapid-scanning stopped-flow kinetics, site-directed mutagenesis, hydrostatic pressurization, or synthesis of potential inhibitors. My research is directed on inhibitor synthesis, where various reaction conditions are experimented with in order to form an ideal molecular structure for which proper reaction inhibition can occur. Currently we are attempting to nitrate the outer ring on the chemical kynurenine, a derivative of the amino acid tryptophan. If successful, this new molecule could potentially block a key passageway responsible for the production of Quinolinic acid, a byproduct known to damage DNA. With such exploration we hope to further our understanding in some of biology's key chemicals, while perhaps paving way for new and powerful pharmaceutical applications.

**Catch Me If You Can: Identifying Fast-Evolving Genes in the Genus *Cryptosporidium***

Garrett Winston Cooper
*Dr. Jessie C. Kissinger, Genetics, Franklin College of Arts and Sciences*

*Cryptosporidium* is a widespread apicomplexan parasite that causes cryptosporidiosis, the second leading cause of diarrheal disease in infants globally. It is often fatal in immunocompromised patients. This genus has at least 30

different characterized species with a broad host range. Unfortunately, single locus genotyping of just one marker *gp60*, which encodes the highly polymorphic 60 kD glycoprotein (*GP60*), is used as the standard for intraspecific genotyping. This marker indeed parallels some phenotypic traits, like host preference, but like many other parasites, *Cryptosporidium* reproduces sexually during its life cycle leading to frequent genetic recombination, yielding increased genetic diversity between samples. Thus, a single-locus is unable to correctly represent population structure. The goal of this project is to identify other potentially fast-evolving loci that can be used for multilocus subtyping of *Cryptosporidium*. All proteins are susceptible to evolutionary pressures. Depending on the nature of these forces, genes can undergo positive, negative, and neutral selection. This project is focused exclusively on genes undergoing positive selection, presumably through the pressure of the host immune system. To identify positively selected genes, variations in single nucleotide polymorphisms (SNP's) were identified in divergent *Cryptosporidium* genome sequences. The SNP data, when combined with genome annotation, permits evaluation of synonymous and non-synonymous polymorphisms, which can in turn be used for dN/dS calculations. Identification of additional fast-evolving gene candidates through dN/dS analysis will help determine loci that may be useful for multilocus genotyping classification.

**A Comparative Analysis of the Impacts of Medicaid Policy on Rural Healthcare**

Jon Cooper, CURO Research Assistant
*Dr. Lesley Anetra Clack, Health Policy and Management, College of Public Health*

Rural healthcare facilities across the United States are currently being faced with very unique and severe challenges. More than 80 rural hospitals have closed since 2010, and an additional 673 hospitals are at risk of closing within the next decade. Moreover, many hospitals at risk of closing have been forced to downgrade by reducing the scope and/or quality of their care services. In contrast to urban areas, these issues are far worse in rural counties due to a higher incidence of lower-income individuals, higher rates of uninsured residents, and higher rates of uncompensated care. Fortunately, recent research suggests that Medicaid Expansion may assist in remediating these issues. The purpose of this study is to conduct a comparative analysis of two similar states: one that has expanded Medicaid coverage (Michigan), and one that has not done so (Georgia). This study will analyze data pertaining to the state of rural healthcare in both Michigan and Georgia, before and after Medicaid was expanded in the former, in order to determine the potential impacts of Medicaid Expansion on rural healthcare in Georgia. We expect to find that Medicaid Expansion in Georgia would closely parallel Medicaid Expansion in Michigan, in terms of reducing the risk of hospital closures/downgrades, lowering the incidence of uncompensated care, and significantly increasing the number of insured individuals in rural areas. Ultimately, this research carries significant implications for the future of healthcare policy in states that have yet to expand Medicaid, such as Georgia.

**Processes Affecting the Ocean's Absorption of Atmospheric Carbon Dioxide and the Impact on Ocean Acidification**

Alana Cordak, CURO Research Assistant
*Dr. Gabriel J. Kooperman, Geography, Franklin College of Arts and Sciences*

Human emissions of carbon dioxide are expected to increase over the 21st century due to the continued use of fossil fuels, and much of this carbon will be absorbed into the oceans. Several processes (e.g., sea-surface temperature, salinity, pressure) affect the ocean's ability to absorb atmospheric carbon dioxide which then further impacts the variability of ocean pH in many ways on different time scales. Because the ocean covers more than 70% of the globe, ocean acidification is a widespread issue, with direct effects on marine animals who live in the ocean as well as many indirect effects that go beyond ocean life. In this study, we evaluate how ocean pH changes as well as the different processes that affect the pH by analyzing output from 21st century climate model simulations from the National Center for Atmospheric Research's Community Earth System Model. These simulations include a realistic high emissions scenario (i.e., RCP8.5) and several $CO_2$ only experiments, which are displayed and analyzed using the MATLAB software. pH fluctuations on shorter seasonal and longer centennial time scales are assessed, both of which can contribute to increasing acidity. Regions are identified where increasingly acidic oceans will create a less inhabitable environment for marine animals to live in which will, in turn, have consequences that spread across the globe.

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

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

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

better understand their field's role in the process and how it is complimented by the other.

**NFkB in the Central Amygdala Mediates the Increased Sensitivity to Social Defeat Stress by Multiple Drinking Paradigms**

Mallory Cotton
*Dr. Jesse Schank, Physiology and Pharmacology, College of Veterinary Medicine*

According to epidemiological data, the prevalence of comorbid alcoholism and depression is quite significant, as 27.9% of those diagnosed with alcoholism also meet diagnostic criteria for depression. Recent evidence has suggested that the neuroimmune system is involved in addiction and depression pathophysiology. Of particular interest is nuclear factor kappa B (NFkB), a transcription factor involved in the innate immune response that mediates the behavioral and physiological responses to both alcohol exposure and social stress. We have previously found that chronic alcohol exposure increases sensitivity to subthreshold social defeat stress (SDS) in mice. We also found via immunohistochemistry that NFkB activity is increased in the central amygdala (CeA), an integral brain region that responds to stressful stimuli, following chronic alcohol exposure. Next, we plan to use an intermittent ethanol access (IEA) protocol to see if the same increase in stress sensitivity is observed. In this model, mice are allowed voluntary alcohol access for 24 hours on Monday, Wednesday, and Friday for a total of 4 weeks, after which the mice will be exposed to subthreshold SDS. Once we determine the effects of IEA on stress sensitivity, we will then examine NFkB levels in the CeA. This data may potentially indicate that despite the method of alcohol exposure, the CeA plays a significant role in mediating the effects of alcohol exposure on sensitivity to subthreshold SDS. Ultimately, we seek to determine new, potential targets, such as NFkB, in order to advance the treatments for those affected by comorbid alcoholism and depression.

**Bringing Light from the Infrared to the Ultraviolet: Third Harmonic Generation with Ultrafast Lasers**

Joshua Courtney, CURO Research Assistant
*Dr. Melanie Reber, Chemistry, Franklin College of Arts and Sciences*

Since their creation, scientists have used lasers as powerful tools to study fundamental science, including observing energy flow through molecules at ultrafast ($10^{-15}$ s) timescales. This project uses lasers to energize electrons in molecules and record changes over time in the molecule through a technique known as transient absorption spectroscopy. The immediate goal is to study the process of light conversion to electrical energy, as used in solar cells, in order to fully understand the process and inform solar cell design. The transient absorption spectrometer uses a home-built fiber laser as the source of ultrafast time resolution. In order to perform this spectroscopy, energies of laser light that will excite the molecules of interest must be created. Initial laser output is centered around 1050 nm, which this project aims to convert to the ultraviolet region, specifically 350 nm, to study dynamics of molecules used to absorb light in solar cells. Infrared light from an ultrafast Ytterbium fiber laser is focused onto a Barium Borate crystal (BBO), which generates a green laser in its second harmonic. The green light and original infrared light then combine into a second BBO crystal generating the third harmonic, in the ultraviolet region. Power output measurements at each step at various input powers evaluate the efficiency of the wavelength conversion processes. Optimization is done to maximize UV output and includes tuning distances between focusing lenses and BBO crystals. Once ultraviolet output is maximized, the beam will be used as a pump laser for transient absorption spectroscopy.

**Determination of the Cellular Functions Required for Transcriptional Activation of the RNA Repair Operon of *Salmonella enterica* Serovar Typhimurium**

Madi Chase Crawford
*Dr. Anna Karls, Microbiology, Franklin College of Arts and Sciences*

*Salmonella* Typhimurium, a food-borne pathogen, must survive a variety of stress conditions encountered during infection. Our laboratory previously showed that a σ54-regulated RNA repair operon, which is additionally regulated by a bacterial enhancer-binding protein, RtcR, is highly upregulated in the presence of treatments that generate nucleic acid damage. These are identical to conditions that activate the SOS response, which involves the activation of several pathways to repair extensive DNA damage. We found that RtcR-dependent expression of the RNA repair operon requires RecA, the master regulator of the SOS response; we therefore hypothesized that some component of the SOS response generates the molecular signal that activates RtcR. Utilizing a reporter strain expressing a constitutively active RecA variant, operon expression was assessed in various SOS gene deletion mutants to identify which of the repair pathways may be involved. There was no significant difference in expression between any of the mutants and a wild type control, so no individual pathway was identified that directly contributes to RtcR activation. However, prophages that reside in the *Salmonella* Typhimurium genome also become induced in an SOS-dependent manner; thus, strains that have been cured of all prophages are being assayed in a similar manner to determine if their presence affects the induction of RNA repair. Finally, a genome-wide screen is being conducted using a library of Tn5 insertion mutants to identify additional genes involved in the signaling pathway; this may reveal a novel subset of genes that are regulated, directly or indirectly, by RecA.

**Characterizing the Immune Response Generated from IgG Antibodies Against Hemagglutinin Antigens**

Zachary Creech, CURO Research Assistant
*Dr. Ted M. Ross, Infectious Diseases, College of Veterinary Medicine*

Throughout the world, the influenza infection is a significant cause of morbidity and mortality each year. Influenza viruses express two glycoproteins on the surface of the virion, hemagglutinin (HA) and neuraminidase (NA). The surface glycoprotein HA, predominately aids in the initial infection of the host cell, while NA facilitates the budding of the virion

from the host cell. Due to antigenic drift, the hemagglutinin and neuraminidase glycoproteins are frequently undergoing genetic variations which allow bypassing of the host's immune system. Seasonal flu vaccinations remain the most effective treatment against the deadly effects of influenza, but they must be reformulated each year due to the antigenic variations. My work involves characterizing immune responses generated from immunoglobulin G (IgG) antibodies in human donors against four antigens found in previous influenza strains. These four antigens are hemagglutinin glycoproteins isolated from A/California/07/2009, A/Hong Kong/4801/2014, B/Brisbane/60/2008 (Vic), and B/Phuket/3073/2013 (Yam) which are thus expressed as proteins within the vaccine. Vaccination is achieved using either an inactivated influenza virus (IIV) formulation or a live-attenuated vaccine (LAV). Human donors will provide serum samples on the day of vaccination (day 0) and 21 days subsequently after vaccination in order to assess the increase in antibody titers due to the vaccines. By characterizing the immune response generated from day 21 in comparison to day 0 using enzyme-linked immunosorbent assays (ELISA), this will allow further testing into IgG class subsets to propel and fine-tune the future of influenza vaccines towards the overall goal of a universal flu vaccine.

**Association of Cognitive Control with STEM Majors**

Chandler Lee Cubbedge, CURO Research Assistant
*Dr. Jennifer McDowell, Psychology, Franklin College of Arts and Sciences*

A measure of cognitive control can be tested through eye tracking tasks. The eye tracking tasks measure saccades, or the movement of subjects' pupils in response to stimuli. This study will examine the correlation between higher cognitive control functioning assessed from saccade performance and whether the subjects are a science, technology, engineering, or math (STEM) major. The examination of cognitive control will be through comparisons of eye movement scores from prosaccade and antisaccade tasks. In the study, specific prosaccade and antisaccade tasks will be administered requiring different levels of cognitive control. The saccadic eye movements will be recorded and scored with focus on the accuracy of the saccade's direction and the response time. It is expected that those with higher levels of cognitive control will have faster response times and less incorrect saccade movements. The hypothesis is that the group of subjects that have STEM majors (n=120) will display a higher level of cognitive control and have more correct saccade responses with faster response times when compared to the subjects that do not have a STEM major (n=80). STEM majors are expected to display higher levels of cognitive control due to the intensity of their studies and the in-depth focus required to understand more complex fields when compared to the sample of non-STEM majors. The findings will determine if there is association between STEM majors and cognitive control in order to evaluate if being a STEM major requires higher levels of cognitive control than a non-STEM major.

**The State of Newborn Hearing Screening in Georgia**

Emily P. Culpepper
Cristina Chastain, Kayla Johnson, Natalie Mathis, Princess Osibodu
*Dr. Sandie Bass-Ringdahl, Communication Sciences and Special Education, College of Education*

The impact of unidentified hearing impairment is well documented in the literature. Children born deaf or hard of hearing who do not share hearing status with their parents are at risk for significant language impairment. Approximately 2-6 per 1000 children are born with hearing impairment. The etiology of hearing impairment varies, but certain demographic and geographic variables impact this number. Universal newborn hearing screening, or the screening of all infants at birth, is now the standard of care for the identification of hearing impairment. Legislation was passed in Georgia in 1999 to initiate universal newborn hearing screening. By July 1, 2002, the goal was to screen at least 95% of all newborns. National Early Hearing Detection and Intervention (EHDI) benchmarks exist which are based on best practice. Georgia's progress in meeting the National EHDI benchmarks is examined. In addition, Georgia's progress in meeting its own Performance Objectives is examined. Data will be examined between the years of 2015 and 2018 across health districts. The Georgia Department of College of Public Health provided The Pediatric Auditory and Early Speech Development Laboratory at the University of Georgia access to the data. All data were collected in the State Electronic Notifiable Disease Surveillance System (SendSS). Factors that influence the incidence of hearing impairment, as well as challenges to the early identification of hearing impairment, will be discussed in the context of the findings.

**Consistent Inter-Individual Differences in Susceptibility to Bodily Illusions**

Sarah A. Cutts, CURO Research Assistant
*Dr. Dorothy Fragaszy, Psychology, Franklin College of Arts and Sciences*

Sense of ownership (the perception that we own our body) and sense of agency (voluntary control over our limbs) are distinct cognitive processes developed by multisensory integration and modulated by proprioceptive feedback. Impairment in one or both processes can result in loss of identification and control over one's limb(s), but it is currently unknown whether these processes work on a spectrum within the general population. In this study, the rubber hand illusion (RHI) and rubber finger illusion (RFI) were used with healthy individuals to induce illusory ownership and agency over a visible rubber hand/finger that was spatially congruent with a participant's occluded hand. Static versions of these paradigms (where visual and tactile cues are congruent between the real and rubber hand) were used to induce illusory ownership while dynamic versions (congruent visual and kinesthetic cues) were used to elicit illusory ownership and/or agency. Proprioceptive drift (a shift in perceived position of one's hand following illusory ownership) and subjective scores of these processes were recorded and compared between the RHI and RFI to determine if illusory ownership and agency are consistent traits across conditions.

If individuals vary in ability to integrate external objects into their body schema, they will show similar scores of illusory ownership and agency between static and dynamic versions of the RHI and RFI and these scores will differ within the population. These findings may reveal differences between individuals' abilities to embody prosthetic limbs and interact with human-machine interfaces.

**Military Deterrence Decision Making**
Sam Daly, Ramsey Scholar, CURO Research Assistant
*Dr. Jeffrey Berejikian, International Affairs, School of Public and International Affairs*

How does military deterrence decision making differ in the domains of nuclear, cyber, and conventional war? To investigate this question, this study undertakes the examination of survey responses provided by 350 active duty military officers. The responses are coded into nine categories that represent various justifications for launching a limited strike or standing firm in deterrence. These classifications were created independent from hypotheses to maintain analytical integrity. Preliminary results reveal interesting differences in the justifications for action in the three conflict domains examined. These differences are critical for understanding the implications of current deterrence policy.

**The Role of the Skp1 Glycan in Skp1-JcdI Complex**
Nitin Daniel, CURO Summer Fellow, CURO Research Assistant
*Dr. Christopher M. West, Biochemistry and Molecular Biology, Franklin College of Arts and Sciences*

The degradation of proteins is vital in regulating developmental progression and response to stimuli. Cullin Ring Ligases (CRLs) are a major class of E3 polyubiquitin ligases that aid in protein degradation. The CRL1 subclass consists of a complex of Skp1/Cullin-1/F-box protein/Rbx1 proteins that recognize and mediate the polyubiquitination of a target protein via a substrate-receptor F-box protein (FBP) and an E2 ubiquitin donor. The polyubiquitinated peptide is then recognized and degraded by the 26S proteasome. In the model organism *Dictyostelium discoideum*, Skp1 is post translationally hydroxylated and glycosylated into Galα1,3Galα1,3Fucα1,2 Galβ1,3GlcNAcα1-O-Skp1. According to our current model, the glycan stabilizes a disordered region on Skp1 which then becomes more likely to bind FBP. However, the role of the glycan after assembly of the Skp1/FBP subcomplex is unknown. To address this question, we have recombinantly expressed JcdI-N, a truncated form of a native *Dictyostelium* FBP, with Skp1, and purified it to near homogeneity for crystallization and structural analysis. After initial failure to achieve crystals in a high-throughput screen, we are in the process of optimizing the protocol to eliminate heterogeneity in JcdI-N gel migration, and to improve stability and solubility of the complex. Obtaining the atomic resolution structure of the glycosylated form of Skp1 in complex with JcdI-N will help define the role of the glycan in the subcomplex, whether it is bound to JcdI-N, to Skp1, or free in solution.

**Countermanding Task Performance in College Students**
Tarun Daniel, Foundation Fellow
*Dr. Jennifer McDowell, Psychology, Franklin College of Arts and Sciences*

Integral to the study of schizophrenia is understanding the influence of cognitive control deficits and how these deficits can be modeled and used to inform clinical diagnoses. There are a variety of tasks that are used to model response inhibition, which is a key aspect of cognitive control. The anti-saccade task measures response inhibition by asking subjects to look away from the movement of a target. In the countermanding task, subjects are asked to look towards a target, but sometimes a stop signal is displayed, in which case the subject is to cease eye movement. While studies have been performed highlighting the effectiveness of antisaccade tasks to test for response inhibition, the relative effectiveness of other measures such as the countermanding task is not yet clear. The objective of this study is to compare the results of antisaccade performance to countermanding performance and to determine whether a positive correlation between the tasks can be drawn in a group of over 200 college students. Additional statistical tests will be performed to identify correlations between countermanding performance and other variables including age, gender, ethnicity, and Mini-Mental State Exam performance. Ultimately, this study will serve to assess the relative merits of both response inhibition saccade tests.

**In-Microbe Analysis of Glycan Substrates via LC-MS**
Mickey Dao
*Dr. Maor Bar-Peled, Biochemistry and Molecular Biology, Franklin College of Arts and Sciences*

Nucleotide sugars are precursors, building blocks, used in every organism for the synthesis of glycan structures. Glycan is a general term for a diverse group of complex sugar polymers. Glycan can be linked to proteins (glycoproteins), lipids (glycolipids) or form large complexes like polysaccharides. Glycan-specific enzymes known as glycosyltransferases recognize and remove the sugar moiety from the nucleotide sugar and attach it, in a linkage specific manner, to the growing glycan chain. My research identified putative genes suspected to encode enzymes involved in nucleotide sugar metabolisms. The first part of this research was to screen *E. coli* strains each harboring different expression plasmids. Each gene was cloned to a plasmid and transformed to a BL21 *E. coli* strain for protein production. To determine the function of the gene product, I used an assay method known as "In-Microbe". In this method the host produces an intermediate that can be utilized by the recombinant protein to make a new product. During the assay screens, the genes were induced to express the protein and subsequently the cell was extracted, and nucleotide-sugars were isolated. The mass to charge (m/z) ratio along with tandem mass spectrometry (MS/MS) provided information about the specific nucleotide-sugar ions after NDP-Sugar isolation. For example, the LC-MS/MS showed one enzyme involved in the production of unique GDP-hexose, and others in the formation of UDP-6-deoxy-hexose, UDP-hexose, UDP-6-deoxy-hexose-keto form, and a few enzymes generated

UDP-HexNAc-uronate structures. The screen provided new insight to the function of these unknown genes and will later illuminate their involvement in the formation of specific glycan structures. Further isolation and analysis of each NDP-sugar by 1- and 2D NMR will provide insight to the absolute structure of a nucleotide-sugar.

**Design of Selective Chromium Catalysts for Ethylene Trimerization**

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

Chromium based catalysts are used for a variety of industrial processes including ethylene oligomerization, oxidative dehydrogenation, and polymerization. Recent theoretical studies reported an effectively designed chromium catalyst for ethylene trimerization/tetramerization. This chromium catalyst uses phosphine monocyclic imine (P,N)-ligands to selectively produce 1-hexene and 1-octene from ethylene. Further computational studies using AARON (an automated reaction optimizer for new catalysts) were conducted to explore the functionality of similar catalysts to determine how to enhance the selectivity while also increasing the activity.

**Feasibility of Tele-Exercise for Persons Aging with Mobility Impairment**

Amber Datta, CURO Research Assistant
*Dr. Jenay M. Beer, Gerontology, College of Public Health*

Persons aging with mobility impairment often encounter difficulty accessing exercise facilities, training, or classes. Tele-exercise has potential to reduce these barriers, by providing the means to support remote exercise classes at home. This feasibility research study used a tele-conferencing platform (OneClick.chat) to demonstrate a seated gentle movements exercise for older adults (N=19, aged 40+) with lower body mobility impairment. The tele-conferencing software facilitated the tele-exercise via two-way video and audio. Questionnaires and semi structured interviews were administered to assess participants' attitudes toward the technology, as well as their perceptions on how tele-exercise might impact them physically (improve strength), emotionally (reduce stress), and socially (engage with others). Overall, participants were very positive toward the potential of tele-exercise. Participants indicated that they were very likely to complete these exercises by themselves on a weekly basis at home using a tele-exercise software. The feasibility study also provided insight into the technical requirements for tele-exercise, such as screen size, audio quality, and depth perception. This research supports the potential of tele-exercise, but also highlights critical design specifications needed to make the tele-exercise implementation both accessible and attainable.

**Realpolitik and Post-2008 Russian National Security and Defense Policy: Strategic Defensive Assertion**

Anna Jewell Davidson, CURO Research Assistant
*Dr. Andy Owsiak, International Affairs, School of Public and International Affairs*

Efforts by the Russian Federation to assert its international influence via the forward deployment of military capabilities and political interventions are becoming more prevalent, specifically in Eastern Europe. This study evaluates three hypotheses attempting to explain the rationale and objectives of Russian military interventions toward this region by evaluating those in the Republic of Georgia and Ukraine. The report employs a most similar systems design since both Georgia and Ukraine are similar states, and since Russian interventions in these states produced two separate and distinct results (an annexation of the Ukrainian territory of Crimea and ongoing conflict in the Donbas region, and a ceasefire and Russian occupation of Georgia's Tskhinvali region and Abkhazia). After proposing a research question and hypotheses, the report compares similarities between Georgia and Ukraine as Russian Areas of Strategic Influence (AOSI) and argues this classification is the fundamental precondition for a Russian military intervention. Building upon that precondition, the report explores dependent variables for intervention followed by an observation and explanation of pre-intervention instruments that serve as indicators of pending Russian involvement. The report then reviews the military interventions and explores why two similar states, both of which were targets of Russian intervention, experienced separate outcomes. By enhancing our understanding of Russian rationale and conduct in Georgia and Ukraine, the study will contribute to an improvement in the international community's response to Russia's perceived expansionist agenda and increase our competency to anticipate future Russian military behavior.

**Understanding the Effects of $CO_2$ on the Temperate Coral *Phyllangia americana***

Alaina Danielle Emily Davis, CURO Research Assistant
*Dr. Brian Hopkinson, Marine Sciences, Franklin College of Arts and Sciences*

For years it has been predicted that ocean acidification (OA) will greatly impact the growth rate of corals and other organisms dependent on calcium carbonate for their structures. How large of an impact is not yet known, including how well these animals can adjust to such chemical changes. In order to better understand the adaptability (or lack of) such organisms, we will be studying and measuring the effects of OA on organisms from Gray's Reef, a temperate hard bottom environment off the coast of Georgia to assist conservationists in protecting threatened areas. The overall goal of the project is to determine which major groups of benthic (bottom-dwelling) invertebrates are most strong affected by OA. Currently, we are investigating the response of a coral, *Phyllangia americana*, to OA by manipulating $CO_2$ concentrations on specimens collected from Gray's Reef. Measurements taken will include calcification rates, photosynthetic rates, respiration rates, and in some cases carbonic anhydrase activity. These measurements will be

taken at the start of the experiment, after two months of $CO_2$ exposure.

**Undergraduates Modeling Small Satellites with Thermal Desktop**

Kaelyn Marie Deal, CURO Research Assistant
*Dr. David L. Cotten, Geography, Franklin College of Arts and Sciences*

Using software applications to model satellites orbiting the earth is challenging to say the least, and even more so if the individual has limited access to supportive educational resources. What are efficient and accurate methods for conducting analyses in Thermal Desktop on the undergraduate level where paid training is not economical and open access resources are limited and unhelpful? Five to ten students in the Small Satellite Research Laboratory at the University of Georgia will be tasked with working through two original exercises designed to guide them through conducting analyses of a simplistic 1U cube satellite in Thermal Desktop. Since there are multiple ways to construct a model in Thermal Desktop, two exercises will be created. By recording common areas of confusion, questioning what methods were preferred and if the student can interpret their results, the two exercises will offer valuable data for the construction of a guide catered to undergraduate students. Specifically, the first exercise will focus on using Thermal Desktop and AutoCAD to create the model. The second exercise will utilize geometry imported from other software and will highlight a different process of completing the analysis in Thermal Desktop. The product of this study is expected to be a guide that students can utilize to perform their own analyses in Thermal Desktop. This resource will be open access, and students at the University of Georgia will have a streamlined way to learn Thermal Desktop, setting them apart from other students in the aerospace industry.

**Is the Rise in Gluten Intolerance Due to the Variety of Wheat Consumed or Modern Chemical Processing?**

Julie Dean
*Dr. Alex Kojo Anderson, Foods and Nutrition, College of Family and Consumer Sciences*

Gluten intolerance can be understood to manifest in humans through three different phenomena: Celiac disease (CD), wheat allergy, and non-celiac gluten sensitivity (NCGS). These conditions are characterized by a physiological response in the individual after the ingestion of gluten, with symptoms ranging from gastrointestinal distress to skin irritation and neurological problems. Although the recent introduction of gluten into the human diet has paralleled the rise of intolerance, it has been hypothesized the origin of the intolerance may be multifaceted and not due only to the ingestion of wheat itself, but other underlying factors. The upsurge in gluten intolerance has been synonymous with the adaptation of the industrial agriculture model, which introduced both modern wheat hybrids and the use of glyphosate chemical processing. Recent studies have pointed to both of these factors as possible explanations to the prevalence of gluten induced conditions. We hypothesize that the rise in gluten intolerance is due to the widespread use of glyphosate in crop desiccation in spite of modern wheat strains. This study is a systematic narrative review of published articles on the topic. We searched multiple databases using these search terms: ancient wheat and gluten intolerance, modern wheat and gluten intolerance, and glyphosate and gluten intolerance. The identified articles were screened for relevance and those that met the inclusion criteria were included in the review. Findings from this review seek to elucidate potential factors contributing to the recent increase in gluten intolerance and inform ways to mitigate the burden of this condition.

**Land Use/Land Cover Change from 1992-2011 in North Georgia: An Appeal to Sustainable Tourism Development**

Sarah DeBlois
*Dr. Jeff Hepinstall-Cymerman, Forestry, Warnell School of Forestry and Natural Resources*

From 1992 to 2011, North Georgia, defined in this study as geographically north of Atlanta, experienced increasing population and development as a result of urban sprawl. Low density development creates the necessary infrastructure to support large populations but increases conversion of land use and therefore land cover, leading to fragmentation of land cover. Fragmentation of forests and agricultural lands effects numerous systems, however the goal of this study is to promote sustainable tourism in North Georgia while promoting natural resource conservation. Specifically, we will quantify the change in landscape composition and configuration between 1992-2011 in North Georgia, with an emphasis on the agritourism industry. We compared development around forests, apple orchards and wineries to understand the role of sustainable tourism in protecting natural resources in North Georgia. Preliminary analysis has found increased low density development around wineries in North Georgia and conversion of forests to low density urban and shrubland. This indicates urban sprawl, however the majority of land cover remained consistent from 1992-2011. A slow conversion from 2001-2011 was likely due to slowed development after the 2008 fiscal recession. A resurging economy will likely increase development and therefore conversion rates. The current rate of change is sustainable and should be encouraged to protect natural resources. Maintaining the integrity of land classified as forests or agriculture is an important endeavor for the sustainability of tourism in North Georgia, meaning development should be planned and managed directly.

**Comparison of Critical Micelle Concentrations of Different Surfactants**

Ana Marie Deegan, CURO Research Assistant
*Dr. Amanda Frossard, Chemistry, Franklin College of Arts and Sciences*

Surfactants are organic compounds that contain a water soluble and water insoluble component. This structure allows them to dissolve and/or adsorb to the interface of a solution and its gas and/or solid phases. Containing a hydrophobic and hydrophilic group, they form clusters of aggregate molecules known as micelles. This semester, I am studying how surfactants depress the surface tension of water, and I am calculating

their specific critical micelle concentrations (CMC). This is the concentration of a given surfactant where micelles form. Any excess concentration of surfactant are formed into micelles. Also, at this concentration, excess surfactant will not have an additional effect on the surface tension of the solution. Surface tension measurements of known standard surfactants and ambient samples of seawater and estuarine water were conducted using a Dataphysics Manual OCA 15EC Tensiometer, which measures the equilibrium surface tension of a solution with the pendant drop method. I used surfactant standards and calculated their CMC's. Then I compared their CMCs to those of samples of estuarine water collected from Skidaway Island in Spring 2018. This comparison identified what surfactants were found in these waters and if they are relatively strong or weak surfactants (based on their CMCs and abilities to reduce surface tension). In this study, I observed that the CMC of estuarine water was similar to that of nonionic surfactant standards.

**The Threshold of Happiness: The Role of Gender Identity as a Moderator Between Income, Career Satisfaction and Marital Satisfaction**

Lydia Michael DelRossi
*Dr. Kristen Shockley, Psychology, Franklin College of Arts and Sciences*

Gender roles within heterosexual partnerships have been studied at length within the Psychology community. Within Industrial-Organizational Psychology, the relationship between work and family is particularly relevant and heavily studied, often with a focus on gender-normative ideology within marriages and domestic partnerships. What happens when there is a disruption of ideology for the sake of what is required within a given relationship, particularly with income discrepancy? Using data from heterosexual normative couples, I plan to analyze how income similarity in spouses relates to marital and career satisfaction and how this relationship varies according to the gender role ideology (traditional or egalitarian) of the couple. I hypothesize that the nature of this moderation is such that in dyads with less egalitarian ideals, marital satisfaction and career satisfaction will be highest when husbands contribute more than wives to household income. In dyads with more egalitarian ideals, marital satisfaction will be highest when husbands and wives have similar levels of income. Using polynomial regression, I will estimate the threshold for overall satisfaction in both egalitarian and non-egalitarian dyads. If we can measure where marital satisfaction begins to decline, with respect to relative income, we can help married couples that may be living against their personal ideologies find a balance between what they want for themselves, and what their realities require of them.

**Documentation of fMRI Analysis Procedures of fMRI Data and of Words in *The Little Prince***

Apoorva Dhanala, CURO Research Assistant
*Dr. John Hale, Institute for Artificial Intelligence, Franklin College of Arts and Sciences*

Documentation is a key part of science and important in the field of research. It is important to record everything that goes into producing certain results; this record is most important in the case that the same research is wanted to be duplicated on new set of data. I will be documenting an Artificial Intelligence project, focused in the field of Computational Linguistics, that uses MATLAB and Python to analyze the relation between FMRI data of subjects being read *The Little Prince* and the words in the book. There are different levels of analysis, level 1 and level 2, that encompass using the Linux operating system and different scripts to automate the running of the data set for specific analysis. I will also be documenting the different roles words from the book play in this project, such as the Agent and Patient roles. I currently plan on documenting all this on a local directory.

**Organic Matter Breakdown in Atlanta Urban Streams: Influences of Urbanization on Organic Matter Dynamics**

Emma Bay Dickinson, CURO Honors Scholar
*Dr. Krista Capps, Ecology, Odum School of Ecology*

The decomposition of organic matter is a crucial process that supports aquatic food webs and mediates other ecosystem processes in streams and rivers. Changes in canopy cover due to variable density and species composition of trees in urban environments can alter the quality, quantity, and timing of organic matter entering urban watersheds. Physical and chemical characteristics--water temperature, water volume, nutrient content, and concentration of pollutants--can influence the decomposition of organic matter. While recent investigations have documented acute and chronic effects that urbanization can have on aquatic chemistry, relatively little work has considered how the rate and intensity of urbanization may influence organic matter dynamics. To assess decomposition, we deployed cotton-strip assays in 19 sites in the Atlanta metro region with variable land use cover during the fall and winter months of 2018. We continuously monitored water temperature and collected water samples at each site to measure differences in aquatic chemistry between sample sites. We will use standard methods to estimate changes in the tensile strength of the strips as a proxy to estimate average decomposition rate. We will also measure differences in the nitrogen and phosphorus content of the cotton strips to assess relationships between ambient water chemistry and nutrient content of organic matter. Finally, we will measure the leucine concentration on each strip as a proxy for fungal activity. Our work will inform our understanding of how the rate and intensity of urbanization alter freshwater ecosystem processes.

**The Last of the Great Student Sit-ins: Athens Eight and Its Significance to Student Protests of the 20th Century**

Rachael Dier, CURO Research Assistant
*Dr. Tim Cain, Higher Education, Institute of Higher Education*

My research involves a historical inquiry into student protests of the late 1960s and early 1970s, specifically the 1968 March for Coed Equality, 1972 Sit-in of the Administration Building, and the creation and activism of Women's Oppression Must End Now (W.O.M.E.N.). The aims of this research are to draw connections to contemporary movements, and gain a better understanding of the role students played in the height of

the civil rights movement in Athens, GA. This research is built on archival work, oral histories and context provided through readings of secondary sources. At the end of my CURO course with Dr. Cain, I will be able to use my historical research to draw parallels to student protests of the 21st century.

**Understanding the Peripheral Nervous System in *Schmidtea mediterranea***

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

The nervous system of cephalized animals consists of two parts: the central nervous system, which includes the brain and other structures like the vertebrate spinal cord or invertebrate nerve cords; and the peripheral nervous system, which contains all nervous tissue outside the central nervous system. The peripheral nervous system serves to relay sensory and motor information between the central nervous system and the body. In humans, the central nervous system lacks the ability to regenerate new neurons, whereas the peripheral nervous system can undergo regeneration after injury. To understand similarities and differences between central nervous system and peripheral nervous system regeneration, scientists can use highly regenerative animal models that possess the ability to regenerate all neurons after injury. Our lab is particularly interested in using *Schmidtea mediterranea*, an asexual, aquatic species of planarian flatworm, to understand neural regeneration. While the planarian central nervous system has been studied, we know very little about the planarian peripheral nervous system. Our objectives are to determine how the planarian peripheral nervous system regenerates and to identify functions of the planarian peripheral nervous system. As a first step toward these goals, we identified genes, *SCNA2* and *SCNA3*, expressed in peripheral neurons. We identified 18 genes expressed with *SCNA3* by single cell-sequencing analyses and are characterizing these genes with *in situ* hybridization in order to identify additional peripheral neural markers. I am currently using RNA interference to determine if genes expressed in the peripheral nervous system influence planarian behavior and/or regeneration.

**Financial Literacy, Risk Tolerance, and the Utilization of Robo-Advisor Platforms**

Cameron J. DiLoreto
*Dr. Swarn Chatterjee, Financial Planning, Housing, and Consumer Economics, College of Family and Consumer Sciences*

In general, the robo-advisors are computer automated investment platforms. A typical client needs to first fill in a survey regarding their investment time horizon, goals, risk tolerance, before the robo-advisor incorporates this information into a complex programmed algorithm to generate an optimal customized portfolio for the client. This study uses Diffusion of Innovation theory developed by Rogers (1962) to examine the characteristics of early adopters into these Fin-Tech based wealth management services. More specifically, this study uses a national dataset available through the FINRA Financial Capability Study to investigate whether factors such as financial capability, risk tolerance, and demographics related characteristics played a role in the utilization of robo-advisor based financial platforms by the current users of these services.

**Sex-Related Differences Exhibited by Middle-Aged Mice in Behavior and Their Response to Inflammation**

Rachel Dockman
*Dr. Nick M. Filipov, Physiology and Pharmacology, College of Veterinary Medicine*

Males and females differ in behavior and immune reactivity and aging has a distinct influence on cognitive, emotional, and motor functioning. Yet, most laboratory data are generated using adult male rodents. We sought to investigate sex differences in behavior in middle-aged mice using tests measuring motor performance, cognitive ability, and mood of sixteen (8/sex) age matched 12-month old C57BL/6 mice with Green Fluorescent Protein (GFP)-tagged microglia/monocytes. Following 4 months of behavioral assessment, mice were given lipopolysaccharide (LPS) to characterize the impact of sex on inflammation and sickness behavior. During motor performance testing, males were more efficient at the pole test (PT). Mood behavior tests included the sucrose preference and elevated zero maze (EZM) tests. Greater female anxiety was suggested due to more time spent in closed arms of the EZM. The Barnes Maze was utilized to measure cognition and memory, with parameters such as errors made, distance traveled, and improvement during the acquisition phase analyzed. Females consistently performed better than males and showed better spatial recall during the probe trial. In the OFT following LPS challenge, number of rearings was decreased in both sexes, but only in females was the effect significant; this effect was not associated with differences in major circulating cytokines. We conclude that during middle age, male mice show fewer anxiety-like behaviors and are less sensitive to the behavioral (OFT) effects of LPS, but their cognitive ability is impaired compared to females. Future analysis will be done to characterize morphological and neurochemical differences between sexes.

**Investigating the Role of Antiviral Hypothiocyanite in Binding of Influenza Virus to Host Cells**

Fayhaa Doja
*Dr. Balazs Rada, Infectious Diseases, College of Veterinary Medicine*

Influenza is an infectious disease of the respiratory system that poses a serious global health concern. The dual oxidase (DUOX) and lactoperoxidase (LPO) system has been shown to play an important role in the defense against influenza *in vitro*. LPO is an enzyme that, in the presence of hydrogen peroxide generated by DUOX, oxidizes thiocyanate ion to hypothiocyanite. Hypothiocyanite has antimicrobial properties that have been shown to kill respiratory pathogens including influenza viruses *in vitro*. To investigate the antiviral mechanism of action of hypothiocyanite on influenza, a hemagglutination assay was conducted using influenza strains H1N1 and H3N2 in three conditions: hypothiocyanite, catalase inhibited, and virus alone. Catalase scavenges hydrogen peroxide which prevents the formation of hypothiocyanite. A "virus alone"

condition was used as a control. We hypothesized that hypothiocyanite inhibits viral binding to host cells that is prevented by catalase. The H3N2 strain yielded expected results as the hypothiocyanite condition had lower hemagglutination units (HAUs) compared to catalase inhibited and "virus alone" conditions. Binding of the H1N1 strain to host cells exhibited resistance to hypothiocyanite since all conditions showed similar HAUs. These results are significant as they show that hypothiocyanite can inhibit the binding of certain influenza strains to host cells and thereby attenuate infection. Further research will look into the amount of antibodies produced in wild-type and *Duox1* knockout mice infected with influenza.

**Synthesis of MOF for the Purpose of Photactivated Drug Delivery**

Richard English Dolder III
Xena Mansoura
*Dr. Richard Morrison, Chemistry, Franklin College of Arts and Sciences*

Metal Organic Frameworks (MOFs) are a highly porous and uniform subclass of coordination polymers. MOFs can be synthesized to create cages in which different chemicals can be efficiently stored. The overall goal of the research team is to construct a zinc-based MOF that can store medicine and effectively release it upon being struck with an ultraviolet wavelength capable of triggering a resonation in one of the ligands of the MOF. The individual goal of this research is to synthesize an organic linker between the Zinc atoms capable of securely holding the photoactive ligand in sufficiently high yield. The necessary design for this linker is a three-benzene organic molecule with a methyl ester at the para position of each end and either an amine or nitrile group at the ortho position of the middle ring.

**Is Luciferase the Only Factor in Bioluminescence?**

Daniel Albert Dolinski, CURO Research Assistant
*Dr. Kathrin F. Stanger-Hall, Plant Biology, Franklin College of Arts and Sciences*

Examine gene expression of pigment genes during signaling (vs. resting) in the light organ to test whether gene products (pigments) could modify light color emitted by the firefly *Photinus australis*. Examine gene expression of pigment genes during signaling (vs. resting) in the eyes to test whether the same gene products (pigments) that are used to filter the light emitted by the light organ, are used to filter the incoming light in *P. australis* eyes. The KSH lab has generated 3 replicate transcriptomes for the eyes and light organs of the *P. australis* fireflies when they are active (emitting a light signal) vs. inactive (not emitting light). These transcriptomes were put through RNA-sequencing to analyze the frequency of expression of possible pigment producing genes. Using bioinformatics, I obtained the annotated names of the expressed pigment genes that are possible screening pigments in the light organs and eyes of *P. australis* and performed gene expression analyses to find significant differences in expression between the activity states of the two tissues that help explain the differing wavelengths of light emission. I found 18 genes in the *P. australis* transcriptomes with a differential expression (DE) between the inactive state of the eye and light organ and 16 genes that were DE between the active states of the eye and light organ. If these are pigment genes, I will further investigate which ones contribute to light color modification through an analysis of gene expression in the ommochrome and pterin pigment pathways.

**Coarse Grain Modeling with Artificial Neural Network Optimization**

Bly Kudzai Doma, CURO Summer Fellow, CURO Research Assistant
*Dr. Rodney D. Averett, Chemical, Materials, and Biomedical Engineering, College of Engineering*

Cardiovascular disease has been the leading cause of death for Georgians. Among those, thromboembolic disease is the third most common acute cardiovascular disease, following ischemic syndromes and stroke. Fibrinogen has been a key risk factor for cardiovascular disease, and may be the cause for certain cardiovascular complications. Fibrinogen is a large glycoprotein that serves an important role in promoting hemostasis. Computational studies and modeling of fibrin clot polymerization is essential to understand the nano-mechanics underlying pathogenic conditions such as venous thromboembolism and deep vein thrombosis. Due to the size of the fibrinogen molecule and the complexity of the biochemical reactions involved in thrombosis, it is impossible to use all-atomic classical molecular dynamics simulations to simulate polymerization. However, coarse grain models have shown promising capabilities in this context. This involves conversion of the fibrinogen molecule, which consists of 31,833 atoms, into a coarse grain model of 9 beads using a combination of topology network algorithm and self-aligning artificial neural networks (ANNs). Currently, this iterative procedure is inefficiently done manually by scaling. In this project, we will utilize self-learning ANNs to optimize the search procedure. The new method will improve coarse graining and can be applied to many large bio-molecular systems.

**The Framing of Democratic Sovereigntist Movements: A Comparative Analysis of the UK's 2014 and 2016 Sovereigntist Referendum Campaigns**

Sam Driggers, CURO Honors Scholar
*Dr. Cas Mudde, International Affairs, School of Public and International Affairs*

In September of 2014, the Scottish Independence Referendum was held by the Scotland's devolved government. 21 months later, in June 2016, the United Kingdom (UK) Government held another referendum, this time on European Union (EU) membership. Although the 2014 Yes Scotland umbrella campaign and the various 2016 "leave" campaigns were both inherently sovereigntist, each campaign reportedly vocalized their separatist and nationalist rhetoric in drastically different ways. This project examines campaign leaflets from each referendum in an attempt to better understand why the two sovereigntist movements differently framed rhetoric and national identity. Nearly 180 campaign leaflets were analyzed

in this comparison, primarily from collections compiled by the National Library of Scotland and a London School of Economics and British Libraries collaborative exhibit. These leaflets were first subject to quantitative content analysis to validate popular observations of dichotomous campaign framing. Leaflets were then subject to careful normative evaluation, which offers evidence that the two campaigns differed in framing as a result of structural differences in perceived risk of disunion, perceived internal threat of minorities, and the ideological leanings of eligible voters.

**The Worth of All Life: A Comparative Study of Genesis and the *Bhagavad Gita***

Will Drosos, CURO Research Assistant
Swapnil Agrawal
*Dr. David S. Williams, Religion, Franklin College of Arts and Sciences*

As religious tensions continue to grow, and misunderstandings grow as well, violence between and among religious groups increases. Perceived differences between religions often ignite these conflicts, making comparative theology necessary as people attempt to cohabitate the world peacefully. While many people perceive Judaism and Christianity to have conflicting ideologies with Hinduism, certain similarities in all three religions provide unifying views. This research uses an ecological lens to examine the Judeo-Christian book of Genesis and a primary Hindu text, the *Bhagavad Gita*. Both texts provide insight concerning the value of all creation—a value that extends beyond humans to include all living things. Further challenging people's place in an ecological hierarchy, this research explores veganism/vegetarianism as prescribed religious practices in both texts. Genesis and the *Bhagavad Gita* show similar respect for life which provides a meaningful platform for discussion and understanding between Judaism, Christianity, and Hinduism.

**The Death of Ananias and Sapphira**

Will Drosos, CURO Research Assistant
*Dr. Wayne Coppins, Religion, Franklin College of Arts and Sciences*

In the Acts of the Apostles, some of the first Christians form a community completely relying on honesty, sharing of goods, and faith in Christ. Ananias and Sapphira, a wealthy married couple, decide that they will withhold proceeds from the sale of property from the larger Christian community. Then, they lie to the apostle Peter and claim to give him all of their money. Ananias and Sapphira are killed by God for this lie. The purpose of this research is to examine Dr. Willie Jennings' approach to the story of Ananias and Sapphira. He probes into lessons about community, violence, and, uniquely, the couple. Jennings' commentary is then compared to several other types of commentaries on Acts that highlight different aspects of this story. Jennings, as well as many of the authors analyzed, propose that the story of Ananias and Sapphira must not revolve around a simple morality test about lying to God. This story must be interpreted through the lens of liberation in order to bring meaning to a text written almost two thousand years ago.

**Analyzing LAMSAS: Charting Regional Dialects in the Middle and South Atlantic**

Leah Dudley, CURO Research Assistant
*Dr. Bill Kretzschmar, English, Franklin College of Arts and Sciences*

The Linguistic Atlas of the Middle and South Atlantic States, or LAMSAS, was a dialect research project that extended decades, charting the dialects of speakers all across the eastern coastal states. The goal of this project was to chart lexical and phonological usages across the country by interviewing speakers native to the region. The data collected by researchers were eventually compiled onto a website that shows speakers demographics as well as geographical location. My research is focused on charting LAMSAS linguistic data by speaker. In studying the dialects of these speakers, I aim to see if there are any regional trends and to disprove my null hypothesis that region has no effect on dialect. The goal of my research is to define geographical regions, and then find a positive correlation between a region and certain dialectal features. I will do this by analyzing the given data, available on lap.uga.edu. As LAMSAS has been around for many years, some of the data has already been analyzed in academic texts. These texts point to a possible impact of geography on dialect, which my research will further explore. By analyzing the data myself and reviewing articles and books about the data, I hope to give further insight on this possible dialectal trend.

**Communicative Methods and Impact of Learning English in Refugee Communities**

Leah Dudley, CURO Summer Fellow
*Dr. Bill Kretzschmar, English, Franklin College of Arts and Sciences*

Since the Displaced Persons Act of 1948, the United States has been at the forefront of aid for global refugee crises (BRYCS). While the number of refugees entering the country has dropped to its lowest numbers since 9/11 due to a lowered admissions ceiling and a reluctant government, there are still thousands of refugees inhabiting the United States. These refugees are expected to acclimate to life in a new country rapidly after being resettled. Part of this acclimation process insinuates, if not outright requires, that refugees learn English in order to truly adjust to America. To learn more about how this pressure can influence refugees acquiring English, I will spend three months researching and doing field work with refugees from around the world who had now settled in the greater Atlanta area. The goals of my research is to see what mistakes are common in refugees acquiring English, what tools speakers use to overcome a lack of English knowledge, when and where code-switching is utilized, and to see how refugees respond to having to learn English. I believe my research is crucial to our understanding of the refugee community as a whole- while it can be hard for them to communicate in an effective way in English, understanding ways we can converse with them deepens our understanding of this population and in turn makes us more tolerant towards this vulnerable minority.

**Evaluation of Botanicals Used to Treat Seborrheic Dermatitis (Scalp Eczema)**

Kristen Dunning, CURO Research Assistant
*Dr. David Knauft, Horticulture, College of Agricultural and Environmental Sciences*

Seborrheic dermatitis is a type of inflammatory condition that causes inflamed, itchy, dry skin to form on one's scalp. Statistics released by the National Eczema Association show for African-American or Black females, the chances of getting childhood scalp eczema are significantly higher than other ethnic groups. Cocamidopropyl betaine (CB) is a common thickening chemical used in shampoos and lotions. This chemical compound, however, has been proven to exacerbate scalp eczema. Furthermore, current eczema treatment shampoos that contain CB are not made for all hair types and none are made specifically for Black hair. We identified pot marigold (*Calendula officinalis* L.) and chamomile (from genera *Matricaria* and *Chamaemelum*) as important botanicals for CB alternatives. To begin evaluation in this study, we grew 10 different genotypes of calendula and 13 different genotypes of chamomile, consisting of US Department of Agriculture plant introductions, cultivars, and species. Timing, growth, and amount of flowers were evaluated to identify the most productive calendula and chamomile genotypes for further study. Once identified, the two most productive of each plant type will be evaluated for the extraction of active plant compounds that contribute to the alleviation of scalp eczema. This research will be the basis for the possible formulation of an all-natural plant-based hair product that will not only target and treat scalp eczema but will also serve as an effective and safe treatment for all hair types.

**Hybridization in Chattahoochee Bass**

Elijah Dwoskin, CURO Research Assistant
*Dr. Bud Freeman, Ecology, Odum School of Ecology*

The Chattahoochee Bass is a fish species native to the Chattahoochee River Basin. These fishes are known to hybridize with other introduced species of black bass to the extent that we fear no genetically pure individuals remain. In addition, phenotypic differences between pure and hybrid Chattahoochee Bass have not been documented. Both hybrid and pure individuals show bright orange fin tips, lateral striping on the side, and similar size characteristics. This creates a management dilemma and a problem for anglers trying to target Chattahoochee Bass. Samples of what are deemed to be Chattahoochee Bass were collected from three different sites and will be genotyped using mitochondrial and nuclear genes and scored as either pure or hybrid individuals. Once genetic makeup is determined, morphological and meristic data such as scale counts, fin coloration, and lateral striping patterns will be recorded and compared to characteristics of genetically pure Chattahoochee Bass and other identified parental species to determine any phenotypic differences. The findings of this study will be used in the creation of future Chattahoochee Bass management plans, therefore ensuring the protection of one of Georgia's native species.

**Prayerbooks of René d'Anjou: Royal Devotion in Late Medieval France**

Georgia Earley, CURO Research Assistant
*Dr. Cynthia Turner Camp, English, Franklin College of Arts and Sciences*

Because of his unique position in the Hundred Years War between France and England (1337-1453), René d'Anjou (1409-1480), a French titular king, provides important insight into individuality in devotional practices of nobility in the late medieval period. I will compare two of his prayerbooks, known as Books of Hours, one custom and one original, in an effort to illustrate how René would have worshiped and how he personalized his devotion. By observing the differing handwriting, understanding the contents of the text, and noting the heraldic devices, mottoes, and emblems, I will show which elements were added to personalize René's manuscripts. I have already discovered several different personalized prayers in René d'Anjou's Books of Hours, and I anticipate that I will be able to connect them to his imprisonment and battles, and to history as a whole. I also hope to find similarities between his two Books of Hours that are unique among prayerbooks, because this will show how René expressed his individual spirituality within the complex set of religious customs in the late Middle Ages. This research is important for learning more about how the nobility of the fifteenth century worshiped, and how even these specific types of worship could be shaped by life events, giving modern readers a better understanding of the people behind the prayerbooks. This will lead to a better understanding of the customization of medieval worship for all types of people, and to increased insight into the role of prayerbooks within these complex religious customs.

**Using Leukocyte Profiles to Measure Stress in Overwintering Rattlesnakes and Rat Snakes**

Miriam Edelkind, CURO Research Assistant
*Dr. John Maerz, Forestry, Warnell School of Forestry and Natural Resources*

In the winter, snakes reduce their activity and undergo brumation. The process of brumation significantly slows the rate of metabolism in snakes to conserve energy in the colder months. However, abnormal brumation behavior has been observed in populations of black rat snakes and timber rattlesnakes in the Di-Lane Wildlife Management Area. These populations have been emerging from brumation to bask during the winter. Basking elevates body temperature and consumes energy to induce a fever; possibly to combat infection or disease proliferating in these populations. This behavior requires significant energy input, and leaves snakes weaker when they emerge in the spring. Stress of reptiles can be measured by analyzing the ratios of two types of white blood cells. Lymphocytes control immune defense, while heterophils respond to infection, inflammation and stress. Heterophils and lymphocytes are affected by stress in opposite ways. As glutocorticoid, a hormone released during a period of stress, levels increase, the number of heterophils increases and the number of lymphocytes decreases. The ratios are found by counting the number of heterophils and lymphocytes per

hundred cells. The ratios from before and after brumation for each of the snakes in study will be compared to determine if stress levels increased. It is expected that the abnormal brumation behavior is correlated with increased stress among snakes.

**The Effect of Socioeconomic Status on White Matter Structure in Individuals with Psychosis**

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

Psychotic illness is among the world's leading causes of disability. While the etiology and pathology of psychosis is not well understood, epidemiological studies suggest that genetic disposition and environmental risk factors are involved in the development of psychotic disorders. One of the main risk factors reported for psychosis is low socioeconomic status (SES). Few studies have assessed how the risk factor of low SES may affect brain structure in psychosis. White matter integrity can be indexed by fractional anisotropy (FA), obtained from a type of magnetic resonance imaging called diffusion tensor imaging. FA is thought to indicate efficiency in the communication between different brain regions, such that decreases in FA indicate decreases in anatomical connectivity. My talk examines the possible effect of SES on white matter structure, as measured by FA, in people with psychosis. Probands with schizophrenia, schizoaffective, and bipolar disorder with psychosis were recruited. The Hollingshead Index was administered and used to sort probands into high vs. low SES. Diffusion magnetic resonance imaging was acquired for each proband; diffusion tensors were calculated for fiber tractography, and the resulting FA values were compared for each group. Based on past findings, I hypothesize that healthy controls with high SES will exhibit the highest FA and the psychosis probands with low SES will exhibit the lowest FA overall. Having a high SES, I theorize, will somewhat protect psychosis probands from having largely reduced FA, and as a result, psychosis probands from high SES will have FA values closer to healthy comparisons.

**Improving Regeneration in Muscular Dystrophy by Targeting HIF2A in Satellite Cells**

Tony Elengickal, CURO Honors Scholar
*Dr. Hang Yin, Biochemistry and Molecular Biology, Franklin College of Arts and Sciences*

Across the United States, muscular dystrophy affects thousands of individuals every year due to genetic mutations causing severe muscle degeneration. There is currently no cure or effective form of treatment, with doctors focusing on physical therapy and steroids to partially rehabilitate the afflicted. Muscle satellite cells can repair the damage and delay degeneration, but when overwhelmed by this damage muscle degeneration ensues, and this leads to muscle weakness. The Yin lab is attempting to destabilize a specific transcription factor known as Hif-2 Alpha, which would allow it to quiescent and downregulate allowing for satellite cell proliferation. This hypothesis is being applied to mouse models by targeting muscle cells to degenerate and observing the surrounding stem cell proliferation. This would allow for satellite cell proliferation and differentiation resulting in improved muscle cell regeneration. Though this is not a cure for muscular dystrophy, it is a method to mitigate the effects and improve the quality of life for those afflicted.

**A Study into the Structural and Thermal Integrity of 6U Cube Satellite Subsystems and Components**

Michael Ely, CURO Research Assistant
*Dr. David L. Cotten, Geography, Franklin College of Arts and Sciences*

Cube satellites are vulnerable to structural failure during spacecraft launch. Shock environments, random vibration, thermal expansion, and low fundamental modes can cause flight failure of a mission. Different strategies are used in satellite design to mitigate the effects. A common approach is to develop an Al-6061 frame that can help relieve weaker components of physical and thermal stress. This study will explore some design changes that can be used to help reduce deformations in different structures of a 6U satellite. Analysis will be performed mainly on the UGA SSRL MOCI satellite. This study will also focus on electronic board integrity. Computer systems have many delicate components that could easily be harmed from launch environments. Damaged electronic boards could cause a cube satellite to lose functionality and possibly provoke mission failure. These analyses will be performed in ANSYS Workbench, an industry standard for finite element analysis software, along with practical testing of PCBs. Charts and requirements, such as minimum factors of safety, will be acquired from the AFRL UNP User's Guide. An analysis of both cube satellite subsystems and components will help improve future structural system designs.

**A Comparison of Protocols to Assess Past and Future Memory in Adults with Acquired Brain Injuries**

Sarah Enterkin, CURO Research Assistant
*Dr. Katy H. O'Brien, Communication Sciences and Special Education, College of Education*

Episodic future thinking (EFT) is a projection of one's self into the future to pre-experience an event. EFT is important for successful planning, behavioral flexibility, and self-regulation. Individuals with an acquired brain injury (ABI) have demonstrated difficulty in remembering past events that coincides with difficulty imagining the future. The current study compares three different protocols for the assessment of EFT with the goal of developing a feasible assessment tool for clinical practice. This pilot study included 10 healthy controls and 4 adults with acquired brain injuries. Participants generated narratives around recent and distant past and future events. Narratives were coded and analyzed for internal memory events (specific episodic details) and external memory events (general semantic details). Participants also completed a neuropsychological battery to determine how the EFT protocols align with or compliment current standard measures. Hypotheses are that healthy controls will perform similarly across the three EFT tasks, but that adults with ABI will generate the most information around distant, well-

learned events (i.e., recalling a birthday). Near events require constant updating of current and future information that may be impaired in adults with ABI. We also anticipate that adults with ABI will rely on more general semantic information, while healthy controls will use episode specific details. Results will inform development of a protocol for a larger efficacy trial with adults with ABI, with the long-term goal of developing a clinical tool to assess future thinking and planning in adults with ABI.

**Gender Differences in Behavior Tests of Piglets**
Emma M Epps, CURO Research Assistant
*Dr. Hea Jin Park, Foods and Nutrition, College of Family and Consumer Sciences*

Gender differences in behavior may emerge from early infancy which may represent a sex-linked disposition in neurodevelopment. To further research in this field, changes in behavior were assessed in male (n=6) and female (n=7) piglets at weaning using an open field test (OF) and novel object recognition test (NOR). Piglets were handled and habituated daily from birth to weaning. The handling involved acclimating piglets to human contact daily. For the habituation, piglets were socially isolated for increased increments of time daily. For the OF test, piglets explored an arena for 10 minute and the exploratory behaviors were recorded. For the NOR test, piglets interacted with two identical objects for 10 minutes, and then reintroduced with the familiar object and a novel object following a 10 minute break. In the OF test, male and female piglets showed similar locomotor function and exploratory behaviors including total moving time, average velocity, wall-sniffing duration/frequency, or time in the center zone. Similarly, in the NOR test, male and female piglets spent similar time with the familiar and novel objects. In conclusion, no gender differences were found in piglets under the current behavior test protocol. Further analysis with more sensitive technology may better detect whether a gender difference exists on the neurological development in piglets. This study is part of a larger study investigating the effect of bioactive component during pregnancy on neurodevelopment in piglets.

**Design and 3D Printing of a Pneumonia Device Casing**
Kimberly Anne Erett
*Dr. Ramana Pidaparti, Environmental, Civil, Agricultural, and Mechanical Engineering, College of Engineering*

Pneumonia is the leading cause of death in younger children and requires proper diagnostics. Most of the available diagnostic devices in the market are expensive and perform the measurements invasively, e.g. chest X-rays. Other methods of diagnosis like physical examinations are unreliable as they often produce an inaccurate observation. In the proposed approach, we sought to address this inconsistency by creating a device that measures fluid buildup through exhalation in the lungs non-intrusively. The device consists of a laser, diode, and the electronics to go with it housed in a casing integrated with surrounding a tube, so that it can be used for diagnosis purposes. Similar to the sputum test, where a sample of fluid is taken from the lungs, the patient will blow into the tube where data is then sent through the diode and laser to the data acquisition system where it is analyzed. The progression of this device was carried out iteratively through CAD and 3D printing until a final design was achieved for further testing. The results of CAD and 3D printing results will be presented to demonstrate the working principles of the diagnostic device.

**Interventions to Increase Access to Mental Health Services: A Review of the Literature**
Sydney Erickson, CURO Research Assistant
*Dr. Ashley Johnson Harrison, Educational Psychology, College of Education*

A significant amount of research demonstrates the long-term benefits of early intervention (EI) and early childhood special education (ECSE) for children with disabilities. Despite the clear benefits, there is still a meaningful and disparate underutilization of these services. The research agenda for health disparities includes 3 phases: detecting, understanding, and reducing disparities. Although there have been studies aiming to detect and understand the patterns of disparities in access to EI and ECSE services, there is very little research on stage three: reducing disparities in access to EI and ECSE services. An understanding of previous successful interventions is critical in informing the development of an intervention to increase access to EI and ECSE services. The current study examines interventions for increasing access to a broader scope of mental health services through a systematic literature review. A search of three databases generates potential studies to include. In order to meet inclusion criteria, interventions must target services for individuals with disorders classified by the DSM-5. Salient details such as intervention target, type, and outcome are then extracted from these studies. This information is synthesized to identify the characteristics and techniques of effective interventions to reduce disparities in access to mental health services.

**One Fish, Two Fish, Low Stream... Full Fish? An Exploration of the Effects of Drought on Stream Darters and Their Prey**
Isabel Evelyn, CURO Research Assistant
*Dr. Amy D. Rosemond, Ecology, Odum School of Ecology*

Droughts are increasing in frequency and intensity in the southeastern United States. Drought can affect fish and the small invertebrates they rely on for food by reducing prey production, while fish may change their consumption patterns, altering prey community composition. Previous studies in a Piedmont river have shown increased densities of a benthic fish, a key predator of aquatic invertebrates, during drought as adults and young-of-year crowd into diminished shoal habitat. However, the effect of these concentrated fish populations on the invertebrate prey community remains largely unstudied, as is how prey quality and thus fish development may concurrently change. To address these questions, we examined the diet of a dominant benthic fish, the turquoise darter (*Etheostoma inscriptum*), in the Middle Oconee River during low- and high-flow years. Preliminary findings indicate an increase in the biomass proportion of Chironomidae larvae in fish diets during low-flow periods. Higher proportions of Chironomidae are also significantly correlated with smaller darter lengths. Together,

these findings of smaller fish size and smaller prey in fish diets show that consumption patterns of a dominant fish may change with drought, with potential implications for fish and invertebrate production.

**An Analysis of the Symbolic Use of U.S. Sanctions: The Influence of Domestic Public Opinion**

Arden Farr, Foundation Fellow
*Dr. Andy Owsiak, International Affairs, School of Public and International Affairs*

The United States has pursued decades of economic sanctions against North Korea with the intent of inducing a behavioral change, but these policies have largely failed, which is evident in the massive expansion of North Korea's nuclear arsenal. The use of economic sanctions as an American foreign policy tool is widespread, but it is puzzling, however, that, although most of these initiatives have failed to induce a change in behavior, the U.S. continues to use economic sanctions as one of its main foreign policy tools. Given the lack of success of economic sanctions imposed by the U.S. in incentivizing behavior change, such as the case of North Korea, what best explains why the U.S. continues to use economic sanctions as one of its main foreign policy tools? Existing research offers at least three reasons for this: the promotion of a certain ideology, incomplete information, and the symbolic purposes of the sanctions to domestic public opinion and interest groups in the sender country. Based on an examination of these hypotheses, the school that focuses on the symbolic purposes of economic sanctions to domestic groups best explains why the U.S. would continue to use economic sanctions that are ineffective. This statement is tested by examining case studies of the historical sanctions use such as the U.S. with similar contexts: Cuba, Northern Cyprus, Rhodesia, and South Africa. A domestic public opinion survey that tests approval of sanctions with various lengths of time and levels of effectiveness is proposed.

**Majoring in Stimulants: Investigating Stimulant Use by College Major and Professional Track**

Corbin Farr, CURO Research Assistant
*Dr. Lisa Renzi Hammond, Psychology, Franklin College of Arts and Sciences*

Several prescription medications such as Adderall and Ritalin are commonly employed by undergraduate students as tools to improve academic performance. The non-medical prescription stimulant use (NPSU) as a means to get ahead or stay afloat in rigorous courses is on a rise paralleled by an increasingly competitive academic environment. Despite medical uncertainty on the long-term effects of such abuse, this problem has gone largely unchecked, and few university programs address or discourage NPSU as a studying tool. More research should be done to characterize undergraduate students at risk of abusing stimulant medications for the purpose of academic gain. This study seeks to explore the relationship between academic pathways and NPSU among undergraduate students at a large four, year university. Data will be collected utilizing a survey distributed through the Psychology Research Participation Pool. We hypothesize that undergraduate students enrolled in Science, Technology, Engineering, and Math (STEM) programs and pre-healthcare professional tracks will be most affected by NPSU.

**A Systematic Review on the Effect of Mobile Device Prenatal Care Reminders on Prenatal Care Utilization**

Savannah Farr
Jessica Liebich, Jaymie Bromfield, Anna Juliao, Slisha Shrestha, Elexis Price
*Dr. José F. Cordero, Epidemiology and Biostatistics, College of Public Health*

Lack of access and utilization of healthcare is a continued issue of today and is a result of several causes including expense, physical distance, and lack of knowledge. As lack of access has continued to be a problem, technological advancements have begun to address some of these issues. Telehealth and mobile apps have been used in public health to improve access and utilization of healthcare services. Our goal was to determine if receiving text reminders helped increase utilization of prenatal care (PNC). We performed a systematic review using Pubmed database in order to determine the efficacy of multi-media reminders on PNC utilization. We included studies that assessed whether text messages or mobile app reminders improved utilization of PNC, regardless of recipient. Only studies which reported PNC visits, specifically 4 or more as the cutoff, were included in the final analysis. Our initial search included 212 papers, 11 of which met our inclusion criteria. We found that multi-media reminders had a positive effect on PNC utilization, with an overall effect of 2.21 odds ratio [95% CI 1.63, 2.99]. Women who did receive text reminders were 121% more likely to utilize four or more PNC visits. Mobile reminders sent to health workers did not significantly increase utilization of PNC. Our findings show promise for the use of multi-media reminders in increasing PNC utilization. Multi-media reminders could be an effective way to increase services to pregnant women which, in turn, will help them and their babies remain healthy throughout the pregnancy.

**Effects of Undergraduate Employment on Graduate School and Post-Graduate School Outcomes**

Nick Riley Findley, CURO Research Assistant
*Dr. Bill Vogt, Economics, Terry College of Business*

Students and others in society have longtime faced the question of whether the student would be better off or not to work a job while enrolled in their undergraduate career. This research attempts to answer that question with those who enroll in graduate studies specifically in mind. I take data from the NLSY97 and constrain that set to only include those who enrolled in a 4-year college program by the end of two gap years of graduating high school and enrolled in a graduate program by the end of two gap years of graduating from their undergraduate institution. With this set, I form measures to gather the effects of working a job during undergraduate enrollment on graduate school placement in tier/ranking based on what type of job they had during their undergraduate career while controlling for other variables. Additionally, I form similar measures to gather the effects of working a job during

undergraduate enrollment on salary outcomes (again, for those who choose to enroll in graduate school). I expect to find a causal relationship that will suggest working a job that is not related to one's area of study will leave them worse off than not working a job at all while enrolled in undergraduate study.

**Potato Resistant Starch Supplementation Improves Satiety Signaling and Neuroinflammation in High-Fat Fed Rats**
Caroline Finn
*Dr. Claire de La Serre, Foods and Nutrition, College of Family and Consumer Sciences*

Research has shown a relationship between high-fat feeding, reduced satiety response, and inflammation in the nucleus of the solitary tract (NTS). Specifically, high-fat feeding has been shown to reduce sensitivity to cholecystokinin (CCK), a peptide hormone released in response to amino acids and fatty acids reaching the small intestine; this decreased sensitivity leads to decreased satiety response and hyperphagia. Additionally, high-fat feeding has been shown to lead to an inflammatory immune response in the NTS, the area of the hindbrain largely responsible for satiety signaling. Potato resistant starch is a starch that is resistant to digestion and that is fermented by the gut microbiome. PRS has been shown to alter the microbiome and improve gut health. In this study, we aimed to investigate the effects of PRS supplementation on these high-fat-diet-induced changes. 24 male Wistar rats (n=8/group) were fed a standard chow diet, a high-fat diet, or a high-fat diet supplemented with PRS. CCK response was measured across groups, and the NTS of each rodent was cryosectioned and stained with a fluorescent ionized calcium binding adaptor molecule 1 (Iba1) label to visualize microglia as a measure of inflammation and immune response. PRS supplementation maintained CCK-induced satiety response in high-fat-fed rodents and significantly decreased microglial activation in the NTS. These results indicate that PRS is sufficient to prevent some level of high-fat diet induced loss of satiety response and improve inflammatory status.

**Modeling Opacity for Spectra of Heavy Elements**
Alicia Flowers
*Dr. Phillip C. Stancil, Physics and Astronomy, Franklin College of Arts and Sciences*

On August 17, 2017, the Laser Interferometer Gravitational Wave Observatory (LIGO) and VIRGO detected gravitational waves (GW170817) propagating from a binary neutron star merger, in which ejected material from the merger emitted thermal radiation in the optical and near-infrared (NIR) ranges of the electromagnetic spectrum. The ejecta is classified into two classes based on the atomic weight of the chemical composition: the first class is composed primarily of light (atomic mass number < 140), and the second class is composed of heavy elements (atomic mass number > 140). The latter incites the possibility that highly-dense mergers are the creation cites for heavier elements, as they are created by the heating of heavily radioactive nuclei, known as rapid neutron capture mechanism (r-process heating). The observed thermal glow, known as a kilonova, can be attributed to the radioactive decays of heavy elements (Rb to U). Unfortunately, there is a limited amount of available spectroscopic data for these elements. The purpose of this research is to alleviate this problem, in which I will utilize GRASP2K, a multi-configuration program package that uses the Dirac-relativistic equation, to calculate atomic energy levels and transition probabilities of the Platinum (Pt) isoelectronic sequence. These findings will be crucial in deriving the opacity and emissivity of these elements, which will describe their effectiveness in transferring and emitting energy in the form of thermal radiation.

**T Cell Expression of Neurotransmitter Receptors: A Global PCR Analysis**
Victoria Fonzi, Foundation Fellow, CURO Research Assistant
*Dr. Kimberly Klonowski, Cellular Biology, Franklin College of Arts and Sciences*

After infection, T cells specific for a given pathogen will divide and mobilize to infection sites to eliminate that causative agent. Some T cells will remain as a specific subset of memory T cells by either migrating or localizing within particular tissues, poised to quickly divide and eliminate an identical pathogen upon reinfection. These cells are maintained homeostatically in the absence of cognate antigen in part by the cytokines IL-7 and 15 and express CD8 as a co-receptor that aids in antigen recognition. Given that peripheral tissues are inundated with nerves, some T cells in these peripheral tissues express neurotransmitter receptors, and cross-talk between the nervous and immune system exists, we wish to determine whether antigen-specific CD8 T cells incorporate neurotransmitter signaling into their biological response. We will extract memory T cell lineages from various murine tissues at different stages of development through a cell sort and perform a global PCR analysis to determine receptor expression in multiple families of neurotransmitters in each of these distinct tissues. Our goal is to comprehensively assess neurotransmitter receptor expression and correlate that with a potential role in memory CD8 T cell development, persistence, and potential reactivation of various subsets. These data will provide a rationale for functionally assessing the *in vivo* relevance of specific neuro-immune crosstalk in the future.

**Investigating Isotopic Tree Ring Data from Coastal Logs**
Emily Fore, CURO Research Assistant
*Dr. Suzanne Pilaar Birch, Anthropology, Franklin College of Arts and Sciences*

By combining archaeology, paleoclimatology, and dendrochronology, we are able to study the past environment of the East Coast though buried logs from the Altamaha River, located in coastal Georgia. However, the application of isotope analysis, particularly high-resolution sampling, is not an established practice. This study will detect environmental fluctuations through isotopic testing of each tree ring growth season. We start by counting tree rings and charting the data onto skeleton plots. To determine the exact years a tree grew, we must compare and connect our skeleton plot data to a master plot, which is previously studied tree ring data from the same region. To study the isotope signals, we must extract

cellulose from both the growing and dry season of a singular ring. The study will produce a record of sub-annual to annual environmental conditions in the recent past. By examining the isotopic data of seasons, we will be able to see what the conditions these trees experienced and how they adjusted, or did not adjust, to the changes. Climate change is actively affecting coasts all over the world, and there is no better way to study the future effects than by studying climate change in the past.

**Activity-Based Closed-Loop System for Brain Re-Functionalization Following Traumatic Brain Injury**

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

Traumatic brain injury (TBI) is a leading cause of death and disability worldwide without clinical treatment, contributing to 50,000 deaths and 2.5 million emergency department visits annually. Our lab previously demonstrated the efficacy of applying open-loop current stimulation (arbitrarily scheduled delivery of stimulation) to glutamate-inhibited cells *in vitro* in increasing neuron excitability and promoting network synchrony, factors believed to be important in regulating recovery after TBI. Our preliminary data confirmed open-loop stimulation can result in transient motor recovery following TBI in rats. Despite these previous works, the effect of timing and duration of stimulation on recovery remains unknown. We hypothesize that, in an animal model of TBI, using specific behaviors to trigger stimulation (closed-loop stimulation) might improve functional response and outcome over currently used open-loop stimulation regiments. Using adult male Sprague-Dawley rats injured by a controlled cortical impact TBI, recording and stimulation electrodes are implanted and surgically fixed in the subdural area. We designed and used a novel paw tracking system during the Skilled Reach Task to enable behavior-triggered closed-loop recording and stimulation, analyzing the behaviors of the animal to change stimulation parameters and modulate behavior in real time. We hope to demonstrate that using these electrical stimulation protocols, we can selectively inhibit and promote functional forelimb movement with and without injury. Finally, we hope to demonstrate that electrical stimulation following stem cell transplantation into the lesion cavity post-TBI will promote neurogenesis, neural synchrony, and improve long-term functional outcomes, as in our previously published work *in vitro*.

**Validating the Orientation and Insertion of GFP11 Knock-in Flies**

Ave Fouriezos, CURO Research Assistant
*Dr. Daichi Kamiyama, Cellular Biology, Franklin College of Arts and Sciences*

The engineered mutator, MiMIC (Minos Mediated Integration Cassette), can be used to tag genes and track their protein products in the model organism, Drosophila, using fluorescent proteins. MiMIC contains transposons that can be exploited in order to insert transgenes into the genome of Drosophila. However, these transposons integrate into the genome at random, so inverse PCR must first be performed to recover the location of intronic MiMIC insertions in the Drosophila genome. Once these locations have been verified, primers can be designed according to the fluorescent proteins, such as GFP11 and sfcherry11, being used to tag proteins of interest. These primers verify that the insertion has successfully incorporated into the genome and is orientated properly for translation to occur, ultimately enabling the creation of extensive libraries of fluorescent protein-tagged genes. These libraries can give insight into the role that neuron adhesion molecules play in neural circuit assembly and the development of neurodevelopmental disorders like Down Syndrome, Autism spectrum disorder, and Fragile X Syndrome.

**The Cost Savings of Health Insurance Networks**

Gavin Frame, CURO Research Assistant
*Dr. Eli Liebman, Economics, Terry College of Business*

Since the introduction of the ACA, there has been a massive increase in the number of limited (narrow) network health insurance plans. These plans restrict the providers that their patients can go to for care by various mechanisms. Plenty of research has shown that narrow network plans have lower costs, but the exact reason for this discrepancy is still being researched. Because of the lack of knowledge about an enormous sector of the United States economy, it is paramount that more studies be conducted to help inform policy. In this paper we sought to examine the long-studied notion that narrow networks "cost" less than other types of networks. Several papers have shown this to be true, but few have broken down the exact reasons why. It could be that healthier people self-select into narrow networks thus reducing overall premiums. Insurance providers may also be using the breadth of their narrow networks to prune overpriced hospitals and bargain with other hospitals for better prices. The answer is likely that each of these hypotheses, along with other unlisted hypotheses, each have their own slight effect on the observed lower costs. We sought to quantify the magnitude of these hypotheses through the construction of several indices called Medical-Care Expenditure indices. These indices help to compare the cost of treating disease episodes due to changes in the price or quantity of services between narrow and broad networks. Our findings thereafter were consistent with past literature concerning the cost savings of narrow networks.

**The Need to Belong, Self-Concept Clarity, and Self-Esteem**

Sabrina Francescangeli, CURO Research Assistant
*Dr. Leonard L. Martin, Psychology, Franklin College of Arts and Sciences*

Studies in the past testing sociometer theory, a prominent theory of self-esteem in psychology, have shown that rejection from a social group can lower a person's self-esteem. This finding has led researchers to conclude that a person's sense of belongingness in a group directly affects their self-esteem. Other research, however, has demonstrated that self-esteem (how we evaluate ourselves) is closely related to self-concept clarity (whether we know ourselves). So, it is questionable whether social rejection is the only mechanism behind self-esteem. We are testing the hypothesis that social rejection

actually lowers a person's self-concept clarity and that this, in turn, lowers self-esteem. To test this, we are having participants play a computer game in which they are either accepted or rejected by other people. Then, we will measure the extent to which they feel socially accepted or rejected by the group, their self-concept clarity, and their self-esteem. We predict that rejection will lower self-concept clarity and that this will lower self-esteem. The findings of this study would contribute to the existing research on the relationship between self-concept clarity and self-esteem.

**Electronic Absorption Spectroscopy Measurements of Low-Temperature Combustion Intermediates**

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

Electronic absorption spectroscopy is an experimental technique that utilizes the interaction of light with molecules for qualitative and quantitative applications. Light absorption at specific wavelengths can cause excitation of valence-shell electrons and provide insight into the types of chemical bonds that define molecular structure. The technique is used to detect a large range of molecules and can decipher samples with minute structural differences based on the unique absorption bands from differences in electronic transitions, where cross-sections reveal specific concentrations of such molecules. In the present work, differential light absorption experiments of the excitation of electrons at specific wavelengths (120—240 nm) are studied using the Beer-Lambert Law to provide measurements of absorption cross-sections of intermediates relevant to low-temperature (< 1200 K) combustion. The results obtained herein are directly applicable to speciation measurements of complex molecules in combustion chemistry experiments, where isomeric resolution is critical. Several classes of species were studied: ethers, pyrans, ketones and hydrogen peroxides. Specific examples include diethyl ether, vinyl ether, 1,4Dioxane, tetrahydropyran, 3,4Dihydro2H-pyran, 2-methyltetrahyrdofuran, butanone, 3-pentanone, tert-butyl hydroperoxide, cumene hydroperoxide, hydrogen peroxide, and water. The outcome from the present work is contribution to the development of a spectroscopy database for absorption cross-sections of gas-phase species relevant to combustion chemistry.

**Remote Robotic Arm Teleoperation Through Virtual Reality**

Anton Eduard Franzluebbers
*Dr. Kyle Johnsen, Electrical and Computer Engineering, College of Engineering*

Remote realtime control of robots is an increasingly relevant problem. Our work builds upon the natural alignment between the fields of virtual reality (VR) and robotics, which have numerous commonalities in terms of technology and research areas, and which complement each other in that the field of robotics centers around the robot and the field of VR centers around the human. A merger of the two allows for a unique focus on the human-robot team. For this research, a realtime teleoperation interface was created to allow users to perform simple tasks with a pair of robot arms with various input mechanisms. In order to visualize the robot environment, several depth-aware visualizations were used, including a point cloud and stereo camera. One of the two compared interfaces was a more traditional approach, using high degree-of-freedom controllers as an approximation of various joystick-based approaches. This case uses a method called relative control, where the input from the user supplies only directional inputs which are converted to instructions for the robot in 3D space. The study compares this approach to one afforded by the tracked Oculus Touch controllers, which allow full six degree-of-freedom control in space. This control scheme is a form of absolute control, where the motion of the controller is mimicked by the robot. In our ongoing study, we expect to find faster learning rates as well as faster overall performance for simple pick-and-place tasks for the absolute control method.

**Superoxide Production of Human Neutrophils in Response to Cystic Fibrosis Clinical Isolates of *Staphylococcus aureus***

Rachel Anne Fricker
*Dr. Balazs Rada, Infectious Diseases, College of Veterinary Medicine*

Cystic Fibrosis is an autosomal recessive disorder. This disorder can cause constant infections in the lungs. Thick mucus trapped in the lungs causes difficulty breathing. Bacteria can be trapped in the lungs if the mucus clogs up the airway, and this leads to bacterial infection and lung damage. Neutrophils are a white blood cell type that serve as the front line defense against bacterial infections. Neutrophils utilize various antimicrobial mechanisms such as superoxide production, NET formation, and phagocytosis. Even though neutrophils have these effector functions, they do not clear certain respiratory pathogens in Cystic Fibrosis such as *S. aureus*. My project focuses on superoxide production in human neutrophils in response to CF clinical isolates of *S. aureus*. Superoxide ($O_2^-$) is created by neutrophils as a defense against bacterial infections. Neutrophils were isolated from peripheral blood of healthy donors. Bacterial density was set at 600 nm wavelength. A superoxide-specific chemiluminescence assay called Diogenes was performed to measure the respiratory burst in human neutrophils in response to various clinical strains of *S. aureus*. The results showed a wide range of oxidative response of neutrophils to CF isolates of *S. aureus*. A potential link between the extent of *S. aureus*-stimulated superoxide production and microbiological features of the bacterium or clinical features to the CF patients they were isolated from, will be explored in the future as part of this work.

**Native Wildlife Species as Hosts of the Exotic Invasive Asian Longhorned Tick, *Haemaphysalis longicornis***

Kenna Frierson
*Dr. Michael Yabsley, Forestry, Warnell School of Forestry and Natural Resources*

The Asian longhorned tick (*Haemaphysalis longicornis*) is an Ixodid tick native to areas of East Asia. This tick has unique ability to reproduce parthenogenetically and has recently become invasive in the United States. Within a year of its discovery, *H. longicornis* has been discovered in numerous Eastern states and on a wide variety of livestock and wildlife

species, as well as humans. This species is of concern because it is a vector of several pathogens that can affect both humans and animals. To investigate the distribution and host-range of *H. longicornis*, regional surveys targeting wildlife species were conducted. Ticks were collected from wildlife during active trapping efforts and at hunter check stations, and from wildlife admitted to rehabilitation centers. Ticks were visually identified using morphological characteristics and dichotomous keys. Although data analysis is ongoing, preliminary results have identified *H. longicornis* on 14/126 (11%) white-tailed deer and 14/27 (52%) of raccoons in several states. Additionally, infestations were noted on 5 other species, including woodchuck (1/22, 5%), gray fox (2/2, 100%), red fox (1/1, 100%), coyote (1/7, 14%) and red-tailed hawk (1/1, 100%). To date, infestation prevalence was highest for raccoons, although this result may also be due to increased sampling of raccoons in New Jersey, where *H. longicornis* is endemic. It is important to identify the relationship between *H. longicornis* and wildlife hosts, as this may be essential to both controlling the spread and identifying areas that may now have a higher prevalence of both native and introduced tick-borne pathogens.

**Ascertaining Inequality in the Millennium Development Goals at the Global Level**

Madisen Ree Fuller, CURO Research Assistant
*Dr. Puneet Dwivedi, Forestry, Warnell School of Forestry and Natural Resources*

In 2000, the United Nations adopted the Millennium Development Goals (MDGs)—a set of eight global development goals to be achieved between 2000 to 2015. I estimated Lorenz Curve and Gini Index for determining inequality for eight development indicators (the gross domestic product per capita, school enrollment rates, the percentage of women in parliament, infant mortality rates, fertility rates, HIV rates, carbon dioxide emissions per capita, and internet access), representing one MDG each. My results indicate that all selected indicators except carbon dioxide emissions per capita improved between 2000 and 2015. I also found that an improvement in an indicator does not necessarily imply a decrease in inequality. For example, the average infant mortality rate went down from 49.7 deaths per 1,000 births in 2000 to 23.68 in 2015, but the Gini Index went up from 0.44 to 0.48 over the same period showing an increase in inequality. The paper also discusses the implications of the data gap, the need for increased focus on developing countries, and ways to apply current research to have more equitable growth for the currently enacted Sustainable Development Goals.

**Expression and Purification of TEV and TEV-GFP Protease**

Nicholas Futrell, CURO Research Assistant
*Dr. David Blum, Biochemistry and Molecular Biology, Franklin College of Arts and Sciences*

Proteases are enzymes that break down proteins through the hydrolysis of peptide bonds formed between amino acids in a protein's primary sequence. Tobacco etch virus (TEV) protease is a 27 kDa enzyme that is commonly used in fusion protein cleavage because of its highly sequence-specific activity. The objective of this research project was to (1) create significant amounts of TEV protease and TEV-GFP protease, and (2) test the activity of the proteases produced using analytical techniques. The proteins were heterologously expressed in a non-virulent strain of *E. coli*, Rosetta 2(DE3). TEV protease was encoded using plasmid pBR322, which contained a T7-lacO promoter along with a six-residue histidine tag fusion. TEV protease, in particular, is a highly valuable protein used throughout the field of biotechnology, specifically when overexpressing and purifying fusion proteins. Throughout the research project, the team was successful in producing large quantities of TEV protease and TEV-GFP protease, as well as using a PelB cleavage assay to quantify the activity of TEV protease through SDS-PAGE gel electrophoresis. After refining these methods, this research project may have commercial implications in terms of the sale of the proteases to academic and industrial clients through the University of Georgia's Bioexpression & Fermentation Facility.

**A Language of Your Own: Developing Personal Iconography in Poetry**

Anthony Gagliardi
*Dr. Ed Pavlic, English, Franklin College of Arts and Sciences*

My research will take place in two parts: The first will involve directed reading regarding writing practice and pedagogy at large, and specifically in the development of a personal iconography in a poet's work. That is: a set of images, symbols, themes, etc. a poet might develop over the course of their writing, or within a single piece of it, that take on a specific and/or particularly layered meaning in the context of that same poet's work. As well as reading of examples of work(s) that do this. The second part will involve the development of a series of workshops around this same topic. I will seek out and speak to a number of teaching artists with experience in developing and leading poetry centered writing workshops, talking about their experiences, things they've seen work well or not, and so on. As this research takes place I will be using it to develop a series of workshops to help poets understand the concept of iconography, and how to use images and symbols as a way to access poetry and the process of writing poems.

**The Search for the Nuestra Señora de la Consolación: A Look at the Fate of the Smaller Vessels of the 1622 Tierra Firme Shipwrecks**

Kate Ganas, CURO Research Assistant
*Dr. Scott Noakes, Marine Sciences, Franklin College of Arts and Sciences*

During a routine voyage in 1622 between the New World and Spain, the Tierra Firme treasure fleet encountered a hurricane that destroyed 8 of the 28 vessels in the convoy. These ships, laden with New World treasures have been sought after for years by treasure hunters and historians alike. Two large galleons from the fleet, the Nuestra Señora de la Atocha and the Santa Margarita, were discovered by Mel Fisher in the late 70s. While the large ships have dominated the spotlight, historians have largely neglected the smaller vessels that sank during the hurricane. These navíos can provide important

archaeological information to our pre-existing literature on ocean current movement and living conditions aboard smaller colonial vessels. My research paper consists of a comprehensive history of the Nuestra Señora de la Consolación, a small navio that sank in the hurricane of 1622. I argue that the Consolación did not sink as previously thought, but rather the ship was confused with a similar vessel, the Nuestra Señora de la Concepción. Using paleography to study old Spanish records about the 1622 hurricane, I collected information pertaining to the Consolación, including its captain, financier, construction, launch date, etc. and created a comprehensive study on the vessel itself. This study will correct previous knowledge on the 1622 shipwrecks and provide the basis to discover the resting place of the Nuestra Señora de la Concepción.

**Identification of New Vaccines Candidates for *Schistosoma mansoni***

Roshini Ganesan
*Dr. Donald Harn, Infectious Diseases, College of Veterinary Medicine*

Schistosomiasis is a global public health problem with high disease prevalence in Africa, China, Southeast Asia and parts of South America. Control of schistosomiasis focuses on mass drug administration to kill adult parasites and reduce transmission. Recently, the World Health Organization (WHO) and the Gates Foundation have suggested adding a vaccine to reduce disease prevalence and intensity. Thus, the goal of my project is to identify new schistosome vaccine candidates targeting schistosomula surface membrane proteins. To obtain schistosomula membrane proteins we produced schistosomula from cercariae. 100,000 *S. mansoni* cercariae were mechanically transformed into schistosomula. Schistosomula membrane proteins were extracted by detergent, then run through a desalting column to remove lipids and detergent, resulting in 400 micrograms protein. Mice will be immunized with protein extract and we will perform ELISA to determine the levels of anti-schistosomula antibodies. Spleen cells from immunized mice will be fused with myeloma cells to produce hybridomas. These hybridomas will be screened by ELISA to select hybridomas producing antibodies binding to schistosomula. Positive hybridomas will be cloned and expanded to produce monoclonal antibodies. These antibodies will be used to identify new schistosomula surface antigens. Identification of new schistosomula surface membrane antigens will lead to testing of these membrane proteins as candidate vaccines. Any newly identified membrane proteins that induce protection against challenge may contribute to a vaccine that can reduce schistosome infection globally.

**Initial Program Stages for Adolescent Cambodian Refugees in Assessing the Prevalence of Culture Bound Syndromes**

Vidisha Gangidi, CURO Research Assistant
*Dr. Denise Clark Lewis, Human Development and Family Science, College of Family and Consumer Sciences*

Dramatic changes tend to occur when Southeast Asian (SEA) adolescent refugees were forced to leave their homes as violence and terror from Khmer Rouge and its aftermath. SEA refugees show a variable prevalence of post-traumatic stress disorder (PTSD) and other variable traumatic disorders following the resettlement and integration into the majority culture. The reason behind the variation involves the lack of an assessment of culture influences on stress symptoms. Some symptoms culturally defined are then universalized to fit with the Western-defined pathologies, such as PTSD. The initial assessment of culture bound syndromes and its effects was conducted through creating a literature review that encompasses articles that report variable PTSD rates for the Cambodian populations in the United States. This analysis involved SEA adolescent refugees between the ages of 14-18 in the Cambodian communities. The literature review also revealed the lack of an accurate diagnosis can hinder later emotional development, because healthcare providers may misunderstand symptoms not observed in Western medicine or listed in the DSM-IV. The lack of awareness can cause a misdiagnosis, which can lead to a domino effect that can impact an adolescent's emotional development and behaviors. To assess this need, it is important to implement a program within the resettlement process that evaluates the influence of cultural factors on psychological symptoms. The program will use the development psychopathology model to define the goals of the program and explain the potential impact this program can have with community dwelling adolescent refugees.

**An Assessment of Campus Farms in Student Involvement and Community Engagement: A Case Study at UGArden**

Reema Garabadu, CURO Research Assistant
*Dr. Jennifer Jo Thompson, Crop and Soil Sciences, College of Agricultural and Environmental Sciences*

A relatively new concept with little existing literature, student-run university farms have the potential to foster student and community engagement. The University of Georgia's student-run campus farm, UGArden, has been in existence for ten years. During this time, hundreds of students have participated in the process of growing food, plants, and herbs through classes, volunteering, semester-long internships, and/or jobs at UGArden. The objective of this study is to understand the value and purpose of UGArden to students and to the Athens community. We are compiling data collected from volunteers and visitors to UGArden between 2016-2018 and analyzing it to determine circumstances of student exposure and involvement. Through a secondary analysis of these data we aim to develop an understanding of trends and demographics of motivations in participation. Toward effort to expand equity and inclusion at UGArden, we will also use these data to begin to ask whether there are groups of students who are not participating. The purpose of this study is to provide a foundation for further research focused on understanding student motivations for participation at UGArden, their commitment to sustainable agriculture and food justice in the long-term, and the impacts of their involvement at UGArden on the community. Engagement on the farm, ranging from class requirement to personal interest, is essential to the farm's existence at both the university and community level.

**Molecular Line Excitation at the Edges of Interstellar Clouds**
Alejandro Daniel Garcia, CURO Research Assistant
*Dr. Loris Magnani, Physics and Astronomy, Franklin College of Arts and Sciences*

We aim to study how density fluctuations at the edges of small, nearby, interstellar molecular clouds affect the excitation of low-density gas tracer molecules such as CO and OH. By using simple toy models of molecular excitation, we will determine how density fluctuations can change the line intensities in these regions. We anticipate that even small density fluctuations will result in significant changes in the line intensities. This could lead to cloud regions of nearly the same density but with very different line strengths for a given molecular transition. Our results may help us better understand the so-called dark molecular gas phenomenon where substantial molecular hydrogen may be present at cloud edges yet, nevertheless, be undetectable in low-density gas tracers such as the lowest CO rotational transitions or the OH ground state, lambda-doubled, hyperfine transitions.

**Alternatives for Atlanta Municipal Peak Water Demands**
Galilea Najera Garcia, CURO Honors Scholar
*Dr. Bill Tollner, Environmental, Civil, Agricultural, and Mechanical Engineering, College of Engineering*

The USDA-Natural Resources Conservation Services (NRCS) has been building dams throughout the country since the 1950s. The dams built in Georgia were originally constructed for the purpose of controlling stream flows and sediment depositions downstream. Although they still serve this purpose, they have since developed a wide range of other uses such as protecting downstream infrastructure and creating potential water reservoirs. Over the last several decades Georgia has been experiencing severe droughts and is also involved in a tri-state water war with Alabama and Florida over the future allocation of water in two major river basins: the Alabama-Coosa-Tallpoosa and the Apalachicola-Chattahoochee-Flint basins. This is a concern because of the growing water demands of Atlanta that Georgia must meet. Since many dams were built in the area that is now Metro Atlanta, an effort is underway to evaluate existing dams and identify if any have the potential to be rehabilitated to use as municipal water supply during peak water demands. To identify the most beneficial options, alternatives such as on-stream and pumped diversion reservoirs will be compared on merits of environmental impact, upstream and downstream impact, safety, cost and feasibility. This study may help to address Metro Atlanta's water supply concerns by providing necessary data to local municipalities and dam sponsors about potential water supplies. Identifying these alternatives now could potentially aid in offsetting Metro Atlanta's peak water demands for the foreseeable future.

**A WRF Sensitivity Study on Optimizing Precipitation Forecasting in an Operational Context**
Richard Garmong
*Dr. John A. Knox, Geography, Franklin College of Arts and Sciences*

This WRF sensitivity study looks to determine what the most accurate microphysics and planetary boundary layer parameterizations are for Georgia during a tropical influenced flooding event in a convective resolving model. Accuracy is determined by using the Fractional Skill Score, Heidke Skill Score, and Frequency Bias. This study is limited in scope due to the domain size being small and only being based upon one case. The Eta (Ferrier) Microphysics model is the most accurate microphysics parameterization for this case and had the second-best time accuracy score. The Mellor-Yamada-Janjic scheme was the most accurate PBL scheme. However, the Yano et al. Planetary Boundary Layer scheme had a better time accuracy score.

**Assessing Vigilance Behavior in Wild Bearded Capuchin Monkeys, *Sapajus libidinosus***
Emily Savannah Garner
Sophie Barton, Sarah Cutts, Holly Presley
*Dr. Dorothy Fragaszy, Psychology, Franklin College of Arts and Sciences*

Vigilance (in ethology) is when an animal examines its surroundings in search of predators or assessment of other conspecifics. Although this behavior keeps individuals or groups safe from lurking threats, it also often comes at the cost of less time spent foraging or engaging in attentional or time-intensive tasks. For non-human primates that engage in attention-demanding tasks, attention taken away from such tasks may limit their ability to learn and to perform efficiently. Currently, there is not much known about vigilance in wild capuchins. We developed a coding scheme to operationalize vigilance behavior in capuchins. To do this, we analyzed videos of habituated wild capuchins (N = 30) in Brazil drinking water from a bowl (that required the monkeys to lower their eyes below the rim). Working from descriptions of vigilance in other species found in the literature, we created a coding scheme that we believed best encapsulated vigilance behavior in our study species. Next, we conducted reliability tests by independently coding multiple videos. After we confirmed that our reliability was acceptable, we coded vigilance-related behaviors during approximately 170 episodes of drinking. Our analyses will evaluate general patterns and individual variation in vigilance behavior in this setting, and together with previously collected data, will be used to test a set of predictions linking variations in vigilance in these monkeys to age, sex, and activity.

**Psychophysiological Effects of Yoga**
Alexeia Garnett, CURO Research Assistant
*Dr. Patrick O'Connor, Kinesiology, College of Education*

Yoga is increasingly popular, especially amongst women. A cross-sectional analysis of 34,525 adults in the United States found people practiced yoga for different reasons including to enhance general wellness and disease prevention (78%), improve mood and energy (66%), support immune function (50%), and treat back pain (20%). To incorporate these different aspects, numerous styles of yoga have transpired through the years, including Hatha yoga, which focuses on physical posture, and Vinyasa yoga, performed using slow breathing techniques. The purpose of this research is to compare the

effect of performing Vinyasa yoga poses with slow breathing to performing Vinyasa yoga poses without slow breathing on mood and conditioned pain modulation in women. Conditioned pain modulation is an experimental measure of the endogenous pain inhibitory pathway in humans. We will place 64 women into 4 groups: rest+normal breathing, rest+slow breathing, yoga+normal breathing and yoga+slow breathing. The participants will be given both a mood questionnaire and a conditioned pain modulation test before and after their experimental conditions to assess changes in pain and mood. We hypothesize that compared to the control condition involving seated rest and normal breathing, and controlling for confounding effects of expectations, systolic blood pressure, and the heat stimulus used to induce pain, both the conditions involving 40 minutes of yoga and those involving slow breathing will result in mood improvement and reduced pain sensitivity. The largest mood improvement and reduced pain sensitivity are expected from those who breathe slowly while performing yoga poses.

**Arboviral Transmission Rates Among Mosquito Populations After a Natural Disaster Occurrence: A Systematic Review**

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

In 2017, numerous hurricanes impacted the southern United States and several Caribbean islands. These areas also face high rates of arboviral transmission and incidence. After a natural disaster, it is possible these rates can be affected due to fluctuations in their arboviral hosts' population and environmental damage. However, evidence supporting this hypothesis is lacking. We conducted a systematic review in order to examine the prevalence of arboviral disease among mosquito populations after a natural disaster. This systematic review was conducted following Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRIMSA) guidelines, using the PubMed and World of Science databases. We did not make any restrictions based on language, country, mosquito population, or type of natural disaster. Our search terms yielded 104 studies. The title and abstract of each study were screened by two reviewers, with a third resolving discrepancies. Each reviewer then screened the full texts of possible studies to ensure that each study met inclusion criteria. From the 4 studies that were included, we abstracted further information, including location and type of arbovirus. The most common natural disaster was floods and the most common arbovirus was Western Equine Encephalitis. Additional studies examined prevalence rates after droughts. Most of the cases showed there was no significant change, whether an increase or decrease, in the prevalence of arbovirus among mosquito populations after a natural disaster. While there is not an absolute trend, there is suggestive evidence that arboviral populations may increase after natural disasters and relief efforts should prioritize mosquito surveillance.

**An Examination of Gender Differences in Occupational Physical Activity**

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

The 2018 Physical Activity Guidelines Advisory Committee set guidelines that adults engage in 150 to 300 minutes per week of moderate-intensity physical activity. The Committee states that half the U.S. adult population do not currently meet this level of physical activity and 30% of the population reports doing no moderate-to-vigorous intensity physical activity at all. Occupational physical activity, or physical activity done while at work, could help some people meet physical activity guidelines. This study examines differences between men and women (n=438, 66% women) in occupational physical activity and their perceptions of their job (e.g., physical load, autonomy). Separate Pearson's correlation coefficients were calculated for men and women of activity variables with job perceptions. A multiple linear regression assessed differences in men and women, as well as by office or field worker, in total physical activity participation. This study found that men were more physically active while at work than women and that those who work in field jobs, rather than office jobs, were more physically active as well. There was no interaction between sex and office worker status, suggesting that men and women in office-based occupations engage in similar amounts of activity, as do men and women in field-based occupations. Perception differences across gender were found for physical demands, psychological demands, skill discretion, and decision authority. Interventions targeting both male and female office workers, such as treadmill desks or using the stairs, may help insufficiently active adults be more physically active while at work.

**Are Clinicians Classifying Traumatic Brain Injuries Accurately?**

Catriona Geddes, CURO Honors Scholar, CURO Research Assistant
*Dr. Jonathan Murrow, Kinesiology, College of Education*

Every year millions of Americans are seen in emergency rooms, doctors' offices, and urgent cares for traumatic brain injuries (TBIs). A traumatic brain injury is often defined as an injury that results in the disruption of normal brain activity that can be the result of a bump, blow or shock to the head. While any impact to the head can be detrimental, there are varying levels of severity when it comes to TBIs. Most providers classify TBIs as either mild, moderate, or severe. However, there is not standardization when it comes to the classification as there is no one way to appropriately determine the severity of a TBI. Clinicians can use the Glasgow Coma Scale (GCS), Loss of Consciousness, Post-Traumatic Amnesia, neuroimaging, and many other techniques. This lack of clarity in how to classify a TBI can lead to confusion within the field and can be detrimental to the patient in accurately determining their plan of treatment and care.

**Reformation and Violence in Sixteenth-Century France**
Morgan Frederick Geiser, CURO Honors Scholar
*Dr. Sandy Dwayne Martin, Religion, Franklin College of Arts and Sciences*

Tensions between European natives and Muslim migrants have escalated to the point where they can no longer be ignored. However, this is not the first time that religious and cultural divides have fueled social tensions in Western Europe. By studying the past bloodshed in the name of religion, we can develop a broader understanding of the problems we face today. My research seeks to explore Catholic violence against Huguenot civilians during the French Wars of Religion to study the roots of the conflict that led to the deaths of thousands of Frenchmen and women during the sixteenth century. This study was conducted by analyzing primary source accounts from both sides regarding specific acts of violence and searching for trends in behavior linked to the violence. Archival sources at the Bibliothèque Nationale de France revealed that perceived oppression and desire for self-preservation caused the violence against civilians during the French Wars of Religion. The ways in which religion affected laypeople's thought and action shed light upon the current acts of religious violence in France and the rest of Europe. Knowing the nature of the religious conflict of the past will allow for a better understanding of the ways in which religious and cultural tensions arise and develop, and how they can be avoided in the modern world.

**Creation of Inducible Genetic Circuits for Transgenesis in *Nicotiana benthamiana***
Stephan Nicholas George, Foundation Fellow
Kelton McConnell
*Dr. Brian Kvitko, Plant Pathology, College of Agricultural and Environmental Sciences*

The development of inducible expression systems in plants is imperative to the field of synthetic biology. Inducible expression systems allow for the implementation of various metabolic pathways that are not naturally found in plants, which can allow for increased pest and toxin resistance, increased fruit durability and size, and faster growth rates. These metabolic pathways that stem from inducible expression systems provide more efficient crop farming and can make the agricultural business less tedious and more profitable. Among the available inducible expression, the Gal4/UAS system is an inducible promoter complex that utilizes the Gal4 transcription factor to activate genes downstream of an Upstream Activator Sequence (UAS). We are utilizing a 6X UAS combined with a minimal CaMV 35S promoter to provide enhanced expression of reporter genes such as GFP and the apoptotic initiator from bell peppers, BS3, in the model organism, *Nicotiana Benthamiana*. With the end goal to produce an inducible expression system capable of inducing apoptosis in response to toxins, sufficient expression from these reporter genes will be imperative to the creation of necessary genetic circuits.

**Elevation and Habitat Distribution in the Sapelo Island National Estuarine Research Reserve**
Sadneya Ghag
*Dr. Charles S. Hopkinson, Marine Sciences, Franklin College of Arts and Sciences*

Elevation is an important factor in structuring forest communities on low-lying barrier islands and in determining their vulnerability to flooding as a result of sea-level rise. Although light detection and ranging (LIDAR) is helpful for measuring elevation, its inability to penetrate vegetation canopies can compromise ground surface elevation. Ground-truthing is therefore necessary to correct LIDAR results. I measured elevation in nine of the most common forest habitat types within the Sapelo Island National Estuarine Research Reserve (SINERR) in order to determine whether the distribution of habitats is related to elevation and whether the ground-truth correction varies between habitats. I used the X90 OPUS GPS receiver for calculating the ground-truth elevation and compared it to LIDAR obtained from the SINERR. I found no consistent offset between lidar and ground truth elevation, suggesting adequate penetration of the forest canopy in all habitats examined in SINERR. There was not a strong relation between habitat type and elevation for the region I studied, but the Maritime Hammock was on average lower (1.7m) elevation (1.7 m) than the upland forest (2.5 m). With an expected sea level rise of 1.69m by 2100, the vulnerability of the maritime hammock habitat is quite high, while the upland forest is lower.

**Measuring Cellular Differentiation in 3D Bone Tissue Models**
Hannah Kaitlyn Giles
*Dr. Karen J.L. Burg, Small Animal Medicine and Surgery, College of Veterinary Medicine*

While cell culture on 2D surfaces has been the prevalent technique for measuring cellular response in biomedical research, it does not accurately represent the structure and microenvironments that living 3D tissues possess. In addition, *in vivo* (in patient) testing presents challenges in studying cellular behavior as each patient has a unique biological response to any given test condition. 3D tissue modeling is the process of building a 3D block of tissue in the laboratory using cells derived from a patient. The models are reproducible, minimizing patient to patient biological variability. The goal of this experiment is to build a 3D tissue model for panosteitis, an inflammatory bone disease in large dogs characterized by over calcification of the bone. The model incorporates polylactide-tricalcium phosphate (PL-TCP) scaffolds, designed to influence the osteogenic differentiation of stem cells. The scaffolds were divided into two halves—one with just polylactide and the other with polylactide interspersed with TCP particles. These halves can respectively be thought of as non-bonelike and bonelike, with the hypothesis that the TCP will influence the stem-like cells to act like bone cells (osteogenic differentiation). Osteogenic characteristics such as calcium concentration, alkaline phosphatase activity, and genes associated with osteogenic cells are being assessed over a four-week culture period. In addition, the growth of cells in each half is being monitored to ensure the scaffolds are compatible with the cells.

The long-term goal of this project is to replicate key aspects of panosteitis to provide a model to study the disease and potential treatments. This approach could ultimately be applied to model more complex diseases and potential treatments.

**Analysis of the Amoebicidal Effectiveness of Experimental Compounds in the Treatment and Prevention of *Acanthamoeba* keratitis**

Lauren Faith Gilstrap, CURO Research Assistant
*Dr. Dennis Kyle, Cellular Biology, Franklin College of Arts and Sciences*

*Acanthamoeba* keratitis (AK) is a debilitating eye infection caused by the free-living parasite, *Acanthamoeba*. These parasites can infect contact lens wearing patients due to their ability to resist antimicrobial medication currently used in contact lens solutions. *Acanthamoeba* can interchange between two life cycle phases: an active trophozoite phase and a dormant cyst phase. The ability to exist in a highly resistant cyst phase when under environmental stress poses a difficult challenge in treating or preventing infection of these amoeba. Analysis of a previously conducted high throughput drug screening of thousands of compounds from an approved drug library revealed that numerous compounds were toxic to *Acanthamoeba*. This research further examined the amoebicidal properties of these select compounds through simulating an environment in which the drug would be used commercially to consider its practical utility in *A*K prevention. Three species of *Acanthamoeba* were exposed to these compounds for a period of six hours at differing concentrations to pinpoint effective concentration levels. The exposure time of the potential drug to the amoeba was a six-hour period to simulate the average time period contact lenses are suspended in cleansing solution overnight. After the removal of the drug following the allotted exposure time, the amoeba were placed in a recovery media to assess the effectiveness of the drug in preventing a return to confluence. The compounds alexidine, DB1736A, DB1734, DB1682, DB1685, DB1690, DB1683, DB2643, and DB2672 demonstrated amoebicidal effectiveness by preventing a return to confluence after thirty days and should be studied further.

***E. coli* and Water Quality in the San Luis River and Tributaries in Monteverde, Costa Rica**

Amanda Glatter
*Dr. Amanda T. Rugenski, Ecology, Odum School of Ecology*

As a developing country, Costa Rica's waste water management is often inefficient, and runoff from septic tanks and agriculture can seep into streams and result in *E. coli* contamination. San Luis is a rural town in Costa Rica, and the San Luis River is at risk of *E. coli* exposure, threatening community members' health. The aim of this study is to examine how *E. coli* levels change from upstream the San Luis River to downstream and to see if total suspended solids and *E. coli* showed a positive correlation. We visited ten sites along the San Luis and tributary streams, collected samples of water, and used a multiprobe to measure chemical and physical characteristics. We counted *E. coli* colonies using Quantitray analysis and used the remaining water for BOD5 tests and measuring total suspended solids. We found an increase in *E. coli* concentrations from upstream to downstream and significantly positive correlations between total suspended solids and *E. coli*. All samples had *E. coli* concentrations below the WHO safety limit for domestic and recreational water use (125 cfu/L), except one, whose contamination was likely due to runoff from a nearby cattle farm. The data supports the hypothesis that *E. coli* concentrations are higher farther downstream. In the future, studies comparing the wet and dry season would help us understand seasonal impacts of *E. coli* in streams and surveying the community would help us understand the public health implications of contaminated water in San Luis.

**Designing Chondroitin Sulfate Glycosaminoglycan Hydrogel Matrices for Neural Stem Cell Differentiation**

Morgan Goeden, CURO Research Assistant
*Dr. Lohitash Karumbaiah, Animal and Dairy Science, College of Agricultural and Environmental Sciences*

There are currently no effective treatments for patients affected by severe traumatic brain injuries (TBI). Neural stem cells (NSCs) have demonstrated great potential as a treatment to repair neural networks following a severe TBI. However, previous studies have shown poor survival of NSCs transplanted after the injury, limiting the therapeutic effects of the treatment. Chondroitin sulfate glycosaminoglycans (CS-GAG) in the brain extracellular matrix (ECM) have been shown to be neurotrophic as well as can regulate neuronal patterning. CS-GAG hydrogels have demonstrated the ability to support the proliferation of NSCs through enrichment of specific trophic factors following severe TBI. We hypothesized that a CS-GAG/laminin interpenetrating network (IPN) hydrogel will promote neuronal differentiation of NSCs into functional neurons and support *in vivo* engraftment and functional recovery post-TBI. Hydrogels were fabricated by facilitating the strain-promoted "click" coupling of a 2.5:1 ratio of azide functionalized CS-GAG and dibenzocyclooctynol (DIBO) CS-GAG to yield 3D scaffolds. Human NSCs (hNSCs) reconstituted in cell culture media containing laminin were added to the mixture of hydrogel solution and allowed to crosslink for ~10 minutes. hNSCs were allowed to differentiate for 7-14 days and neuronal differentiation was validated via immunohistochemistry. In future studies, network function of differentiated NSCs will be monitored via calcium imaging upon transfection of AAV (pAAV.Syn.NES-jRGECO1a.WPRE.SV40) for fluorescent calcium sensor expression. These studies demonstrate the potential applications of CS-GAG hydrogels possessing defined mechanical and biochemical properties to support neuronal differentiation and functional network formation.

**The Development of Nonprofits in West Africa: An Examination of Habitat for Humanity**

Elizabeth Goggin, CURO Research Assistant
*Dr. Oscar Chamosa, History, Franklin College of Arts and Sciences*

What started as a small community at Koinonia Farms in Americas Georgia has grown into an international nonprofit and NGO. In 1973 The Fund for Humanity initiated a three-year housing project in Zaire, present day Democratic Republic of

Congo. My research under the faculty mentorship of Professor Chamosa will focus on the development and evolution of The Fund for Humanity into Habitat for Humanity International. It will discuss Habitat building projects in West Africa, and explore, elaborate, and investigate accomplishments and constraints. My research will also showcase the institutional and political changes that must occur in West Africa in order to ensure sustainable housing development after the departure of NGOs. This project will explore the motivations, limitations, and successes of nonprofits in Africa, and how to frame their contributions in a global context. Through examination of the Habitat for Humanity archives and the Millard Fuller Papers in the Special Collections Library, I will determine the achievements and constraints of Habitat for Humanity in West Africa. I would prefer to present my research in an oral format to explain the context of my research.

**Elucidating the Role of Cas2 in CRISPR DNA Uptake of *Streptococcus thermophilus***
Riya Gohil, CURO Research Assistant
*Dr. Michael Terns, Biochemistry and Molecular Biology, Franklin College of Arts and Sciences*

The CRISPR-Cas system in bacteria and archaea serves as an adaptive immune system against viruses and other foreign genetic elements via integration of exogenous DNA into the CRISPR array, termed adaptation. There are three stages of CRISPR-Cas immunity: adaptation, crRNA biogenesis, and invader silencing, however the mechanisms of adaptation differ between diverse systems and are the least well understood. Cas2 is one of the most highly conserved Cas proteins and is essential in adaptation, but its role has not yet been fully elucidated. For example, it is unknown if Cas2 nuclease activity observed *in vitro* plays an important *in vivo* role in mediating efficient and proper integration of DNA fragments at the CRISPR loci. The purpose of this project is to investigate the role Cas2 plays in adaptation in *Streptococcus thermophilus*, specifically through monitoring adaptation *in vivo* in strains expressing either wild-type or nuclease-defective Cas2 proteins. We hope to understand if Cas2 nuclease activity is critical for novel spacer acquisition into the CRISPR loci. Differences in the frequency or types of DNA fragments incorporated into the CRISPR array in the presence of nuclease defective Cas2 proteins would provide important insight to the mechanisms of adaptation.

**Evolutionary Insights into the Differential Risks of Gout Across Human Populations**
Kyndal Goss
*Dr. Kaixiong Ye, Genetics, Franklin College of Arts and Sciences*

Gout is the most common type of inflammatory arthritis and is initially caused by a buildup of urate or uric acid (Kuo et al., 2015). Different human populations have varying risks for gout, but the genetic basis is still unclear. Studies have been done to identify genes associated with uric acid and gout, providing opportunities to identify genetic variants with different frequencies across populations. This study focuses on the *ABCG2* gene (Chung-Jen et al., 2018) and applies evolutionary analyses to identify such genetic variants and to evaluate if they were results of genetic adaptation to local environment. We found evidence of genetic adaptation in four human populations: Africans, Europeans, South Asians, and East Asians. We also identified candidate genetic variants with geographically varying frequencies. Overall, this study suggests that genetic adaptation to local environment leads to varying frequencies of genetic variants, which further contribute to different risks for gout.

**Heterologous Expression of *K. marxianus* Rce1 in *S. cerevisiae***
Arnav Goyal, CURO Research Assistant
*Dr. Walter K. Schmidt, Biochemistry and Molecular Biology, Franklin College of Arts and Sciences*

Many clinical drugs target membrane proteins because they are typically involved in intercellular communication and mediate important cellular processes. Rce1 is a clinically relevant membrane protein that is implicated in cancer. Drug development often depends on knowledge of a protein's structure; however, this remains unknown for mammalian Rce1. Since both *S. cerevisiae* and human Rce1 have resisted purification, thus precluding structural studies, investigations of a more structurally stable Rce1 homolog may be warranted. Toward this end, we describe cloning and expression studies of Rce1 from the thermotolerant *K. marxianus* species of yeast. The expression plasmids for recombinant KmRce1 were designed for use in conjunction with *S. cerevisiae* for which several *in vivo* and *in vitro* and assays exist to determine the activity of Rce1. Results indicate that KmRce1 is functionally expressed as monitored using *in vivo* yeast mating assays and *in vitro* proteolysis assays. Attempts to purify KmRce1, however, have offered similar resistance to purification as for other Rce1 homologs. To attempt to stabilize the structure of KmRce1, we will report on efforts to engineer a stabilizing linker that is expected to mimic the substrate-bound state of Rce1. With success, this effort is expected to provide details on the topology of KmRce1 and potentially yield a more stable form of the protein for purification studies.

**Testing for Influences of Ovarian Follicle Growth Rate in Japanese Quail**
Kylie Graden, CURO Research Assistant
*Dr. Kristen Navara, Poultry Science, College of Agricultural and Environmental Sciences*

In poultry, the rate at which ovarian follicles grow in the female not only determines the size of the egg that is produced, but there is now evidence that a fast rate of follicle growth may also result in an egg that retains the male sex chromosome and ultimately produces a male chick. However, the factors that influence the rate of follicle growth are not currently understood. We hypothesize that the rate of follicle growth is directly related to the weight of the female and/or her mate. To test this, we will determine whether the body fat composition of the female and/or her corresponding male is correlated with follicle growth rate, whether follicle growth rate varies within and among females, and whether growth rate is related to egg size and sex of the egg. To do this, we will pair-house Japanese quail and measure body conditions of all females

and males. We will then collect five eggs from each female and perform yolk ring staining to determine the rate of ovarian follicle growth. Following this, we will compare male and female body condition with follicle growth between the same females, and sex the genetic material of the egg to determine whether follicle growth rate is related to the sex of the egg. An understanding of this could ultimately help us to find ways to maximize egg production in poultry.

**Vaccine Refusers and Acceptors: The Influence of Health Belief Model Factors and Media Selectivity on Vaccination Uptake**
Connor Grady, CURO Research Assistant
*Dr. Michael A. Cacciatore, Public Relations, Grady College of Journalism and Mass Communication*

Previous studies have applied the Health Belief Model (HBM) to understand the predictors of health behaviors. Vaccine benefits and recommendations from healthcare professionals have been identified as two crucial factors associated with vaccine acceptance, while vaccine refusers report lower confidence about vaccine safety, are less likely to believe the necessity of vaccines to fight against flu, and more likely to ignore flu susceptibility. Using a nationally representative survey of U.S. adults (n = 1005), we focused specifically on the association between participants' past vaccination behavior, HBM measurements and vaccine-related information-seeking behavior. Such an approach can help to disentangle the process behind vaccination decision-making and the role mediated content plays in that process. In line with the tenants of HBM, we found that people who reported having received the flu shot in the previous year reported significantly higher perceived susceptibility to flu, higher perceived flu communicability, higher perceived severity from the flu, and saw fewer barriers to vaccination. In terms of vaccine-specific and overall health-related information seeking, vaccine refusers relied less on information from professional healthcare providers, news stories, government agencies, and medical or health-related interest sites. Those declining a flu vaccination in the previous year were also more likely to report either personal or indirect negative experiences from a vaccine, specifically, an adverse reaction. The results reported here suggest the importance of information-seeking on vaccine behaviors, particularly in our current media environment where audiences can tailor their information searches to confirm their beliefs about health issues, including vaccination.

**'To Kill a Wife with Kindness': Contextualizing Shakespeare's *The Taming of the Shrew***
Kristen Nicole Gragg
*Dr. Frances N. Teague, Theatre and Film Studies, Franklin College of Arts and Sciences*

In my research, I examined the literary and folkloric practice of shrew taming as a source for Shakespeare's *The Taming of the Shrew*; I combined the use of primary and secondary source materials, obtained through the University of Georgia library, to study how Shakespeare's deviation from the taming tradition affects the text. *The Taming of the Shrew* is often criticized by modern audiences for its misogynistic depiction of wooing and marriage. The play's central plot element—female submission to a domineering male force—is unappetizing to a global culture growing as increasingly concerned with women's empowerment and liberation as ours is. In accordance with previous Shakespearean scholarship, however, I suggest the presentation of gender and marriage in *The Taming of the Shrew* is not as single-faceted as it might cursorily appear. Rather, when we examine the text in conjunction with its folkloric and literary source materials, we can create a more palatable reading of the play in which Katherine is not truly the eponymous shrew of the title and, as such, is never truly tamed.

**Psychological Response to Environmental Design Factors Experienced in Virtual Landscapes**
Clint Granros, CURO Research Assistant
*Prof. Brian Orland, Environment and Design, College of Environment and Design*

Environmental psychology is the study of how spaces and places in the environment affect the people interacting inside them. My research will evaluate the effects of different design modalities on the perception of the landscape by its users. Using virtual reality (VR) tools, immersive visual representations of environments will identify how experiential designs are perceived by the people who will use them. Collaborating with Professor Orland and PhD students in the College of Environment and Design (CED), I will model designs created for Athens elementary schools and evaluate respondents perceived safety, comfort, and attractiveness of the redesigned spaces in three ways: 1) on-site, by viewing images of the proposals; 2) in the classroom, by viewing before/after renderings; 3) in 3D, by experiencing VR designs. While the designs incorporate tangible elements such as tree cover, lighting, and walkways, this study will investigate students' perception of the intangible experience of those attributes. Satellite imagery and VR software will create 3D renderings of the sites, which student respondents will experience via a VR headset. Feedback from the experiences will be collected by survey methods and analyzed to record how the display modalities yield similar or different psychological responses to the landscape. I predict that the VR experience of intangible design factors such as plant diversity, density and spatial relationships, will allow more meaningful appraisal of the perceived safety, attractiveness, and comfort. The results of this study will benefit designers in determining appropriate use of VR to best serve the communities they are helping.

**Effect of Prenatal Exposure to Endocrine Disrupting Chemicals on Metabolic Function**
Bethany Graulich
*Dr. Jarrod A. Call, Kinesiology, College of Education*

Over the past few years, there has been an increasing focus on the detrimental health effects of plastics, such as bisphenols, that contain endocrine disrupting chemicals. It is hypothesized that prenatal exposure to these chemicals may predispose offspring to develop many negative health effects, e.g., a predisposition to diet-induced obesity and hyperglycemia. For this study, pregnant rats were randomly assigned to groups

exposed to either normal drinking water (control), or BPA, BPS, BPF, DEHP, or a combination of BPA and DEHP in the drinking water from days 6-21 of gestation. Because hyperglycemia and type II diabetes has been linked to metabolic dysfunction, each group of offspring was further divided and fed either a high fat diet or regular chow for two weeks when the pups were 12 weeks old to see if prenatal exposure would exacerbate the effects of a high fat diet. Metabolic function of the soleus muscle, a mitochondrial rich muscle, was determined using mitochondrial enzyme assays to approximate mitochondrial content and function. These investigations will determine if prenatal exposure to endocrine disrupting chemicals in plastics has an effect on skeletal muscle metabolic function and if this effect will be further impacted by a high fat diet.

**Agriculture College of Education Teacher Attrition and Mobility**
Dalton Green
*Dr. Jason Boone Peake, Agricultural Leadership, Education, and Communication, College of Agricultural and Environmental Sciences*

The purpose of this research is to examine Georgia 6-12 Agriculture Teachers' attrition rates and report where these teachers go when they leave the classroom. Agriculture teacher numbers has been tracked since the inception of secondary agricultural education and "teacher shortage" has been a consistent problem in secondary agricultural education for at least the last four decades (Kantrovich, 2010). There were 10,600 secondary agricultural education positions nationwide on September 1, 2009, with a net demand of 667 replacements, or 6.3% (Kantrovich, 2010). By examining where teachers go when they leave, we can better understand their reason for this move. There are several factors that contribute to the lack of retention. This study uses data from the past ten years containing the move of each agriculture education teacher in the state of Georgia. The data includes which school they were at, and where they went when they left the classroom. The places in which the Ag teachers went when they left the profession were divided into categories including home, retirement, industry, and unknown. This information lines up with previous research on this topic. Ingersoll and Smith (2003) reported 42% of former teachers indicated a variety of personal reasons for leaving the profession. This project will continue to grow as more data is acquired in future years. It can be concluded that over the past ten years, in the state of Georgia, the professions in which Ag teachers go when they leave the teaching profession is varied amongst the population.

**Applying Statistical Analysis to fMRI Data**
Nathan Greene, CURO Research Assistant
*Dr. Nicole Lazar, Statistics, Franklin College of Arts and Sciences*

The blood oxygenation level dependent (BOLD) response is an indirect measure of neuronal activity. It reflects changes in the oxygenation of blood in the brain as a reaction to performing a task or exposure to some stimulus. Functional magnetic resonance imaging (fMRI) exploits the BOLD response to take scans over time of the human brain in action. This is more information than still images. This semester I am learning how to use statistical analysis to draw meaningful conclusions from fMRI data. In fMRI data analysis, an important component is visualization of results, which aids in interpretation. I am also exploring ways of visualizing the results of these statistical methods.

**Leveraging A-Factor as a Reporter to Test FTase Specificity Predictions**
Jacob W. Greenway
*Dr. Walter K. Schmidt, Biochemistry and Molecular Biology, Franklin College of Arts and Sciences*

CaaX proteins undergo multiple post-translational modifications at their COOH-terminus: isoprenylation at Cysteine, followed by removal of the three terminal amino acids (aaX), and lastly carboxyl methylation of isoprenylated cysteine. Reporters such as Ras (human; yeast) and the **a**-factor mating pheromone (yeast) have been used to understand these post-translational events. Recently, our lab discovered that certain CaaX sequences are subject only to isoprenylation and not subsequent modification (i.e. a shunt pathway). From the results of two published yeast genetic studies involving Ras (standard) and Ydj1 (shunted) reporters, we were able to build rules to predict whether a Cxxx sequence would be subject to standard or shunted modification. We categorized all known yeast proteins (n=93) based on this rule and are using a-factor as a surrogate reporter to confirm our predictions. Motifs were incorporated into the a-factor-encoding *MFA1* gene to create a plasmid library of **a**-factor CaaX mutants. The plasmids were individually transformed into *mfa1*Δ *mfa2*Δ yeast that lack both of the **a**-factor genes. We are using mating assays to assess the phenotype of each a-factor mutant and judge the predictive value of our rules. This project will provide a more accurate binning of the yeast prenylome into standard, shunted, and unmodified proteins and such information could prove useful for understanding the post-translational modification of prenylproteins in other systems, such as humans where carcinogenesis often involves prenylprotein activities.

**Developing and Optimizing a Minimal Medium for *Vibrio fischeri***
Korryn Gregory, CURO Research Assistant
*Dr. Eric Stabb, Microbiology, Franklin College of Arts and Sciences*

*Vibrio fischeri* is a bioluminescent bacterium and a symbiont of certain marine animals such as the Hawaiian bobtail squid, *Euprymna scolopes*. Much of the research surrounding *V. fischeri* explores the conditions and signals that cause the bacterium to luminesce. "Defined" or "minimal" media may be advantageous in such studies, because they give researchers exact control over specific components and their concentrations in the medium, allowing a controlled experimental approach to exploring compounds that affect growth and luminescence. In contrast, a rich medium such as LB, which contains undefined complex ingredients such as yeast extract, does not allow such specific control. This is especially problematic because unknown compounds in standard rich media affect the bacteria's regulation of luminesce. Despite the potential advantages of minimal media, past recipes used for growing *V. fischeri* resulted in inconsistent growth and low cell yield (OD600 of ~1.5-1.8).

This research addresses problems with defined medium use in *V. fischeri* research by adjusting components of the standard defined medium to increase final OD600 and luminescence output. By switching to an organic phosphate source and adjusting the buffer used, we achieved a final OD600 of >6 in a defined medium. Moreover, the bioluminescence of cells in these defined media has been equivalent to or higher than cultures grown in SWTO, the standard rich medium used for luminescence experiments. This research continues to explore different defined media recipes, with the goal of creating a medium optimized for growth and luminescence.

**School Distress in Adolescence and Antibody Response to the Influenza Vaccine**

Rebecca Nicole Guerreso, CURO Research Assistant
*Dr. Katherine B. Ehrlich, Psychology, Franklin College of Arts and Sciences*

Adolescence is a period of increased stress levels, due to developmental changes as well as external pressures from family and peers to succeed socially and academically. Psychological stress, a distinctive component of adolescence, has been found to have profound physiological effects; in fact, social stressors can result in the body being less effective at producing antibodies and other defense mechanisms which combat disease and infection. Academic pressure is a main source of stress in adolescence, and the impact this has on the immune system can be detrimental. This study investigates the impact school distress has on antibody response to the influenza vaccine in adolescence. Adolescent participants completed two study visits. At the first visit, adolescents received the seasonal influenza vaccine, provided a blood sample, and participated in an interview to determine the amount school distress present in his or her life. Approximately 28 days later, adolescents returned and provided a second blood sample, which was then compared to the initial blood sample to determine antibody production levels. Participants' interviews were coded by a team of graduate and undergraduate research assistants to determine school distress levels. We hypothesized that participants who experience high amounts of school-related stress will produce fewer antibodies in response to the influenza vaccine compared to adolescents who experience low levels of school-related stress. We anticipate that there will be a negative correlation between academic stress levels and antibody response to the vaccine, such that heightened school distress is associated with poorer immune system functioning in adolescence.

**Toxicity of 1-Hydroxyphenazine on UGT-1 Mutants of *Caenorhabditis elegans***

Jane Guo
Sharon Maina, Taha Rahmatullah, Tori Van der Gaag
*Dr. Art Edison, Genetics, Franklin College of Arts and Sciences*

*Caenorhabditis elegans* is an ideal model organism used to study the xenobiotic detoxification pathways of various toxins. UGT proteins play a fundamental role in detoxifying xenobiotics, but not much is known about the phenotypes for specific UGT genes. Through a developmental assay, we will examine the effects of 1-hydroxyphenazine on the growth and development of a uridine diphosphate-glucuronosyltransferase (UGT) deletion strain of *C. elegans*. Our objective is to determine whether the UGT-1 deletion mutant is associated with increased or decreased detoxification phenotypes by assessing whether the worms mature into adults or if their growth is stunted. Due to a hexosyl group found in the structure of UGT-1, it is predicted that UGT-1 will in fact have an effect on the detoxification of *C. elegans*. Future experiments will test the toxin on other available mutant strains in order to determine which UGT genes play a role in the xenobiotic process in nematodes. Understanding which UGT genes are involved in the detoxification process will help to combat drug resistance in parasitic nematodes.

**The Athens Music Scene Through the Eyes of Audience Members**

Lily Guthrie, CURO Research Assistant
*Dr. Naomi Graber, Music, Hugh Hodgson School of Music, Franklin College of Arts and Sciences*

Athens, Georgia has been one of the most thriving alternative music scenes in the country since the rise of R.E.M. and the B-52's in the 1970s. The quality of acts coming through town is still strong today, but the people in the audience have changed. From online reviews, I am currently in the process of tracking audience opinions at four local venues, which are the Georgia Theatre, the 40 Watt Club, the Foundry, and the Caledonia Lounge. I am covering Facebook, Yelp, and Instagram in an attempt to represent a broad and diversified audience. I am recording reviewers' age, race, gender, relationship to UGA, the atmosphere they describe, the number of stars they give the venue, and the genre of music they were there to see. I am also watching an Athens music documentary for research. What I have seen from the myriad of reviews I have read is that people are generally impressed with the sound quality, the cheap drinks, and the high caliber acts that come through these venues. Though I have not read too many complaints, multiple people have remarked on the small crowd sizes, the generally older age group present, and some discriminatory actions. This data will be useful to club owner, organizers, and managers to make better use of their space so it is more welcoming and inviting for all. I believe these issues should be brought to the venues' attention and solved to make for a more inclusive and energizing environment.

**Transcriptome Profiling of Equine Insect Bite Hypersensitivity Lesional Skin Using Next-Generation Sequencing**

Alyssa Gutierrez, CURO Research Assistant
*Dr. Frane Banovic, Small Animal Medicine and Surgery, College of Veterinary Medicine*

Insect-bite hypersensitivity (IBH) is caused by the biting of insects of the genus Culicoides and is the most common allergic skin disease in horses worldwide; approximately 10% of all horses worldwide are affected by IBH. Pathogenesis of IBH involves IgE-dependent type I allergy with strong involvement of type IV allergic hypersensitivity reactions. Current treatment options are limited to glucocorticoids, which have problematic

side effects and are not effective in many cases. Increased knowledge about the molecular phenotype of human allergies has contributed to the development of novel therapeutics, including trials with targeted therapeutics. To expand our knowledge of molecular signature in IBH, we investigated the differentially expressed genes (DEGs) in lesional IBH (acute and chronic;) and normal healthy skin samples using RNA sequencing; our analysis focused on the upregulation of inflammatory markers, pruritogenic (itch) mediators and receptors. RNA sequencing allows for precise gene identification and quantification of gene expression, even when genes are expressed at low levels. Five affected IBH horses were enrolled; the median pruritic score using client evaluated visual analog scale was 7/10. Total RNA was extracted from 10 IBH lesional samples and healthy control; all samples were included in subsequent library preparation and sequencing as they contained an OD260/280≥1.8 and an RNA integrity number (RIN)>7. Anticipated outcomes from this study include identifying inflammatory cytokines and possible pruritogenic pathways to find new target treatments for equine IBH.

**Oxycodone Self-Administration and Stressed-Primed Reinstatement in Rats**

Hiba Hafeez
*Dr. Jesse Schank, Physiology and Pharmacology, College of Veterinary Medicine*

According to the CDC, 46 people die daily from prescription opioid-induced overdoses. Opioids are commonly prescribed painkillers that are beneficial, but potentially addictive. The mu opioid receptor is targeted by these drugs creating an analgesic effect and also the reinforcing effect associated with addiction. Oxycodone, a mu opioid receptor agonist, initiates a response in this receptor causing pain relief but also potential addiction. Prescription opioids are most commonly used by the oral route of administration in humans, but few animal studies have researched the effect of this route. There is also limited literature on sex differences in drug-seeking behavior. Therefore, we assessed the difference in oral oxycodone self-administration in male and female rats. First, adult male and female Long-Evans rats were trained to self-administer oral oxycodone solution in operant chambers by lever press. Next, naloxone, a mu opioid receptor antagonist, was administered to investigate the role of the receptor in self-administration. The estrous cycle was monitored throughout to examine the effect of hormones on female oxycodone intake. We also assessed relapse-like behavior triggered by stress using the reinstatement model. We found that female rats self-administered significantly more oxycodone than males and that the estrous cycle had no significant effect on self-administration in females. Males and females extinguished pressing when water was substituted for oxycodone and reinstated drug seeking following footshock stress exposure. Our findings conclude a difference between males and females in oral oxycodone intake and report a rodent model for oxycodone self-administration and relapse.

**Interaction of the Endosymbiont *Wolbachia* and Pathogenic Bacteria in *Drosophila* Flies**

Ali Haider
*Dr. Kelly Dyer, Genetics, Franklin College of Arts and Sciences*

*Wolbachia* are a common intracellular bacteria found in ~ 60% of arthropod species. They are capable of manipulating the reproduction of their host, enabling invasion of previously uninfected populations. However, certain strains do not appear to possess the capacity for manipulation of host reproduction yet are commonly found to persist in and invade novel host populations. One potential explanation for this phenomenon is *Wolbachia*-mediated host protection from other pathogens. While much research has been done with respect to *Wolbachia*-mediated pathogen resistance to viral pathogens, we know little about how *Wolbachia* interacts with natural bacterial pathogens. In this experiment, two bacteria isolated from wild-caught *Drosophila tripunctata* were cultured and injected in *D. tripunctata* and *D. recens* flies via pinprick. We found that both bacteria are antagonistic and infection results in a shorter host lifespan in both species. One of these bacterial pathogens was then injected into *D. recens* and *D. subquinaria* to test for *Wolbachia*-mediated resistance. Our results help understand the spread and maintenance of *Wolbachia* and are relevant to the use of *Wolbachia* in biocontrol of insects that transmit human diseases.

**Let's Talk About Literacy: A Study of Margaret Mautby Paston and Medieval Laywomen's Literacy**

Katherine Haire, CURO Research Assistant
*Dr. Cynthia Turner Camp, English, Franklin College of Arts and Sciences*

Literacy in medieval England varies greatly from a modern understanding of literacy. A current cultural assumption views literacy as a dichotomy: either you can read and write, or you cannot. This study, however, examines literacy as a multifaceted concept, using Margaret Mautby Paston (1423-1484) as a case study for medieval lay gentlewomen's literacy, and outlines the complications which arise when considering the literacy of a multilingual society. Margaret was a notable middle-class woman in fifteenth-century Norfolk, England, and a considerable contributor to the Paston family epistolary collection. She composed a massive 104 letters in vernacular English, mostly addressed to her husband and sons, over a span of roughly 30 years, yet she is still regarded as illiterate by some scholars. This paper reevaluates Margaret's literate abilities through her potential engagement with the newly discovered Paston family's Book of Hours: Saint Benedict, OR, Mount Angel Abbey, MS 27. This religious text, a medieval Latin prayerbook used in daily devotion, provides an additional angle on laywomen's literacy which incorporates the varying skills needed to engage with Latin texts. It becomes apparent that laywomen's literacy was not simply determined by comprehension of the Latin language but also the user's ability to navigate and engage with the text's format and thematic content.

**It Never Hurts to Ask: The Potential Danger of Suicide and Depression in Those Questioning Their Sexuality and the Protective Role Parental Support May Play**

Jahi Hamilton, CURO Research Assistant
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Emerging adults (18-24) are at a greater risk of negative mental health outcomes such as suicide and depression, and suicide is the third leading cause of death among youths aged 10-24 years old. LGBT youth are particularly vulnerable due to cognitive and emotional dysfunction which can result in suicidal behavior. Emerging adults who are still questioning their sexuality may be even more vulnerable, perhaps due to conflicting cognitions and emotions that place them at a higher risk for suicide/depression than LGBT or heterosexual youth. Although questioning individuals have been identified as a group needing support and further research, very few studies explore questioning students exclusively. Several studies have found parental rejection/acceptance in the LGBTQ community to be a prevalent issue that has a major effect on current identity and psychological maladjustment; however, current research does not specifically explain why questioning youth may be at a higher risk of negative mental health outcomes. Data for the current study will come from a larger study concerning the development of African American emerging adults. The study will recruit 150 African American emerging adults aged 18-25 enrolled at UGA and their caregivers. We will recruit via email, flyers, and via the Psychology Department Research Participant Pool. Participants will complete a survey concerning their sexual identity and parental rejection/ acceptance. We anticipate that sexual questioning status will be associated with higher levels of negative mental health outcomes and that parental acceptance/ rejection will significantly impact this association.

**Maternal Intake of Lutein and Omega 3 Fatty Acids on Cognitive Development in an Infant Piglet Model**

Madelyn Hansen, CURO Research Assistant
*Dr. Hea Jin Park, Foods and Nutrition, College of Family and Consumer Sciences*

Lutein and docosahexaenoic-acid (DHA) are bioactive compounds that benefit neurocognitive function. Their supply in fetuses/infants is dependent on the mother, and dietary supplementation increases their concentration in breast milk. Lutein, the dominant carotenoid in the neocortex and neural retina, strengthens visuo-motor responses. DHA, part of the brain's phospholipid membrane, is associated with improved memory, visual acuity, and brain development. This study investigated whether oral intake of lutein and DHA during pregnancy and lactation would increase locomotive/exploratory behavior and enhance memory in piglets. Pregnant sows were provided either normal diets (n=3, CON) or lutein+DHA containing diets (2.2mg lutein/kg-BW/day, 75mg DHA/kg-BW/ day, n=5, LD) from day 74 of gestation to the end of lactation. Male piglets with an average body weight of each litter were chosen for behavior testing (n=6 CON or n=9 LD). At weaning (19-21 days after birth), an open field (OF) test was performed to assess motor/sensory/exploratory behaviors and novel object recognition (NOR) test was performed to as assess trial-unique episodic memory of a novel object. In the OF test, no significant difference occurred between the control and LD groups' total moving time, average velocity, wall-sniffing duration/frequency, or time in the center zone. In the NOR test, LD piglets spent more time exploring a novel object than a familiar object, however significance was trending (p=0.078). These findings suggest that maternal intake of DHA+lutein during gestation and lactation may enhance episodic memory in male offspring while no influence on locomotive and exploratory behaviors was found. Additional studies with larger sample sizes are needed to better understand the impact of maternal diets on neurodevelopment of offspring.

**When Does Mindset Matter? Relationships Between Mindset, Attributions, and Coping with Failure**

Hannah Grace Harper, CURO Research Assistant
Jun Choe
*Dr. Erin Dolan, Biochemistry and Molecular Biology, Franklin College of Arts and Sciences*

Implicit theories of intelligence, or mindsets, refer to whether a person thinks that intelligence is a trait that is unchangeable (fixed) or malleable (growth). Previous studies have shown that students' mindsets could greatly affect their academic performance, with growth mindsets associated with higher performance. This effect is theorized to be mediated by how students respond to academic struggle. However, research has shown that the relationship between mindsets and academic performance is inconsistent among college students. Thus, we conducted an exploratory qualitative study to gain deeper insight into the factors that affect the relationship between mindset, coping with academic struggle, and academic performance. We conducted semi-structured interviews with 20 students enrolled in a challenging upper-level STEM course (organic chemistry) at a large research university. Interviews were transcribed and analyzed using standard content analysis methods. Based on these analyses, we found that how students attribute their academic performance seems to influence how students cope with academic struggle. We propose a model of the relationships among mindset, attributions, and coping responses. The proposed model provides hypotheses about the relationships between these variables that future studies should evaluate.

**Comparing the Effectiveness of Floral Dip and Tissue Culture Plant Transformation Methods for Gene Editing in *Arabidopsis thaliana* Utilizing CRISPR/Cas-9**

Gabriel Steven Harris
*Dr. C.J. Tsai, Genetics, Franklin College of Arts and Sciences*

Advancements in gene editing technologies such as CRISPR/ Cas-9 have led to tremendous changes in the field of plant genetics. This technology allows us to study gene function by creating targeted mutations. *Arabidopsis thaliana* is a model plant popular due to its small size, short generation times, large number of seeds, and ease of transformation with *Agrobacterium tumefaciens* through floral dip. Floral dip yields about 1% of

transgenic seeds per plant; however, the efficiency of Cas9 editing is even lower and multiple generations are necessary to obtain homozygous mutants. This emphasizes the need to establish a more efficient method for plant transformation that recovers a higher number of Cas9-edited mutant plants in a single generation. Tissue-culture based transformation methods have shown higher Cas9-editing efficiency in other plant species. This study will compare a root-based tissue culture transformation method with the floral dip method when generating Cas9-edited *Arabidopsis* plants, by targeting the transcription factor AtDEAR1. To ensure the Cas9 transgene and kanamycin resistance gene are present we will perform PCR analyses. The AtDEAR1 gene of the PCR positive plants will be amplified and sequenced to determine mutations with respect to the wild type. If a root-based tissue culture method is more effective at creating Cas9 edits, this methodology will significantly improve both the efficiency and rate of obtaining biallelic mutations in *Arabidopsis*.

**Development of Next-Gen Flu Vaccines**
Joanne Gina Harrison, CURO Research Assistant
*Dr. Ted M. Ross, Infectious Diseases, College of Veterinary Medicine*

Influenza is a highly contagious viral infection that causes high fever, severe aching, and catarrh, and often occurs in epidemics. These Influenza "epidemics" usually happen within certain seasons which occur yearly. This viral infection has hospitalized between 140,000 - 960,000 people since 2010. It has also likely killed in between 12,000 - 79,000 people annually since 2010 meaning that this infection has now become a serious problem for everyone. Since this viral infection has likely been around for several thousands of years, the science field should begin to recognize the dangers of this infection a little more and coming up with something that works better than the current influenza vaccine. Maybe the current roadblock and reason that why making a better vaccine is difficult is because of Influenzas's rapid mutations and antigenic variability. So, how can the science community make a better vaccination if we seem to be at a roadblock? To start in Dr. Ross's lab, we will be working on creating a better and "universal" vaccine so that so many people will not be affected around the world. To make this better vaccination, we will be working on creating some recombinant hemagglutinin that can be expressed from a plasmid with many cloning techniques. We will be targeting the hemagglutinin with is used by the virus to attack and use host cells and basically use of DNA plasmids, transcription, and translation to create the biomolecule we wanted.

**Chemical Kinetics Modeling of Biofuel Combustion**
Sam William Hartness
*Dr. Brandon Rotavera, Environmental, Civil, Agricultural, and Mechanical Engineering, College of Engineering*

Approximately 90% of transportation energy in the United States is provided by petroleum-based hydrocarbons, a non-renewable resource. To meet growing energy demands, both in the U.S. and globally, the development and application of renewable biofuels remain a priority. Biodiesel and ethanol are currently used as biofuel sources, but there is great interest in examining different biofuels, such as tetrahydrofuran and diethyl ether, to broaden the impact on sustainable transportation energy. However, before new biofuels can be utilized on a commercial scale, it is necessary to understand the effects on combustion and emissions. In this study, computer-based simulations were conducted on the reaction mechanisms of diethyl ether and tetrahydrofuran using ChemKin, a numerical modeling tool which simulates combustion chemistry. The main motivation for the present work concerns determining the impact of molecular structure of biofuels on major reaction pathways leading to intermediates, such as cyclic ethers and other partially oxidized species. Because the molecular structures of tetrahydrofuran and diethyl ether contain an oxygen atom, initial reaction pathways towards oxygenated pollutant formation are expected to differ substantially from simple hydrocarbon combustion. To investigate the impact of the oxygenated biofuels on combustion chemistry, mole fractions and reaction pathways of intermediates were analyzed over the temperature range 500-1200 K and pressures of 1, 5, 10, and 20 atm. The findings from the numerical simulations provide preliminary analysis of the temperature and pressure dependence of intermediates expected to form in planned experimental work on biofuel combustion at the University of Georgia.

**Modeling Seasonal Infection Dynamics in Food-Subsidized Wildlife Populations**
Nathaniel Haulk, CURO Research Assistant
*Dr. Richard John Hall, Ecology, Odum School of Ecology*

Often during harsh seasons, animals struggle to survive due to lack of food and extreme temperatures. Supplemental food provided by human activities, such as agriculture or backyard bird-feeding, can offset some of these hardships, but can also facilitate transmission of infectious diseases. Previous studies of wildlife-parasite interactions have looked at the effects of seasonality and food provisioning separately, but to date we lack theory for understanding their interactive effects. Here we built a mathematical model to understand how food provisioning can affect organisms during harsh seasons and how pathogen transmission is changed by this. We use the model to determine conditions when food subsidies provide a net benefit by improving host survival vs. a net loss by increasing transmission and disease-induced mortality. These results highlight the need for further empirical studies in how pathogen transmission and impacts are affected by seasonal changes in hosts condition and aggregation in food-subsidized populations.

**Physicians and Fatigue: Understanding the Boundaries of Human Performance**
Raquel Hazzard, CURO Research Assistant
*Dr. Jim Coverdill, Sociology, Franklin College of Arts and Sciences*

There exists a cultural phenomenon in the world of medicine in which surgeons are expected to perform under conditions that would detriment the function of any human. In particular, surgeons are often expected to work while experiencing acute or chronic fatigue. This fatigue is consequential of the nature

of shift work in any given hospital, with physicians working overnight shifts that disrupt their circadian rhythm and rob them of both sleep and its numerous benefits. While most people would feel as if they could not perform optimally under these conditions, physicians are much less likely to accept the fact that a lack of sleep negatively affects them. They feel that they know their limits, despite evidence indicating that no one can correctly estimate their level of impairment due to sleep loss. Residents and interns are often subjected to even harsher work hours, with the justification that doing so will allow them to perform better in the "real world." This research focuses on analyzing the existing literatures that support two opposing views, one which posits that the sleep culture of surgeons leads to an increase in the number of preventable accidents and one which posits that surgeons can perform well under fatigue because they are trained to do so and the benefits of doing so, such as continuity of care, outweigh any consequences. There is evidence, both experimental and observational, supporting both views. My goal is to analyze each view and determine how they compare with the views of surgeons.

**Analysis and Design of Aluminum-6061 Structures for Use in Satellites**

Nicholas Andrew Heavner, CURO Summer Fellow
*Dr. David L. Cotten, Geography, Franklin College of Arts and Sciences*

The miniaturization of computer components and the recent increase in space exploration and missions have primed the rise of cube satellites. These small satellites are a good way for students and companies to explore the exciting challenges that come with putting and maintaining an object in Earth's orbit. Many of these challenges are focuses of important topics in mechanical engineering, such as material strength and heat transfer. The frame of a cube satellite is no exception to this as it must be capable of withstanding nearly constant solar radiation while also helping keep the satellite's electrical components within their operating temperatures. In addition to needing decent thermal properties, the frame must also be able to provide adequate protection of the internal electronic components from the vibrations and forces experienced during launch. One way to achieve both requirements is the use of an aluminum alloy. Aluminum is best known for its corrosion resistance, light weight, and high strength to weight ratio. All of this makes it the most commonly used material for cube satellite structures, with aluminum-6061 and 7075 alloys being the specific alloys that are used for aerospace applications. For my research, I would like to study the use of aluminum-6061 in the structure of UGA's Small Satellite Research Laboratory Multi-View On-board Computational Imager (MOCI) mission. This mission relies heavily on the implementation of a student designed 3U cube satellite frame which must meet a specific set of design requirements and adhere to strict Air Force Research Lab standards. My research would focus on the structural and thermal properties of the frame to investigate the limitations of this material for use in satellite structures and the findings of this research would not only be applicable to the MOCI mission, but also various other industry applications due to the ubiquity of this material in the aerospace industry, most importantly aircraft and spacecraft structures. Data will be obtained from simulations ran in ANSYS and Thermal desktop; the initial parameters of these analyses are set by the University Nanosat Program (UNP). Upon meeting success criteria, which is also specified by the UNP, the structure would then be subjected to more rigorous analyses in these programs to define the limits of this material. If at any point the design fails during analyses, changes will be made to the current design, using the results as guidance, and then reran through the previous analysis. The goal of this research is to define the structural and thermal limitations of aluminum-6061 in satellite structures.

**The Appeal of Poverty**

Sarah Henning, CURO Summer Fellow
*Dr. Maryann Gallagher, International Affairs, School of Public and International Affairs*

This project will focus on developing a better understanding of the lasting impacts of poverty tourism, a growing trend in recent travel with State investment within communities. The term poverty tourism or slum tourism was coined to describe international travel to communities of high levels of poverty. Communities like South Africa, India, Brazil, Kenya, and Indonesia has been increasingly prominent in recent years. The idea of 'slumming' has been a lasting tradition in the Global North since Victorian London. This type of travel has grown in popularity, and is often run and advertised by professional companies. Although some argue, the local economy and communities benefit from the growing tourism, little has been studied to understand the long-term effects of this growing type of travel. Major push-back has been expressed from communities claiming the tours to be exploitative and nothing more than entertainment for Westerners as they escape from their developed lives. I wish to contribute to the limited existing literature by building an empirical study with a systematic codified evaluation of the impacts and interactions of poverty tourism in addition to my theoretical insight. An in-depth literature review will define a subject with little previous specific academic review. A statistical analysis will attempt to collect data and discover a trend between the growing influx of humanitarian aid/tourism and the economic development of those communities. Ultimately, I hope to better understand the how growing trends that are impacting local communities. Using the global perspective to understand how core concepts like 'poverty', 'power', and 'ethics' interact with this issue.

**Carbohydrate Application as Mechanism in Influenza Vaccines**

Clare Hill, CURO Research Assistant
*Dr. Robert Woods, Biochemistry and Molecular Biology, Franklin College of Arts and Sciences*

N-acetylneuraminic acid (Neu5Ac) is a prevalent form of sialic acid found in mammals and plays an integral role in the function of glycans and glycoproteins found in cell membranes. The Neu5Ac has been found to play a role in the reception of the influenza virus by the cell. It is believed that by adding substituents to the amine group of sialic acid derivatives, the

membrane may obtain influenza inhibiting properties. In our laboratory, multi-step organic synthesis methods are used to add substituents to N-acetylneuraminic acid. The goal of this research is to create multiple N-substituted aldehyde sialic acid derivatives in hopes to find one which would function as an inhibitor. It is suspected that the addition of the correct aldehyde functional groups to the sialic acid derivatives, when introduced to the cells, will provide the cell membrane the ability to resist the infiltration by the influenza virus, making it immune. Future research will focus on improving the efficiency of each synthesis step and create new N-substituted compounds.

**Lessons Learned: The Effects of Colorism, Ethnic Identity, and Brand Familiarity on Consumers' Advertising- and Brand-related Outcomes**

Jayda Hill
*Dr. Nathaniel J. Evans, Advertising, Grady College of Journalism and Mass Communication*

In recent years, prominent brands such as Dove and Shae Moisture have been criticized for advertising executions that have incorporated elements of race, skin tone, or skin color - a practice known as colorism. Rooted in the historical emphasis on European Beauty Standards, colorism is a system that grants advantages and opportunities to individuals who possess lighter complexion. Extant research suggests that colorism, brand familiarity and ethnic identity, which refers to how strongly one ties their identity with their ethnic group, can shape consumers' advertising and brand related preferences, attitudes, and behaviors. We conducted two online between-subjects factorial experiments to first determine the effect of colorism (present vs. absent) and brand familiarity (familiar vs. not familiar) on attitudes toward the ad, attitudes toward the brand, and brand recommendation. Second, we investigated how ethnic identity would moderate the above effects. In study 1, among a sample of 193 college students, there was a significant negative (positive) effect of colorism (brand familiarity), on attitude toward the ad, the brand, and brand recommendation. In study 2, among a more diverse sample (N=93), the significant negative (positive) effect of colorism (brand familiarity), on attitude toward the ad, the brand, and brand recommendation was replicated. Across studies 1 and 2, self-reported ethnic identity did not moderate the impact of colorism or brand familiarity on the dependent variables. Our findings offer consumer-based strategic implications for advertisers of both familiar and unfamiliar brands that seek to incorporate race or skin-tone appeals.

**Developing Effective Governance Strategies in the Face of Water Scarcity**

Taylor Hill, CURO Honors Scholar
*Dr. Don Nelson, Anthropology, Franklin College of Arts and Sciences*

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

**Gene Knockouts in Vero Cell Genes *EMX2* and *FGF2* to Increase Viral Antigen Production**

Noor Hillou, CURO Research Assistant
*Dr. Ralph A. Tripp, Infectious Diseases, College of Veterinary Medicine*

Throughout the Fall semester, gene knockouts were conducted to Vero cell colonies was used to examine which gene would lead to the desired phenotype of increased virus production. During this project, genes *EMX2* and *FGF2* were primarily investigated. This is in conduit with another project determined to produce *Norovirus*, which has no source other than human feces as of currently. Vero cells were used since they are qualified vaccine cell lines approved by the FDA, and it is commonly used for virus research pertaining to polio, influenza, and others. Before determining whether genotype yielded our desired phenotype, the primary research question this semester was to produce successful gene knockouts that were homologous and a non-multiple of three deletion. Our hypothesis is that selected gene knockouts of genes *FGF2* and *EMX2*—based on previous siRNA study data—will increase viral antigen production in Vero cells. CRISPR- Cas9 will be used to create vaccine cell lines to enhance the producing of virus. *EMX2* and *FGF2* (fibroblast growth factor) were selected after a siRNA screen was ran. These genes were silenced and were observed to have potential in producing the desired phenotype. Further investigation of the *EMX2* and *FGF2* is needed, and the successful knockout clones' phenotypes have yet to be determined. *EMX2* shows signs of being a successful gene knockout to contribute to desired phenotype based on the viability of the Vero cells after homologous gene deletion.

**Kinematics of the Canine Forelimb**
Parker Hinson, CURO Research Assistant
*Dr. Tim Foutz, Environmental, Civil, Agricultural, and Mechanical Engineering, College of Engineering*

Service dogs wear military grade vests that enable them to carry supplies for soldiers as well as provide protection on other dangerous missions. However, the manufacturing of this product is inefficient because they are customized for each dog. Once the dog is out of service the vest is discarded and money is wasted to create a new one. The solution to this problem is to develop an adjustable vest that can fit multiple service dogs. To ensure the gear fits comfortably on its wearers, the kinematics of the canine forelimb should be analyzed. For the analysis done in this research, the UGA College of College of Veterinary Medicine has provided dynamic data of multiple canine subjects. However, this data is in terms of global coordinates (Global Coordinate System) and the aim of this study is to observe the relative motion of joint-segments. For practicality, a new coordinate system must be defined on the forelimb itself (Joint Coordinate System). The purpose of this research is to write a MATLAB program that creates a Joint Coordinate System from the global data and calculates the range of motion of the forelimb joints during walking and trotting gaits (with and without vests). The resulting range of motions will display how much the prototype jacket impedes the subject's movement and determine future modifications of this prototype.

**Lazos Hispanos: Bridging Community Partners and Promotoras as Agents of Change**
Chelsea Ho, CURO Research Assistant
Lila Mitchell
*Dr. J. Maria Bermudez, Human Development and Family Science, College of Family and Consumer Sciences*

Many Latinos in the US experience disparities and barriers to adequate healthcare, education, and other important resources. Given the need to address these disparities in Athens, an interdisciplinary research team was formed and funded by UGA with the aim to develop a community-based outreach research program, which was named Lazos Hispanos. To date, 9 women have worked as community health workers/promotoras and 12 local community service providers have partnered with us, signing formal MOUs. In this capacity, together we have made considerable progress in bridging Latinos to local community agencies and social services. A mixed-method design was implemented, however, for this presentation, we will present findings from the group interviews with the promotoras and individual, in-depth interviews with a representative from each one of our community partners. Informed by grounded theory, a thematic analysis was conducted to obtain major themes. The aims of the presentation will be to discuss: 1) the relationship between the sociopolitical climate and Latino health and wellbeing, 2) how the promotoras and service providers describe the effectiveness of Lazos Hispanos, and lastly, 3) our experience as researchers.

**Evaluating the Constitutionality of the Death Penalty and Lethal Injection**
Kaitlin Hocker
*Dr. Jonathan Peters, Journalism, Grady College of Journalism and Mass Communication*

America's use of the death penalty brings into question the limits of government power. Although the U.S. Constitution's 8th amendment prohibits cruel and unusual punishment, the death penalty is still in use in many states. The purpose of this research will be to evaluate the constitutionality of the death penalty, with a focus on lethal injection as a method of execution. Lethal injection's popularity as a method of execution poses unique challenges. Primarily, the integrity of the drug cocktails that are used is particularly difficult to determine due to the lack of transparency around the implementation protocols. Therefore, investigating the risks associated with administering the lethal injection will be a crucial aspect of this research. References will include judicial opinions, peer-reviewed academic articles, and DEA data about the distribution of the drugs commonly used for lethal injections

**Reclaiming Sex in International Law: The Ability to Self-Select Sex as a Human Right**
Erin Hogan
*Dr. Maryann Gallagher, International Affairs, School of Public and International Affairs*

Within international law, existing precedent and norms obligate international organizations to uphold systems which afford the greatest measures of equality to all persons in the global system. This paper analyzes the ways in which international law addresses sex and gender conceptually, and criticizes the spaces in which the legal definition of both concepts is unclear. Based on existing precedent and the similarity of construction of sex and gender, this essay also argues that the international system is obligated, by law, to allow for the self-selection of sex for each person as a human right. This self-selection is meant to afford equality to those who are marginalized by binary systems, and increase access to rights such as a self-determination and freedom from discrimination. In analyzing the role of sex in international law, this article also problematizes the idea of sex and gender as binaries at all, and obligates international organizations to reexamine the way sex and gender are discussed in international human rights law.

**Social Media as a Behavior Disorder**
Cameron Holsomback, CURO Research Assistant
*Dr. W. Keith Campbell, Psychology, Franklin College of Arts and Sciences*

While substance use disorders are well defined by the DSM-V, there is only one behavioral disorder that is listed: gambling. However, as more people start to rely on social media, not only as a casual past time, but as a form of self-esteem/validation, one cannot help but question if social media use should be added to the DSM-V as a behavioral disorder. Our research strives to confirm that social-media addiction should be added

to the DSM-V, by further exploring the effects that social media use has on an individual, not only on a psychological level, but also on a biochemical level. First, we needed to better understand what classifies as addiction. We studied the effects that SUDs have on a physiological level, specifically what is dopamine's role in SUDs. Then we explored the physiological effects of an individual with a gambling disorder. By comparing the two, we were able to better understand the relationship between SUDs and behavioral disorders and create a profile of addiction. Currently we are exploring the physiological effects of social media use and its impact on one's motivation. We will then compare the data we find regarding social media use with the profile of addiction we created. It is predicted that we will observe very similar dopamine behavior, and many other addiction criteria with people who are dependent on social media to those with SUDs or behavioral disorders. The addition of social media use would urge researchers to further understand its implications on society.

**Playing God: Creature/Creator Relationships in *Frankenstein* and *Paradise Lost***

Johanna Hoover
*Dr. Richard Menke, English, Franklin College of Arts and Sciences*

In Mary Shelley's *Frankenstein* (1818), the creature finds a satchel with three books inside: *Paradise Lost*, a volume of Plutarch's *Lives*, and *The Sorrows of Young Werther*. These books are formative for his education in human language, culture and society, and shape his speech throughout the novel as he and others tell the story of his creation and existence. I argue that *Paradise Lost* has the most profound effect on the novel as a whole, as well as on the creature's attitudes towards himself and his creator. The creature realizes that his creator tried and failed to create him in his own image, yet he still hopes to be given a mate like Adam and Eve or the animals of Noah's Ark. The creature expects a certain relationship between himself and Victor Frankenstein, and Frankenstein's failure to fulfill this role triggers their dual descent into demonic madness. I will analyze the relationship between *Paradise Lost* and *Frankenstein*, examining where the two narratives intersect and diverge, particularly in relation to the creature's moral development. I will explore relevant literary criticism in hopes of contributing to current discourse on the subject.

**Role of Hedgehog Signaling on Splitting of the Eye Field and Gene Expression**

Emma Hope, Ramsey Scholar, CURO Research Assistant
*Dr. Jonathan Eggenschwiler, Genetics, Franklin College of Arts and Sciences*

The Hedgehog (*Hh*) signaling pathway is a highly conserved pathway implicated in critical cell signaling events during embryonic development. Past studies demonstrate the importance of Hh signaling in splitting the early retinal primordium into two distinct eye fields. Early in development, the entire anterior neural plate has potential to give rise to an eye field. Localized *Hh* signaling secreted from anterior ventral midline tissue triggers signaling pathways leading to specification of distal cells. Graded concentrations of secreted Hh appear to instruct different responses along the proximal-distal axis. *Hh* signaling is required so that cells at the midline lose their optic identity, and the eye field splits; failure of this process results in holoprosencephaly, which presents as cyclopia in severe cases. It is unclear whether localized signaling in cells near the source of *Hh* production is necessary to split the eye field, as global, unlocalized *Hh* signaling activity may be sufficient. *Smo* mutant cells do not sense *Hh* signals but, in this background, loss of *Gli3* will force ligand-independent *Hh* pathway activity. $Smo^{-/-}$; $Gli3^{-/-}$ mice embryos will be analyzed with various analysis techniques such as immunohistochemistry and *in-situ* hybridization to determine whether basal activation of the *Hh* pathway in such mutants leads to splitting of the eye field in the absence of localized signaling. As *Hh* signaling downregulates *Pax6* expression in the eye field, we will determine whether genetically disrupting *Pax6* in *Smo* mutants ($Pax6^{-/-}$; $Gli3^{-/-}$) is sufficient to rescue splitting on the eye field, which fails in *Smo* single mutants.

**Molecular Steps Involved in Bacterial Colonization and Biofilm Formation on Maize Aerial Roots**

Tristan Horton, CURO Research Assistant
*Dr. Maor Bar-Peled, Biochemistry and Molecular Biology, Franklin College of Arts and Sciences*

The roots of plants are colonized by mixed microbial species in the rhizosphere forming colonies called biofilms. The mucus-like sugary secretions of the aerial roots of corn, mucilage, also provide an ideal environment for the bacterial colonies. How specific bacterium colonize the root, interact, and form the complex structure of a biofilm is largely unknown. To begin study of the mucilage system, a baseline sugar profile of natural conditions is necessary. Samples from rows of genetically identical corn plants were tested for the identification of glycans (sugar-containing polymers) in the mucus region and to identify the nature of the bacterial species that co-reside with the aerial roots. The glycan samples were hydrolyzed to break down the polymers. The released sugars were derivatized, separated by Gas Chromatography and analyzed by Mass Spectroscopy. Separately, sample were streaked on nutrient agar plates for the analyses of the bacteria. Maize plants with different genetic backgrounds and with different aerial root mucilage levels were anticipated to either have different glycans and/or different bacterial mix species that associated in the biofilm. In addition to glycan composition, the samples are also to be tested for the presence of metabolites. The combined study will establish a background for the metabolic process involving the interactions between the plant and the bacteria. Once the metabolites and glycans of each of the samples are compared, further studies targeting the genes will be initiated to identify key steps involved in the colonization of the aerial roots.

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

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

In the southeastern U.S., coastal saltwater marshes provide not only a healthy environment for wildlife and several different plants, but also provide coastal protection, flood protection, and water quality improvements by absorbing many harmful pollutants. Construction, reconstruction, and maintenance of road infrastructure in Georgia's coastal counties can cause disturbances of coastal marshes. The Georgia Department of Transportation's (GDOT's) Standard Specification 107.23.E-Temporary Work in Wetlands, does not specifically require documenting or restoring any prior soil properties, nor the re-establishment of native or existing vegetation that would maintain and/or improve the functionality and ecology of the area. This research will identify efficient and cost-effective procedures to improve the soil properties of post-construction saltwater marshes to imitate prior conditions and reduce the time required for re-establishing natural vegetative cover and ecological functionality of the disturbed areas. The research team has developed soil mixtures to replicate prior conditions in order to evaluate vegetation growth in designed soil mixtures. The team has designed a greenhouse study to investigate the plant success of several target species in soil design mixtures. Mesocosms will mimic the physical and chemical conditions of saltmarsh soils (e.g., pH, salinity, redox, bulk density, and organic matter content) found at each of the coastal sites under evaluation. The experiment is projected to begin in mid-February 2019, and growth will be monitored by measurements of stem count, leaf color, plant height, number of leaves, for approximately seven months. This research will determine if the soil mixtures will be effective in post-construction restoration projects.

**Shakespeare's Storm: A Look at Renaissance Meteorology**

Lily Kathryn Houston, CURO Research Assistant
*Dr. Frances N. Teague, Theatre and Film Studies, Franklin College of Arts and Sciences*

The weather affects lives today, but it also affected the lives of those who lived in the Renaissance. Even in Shakespeare's *Othello*, the weather has significant impacts on the story and characters, when a raging storm ends a war by driving one army away. The storm acts as a catalyst for the play. Desdemona and Othello are married and go to Cyprus, and because of the storm, there is no war. However, that miracle is turned dark by Iago's trickery and the tragic end which is in part caused by the storm. Through literary research, I found documents, books, and letters which discuss the weather during Shakespeare's lifetime, but specifically during 1588 when the Spanish Armada was destroyed. Looking at the social and historical connotations of the storm in Othello, I recognized how similar the historical storm in 1588 is to the storm in Shakespeare's play. By examining weather forecasting in the Renaissance as well as applying this knowledge to look at the Shakespeare's language in *Othello*, I argue that the weather was an inspiration for the way Shakespeare wrote his play.

**CRISPR/Cas9-Mediated Knockouts Targeting Immunodominant CD8+ T cell Epitopes Within a Large Gene Family in *Trypanosoma cruzi***

Nina Grace Howard, Foundation Fellow
*Dr. Rick Tarleton, Cellular Biology, Franklin College of Arts and Sciences*

The parasite *Trypanosoma cruzi* causes Chagas disease in humans, which affects over 8 million people worldwide. The immune response against *T. cruzi* controls parasite levels, but overall fails to clear infection. The difficulty in curing infection has been attributed to the variability within large gene families in *T. cruzi*, including the trans-sialidase (ts) family. In C57BL/6 mice, the CD8+ T cell response is highly focused on the ts epitopes TSKb20 and TSKb18. We hypothesize that the knockout of ts genes will result in a decreased CD8+ T cell response to the two ts epitopes and a broader response to non-ts epitopes. To test this, gene knockouts were performed using CRISPR/Cas9, whereby specifically designed single guide RNAs (sgRNA) that target genes containing TSKb20 and TSKb18 epitopes were delivered into parasites. To track gene knockout, repair templates were designed containing an antibody epitope tag and a stop codon to terminate gene expression. Results showed parasites to be expressing different levels of the tag, indicating genes were knocked out to varying degrees within parasite clones. The next step will involve infecting mice with parasites showing the highest level of tag and evaluating immune responses and infection control in these mice. Because we are targeting the knockout of the usual immunodominant epitopes, we hypothesize the immune response in animals infected with the ts-knockout parasites may be more effective and could potentially clear the infection. Such a result would be a significant step toward the development of an attenuated parasite line for use in vaccinations.

**Association of Mercury Exposure from Dental Amalgam**

Hannah Huang, Ramsey Scholar, CURO Research Assistant
*Dr. John Yu, Environmental Health Science, College of Public Health*

Dental amalgam continues to be one of the most widely-used restorative materials for dental fillings in the United States. According to the United States Food and Drug Administration (USFDA), amalgam fillings are safe for adults and children 6 and above, yet these mercury-based dental surface restorations remain a potential threat as accumulation of elemental mercury is associated with adverse health effects. Thus, this research is designed to build on previous analysis of the association between dental surface restorations (DSR) and blood mercury levels, including total blood mercury (THg), inorganic mercury (IHg), and methyl mercury (MeHg). In addition, the project will specifically assess the association between amalgam-based dental restorations and blood mercury levels. This will be done through analysis of 2015-2016 National Health and Examination Survey (NHANES) data, a survey program administered by the National Center for Health Statistics to assess the health status of the US population, using JMP

Statistical Software. Subjects will be clustered based on dental surface restorations (0, 1-8, >8) consistent with previous studies using 2003-2004 and 2011-2012 data. After adjusting for covariates, higher levels of blood mercury are expected with increased number of amalgam fillings. This research is crucial as tooth decay remains among the most common chronic diseases worldwide. Thus, fully understanding the health risks of current treatment options is more important than ever.

**Antibodies to Type A Influenza Virus in Lesser Scaup from Maryland**

Harrison Huang, CURO Research Assistant
*Dr. David Stallknecht, Population Health, College of Veterinary Medicine*

The lesser scaup (*Aythya affinis*) is the most populous diving duck in North America, but few influenza type A viruses (IAV) have been recovered from this species despite recent surveillance. In contrast, the observed antibody prevalence to IAV in lesser scaup populations suggests a high infection rate. Because of this limited information, it is unknown which IAV subtypes are linked to these infections, and this is further complicated by IAV antigenic diversity which includes 16 hemagglutinin (HA) and 9 neuraminidase (NA) subtypes. This study aimed to identify HA-specific antibodies from 252 lesser scaup sampled from Maryland during March 2016 and 2017. The samples were tested by a commercial blocking enzyme-linked immunosorbent assay (bELISA), which detected antibodies to IAV in 61% (154/252) of samples. These IAV antibody positive samples were then tested for subtype-specific antibodies against H1-H12, H14, and H15 with a virus microneutralization assay (MN). Overall, the highest prevalence of neutralizing antibodies was detected against H1 (39%), H6 (32%), and H11 (41%), while a low antibody prevalence was observed for H3 (2%), H4 (2%), H14 (3%), and H15 (2%). Questions remain regarding potential cross-reactivity between subtypes, the effects of NA interference, and the role of population immunity in regulating IAV infections in scaup populations, all of which warrant further research.

**Investigation into the Role of RGS-10 in Ovarian Cancer**

Ashley Huggins, CURO Research Assistant
*Dr. Shelley Hooks, Pharmaceutical and Biomedical Sciences, College of Pharmacy*

Ovarian cancer is the fifth deadliest cancer among women, with a high reoccurrence and mortality rate. The severity and complexity of this disease calls for an inquiry into the molecular mechanism by which it acquires resistance to treatment. Regulators of G-Protein Signaling (RGS) proteins are a superfamily of proteins that regulate intracellular signaling pathways. The RGS-10 protein has been specifically shown to play a role in the chemosensitivity of ovarian cancer cells through the epigenetic silencing of RGS10 expression by DNA hypermethylation and histone deacetylation. This research investigates the effect of chemotherapeutic drugs on the tumor microenvironment and RGS10 expression through direct coculture, cell viability assays, and Western blotting. A fluorescently labeled ovarian cancer cell line, ID8-RFP, was developed through transfection with a lentiviral vector. The fluorescent tagging allowed for the plating of these cells alongside RAW cells, a mouse macrophage cell line. This coculture mimics the ovarian cancer environment, and cellular activity was monitored through direct observation over a 48-hour period. These observations were further analyzed by a CellTiter-Blue Cell Viability Assay, establishing the correct controls and quantifying the effect of chemotherapeutic drugs on cell survival. Results to date show RFP-tagging to have no effect on cell viability, with chemotherapeutic drugs decreasing wild type ovarian cancer cell survival. Coculture experiments point to altered cellular patterns when exposed to chemotherapy with differing ratios of ovarian cancer cells to macrophages. Further quantitative analysis will demonstrate the effect of RGS10 expression on ovarian cancer cell survival and proliferation.

**The Vascular Flora of Cherokee County, Georgia**

Richard Hull
*Dr. Wendy B. Zomlefer, Plant Biology, Franklin College of Arts and Sciences*

Cherokee County is an unusual county in Georgia because of its location at the confluence of the Piedmont, Blue Ridge, and Ridge & Valley ecoregions. Due to the proximity of these three major ecoregions within the county, the region has a unique biological biodiversity. The goal of this project was to document the biodiversity of Cherokee County's vascular flora by collecting vascular plant specimens for the UGA Herbarium. Nineteen collection sites were surveyed, including Cherokee County parks and properties, private properties, roadsides, and McGraw Ford Wildlife Management Area. All collection sites were accessed with permission to collect vouchers. Several habitats were accessed to best represent the region's vascular plant flora, such as mountains, riversides, disturbed areas, bottomlands, and woods. Vascular plant vouchers were collected in Cherokee County, Georgia, from the 4th of April 2017 to the 30th of September 2018. Potential county records were targeted. The Reinhardt University Herbarium was also searched for county records. These efforts resulted in increasing the amount of known vascular plant species within the county from 405 to 606 species; 59 of the new records were found at the Reinhardt University Herbarium, while the remaining 142 records were collected for the current project. All county records were properly vouchered according to herbarium protocols and were accompanied by complete data. The collecting efforts added to the vouchers for the county's flora and added several new localities of rare or unusual Georgia species, including: *Amorpha schwerinii*, *Phacelia fimbriata*, *Solidago hispida*, *Solidago ulmifolia*, and *Elymus villosus*.

**The Lampyrids of Cherokee County, GA**

Richard Hull, CURO Research Assistant
*Dr. Kathrin F. Stanger-Hall, Plant Biology, Franklin College of Arts and Sciences*

In order to better understand the lampyrid biodiversity of northern Georgia, firefly specimens were collected at a total of six sites in Cherokee County, Georgia, from the beginning of

May to the end of July. The Piedmont, Blue Ridge, and Ridge & Valley ecoregions were each represented by two sites. All collection sites were accessed with permission to collect specimens. Each site was visited approximately once a month for a duration of four hours so that both diurnal and nocturnal lampyrids would be represented. In addition, specimens were collected in a wide range of habitats, including fields, wetlands, and woods. Most preserved specimens were accompanied with species-specific flash series data and all were accompanied with behavioral notes. These specimens were then grouped using morphological features and species-specific flash patterns. Furthermore, six specimens representing these groups underwent molecular species identification using the mitochondrial COI gene. Overall, a total of 65 specimens were collected, including a total of six lampyrid species from three genera. These findings further establish what firefly species occur at the intersection of the Piedmont, Blue Ridge, and Ridge & Valley ecoregions in northern Georgia.

**Men's Voices on Mapping, Neighborhoods, and Technology**
Baqar Husain, CURO Research Assistant
Sania Qazi
*Dr. Nathan Hansen, Health Promotion and Behavior, College of Public Health*

In the United States, HIV incidence is highest among young men who have sex with men (YMSM) between 18-29 years old and new diagnoses occur disproportionately in the South compared to other regions of the country. Although HIV incidence occurs primarily in urban areas across the United States, HIV incidence in the South is higher in rural and suburban areas. To combat this disparity, it is pertinent to understand the unique social and geographic context of HIV incidence in this sparsely populated region with limited public health infrastructure. This presentation will review the developmental phase of a large, multisite study examining HIV risk behaviors of YMSM in nonmetropolitan parts of the Southeastern and Northeastern United States. Men's Voices on Mapping, Neighborhoods, and Technology (MVMNT) is a formative, surveillance study that will examine geographic data captured through mobile GPS monitoring, social network analysis, and context-aware experience sampling. The aim of the study is to understand how social networks and physical locations impact HIV risk behaviors in an effort to inform future prevention interventions.

**Fighting Hospital Acquired UTIs with Antimicrobial Urinary Catheters**
Huzefa Husain, CURO Summer Fellow
*Dr. Hitesh Handa, Chemical, Materials, and Biomedical Engineering, College of Engineering*

Hospital acquired infections (HAIs) are the 4$^{th}$ leading cause of death in the United States according to the Center for Disease Control. A common HAI caused by *Escherichia Coli* and *Staphylococcus Aureus* is a Urinary Tract Infection (UTI), caused by the rapid of microbes in the urinary catheter tube. A solution to this problem comes in the form of nitric oxide (NO), which is an endogenous gas produced by the body with bactericidal, anti-clotting, and anti-inflammatory properties. By utilizing the NO donor S-nitroso-N-acetylpenicillamine (SNAP) in a solution, a catheter can be swelled and gain NO releasing capabilities. Additionally, the catheter can gain anti-fouling properties by soaking in silicone oil thus limiting the ability of bacterial and nutrients to adhere to the interior of the catheter. By performing a 7-day *in vitro* drip-flow bioreactor study, the fabricated samples were tested against commercially available urinary catheters. After the study was completed, the bacteria from the bioreactor samples were plated as well as subjected to a Live/Dead assay in addition to SEM. The SNAP-Oil sample demonstrated the highest bactericidal ability with a 99.999% (~ 5 log) reduction in S. Aureus and ~ 6 log reduction in *E. coli*. SEM pictures additionally showed significantly less growth on SNAP-Oil catheters in comparison to the Control. The ability of the SNAP infused Silicone Oil urinary catheter shows a promising solution in combating hospital acquired UTI's and demonstrates its potential application to similar biomedical devices.

**Front End Design/Development for Lab Systems**
Derek Huynh, CURO Research Assistant
*Dr. David L. Cotten, Geography, Franklin College of Arts and Sciences*

The goal of this research is determining how to better show information in front facing systems. The significance in this research is that it will improve the Small Satellite Research Laboratory's outreach capabilities and better inform the public about UGA's aerospace program. This was done by using standard user experience research methods. First, determining what users wanted and looking at what the current system lacked. After gathering initial information, it became an iterative process of implementing and testing. What came about from this is the current http://smallsat.uga.edu/ website.

**Effect of Benfotiamine in Combination Chemotherapy for Colon Cancer**
Lan Huynh, CURO Research Assistant
*Dr. Jason Zastre, Pharmaceutical and Biomedical Sciences, College of Pharmacy*

Colon cancer is one of the most commonly diagnosed cancers and ranks as the third leading cause of cancer-related mortality worldwide. Other than surgery, treatment for cancer patients relies primarily on chemotherapy. However, the efficacy of chemotherapy can be limited by drug resistance and severe side effects. For decades, combination chemotherapy has become a higher quality alternative where more than one anticancer drugs are used together to improve efficacy, lower dosage, and reduce the likelihood of toxic effects. In our previous studies, we have demonstrated that high-dose thiamine (vitamin B1) and its more potent synthetic derivative, benfotiamine, decrease proliferation of colon cancer cells by inhibiting pyruvate dehydrogenase kinase and promoting apoptosis. In this study, we evaluated the impact of benfotiamine when used in combination with the standard chemotherapeutic agents 5-fluorouracil (5-FU), cisplatin, and SN-38 (irinotecan metabolite) in the treatment of colon cancer. The antiproliferative effect on the human colorectal cell line, HCT116, of each individual drug compound and their

combination were measured using MTT assay. Isobologram analysis and combination index analysis were used to provide a quantitative estimation of the extent of synergy or antagonism between benfotiamine and the anticancer drugs. Our preliminary results suggest that the addition of benfotiamine does not affect the antitumor activities of 5-FU and cisplatin. However, the combined effect of benfotiamine and SN-38 was greater than that predicted by their individual potencies. This result suggests benfotiamine as a promising candidate to enhance irinotecan-based therapy for cancer treatment.

**Women of the Revolution: A Feminist Analysis of Third Cinema via the Work of Tomás G. Alea**

Alexandra Ibarra, CURO Research Assistant
*Dr. Eric Morales-Franceschini, English, Franklin College of Arts and Sciences*

Third Cinema is both a geographical and ideological wing of the cinematic world. Its films attempt to be pedagogical and consciousness-raising in addition to entertaining. In Latin America, Third Cinema often has a revolutionary nature. One notable example is Cuban cinema, which entered a golden age after the Cuban Revolution. As Third Cinema emphasizes progressiveness, my research take a critical, feminist lens to three films from noted Cuban director Tomás Gutiérrez Alea: *Hasta Cierto Punto / Up to a Certain Point* (1983), *Memorias del Subdesarrollo / Memories of Underdevelopment* (1968), and *La Muerte de un Burócrata / Death of a Bureaucrat* (1966). I am using linguistic measures to analyze the representation of women and their role in the revolutionary society; I am coding whether leading female characters' speech is initiative or responsive to males and whether female characters are described using traditionally feminine or traditionally masculine value words (by males and females). I anticipate finding that Alea uses these films to contest and reimagine the role of women in the revolution and Cuban society as a whole.

**The Woman as Resistance: Female Characters in the U.S. Black Film Community**

Alexandra Ibarra, CURO Research Assistant
*Dr. Ed Pavlic, English, Franklin College of Arts and Sciences*

A society's movies carry that culture's mythos, acting as mirrors or challenges to its values and beliefs. For this reason and others, feminist research into the representation of women in films is a valuable resource. In order to contribute this field, my research analyzed three films—*Middle of Nowhere* (Ava DuVernay), *An Oversimplification of Her Beauty* (Terence Nance), and *Restless City* (Andrew Dosunmu)—released in the same year (2012) in order to analyze the contemporary representation of black women and their relationships to themselves, other women, men, and their families/communities. I used linguistic measures to assess this representation; I coded whether female speech was initiative or responsive to males and whether female characters were described using traditionally feminine or traditionally masculine value words (by males and females). Based on my findings, I argue these films employ their female characters as resistance to stereotypes of femininity and black womanhood.

**LED vs. HPS Lighting Fixtures in Controlled Environment Agricultural Settings**

Michael Ilardi
*Dr. Tom Lawrence, Environmental, Civil, Agricultural, and Mechanical Engineering, College of Engineering*

My goal in this project is to analyze the effects of shifting to LED lighting fixtures from the current standard practice of using traditional fluorescent and high-pressure sodium (HPS) lights in controlled environment agricultural settings (greenhouses and indoor farming). This project aims to prove the capability of LED lighting as a more effective, economic, and energy conservative alternative to high-pressure sodium lighting fixtures, and is being done in support of a larger-scale project funded by the U.S. Department of Agriculture that is evaluating the impacts on energy consumption and plant production with the newer lighting technologies. High-pressure sodium lighting fixtures are the status quo in greenhouses, but they release a large amount of wasted energy as heat. This is important because greenhouses are used around the world and play a major part in production in the food industry. Work to be done this semester includes evaluating the thermal conditions around operating LED and the traditional lighting fixtures using an infrared camera. I will also be working to create a computational fluid dynamic (CFD) model of a greenhouse that will be used to study the effects on the overall thermal environment inside a greenhouse using the different lighting fixtures. The project will also support comparisons of the spectral thermal emissions, particularly in the infrared bands, for traditional and LED lighting fixtures.

**Collaborating Toward Coastal Resilience in the Southeast**

Grace Anne Ingham, CURO Honors Scholar
*Shana Jones, Carl Vinson Institute of Government, Public Service and Outreach*

Recurrent flooding can compromise military operations of coastal installations and therefore represents a national security issue. The Southeast Regional Partnership for Planning and Sustainability seeks to improve coastal resilience, and research by the Carl Vinson Institute of Government will offer solutions. Our objective is to create collaboration between public and private stakeholders to protect and sustain military-compatible shoreline and marine space while upholding the coastal economy and natural resources. We focused on three categories of resilience solutions- living shorelines, habitat conservation, and wave attenuation. Living shorelines absorb wave forces, minimize erosion, and block water from reaching terrestrial structures. Habitat conservation maintains ecosystem services such as fresh water provision and protects threatened species. Wave attenuation involves innovative engineering to reduce the force of waves especially during storm events. Utilizing existing GIS maps of coastal environments and wave forces as well as an extensive review of existing coastal resilience projects in the southeast we recommended the best solutions for each coastal installation. Recommendations also considered local economic interplay with the marine system and special environmental concerns such as endangered species and critical ecosystem services. Additionally, we worked

within local, state, and national laws and regulations for altering marine environments. Our recommendations will be presented to public and private stakeholders in August 2019. From there, our role will be creating and maintaining active discourse between players at local and national levels as solutions are implemented.

**The Lizard Third Eye**
Katie Irwin
*Dr. James D. Lauderdale, Cellular Biology, Franklin College of Arts and Sciences*

The third eye, commonly known as the parietal eye, is a non-visual, photosensitive parapineal organ found in most lizards, frogs, the tuatara, and some fish. The lizard parietal eye is remarkably well developed, possessing a complete lens, cornea, and retina, but little else is currently known about this organ. This project studies the parietal eye in comparison to the lateral eye in the *Anolis sagrei* (brown anole) lizard, hypothesizing that parietal and lateral eye development employ similar gene networks. Because of the parietal eye's fascinating eyelike structures, understanding its development in comparison to the lateral eye will provide a unique system, not present in humans or many other vertebrates, for gaining insight into mechanisms underlying vertebrate eye formation. *A. sagrei* eggs were collected from adult lizards, and embryos were removed from their shells and assigned developmental stages based on morphological criteria. Tissue was then dissected, fixed, and processed for paraffin wax sectioning. After sectioning, tissue was stained with hematoxylin and eosin and imaged to construct a timeline of morphological development. Indirect immunofluorescence microscopy was used to assess the expression of genes associated with eye development, including *Pax6*. Although parietal eye development includes the formation of lens, cornea, and retina, the embryonic origins of these tissues differ from those associated with the development of the lateral eye, suggesting that alternative pathways govern the histogenesis of these structures. Further elucidating the specific roles of parietal eye regulatory networks could complement lateral eye studies to lead to better understanding of vertebrate eye development.

**Weaponizing Dynamic Decision-Making Models: The Principle of a Trusted Autonomous Governor**
Noble Jacob, CURO Research Assistant
*Dr. Christian Turner, Law, School of Law*

As the ramifications of decision-making become increasingly instantaneous for high-volume action corporations and governments involved in politics and trade, an increasing number of organizations have turned to developing and implementing static decision-making models integrating into their existing platform to assist executive in short-term strategic leadership decisions. However, with the advent of limited dynamic models and modern platforms of trust networks, it is now possible to develop a dynamic decision-making model authorised by a trust network to independently manage and lead an organization with limited personal oversight. Sourced from previously developed technology and logic whitepapers, this research will attempt to find if there exists now a space for dynamic TAGs to advance the current static DMMs. The purpose of this research is to develop a rigid set of principles with which it is possible to develop a network of trusted autonomous governors that can interact within the same authority as existing state and organizational leaders, and implementations of dynamic TAGs per the sectoral model of international political economics. This paper will create a defined parameter for variations of static DMMs which can be implemented towards a dynamic DMM by creating definied parameters of implementation and delivery of the logic use, technological limitations and theories, and learned-knowledge limitations of existing DMMs; argue how the current sectoral models of industry and government will respond to a shift from static to dynamic DMMs; and develop a theory sandbox for learned-knowledge TAGs to simulate interactions as statal governors or corporate executives using UGA-taught theories respectively.

**Understanding Genetic Redundancy Within the MAP Kinase kinase (MKK) Gene Family of *Arabidopsis thaliana***
Sascha Jakobs, CURO Research Assistant
*Dr. Wolfgang Lukowitz, Plant Biology, Franklin College of Arts and Sciences*

The research aims to understand the functional overlap within the MAP kinase kinase (MKK) gene family of *Arabidopsis thaliana*. As a first step toward experimentally assessing the extent of genetic redundancy, we are creating loss of function mutations in the six genes of the C and D clades of this family (*MKK4*, *MKK5*; and *MKK7* through *MKK10*) using CRISPR/Cas9 genome editing techniques. T-DNA constructs targeting the seven genes individually were created and transformed into plants. Primary transgenics with apparent mutant sectors were then identified and their seeds collected. The DNA sequence of the induced mutations is currently being determined and will be presented. Our collection of alleles will enable us to assess functional overlap by creating higher order mutants.

**Improving Broiler Breeder Flock Welfare and Reducing Stress Through Early Photostimulation and Spin Feeding**
Kavian Jalili
*Dr. Andrew Benson, Poultry Science, College of Agricultural and Environmental Sciences*

Through intense genetic selection for rapid growth rate and feed conversion, the modern broiler can reach market weight in five to six weeks. This has led to huge birds with insatiable appetites. While these birds are great for meat production, their increased mass has become problematic for optimal reproductive performance in the parent stock. A major factor in obtaining optimal reproductive efficiency in broiler breeders is maintenance of a healthy and ideal body weight while also undergoing photostimulation in proper uniformity. If the chickens were managed properly to permit for earlier photostimulation, there may be a potential improvement in bird welfare as well as economic gain. Therefore, the basis of this research proposal is a 2X2 factorial designed experiment featuring two rearing growth curves/photostimulation ages and

two different feeding regimes. This research will determine if advancement of the age of photostimulation and subsequent attainment of the target body weight in broiler breeder chickens may allow for the reduction of the severity of feed restriction, and the enhancement or maintenance of current reproductive efficiency.

**The Theoretical Determination of Collisional Sticking Coefficients Between Molecular Hydrogen and Amorphous Water Ice in the Interstellar Medium**

Anastashia Jebraeilli
*Dr. Phillip C. Stancil, Physics and Astronomy, Franklin College of Arts and Sciences*

The interstellar medium (ISM) is the matter and radiation that exists between stars of a galaxy. 99% of the ISM is composed of interstellar gas and dust, with 75% of its mass being in the form of either molecular or atomic hydrogen. This interstellar gas is highly dilute and generally either cold clouds of neutral hydrogen or hot ionized hydrogen. The cold cloud of the neutral molecular hydrogen is capable of becoming gravitationally unstable and known to collapse, resulting in the creation of new stars. The ISM is also sufficiently cold that ice mantles form on dust grains. In order to better understand the formation of new stars from the gas within the ISM, we must better understand the atomic, molecular, and surface collisions and interactions which lead to the ultimate collapse of gas clouds to form stellar structures. Thus, determination of the collisional sticking coefficient of molecular hydrogen and amorphous water ice under conditions similar to those present in the ISM is important in understanding the formation of new stars. The collisional sticking coefficient describes the ratio of the number of adsorbate hydrogen molecules that "stick," to the amorphous water ice, and is used in multiple calculations and models of star formation. Modeling the collisions of interest is done by applying the 8-6 Lennard-Jones potential to, Large-scale Atomic/Molecular Massively Parallel Simulator (LAMMPS), a molecular-dynamics modeling software. After collisional data collection is completed by LAMMPS, analysis through Python is done in order to determine the sticking coefficient.

**Diurnal and Seasonal Calling Patterns of Oyster Toadfish**

Danielle E. Jenkins
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Male oyster toadfish, which are a marine fish that can be found along the East coast of North America, produce a distinct mating call that sounds like a boat whistle. This call can provide information to help determine spawning seasons, habitat and other behavioral information on a daily and seasonal time scale. This study looked at the daily and seasonal calling patterns of mating calls, by oyster toadfish, *Opsanus tau*. To determine these calling patterns, sound recordings were taken under water at different times of the day and analyzing them to find call rate and call occurrence. Seasonal recordings were also analyzed, which were obtained from past samples that were taken across multiple years and during different times of day on Sapelo Island. From the daily recording data, I conclude that toadfish call during all times of the day and that they are more active at night. Likewise, I concluded from the seasonal data that while toadfish call all year long, they are more active in the summer and winter. This information is used to suggest spawning seasons and habitat preference determined by areas and times with higher call rates and occurrence which can help determine optimal primary productivity levels and optimal survival environments.

**Exploring the Typology of Generation Z Activists in Relation to Dystopian Literature**

Aysha Jerald, CURO Research Assistant
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Despite the lack of studies focused on the most recent generation, the question of what motivates the behaviors of Generation Z has been highly debated among researchers. In summary, many scholars believe that the independent and revolutionary traits of Generation Z are derived from the circumstances of their births, that which allude to the Great Recession and the 9/11 attacks. While there has been research examining the effect of the Great Recession and 9/11 attacks on the type of behavior Generation Z has towards politics and societal issues, there has been little research that examines if the typology of Generation Z activists has a relationship to the characters found in speculative literature and literary media. Specifically, with dystopian literature on a rise, this paper will examine and compare the current types of Generation Z activism with the types of activism found in the fictional characters they read about and/or viewed in their youth. Using a qualitative approach, this proposed study will contain several in-depth interviews with a select group of Generation Z students from the University of Georgia and a literary analysis of popular dystopian fiction within the last ten years, such as *Catching Fire* by Suzanne Collins (2009), *Divergent* by Veronica Roth (2011), and *Maze Runner* by James Dashner (2009). The study will hope to add to the literature surrounding the characteristics of Generation Z and explore the possible significance fiction may have not only on a young adult's thoughts but also their actions.

**A Mechanism for Maintaining Microglial Homeostasis in Response to Chronic Inflammation and Metabolic Dysregulation**

Janna Elizabeth Jernigan, CURO Research Assistant
*Dr. Jae-Kyung Lee, Physiology and Pharmacology, College of Veterinary Medicine*

When chronically activated, microglia, the immune cells of the central nervous system, contribute to neuropathogenesis by expressing proinflammatory cytokines and reactive oxygen species (ROS). Microglia play a critical role in maintaining brain homeostasis but are dysregulated during neurodegenerative disorders. Previously, Regulator of G-protein Signaling 10 (RGS10) was recognized as a negative regulator of microglia activation by negatively regulating the nuclear factor kappa-light-chain-enhancer of activated B cells (NF-kB) pathway. RGS10 level is significantly downregulated in microglia with aging and neurodegenerative diseases. Furthermore, RGS10 deficiency in mice results metabolic disorder. The combination

of metabolic dysregulation and chronic inflammation has been associated with neurodegenerative diseases, however, the detailed mechanisms have not been elucidated. We have previously shown that RGS10 deficiency exacerbates microglial activation in response to glucose under proinflammatory conditions. In this study, we aim to characterize the mechanism behind this result. Throughout the study, we utilize a murine microglia cell line stable for RGS10 knockdown. From ELISA data, we have validated that the glucose augmentation of TNFα under proinflammatory conditions is exacerbated with RGS10 deficiency and ROS assays have elucidated that glucose increases ROS production, most significantly in RGS10 deficient cells. By qPCR and western blot, we anticipate nitric oxide to be the largest contributor of ROS and NF-kB expression to reflect previously described TNFα expression. Moreover, signal inhibitors will allow us to illuminate the principal intermediaries in RGS10 regulation. We hypothesize that RGS10 negatively regulates NF-kB pathway intermediates to maintain microglial homeostasis in response to chronic inflammation and metabolic dysregulation.

**Fostering Explosion: Decentralizing Paths to New Play Development**

Abraham Johnson, CURO Summer Fellow, CURO Research Assistant
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How do we build and support theatre structures that build and support new artists? In contemporary theatre, generative artists are increasingly asked to reduce their development period, adhere to stage conventions, and create sound business ventures that rarely challenge audiences. New playwrights are especially vulnerable to a system of new play development that places easy producibility synonymous with "success." A continuation of previous research, this project focuses on playwrights at the very beginning of their development by creating a space that provides financial, communal, and experiential support of their voices. These steps were taken by founding a student organization called EXPLODE that was dedicated to producing new plays, in new ways, in 365 days. First, we published a "Combustion Manual" of all scholarships, grants, and stipends that the University of Georgia provides for artistic projects and we distributed these at every meeting, helping to review applications and encourage students to manifest their seedling ideas. Second, we created spaces to develop the voices of four central playwrights over the course of the year through site-specific theatre productions, multiple-step staged readings, and occasional workshops. Third, we focused on creation through invitation and supported first-time playwrights in multiple "Bake Off" weekends, cinema nights, and staged reading festivals which saw the "combustion" of their scripts for the first time. This research has seen a significant jump in the number of self-identifying playwrights at the university, playwrights submitting to professional development programs, and the scripts we developed have all challenged conventional modes of theatrical production.

**Structural and Incremental Validity of Sluggish Cognitive Tempo in a College Sample**

Elizabeth Johnson, CURO Summer Fellow
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Sluggish cognitive tempo (SCT) has emerged as a newly proposed construct in the field of attention-deficit hyperactivity (ADHD) research. Defined by symptoms which include mental fatigue, underactivity, and "pathological" daydreaming, it has been hypothesized that SCT is related to but distinguishable from ADHD and therefore a disorder in its own right. Thus, investigation of this topic is highly important because SCT has yet to be formally recognized within accepted diagnostic classification systems, yet it may be a disorder in need of treatment by individuals experiencing its symptoms. ADHD is one of the fastest growing disorders on college campuses, and some have argued that many of these individuals actually have SCT. Some research has indicated that up to 5% of the general population experiences significant SCT, but little is known about the prevalence of SCT within the college population. The purpose of the current study is to examine SCT symptoms within a large college population (N=1100). Two aspects of validity, structural and incremental, are essential for determining if SCT is separable from ADHD in a meaningful way. To examine structural validity, we used exploratory factor analysis (EFA) to determine if SCT forms a factor separate from ADHD. Next, we investigated the incremental validity of SCT by determining whether it predicts functional impairment beyond what is predicted by ADHD symptoms.

**Relationship Between Socially Responsible Corporations and Financial Performance**

Jan Joho, CURO Research Assistant
*Dr. Daniel Rettl, Banking and Finance, Terry College of Business*

This study seeks to explore whether focusing on goals other than short-term profit-seeking adversely impacts firms' short-term financial performance. To this end, we use Environmental, Social, and Governance (ESG) Criteria to classify the degree to which firms may deviate from short-term profit-seeking activities. Environmental criteria examine a company using a set of environmental output standards. Social criteria relate to a company's interactions with society including customers, employees, and communities. Governance pertains to a company's leadership, transparency, and values. These three factors are often considered by investors who practice socially responsible investing. ESG investing has expanded to include options such as socially-responsible mutual funds and exchange-traded funds with an emphasis on investing in ESG category leaders. Strong performance in various ESG categories demonstrates the forward-thinking nature of a company and its ability to anticipate and mitigate concerns or issues which may arise in the future. This study harvests available data using Bloomberg Terminals on around 4,000 firms from various industries and market capitalizations.

**Caffeine Mouth Rinsing on Running Endurance Performance in Men**

Allison Jones, CURO Research Assistant
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Previous studies have shown carbohydrate (CHO) mouth rinses (MRs) have improved performance in endurance exercise lasting about 1 hour by eliciting a cephalic phase response (CPR). Further, research has shown caffeine (CAF) MRs can improve sprint performance, but it is still unknown if there are beneficial effects of CAF MRs on endurance running performance. To examine the effects of CAF MRs alone, and in combination with CHO, on endurance running performance in men, endurance-trained males completed 4 separate 12.8Km running time trials (TT) in this double-blinded, cross-over study. During each TT, participants MR solutions every 12.5% of distance completed. The 4 treatment solutions were: water alone (placebo), CAF solution, CHO solution, and CAF and CHO solution. Heart rate, completion time, and rating of perceived exertion were measured. To date, 5 males completed all 4 trials. There was no significant difference in completion time between treatments A, B, C, and D (00:52:04±00:02:12; 00:52:50±00:01:49; 00:53:40±00:01:32; 00:52:21±00:02:05, respectively). Treatments A, B, C, and D also showed no difference in average heart rate (171.8±4.3; 170.6±4.9; 171.7±5.8; 163.6±5.6 beats/min, respectively). This study is not complete so treatments are still blinded. Based on current results, there are no differences between treatments A, B, C, and D. Recruitment is still in process and 5 additional participants will complete the study this year.

**Comparing Two Muscle Specific Endurance Tests**

Emily Gardner Jones, CURO Research Assistant
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A nine-minute muscle specific endurance protocol has been developed for clinical populations. A shorter protocol would provide increased ease of use in clinical populations. To compare a shorter five minute five Hz protocol to the already developed longer nine minute two, four, six Hz protocol. Methods: The forearms of young healthy adults were tested (n=15). Each subject was tested twice; once with the five-minute protocol and the other time with the nine-minute protocol. The tests were performed on separate days in a balanced order. Two electrodes were placed on the forearm with an accelerometer in between that measured muscle twitch acceleration. The current was adjusted to get a vigorous contraction and this amplitude was constant within each subject. The endurance index (EI) was calculated by dividing the end twitch by the start twitch and multiplying times one hundred. Results: Endurance Index values for four and six Hz were 75.0%+17.6% and 64.7% + 21.8%, respectively. The Endurance Index for five Hz was 64.9 % + 20.7%. Four Hz compared to five Hz had an R2 value of 0.69, and six Hz compared five Hz had the R2 value of 0.93. Conclusions: The short five Hz correlated with both the longer four Hz and six Hz, although it correlated better to the six Hz. The five Hz test is shorter and can potentially be used in various populations in the clinical setting.

**The Future's Inevitable Change: Effects of Blockchain and Cryptocurrency**

Mason Thomas Jones
*Dr. Margaret Christ, Accounting, Terry College of Business*

The importance and effect of blockchain and cryptocurrencies cannot be understated. However, governmental regulations and the accounting of financial statements as well as internal control for these innovations are now pressing issues. Through analytical research methods of quantitative and qualitative data, this paper intends to establish an understanding of how these innovations cure past and current financial issues, but also catalyze emerging concerns. Specifically, this paper anticipates the changes that will come with the adoption of new currency methods and what auditors of public and private accounting firms can expect from them. The past and present issues include, but are not limited to, the inequality between powerful industries and its users, and the lack of identification and compensation protection. While some traditional services will remain unchanged, there exists key differences particularly within audit and assurance procedures. In terms of results, this research paper highlights the foreseeable new roles of CPA auditors based off available market data and expected future modifications. As mentioned above, the innovative nature of blockchain and cryptocurrencies accompany emerging issues, such as how to account for both material and immaterial financial differences. The underlying importance not only affects the accounting information, but also user decisions that complement them. With a deeper understanding of the of blockchain and cryptocurrency, users and firms alike will have the ability perform financial activities with more efficiency and effectiveness.

**Superresolution Analysis of Meiotic Chromosome Synapsis in the Domestic Cat**

Zachary T. Jones, CURO Research Assistant
*Dr. Rabindranath De La Fuente, Physiology and Pharmacology, College of Veterinary Medicine*

Dog and cat overpopulation results in the annual euthanasia of millions of animals according to the Humane Society of the United States. Current contraceptive strategies, including spays and neuters, are unable to adequately control the populations and limit loss of life. An alternative approach involves interference with meiotic germ cell development (as a method of controlling gamete formation) and thus, to induce infertility in stray animals. However, little is known about meiosis in the tomcat, with only one published report to date. In this study, we conducted fluorescence immunochemistry and superresolution structured illumination microscopy (SR-SIM) analysis to characterize chromosome configuration during cat spermatogenesis in surface spread early, mid, and late pachytene stage spermatocytes. Preliminary data demonstrate previously unreported patterns of DNA double strand breaks (as identified by phosphorylated histone H2AX (γH2AX)) in autosomes. In addition, we provide a detailed analysis of the stage-specific configurations of the XY chromosome pair during pachytene stage of meiosis. SR-SIM analysis of feline XY body revealed structural chromatin organization of this

specialized nuclear domain with unprecedented resolution, and provided novel insight into protein markers involved in DNA damage response and epigenetic modifications. These results further our understanding of critical proteins and their functional implications in normal feline spermatogenesis, and may provide the initial stepping-stones for strategies to inhibit spermatogenesis in the cat.

**Using Deep Reinforcement Learning to Develop an Intelligent Traffic Signal Control Algorithm**

Jebin Joseph, CURO Research Assistant
*Dr. In Kee Kim, Computer Science, Franklin College of Arts and Sciences*

Traffic congestion control requires enormous financial, engineering, and administrative efforts. According to a report from Forbes in 2014, the U.S. spends $124 billion on reducing traffic congestion in metro areas. Atlanta is ranked the 8th city in the world (4th in the U.S.) regarding the severity of traffic congestion. Intelligent traffic signal control is key to addressing traffic congestion for improving the efficiency and economy of the city and making people's daily lives better. However, most cities in the U.S. (including Atlanta, Georgia) still dominantly use (Fixed-Time) conventional traffic signal control systems, resulting in increased management costs for traffic congestions. In this study, we aim to develop an intelligent traffic congestion algorithm with deep reinforcement learning, which provides more efficient traffic congestion management in metro areas. This project will leverage diverse open-source deep-learning frameworks including Google's TensorFlow, Keras. The core research challenge for the algorithm development is to implement a reinforcement mechanism and optimize it to traffic congestion control. We plan to implement three approaches in reinforcement learning: Deep Q Learning, Policy Gradient, and Actor-Critic. We will test these three approaches with real-world datasets provided by the Georgia Department of Transportation. The algorithm will be evaluated with several metrics (e.g., average wait time) to confirm how efficiently the algorithm addresses traffic congestion. Furthermore, the algorithm will be evaluated against current traffic signal approaches (e.g., Fixed-Time), and we expect that this research could lead to reducing traffic congestion in the Atlanta metropolitan and other areas.

**Characterizing Surface Wave and Wind Climate Around a Small Island for Wave Energy Feasibility**

Harshal Mukesh Joshi, CURO Research Assistant
*Dr. Brock Woodson, Environmental, Civil, Agricultural, and Mechanical Engineering, College of Engineering*

Solar radiation, winds and surface waves are the most common energy rich features present on the Earth that can be harnessed as sources of renewable energy. Wind energy is typically harnessed through turbines that are rotated as the wind blows across a set of blades like a fan. Surface wave energy can be harnessed through the kinetic energy of the wave movement (similar to wind energy harvesting) or from the potential energy of the surface elevation change. Winds and waves are an intriguing form of renewable energy, especially for remote locations, but their potential has not been fully realized due to issues of cost and maintenance. This project examines the solar, ocean wind and wave climate around Isla Natividad, located off Punta Eungenia in central Baja California, Mexico. The data consists of three long-term sets, identifying short-wave radiation, dominant wind speed, wind direction, wave height, and wave period. These data are used to assess the potential for solar, wind and wave energy production, the reliability of these energy sources and the environment impact on the island when compared to the current fossil fuel consumption.

**Efficacy of Nutrition and/or Physical Activity with Alternative Pain Management Methods Among Patients with Chronic Conditions**

Faeez Juneja
*Dr. Janani Rajbhandari-Thapa, Health Policy and Management, College of Public Health*

The rise in chronic diseases has triggered widespread opioid drug use for pain management. The health cost burden associated with opioid prescription overdose and addiction treatment is $78 billion annually. Alternative pain management techniques exist as a possible pathway away from opioid prescriptions. These techniques are medical marijuana, acupuncture, physical therapy, physical activity, improved nutrition, and cognitive behavioral therapy. Systematic reviews on medical marijuana have been accomplished. However, there is no systematic review on the use of physical activity and diet changes in alternative pain management methods to patients with chronic comorbidities. The process will involve pairing search terms using Google Scholar and PubMed databases to include relevant articles. I will pair the search terms "chronic pain", "exercise", "painkiller", "patient", "lifestyle factors", "diet", "nutrition", "physical activity", and "therapy" with one of the following search terms: "treatment", "addiction", "reliever", "cognitive behavior therapy", "acupuncture", and "risk". The systematic review process is ongoing. It is expected that when combined with alternative pain management methods, physical activity and improved nutrition are more effective than non-activity controls for improving chronic pain. Preliminary results reveal that cognitive behavior therapy when combined with antioxidant use can improve chronic pelvic pain. We expect improved dietary and physical interventions when combined with alternative pain management methods to have the same effectiveness as pharmaceutical induced outcomes. We expect that the results found will provide healthcare professionals an organized, up-to-date source that can accurately depict opportunities in combining lifestyle factors with alternative pain management methods as opposed to opioid prescriptions.

**The Effect of Light on the Growth and Development of the Painted Lady Butterfly (*Vanessa cardui*)**

Elyssa Junio
*Dr. Paul Guillebeau, Entomology, College of Agricultural and Environmental Sciences*

*Vanessa cardui* (L.), commonly known as the painted lady butterfly, is found all over North America and is considered to be both beneficial and harmful (i.e. crop pest) to the

environment. Previous studies showed that light could have an effect on the growth and development of Lepidopterans. In this experiment, we investigated the effect of blinking white lights during the night on the growth and development of painted lady butterflies and hypothesized that there would be differences between the blinking light group and no light group (normal 12 h light during the day). We placed the larvae on artificial diets in transparent cups: one group was exposed to blinking light pattern during the night while the other group was put on a 12 hr:12 hr light-dark cycle. We reared the larvae to the adult stage for each trial; we took the weight of each subject twice a week and measured the overall development and eclosion times. We analyzed the data with *t*-tests and concluded that there are no significant differences in larval growth. There were differences in development time into pupae. Additional trials, however, should be made to solidify that there are differences in the time to develop from larvae into pupal and adult stages. Our results can open up the possibility of using light to control populations of this important pest species, thus potentially reducing crop loss.

**Effects of Chronic Stress on the Acute Stress Reaction of Horned Passalus Beetles, *Odontotaenius disjunctus***

Liz Ann Jurado, CURO Research Assistant
*Dr. Andy Davis, Ecology, Odum School of Ecology*

All animals are faced with situations that are stressful, sometimes for long periods. The stress reaction of animals is primarily designed to enhance animal performance temporarily, to allow it to deal with the danger at hand. This 'acute' stress response is therefore beneficial. However, problems can occur if animals are faced with repeated or chronic stressors. Most of the work dealing with stress physiology comes from research conducted on vertebrate animals (mice, birds, humans). However, there is very little research focusing on invertebrates, and especially on the effects of long-term, chronic, stress. This experiment consisted of three trials that involved exposing Horned Passalus Beetles to acute chronic stress over a three-week period using mechanical tumblers. Their heart rates were measured before and after being exposed to chronic acute stress to determine the effects of chronic stress on their acute stress reactions. However, results from each of the three trials revealed that the chronic stress did not lower heart rates when later exposed to acute stress. The resting heart rates of the chronically stressed beetles did increase, possibly leading to increased metabolic rates and therefore causing them to use more energy, and as a result, lose more weight. Future research should concentrate on the effects of acute chronic stress on the metabolic rate as these findings were not the intent of this experiment.

**Preliminary Evaluation of Equine Forelimb Kinematic Response to Commonly Used Head and Neck Positions**

Micayla Marie Kane
*Dr. Kylee Duberstein, Animal and Dairy Science, College of Agricultural and Environmental Sciences*

Recent controversy over head and neck positions (HNP) used in equine sports has sparked interest in the field of equine kinematics due to potential effects on muscular and spinal health. Studies have found direct correlation between HNP and kinematics of the back and hind limbs. However, little to no research has related forelimb kinematics to HNP. The objective of this study was to examine the effects of four commonly used HNPs on forelimb kinematics to assess any positive or negative effect of treatment. Four stock-type horses, accustomed to a regular riding program, of comparable height and neck length were used in a Latin square design to test the following HNPs: (1) free/loose, 2) high/flexed, 3) low/flexed, 4) neutral/flexed. HNPs were accomplished through the use of a chambone and side reins attached to a surcingle fitted to each horse by the same handler. Horses were trained for six days over a two-week period prior to data collection for acclimation. Three synchronized cameras (XcitexTM Procapture, Woburn, MA, USA) set to record at 150 fps were used to record horses as they trotted freely down a 30 m concrete pad. Preliminary results show no influence of HNP on stride duration or percent of stride duration spent in the swing phase. Further research should look at a larger number of animals, a longer acclimation period, and the effects of HNP on forelimb loading and joint angles.

**Testing the Effects of Varying Concentrations of Ivermectin on Egg Lay Assays for Three *C. elegans* Mutations—avr-14, avr15 and glc-1**

Kangan Kanjhlia, CURO Research Assistant
*Dr. Barbara Reaves, Infectious Diseases, College of Veterinary Medicine*

Glutamate gated chloride channels (GluCls) are targets the anthelminthic drug ivermectin. These receptors are known to modulate a number of processes which are inhibited by ivermectin including locomotion and pharyngeal pumping. They are composed of 5 subunits. Mutations in three of the five receptor subunits in *C. elegans* (avr14, avr15 and glc-1; strain JD608) results in ivermectin resistance in development assays. The direct effect of ivermectin on individual or combinations of subunits in egg lay assays, however, has not been assessed. The purpose of this study was to test the effects of ivermectin on egg laying behavior in *C. elegans* strains carrying single mutations in avr-14 (CX12709) or glc-3 (XA7400) and double mutations in avr-14 and glc-1 (DA1384) or avr-14 and avr-15 (JD740). Egg lay assays were also performed with the ivermectin susceptible strain N2 and the resistant strain JD608 as controls. Individual adults were incubated for 24 hours in one well of a 96 well plate in media containing either a DMSO control or varying concentrations of ivermectin. Eggs and larvae were counted and the IC50 values were calculated and results graphed using GraphPadPrism. The IC50 for the susceptible N2 strain was 90nM and 1 mM for the resistant JD608 strain, 17nM for XA7400, 22nM for JD740 However, the results for the strain CX12709 and the strain DA1384 were inconclusive requiring additional repeats. These results suggest mutations in avr-14 and glc-3 individually confer hypersensitivity to ivermectin in egg lay assays and suggest each subunit may contribute differently to ivermectin sensitivity.

**Structure of Free Oligosaccharides in Human Breast Milk**
Arjuna Karikaran
*Dr. Parastoo Azadi, Biochemistry and Molecular Biology, Franklin College of Arts and Sciences*

The purpose of the research was to determine the type and relative percentages of free oligosaccharides found in human breast milk from mothers in Bangladesh, who were classified into different groups based upon income levels and otherwise randomly selected. The samples were taken from Bangladesh because the study wishes to see how malnutrition of mothers translates into changes in the structure of the oligosaccharides produce by the mother. Specifically, the ratio of sialyated milk sugars is of interest as they are known to promote better growth of infant microbiota. Milk oligosaccharides have been implicated in having an effect on the microbiome and immunology of infants. Specifically, using the Fusion Orbitrap MS instrument, we have performed LC-MS/MS analysis on permethylated human milk samples and so far have found both neutral and sialylated oligosaccharides, including isomeric forms. We are currently creating an in-house database of human milk oligosaccharides (HMOs) we can use to analyze the remaining samples more efficiently. The majority of the completed work has been in the completion of the database. Currently, without a functioning database, analysis of LC-MS/MS data of HMOs samples is done manually. This is a very tedious and involved process, requiring a high degree of knowledge regarding linkage and composition patterns of HMOs. We are confident this database will become a highly useful tool in the automation of HMOs data analysis, as it will facilitate analysis even by users without extensive knowledge of structure possibilities.

**Search for Anti-CRISPR Proteins**
Jamil Fayazali Kassam, Foundation Fellow, CURO Research Assistant
*Dr. Michael Terns, Biochemistry and Molecular Biology, Franklin College of Arts and Sciences*

The battle between bacteria and bacteriophages has been waged for billions of years. Bacteria have many defense systems against bacteriophages including CRISPR (clustered regularly interspaced short palindromic repeats) adaptive immune systems. CRISPR loci contain DNA sequences from previous invaders (spacer DNAs) that have been incorporated into the bacterial genome at CRISPR loci. Upon subsequent invasion, transcribed spacers (crRNAs) assemble with specific proteins to form crRNA-protein complexes (crRNPs) containing at least one nuclease. The assembled crRNPs bind complementary invader DNA or RNA and cause degradation of the bacteriophage genome or transcripts, respectively. To combat bacterial CRISPR systems, evolution has driven bacteriophages to encode anti-CRISPR (Acr) proteins, allowing them to infect bacteria that have a spacer against them. To better understand the coevolution of bacteria and bacteriophages, we are identifying novel Acrs that act against the CRISPR systems in *Streptococcus thermophilus*. Genes encoding Acr proteins are often found close to genes coding for anti-CRISPR associated (Aca) proteins. Acr candidates are identified by looking in close proximity to the Aca genes. To test these candidates, a sequence identical to a spacer from the CRISPR system is inserted into a plasmid, creating a target vector. If the CRISPR is active in defense, the target vector will be destroyed. If an Acr is functional, the target vector will survive. This allows us to screen candidates for Acr activity. Identification and characterization of novel Acr proteins will enable a better understanding of the complex dynamics between bacteriophages and their bacterial hosts.

**Large Animal Model of Acute Arthritis for Stem Cell-Based Regenerative Medicine**
Hannah Kemelmakher
*Dr. John Peroni, Large Animal Medicine, College of Veterinary Medicine*

Synovitis is an acute inflammatory response of the synovial membrane to joint trauma or infection and is thought to be a major role player in progressive joint deterioration as seen in osteoarthritis. To study synovitis, researchers have relied on synoviocyte cell culture to mimic and modify the inflammatory events postulated to underpin synovial inflammation. Unfortunately, synoviocytes de-differentiate and lose their phenotypic features when grown in monolayer, limiting our ability to appropriately interrogate the synovial environment ex vivo. It is, therefore, the overall goal of this project to develop an *ex vivo* technique to study the role of the synovium in joint inflammation. Specifically, our objectives are to establish a culture technique that maintains porcine full thickness synovial explant viable for up to 14 days and to determine the responses of the synovial explant to an inflammatory stimulus such as Interleukin-1 (IL-1). The fibrous joint capsule and synovial membrane will be removed as full thickness plugs using aseptic technique in block from the joint, and placed in complete medium in a transwell system. Synoviocytes will be monitored for viability, composition, and secretory function through histology and cell function assays. Supernatant will be evaluated for the production of pro-inflammatory markers such as TNFα. Our hypothesis is that the biological and mechanical composition of a synovial plug containing fibrous capsule and intact synovial villi will produce a useful model for researching acute arthritis, and render us able to explore possible applications of mesenchymal stem cells (MSCs) in synovitis.

**Foliar Nitrogen and Carbon Content in Four Tree Species in Response to Soil Warming**
Lexi Kenna, CURO Research Assistant
*Dr. Jacqueline E. Mohan, Ecology, Odum School of Ecology*

Since 1880, Earth's average temperature has increased by about 0.9°C (1.6°F). End-of-Century temperatures may be 5.4°C warmer. Soil warming experiments have examined impacts of increased temperatures on soil microbes and vegetation, but few examine macroinvertebrate fauna. In these previous experiments, availability of soil nitrogen (N) to plants increased with warming. However, these studies occurred in northern, less weathered, more fertile soils, biogeochemically different from weathered soils of the sub/tropics including the southeastern Piedmont of the US. I examined potential soil-plant N responses to warming and impacts on insect herbivory in a soil warming study using twelve 18$m^2$ plots in the Whitehall Forest

of Athens, GA. Leaf samples and visual invertebrate herbivory observation data were collected in July 2018. Data from seedlings and saplings of four tree species were used: *Quercus rubra*, *Quercus alba*, *Acer rubrum*, and *Acer barbatum*. These samples will be used to assess mid-season foliar %N, %carbon (C), and isotopes $^{15}N$ and $^{13}C$ responses to soil warming. These samples will be submitted to the UGA Stable Isotope Ecology Laboratory for analysis. I will then analyze the %N, %C, $^{15}N$ and $^{13}C$ foliar contents and visual herbivory data to assess any variation among the ambient, +3°C , and +5°C soil warming plots. I hypothesize that there will be higher %N and $^{15}N$ foliar contents in +3 and +5°C plots vs. ambient plots, significantly lower C/N ratios, and as a consequence, higher rates of foliar herbivory in the warmed plots.

**Evaluation of Larval Medium in the Controlled Current Toxicity Test**

Skyler Magnus Kerr, CURO Research Assistant
*Dr. Marianne Shockley, Entomology, College of Agricultural and Environmental Sciences*

The University of Georgia's Black Fly Rearing and Bioassay laboratory has conducted research on larval black flies for decades. Research on larval black flies mostly pertains to survivability of larvae in varying amounts of *Bacillus thuringiensis* subsp. *israelensis* (*Bti*)—a common larvicide in use against immature Nematocerans. However, questions concerning the consistency of bioassay tests were raised. If elements were altered during the conduction of a standardized Controlled Current Toxicity Test (CCTT), would differing outcomes result? In a standard CCTT larvae require a substrate flask, continual aquatic flow, and aquatic medium. The element altered for this study was the type of aquatic medium. Generally, deionized water with additional suspended nutrients is used for aquatic medium. Alternative aquatic mediums tested in this research were: deionized water without suspended nutrients, moderately hard water without suspended nutrients, and distilled water without suspended nutrients. Expected findings for this project were truly unclear as no elements to the test have been altered since its standardization. However, we can assume that LC50s for varying mediums will be different from the generalized curve. Information gained from this test will assist the lab in understanding both consistency and efficiency of the standardized CCTT. This research can prove significant as a more streamlined process would lay the path for a quicker process, in turn producing data at a faster rate.

**Calcium Signaling and Potassium in the Lytic Cycle of *T. gondii***

Nicole Khamsa, CURO Research Assistant
*Dr. Silvia N. J. Moreno, Cellular Biology, Franklin College of Arts and Sciences*

*Toxoplasma gondii*, an intracellular pathogen capable of infecting virtually any nucleated cell, is the causative agent of one of the most prevalent parasitic infections in the world and is responsible for disseminated toxoplasmosis. Calcium signaling, governed by fluctuations in cytosolic calcium ion concentrations, regulates a plethora of cellular responses and is utilized universally across life. As an obligate intracellular organism, *T. gondii* must "sense and adapt" to changes in its surrounding ionic composition in order to effectively propagate throughout its lytic cycle. Egress and invasion both involve dramatic changes in ionic concentrations in which the potassium ion concentrations ($K^+$) inverts from high (intracellular) to low (extracellular). Previous work has proposed a model in which a drop in $K^+$ serves as a key player in inducing the $Ca^{2+}$ signaling pathway necessary for egress. The genome of *T. gondii* encodes for two predicted $Ca^{2+}$ activated potassium channels whose function remains unknown. Using a combination of genetic and molecular biology techniques such as CRISPR, we have successfully generated epitope tagged clones of *Toxoplasma* and have localized both channels using immunofluorescent microscopy. We are currently in the process of generating knock-out mutants to further characterize the role of these two channels in the *T. gondii*'s lytic cycle. Ideally, our work will pave a path for future drug interference strategies.

**Impact of Prenatal Exposure to Bisphenol-A Alternatives on Abdominal Adipose Tissue in the Rat**

Reza Kianian, CURO Summer Fellow
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Pregnant women are often exposed to endocrine disruptors such as Bisphenol-A (BPA). BPA is used in the manufacture of plastic products and can "program" the offspring for metabolic disorders such as obesity. Recently, Bisphenol-S (BPS) and Bisphenol-F (BPF) have been introduced as "safe" alternatives to BPA, but their effects on the developing fetus are unknown. We hypothesized prenatal exposure to these chemicals would cause hypertrophy and/or hyperplasia of adipose tissue in the offspring. This would be exacerbated if offspring are challenged with a high fat (HF) diet. Pregnant rats were exposed to 0, 5µg/kg BW BPA/ BPS, or 1µg/kg BW of BPF from gd 6 to 21. When they were 4 months old, offspring were placed on a HF or regular diet for 2 weeks after which they were sacrificed. Adipose tissue weight, adipocyte size and number were assessed. The results showed HF diet challenge increased adipose tissue mass significantly in male but not in female offspring. BPS exposure produced hypertrophy of adipocytes in female offspring even on regular chow. HF diet challenge induced adipocyte hypertrophy in control, BPA and BPF treated animals compared to their chow-fed counterparts. In male offspring, prenatal exposure to BPS and BPF followed by HF diet challenge produced marked hypertrophy of adipocytes compared to control animals on HF diet. These results indicate BPA alternatives are capable of promoting obesity in females and the effect is exacerbated in male offspring when challenged with a HF diet.

**The Development of International Law in Cyberspace**

Hallie Kielb, CURO Research Assistant
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How do international laws evolve in cyberspace? I seek to answer this question by examining the existing cyberspace laws, as well as what factors motivate their writing and implementation. I argue that technological innovations and

increasing interconnectivity create a basic need to develop an international legal structure to govern cyberspace (e.g., to combat cross-national crime). This process is already underway, but remains disputed on many fronts. Actors, for example, have questioned the applicability of existing international law to cyberspace since cyber operations first began to draw international attention. This trend will continue and accelerate. As people connect with one another more deeply in cyberspace, states will increasingly express and advocate for their own positions about if, how, and why the existing law applies—or not—to specific cyber issues. These states' positions will then need to be reconciled, and I aim to understand how and why that occurs. Results of this study will therefore not only advance our understanding of how international law develops in cyberspace, but also, perhaps, start a more comprehensive discussion about how we govern the technology that increasingly pervades our everyday life.

**Axon Projection in the Optic Tract and Chiasm of *Anolis sagrei* Lizards Observed Through DiI Fluorescence Tracing**

Hannah Kim, CURO Research Assistant
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The eye is a complex organ that involves many working parts. In the retina, visual information is processed by many different cell layers. One of these layers is the ganglion cell layer whose axons exit the eye forming the optic nerve and project to either the right or left hemisphere of brain through the optic chiasm. In humans, normally 55% of these axons cross at the optic chiasm. In albinism, a condition that results from lack of pigmentation, 80% of these axons cross. Individuals with this condition also fail to develop a fovea—which is a pit in the back of the retina critical for vision. Genetically, these phenotypic results can be due to a mutation in the Tyrosinase gene—required for normal fovea development and pigment production, but the underlying mechanisms of tyrosinase involvement in fovea development and how that impacts axon crossing is unknown. Progress in this area is largely limited due to a lack of a foveated model. Therefore, our work focuses on establishing the foveated *Anolis sagrei* lizard as a new model system for eye-related research. The aim of this project was to determine in the lizard what percentage of axons cross at the optic chiasm. Lipophilic fluorescent dyes (DiI) were used to label ganglion cells and trace axons projections to the optic chiasm in the developing lizard eye of embryos and hatchlings. This work lays the groundwork for future studies exploring Tyrosinases' role in axon projections and fovea development in the lizard.

**HIF2A Knockout in Mature Myofibers Improves Muscle Regeneration**

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Yin lab in Department of Biochemistry previously found that the knockout of HIF2A in muscle cell stems resulted in better muscle regeneration; however, the effect of HIF2A knockout in a mature myofiber has not been explored. With HIF2A inhibitor's potential in treating muscle injuries, understanding the function of HIF2A in myofibers, the major constituent of skeletal muscle tissue, is crucial for developing HIF2A inhibitor-based therapeutic strategies. In order to investigate HIF2A's function in myofibers, transgenic HSA-Cre$^{ER}$; HIF2A$^{f/f}$ mice were injected with tamoxifen (TMX) to induce HIF2A knockout specifically in myofibers. Then, cardiotoxin (CTX) was injected into the tibialis anterior muscle (TA muscle) of the transgenic mice to induce muscle injury and later muscle regeneration. This muscle regeneration model can test the hypothesis that HIF2A knockout in myofibers affects muscle regeneration and indirectly impacts on muscle stem cell dynamics. The regenerative muscle samples were collected at 14 days post-injury (dpi) and examined with immunofluorescence staining for markers of muscle stem cells and muscle regeneration. The preliminary data indicated that HIF2A knockout in myofibers improved the proliferation and differentiation of muscle stem cells and improved muscle regeneration. This study suggests that a HIF2A-related feedback mechanism in myofibers regulates muscle stem cell behaviors during muscle regeneration, which may be explored in future studies for muscle regeneration and implemented in therapeutic studies.

**Stacking Interactions of BN-hetereocycles**

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The majority of pharmaceuticals contain aromatic rings that play key roles in their binding to targets. It has been suggested the carbon atoms in these aromatic rings can be replaced with boron and nitrogen atoms without significantly altering efficacy. This could be a way to not only circumvent costly patents, but also make drugs more affordable. This strategy, however, is based on the implicit assumption introducing B and N into an aromatic ring will not significantly impact a drug's ability to bind to its target. In order to test this assumption, I have used quantum mechanical (QM) methods to quantify the π-stacking interactions between three aromatic amino acids (phenylalanine, tryptophan, and tyrosine) and nine BN-heterocycles. The resulting binding energies and geometries were compared to data for the analogous all-carbon aromatic rings. Energy decomposition methods were used to further analyze the differences in the energetic contributions between the stacking of the conventional aromatic rings and the BN-heterocycles with aromatic amino acids. The results indicate π-stacking interactions of BN-heterocycles with aromatic amino acids are significantly different from those of their carbon-based analogs, suggesting these changes will alter the drug's effect in the body.

**What Role Does the Intracellular Population of *B. pertussis* Play in its Pathogenesis?**

Randy Kim, CURO Research Assistant
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*Bordetella pertussis* is the bacterial agent responsible for whooping cough, a severe and sometimes deadly respiratory infection, especially in infants and children. Despite

vaccinations, cases of whooping cough have been rising. *In vitro* tests consistently show that *B. pertussis* can survive intracellularly within macrophages, although what role this intracellular population plays *in vivo* is less obvious. Intracellular survival in pathogens is a trait associated with virulence and we hypothesize that intracellular survival plays a significant role in the infection and persistence of *B. pertussis*. To test this hypothesis we have screened a transposon based random mutant library using an *in vitro* intracellular assay to identify mutants defective in intracellular survival. Identified mutants will be used to test the effect this deficiency has on infection and persistence *in vivo*. We have identified two mutants that fail to gain entry in macrophages *in vitro* but otherwise display no other deficiencies in viability or growth, and are currently testing them *in vivo* to observe their phenotype. Current acellular vaccines in the US against pertussis, unlike whole cell vaccines formerly used, do not recognize or target intracellular proteins that are upregulated during intracellular survival and are not as effective as the whole cell vaccine. The characterization of intracellular survival in *B. pertussis* could lead to the development of a more effective vaccine that would lessen the resurgence of whooping cough.

**Role of the Midtarsi in Courtship Signaling and Copulation Duration of *Drosophila subquinaria* and *D. recens***
Samantha Kincaid
*Dr. Kelly Dyer, Genetics, Franklin College of Arts and Sciences*

In a recent study examining the mating practices of *Drosophila saltans*, the midtarsi were discovered to have a sex-based effect on mating occurrence. This effect was unexpected and warranted further exploration. In this study, we examine the impact of the midtarsi on the courtship and mating duration of *Drosophila subquinaria* and *Drosophila recens*, two species which are closely related but have evolved slightly different courtship rituals. We surgically removed the midtarsi and ran mating trials across four treatment groups in each species—uncut male with uncut female, uncut male with cut female, cut male with cut female, and cut male with uncut female—and recorded mating occurrence and copulation duration. In *D. subquinaria*, removal of the midtarsi resulted in decreased mating occurrence based on the cut or uncut status of both the male and female and increased copulation duration based on the status of the male; in *D. recens*, removal of the midtarsi had no effect. This suggests that the midtarsi could play a role in other species in the *Drosophila* genus, and also provides another marker for divergence between *D. subquinaria* and *D. recens*.

**Analyzing Potential Effects of Vibration Therapy on the Central Nervous System in Children with Cerebral Palsy**
Colleen Kinsella, CURO Summer Fellow
*Dr. Christopher Modlesky, Kinesiology, College of Education*

Cerebral palsy (CP) is a neurological condition characterized by motor impairment that is often accompanied by global physical and mental dysfunction. CP is the result of a brain injury that occurs sometime in utero or during the first 2 years of a child's life. This brain injury manifests differently in each child but nearly all children have a decrease in physical activity and a lower bone and muscle mass than typically developing children. Recent studies suggest that mild vibration treatment improve balance, which may lead to increased participation in physical activity and a greater development of muscle and bone. It is plausible that this improvement in balance is associated with an increase in brain activity in areas related to balance and motor control. Functional near-infrared spectroscopy (fNIRS) is a non-invasive way to monitor vascular activity in the brain. Since the fNIRS devices are somewhat portable, participants are free to perform fine and gross motor tasks. Despite the promise associated with mild vibration treatment and the recent development of fNIRS, to our knowledge, no studies have assessed the relationship between vibration treatment and brain activity in children with CP or any other population. The purpose of this project was to begin developing a protocol to assess brain activity during vibration treatment and motor control testing using functional near-infrared spectroscopy (fNIRS). The resulting procedure will be used to determine the effects of a mild vibration treatment on the central nervous system in children with cerebral palsy (CP).

**Developing a Python Package for Automated Mineralogical Compositional Analysis**
Yung Ellen Kipreos, CURO Research Assistant
*Dr. Inseok Song, Physics and Astronomy, Franklin College of Arts and Sciences*

The circumstellar disk that surrounds a star is composed of the gas and dust particles that are in orbit around it. Around infant stars, this disk can act as a source of material that can be used to form planetesimals, which can then accrete more material and form into planets. The composition of these circumstellar disks is of importance because it can indicate either what future planetesimals might be made of, or it can shed some light on the history of any planetesimals that have already formed. In this research project, we have created an automated computer program that will take in the spectra of a circumstellar disk as input and will output its most likely mineral composition and the relative abundances of each mineral. For the mineral spectra, we used the mid-infrared wavelength range because the inner section of the circumstellar disk, where planetesimals are thought to form, radiates strongest in mid-infrared light. The most likely mineral composition is found by measuring the RMS (root mean square) of the observed circumstellar spectra before and after subtracting each mineral spectra from it. The creation of this program will help to identify the possible mineral composition at a faster rate than could be done otherwise. Final mineral compositional analysis result then can be compared to various solar system objects such as comets and asteroids.

**Data Compilation on Sex Trafficking in Atlanta, GA Focusing on Significant Determining Variables**
Alyssa Kiss, CURO Research Assistant
*Dr. David O. Okech, Social Work, School of Social Work*

Sex trafficking, a form of modern-day slavery, is a huge epidemic in our culture today. With hundreds of young girls and boys being sold into sexual servitude and bondage monthly, this

is a problem that cannot be ignored especially when a large amount of this is happening in very localized places. There is a need and the ability to target these areas and bring awareness to specific points of increased risk and danger pertaining to abduction, as well as looking at the broader systematic issue surrounding this topic concerning prosecution rates and policies already in place. The purpose of my research is to aid in a measurable and sustainable decrease in sex trafficking in Atlanta, Georgia by establishing a centralized data bank of significant quantitative data from relevant sources focusing on locations of entrance into trafficking, contributing external factors, prosecution outcomes, and existing protocols. Using online resources, relevant data from governmental agencies, and UGA's library databases, data points on trafficking cases, demographics, location analysis, and prosecution trends were compiled and analyzed. I anticipate finding data that will aid in a measurable and sustainable decrease in sex trafficking. The data collected so far indicates a broader systemic problem. Sex trafficking cases are difficult to find, listed under "other" in a list of offenses, and usually involve negotiated pleas that negate sexual servitude charges. I think we will continue to find this trend throughout the rest of the data, as well as clear areas of higher risk in Atlanta being present.

**Athens Music Communities and Their Societal Impact**
Mary Frances Kitchens, CURO Honors Scholar
*Christian Lopez, Russell Library, UGA Libraries*

Athens, Georgia is a city known for its rich music history. However, most resources primarily focus on the rock music scene of the 1980s and 1990s, and there is very minimal light shone on the many other music communities that have impacted Athens. I am going to research the various musical movements and musical aspects of the city's history so that I can then focus in on a specific topic and research its importance in shaping the Athens community. I will use oral histories and a variety of other resources to expand my knowledge and appreciation of Athens music so that I can then decide what specific music classification I would like to research more in depth. I will eventually use my findings to show the social, economic, and political effects of an Athens' music community and to inform the public of the significance musical groups have had, other than the rock ones that are often considered to be most notable.

**Exploring Young Liberian Women's Experiences with Intimate Partner Violence: Links to Conflict-Related Trauma and Mental Health**
Apoorva Kommajosula, CURO Research Assistant
*Dr. Tamora Callands, Health Promotion and Behavior, College of Public Health*

There is a body of research that has focused on understanding the link between exposure to trauma and mental health. This study, however, seeks to better understand the relationship between intimate partner violence, exposure to potentially traumatic conflict-related events, daily stress, and mental health among young women in Liberia who have experienced at least one act of intimate partner violence (IPV) throughout their lifetime. 106 female participants completed a quantitative assessment battery administered by a trained research assistant. The assessment examined exposure to intimate partner violence, exposure potentially traumatic conflict-related events, daily stress, symptoms of post-traumatic stress disorder, and depressive symptoms. Analyses were conducted through the statistical package, SPSS, to compute descriptive statistics, bivariate correlations, and multivariate regression analysis. The average age of the participants was found to be 23.09 with most lacking marriage history. While significant relationships were found between IPV and all variables, the strongest correlation at the 0.01 level was between IPV and daily stress ($p = 0.511$). Overall, this research provides insight into how experiencing distress and trauma is related to mental health outcomes in a post-conflict setting such as Liberia. It highlights the need for more culturally sensitive, professional mental health services targeting the needs of Liberian women. It further calls for a need to focus on low-resource settings and take public health measures on a community or policy level to provide the necessary resources and tools for this population.

**Vocal Exchanges and Effects on Dominance and Group Cohesion in Western Gorillas**
Manya Kothapalli, CURO Research Assistant
*Dr. Roberta Salmi, Anthropology, Franklin College of Arts and Sciences*

In many social animals, vocal communication aides in the facilitation of social bonds and allows for adaptive group interactions. In primates, vocal communication has been shown to help in maintaining vocal contact between separated group members, aiding in group cohesion, and reinforcing social hierarchies, among other functions. To further our understanding of the function of primate communication, we analyzed previously collected data from a well habituated group of *Gorilla gorilla* at the Mondika Research Center in the Republic of Congo. We used focal data (1,572 total focal hours) to examine the relationship between the grunt and double grunt calls (2,163 total number of calls). Spatial data analysis revealed that these calls are exchanged most frequently when callers are within 10 meters from each other. Calling rates were associated to individuals' dominance rank, with higher ranking individuals calling and being replied more often than others. Our results suggest western gorillas use vocalizations to reinforce rank dominance and to maintain beneficial social bonds within pairs in the group. This analysis supports recent arguments on the great flexibility in close range calls of gorillas, contributing to our understanding of vocal communication of ape species. Implications for this research might shed light on poorly understood behavior patterns and allow us to further understand the origins of language or vocal production in species of apes and hominins.

**Quality Analysis of Peanuts Using Image Color Processing**
Swecha Kranthi, CURO Research Assistant
*Dr. Zion Tse, Electrical and Computer Engineering, College of Engineering*

Today, Georgia annually produces 2.5 billion pounds of peanuts which yields to over 50% of peanuts produced across US. Despite a growing market and heavy competition, peanut farming still bears many risks that may diminish the quality of the harvest. Currently, farmers monitor the quality of the produce by taking periodic samples and grading the size, mass and the moisture of shelled peanuts. The process takes 2 hours and has to be done in specific facilities. The goal of my research is to design a mobile application that can grade the quality of the peanuts based on color and texture of unshelled peanuts. To create a cheaper and more efficient grading mechanism, the application will utilize object recognition to recognize various peanuts from a photograph and grade the color and texture of these individual peanuts by computing a small cross-section of each peanut and comparing data with rest of the sample. The resulting data can be used to determine the best harvest time for the best average quality and size of the harvest. This application is capable of reducing sampling cost and grading time by bring a peanut grading system to the palm of a farmer's hand.

**Why has the Democratization Process for India Looked So Different for Pakistan?**
Vaibhav Kumar, CURO Research Assistant
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Given the overwhelming similarities between the two states following their partitioning by the British Government, one could rightfully assume that their transition to democracy would proceed in a similar manner. However, quite the opposite proved to be true. India stands as a beacon of democratic success, while Pakistan dances on the line dividing successful nations from failed states. This difference leads to the thesis of this paper- countries with the foundation for democracy such as the infrastructure, norms, and political leaders will have a greater chance at democratizing. This project attempts to explain these different outcomes by historically analyzing the absence of necessary infrastructure in Pakistan including a lack of political leaders, assassinations of politicians early in Pakistan's history, and a rigid "don't ask don't tell" policy instated by the United States during the Cold War. It is anticipated that these reasons explain the difference in democratic development between these two originally very similar countries. Understanding how India and Pakistan democratized differently is crucial to not only help future state development within these two nations but to serve as a model for other countries. By researching this question, policymakers can help Pakistan develop into a democracy by learning from mistakes the Pakistani government has made throughout history. Furthermore, a crucial awareness of these two countries can help policymakers adopt certain guidelines when assisting with the democratic transition of other states. As a result, policymakers could try to avoid critical choices that Pakistan made during their democratization phase and instead apply policies from India's history.

**An Examination of the Impact of the Tourist Economy on Small Cities and Villages**
Adam Kunis, CURO Research Assistant
*Dr. Hua Chen, Marketing and Distribution, Terry College of Business*

As developed nations transition from manufacturing economies to service economies, local governments and residents are taking advantage of the fastest growing industry in the world: Tourism. This study aims to understand the perception of the tourism industry held by residents surrounding popular tourist destinations in the European Schengen Region, through the tri-dimensional factors of tourism: economic, environmental, and social-cultural. Specifically, we investigate the influential factors that lead to sustainable development and practices within the tourism industry. A total of 111 participants answered the survey and they were also given the opportunity to write in the changes they wish to see in the community pertaining to the tourism industry at the end of the survey. In addition to the survey, 11 in-depth interviews were also performed, which provided an opportunity for participants to clearly articulate their opinions and perceptions on the impacts of tourism. Results showed that residents in the Schengen Region of Europe have an extremely strong relationship with tourism and perceive it to be very important to their communities. Tourism plays a vital role in these local economies but must be monitored to limit potential threatening externalities. As tourism increases, so does energy consumption, waste production, and environmental impact. In order for tourism to remain a sustainable industry, local residents must actively participate and communicate with tourists to ensure that both parties are taking responsible actions in sharing and maintaining tourist destinations.

**Psychological Aspects of Self-Reported Measures of Stair Climbing**
Chantal Claudette LaFlamme, CURO Research Assistant
*Dr. Jennifer L. Gay, Health Promotion and Behavior, College of Public Health*

Past research has found associations between limited physical activity and poor mental health outcomes. However, there are few studies that have focused on the relationship between stair climbing and mental health outcomes. We did a systematic literature review using Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) method to study psychological aspects associated with self-reported stair climbing. Studies that were included in the review used stair climbing as an independent variable and also had at least one psychological outcome related to mental health. Participants in the studies were usually elderly and often had difficulty climbing stairs due to diseases such as dementia, stroke, and peripheral artery disease. Data from six studies indicated that difficulty negotiating stairs is associated with elevated symptoms of anxiety and depression. Samples of women showed more statistically significant associations between psychological symptoms and difficulty climbing

stairs. Furthermore, the fear of falling, a specific type of anxiety common in older adults with poor physical health, was examined in four studies. Individuals who experienced a prior fall that resulted in a fracture and those who needed assistance with stair climbing often reported having elevated scores on questionnaires measuring fear of falling. Overall, the available evidence supports an association between increased ability for stair climbing and fewer symptoms of anxiety and depression in older adults. However, there is a small body of evidence about associations between stair climbing and mental health, which limits the strength of this conclusion.

**Analysis of Pharmaceutical Contaminants in the Sewanee Constructed Wetland by Mass Spectrometry**

Jackie Langmo, CURO Research Assistant
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The Sewanee Wetland was built as a pilot system at the Sewanee Utility District's wastewater treatment facility to test if constructed wetlands could be a viable water treatment method for rural communities. This study builds upon previous research focused on the uptake of pharmaceuticals by plant species in the wetland. In addition to continuing to monitor the phytoremediation efficiency of plants on known analytes, this study utilizes mass spectrometry-based approaches to run untargeted analysis in order to identify any additional emerging contaminants and potential transformation products. Emerging contaminants, including pharmaceuticals, are worrisome due to potential negative organismal impacts including endocrine system disruption. Transformation products (TPs) have been found in waste water treatment plants and are of particular concern due to their potential to be even more active than their precursor compounds on aquatic ecosystems. Samples of soft-stem bulrush (*Schoenoplectus tabernaemontani*), pickerelweed (*Pontederia cordata*) and duckweed (*Lemna* spp.) were analyzed with two different solvent systems to extract compounds of interest. The samples were initially run on a triple quadrupole LC-MS for targeted acquisition of known analytes. Untargeted analysis utilizing LC-MS methodologies will be conducted, and identification of potential unknowns analyzed by m/z ratios, retention times and intensities utilizing various data processing mechanisms. We hypothesize that additional emerging contaminants beyond those previously targeted will be present in the samples along with various transformation products. This project seeks to determine the effectiveness of each species for pharmaceutical removal and provide data to improve the efficiency of constructed treatment wetlands.

**Composition of a Global Motor Performance Score for the Neural Correlate of Motor Cortex Recovery following Traumatic Brain Injury**

Lane Langston, CURO Research Assistant
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A traumatic brain injury (TBI) is the result of a significant mechanical impact to the brain, leading to damage of brain matter and overall cognitive function. To date, no clinical treatments are available for TBI and the mechanism of recovery following available therapies remain unknown. In our lab, we subject rats to TBI that affects the motor function of their left forepaw (M1 cortex), then measure their recovery following electrical stimulation over 5 weeks. We used a combination of behavioral assays to assess motor function as well as terminal immunohistochemical quantification of neuroplastic change in the brain following TBI. We used the 3 following assays: 1) Skilled Reach Task to quantify forelimb coordination in rats, 2) Beam Walk to quantify forced balance, and 3) Vertical Cylinder test to quantify spontaneous balance. We hypothesized that combining behavioral scores with immunohistochemical stainings would provide a neural correlate of motor impairment following TBI and recovery following electrical stimulation. Therefore, we will design and evaluate a global performance score using individual measures and quantify behavioral changes in 3 different groups of rats: control with no injury, control with injury, and injury with stimulation. Our new global score will reflect motor impairment following TBI and subtle distinction in recovery in animals receiving electrical stimulation compared to control and TBI without stimulation. This study will reveal both the impact of electrical stimulation as a treatment for the TBI as well as a new approach to score motor impairments in rats subject to brain injury.

**Hypoxia Signaling in *Tribolium castaneum***

Bren Latorre-Murrin, CURO Research Assistant
*Dr. Kevin Vogel, Entomology, College of Agricultural and Environmental Sciences*

Insects grow discontinuously, acquiring nutrients during intermolt periods and then molting when sufficient nutritional status is achieved. The ultimate signal an insect is ready to molt remains unclear, though changes in oxygen supply and demand have been proposed to play a role. Recently, a decrease in oxygen (hypoxia) has been shown to be an essential signal for molting in larval mosquitoes. Hypoxia is detected by the hypoxia-inducible factor (HIF) pathway, a highly conserved pathway in metazoans. It remains unclear if the developmental role of HIF is conserved more broadly across insects. To test this hypothesis, the role of HIF signaling in development of the red flour beetle, *Tribolium castaneum*, was examined. Expression of the HIF transcription factor HIF-$\propto$ was silenced using RNAi and HIF-$\propto$ inhibiting drugs. Due to poor survival of the drug-injected larvae, we focused on RNAi using dsRNA injections into late-stage larvae and observing molting outcomes. Fourth-instar larvae injected with HIF-$\propto$ targeting dsRNA exhibited abnormal molting. Larvae that did pupate displayed highly abnormal phenotypes and failed to properly sclerotize. Few of the pupae from treated larvae eclosed into adults, and those that did eclose did so abnormally, with pupal fragments attached to their abdomen, wings, and elytra, and died soon after eclosing. Control larvae pupated and eclosed normally at high frequency (90%). Currently we are determining the degree of HIF-$\propto$ expression in dsRNA-treated larvae. In the future, this work could provide valuable insights into insect developmental physiology and possibly uncover a novel target for insect pest control.

**Physiological Mechanisms Regulating Metabolic Efficiency in Ross Broilers**

Samuel G. Latzsch, CURO Research Assistant
*Dr. Laura Ellestad, Poultry Science, College of Agricultural and Environmental Sciences*

A shift in consumer interest and agricultural policy has led to the removal of antibiotic growth promoters (AGPs) in broiler production. Without AGPs, alternative methodologies must be developed to maintain current broiler performance and feed efficiency. This experiment aims to identify physiological mechanisms correlating with higher metabolic efficiency. Male Ross birds were evaluated for their ability to convert feed into weight gain and ranked using feed conversion ratio (FCR). Lower FCR indicates that the bird has greater metabolic efficiency, thus the six highest and lowest FCR birds were selected for experimentation. Plasma samples were collected from each animal to check nutritional condition and circulating hormone concentrations relevant to metabolic activity. Muscle, liver, jejunum, and cecal tonsil tissues were also collected to measure gene expression which may be contributing to improved performance. Hormone data demonstrated that low-efficiency birds had a 1.60-fold greater concentration of corticosterone and a 1.47-fold greater concentration of growth hormone in circulation. In contrast, insulin-like growth factor (IGF) was 1.27-fold greater in high-efficiency broilers. RT-qPCR results from muscle tissues corroborated IGF1 hormone levels, with low-efficiency birds only producing 57% as much IGF1 as their high-efficiency counterparts. Further studies will focus on differences in expression of genes involved in gut nutrient uptake and inflammatory status. The stark differences in hormone prevalence between high- and low-efficiency animals suggests their involvement in metabolic activity and value as targets to improve broiler production.

**Analyzing Associations Between Social Functioning, Cognition, and Resting State Connectivity Among Schizophrenia Biotypes**

Connor M. Lawhead, CURO Research Assistant
*Dr. Brett Clementz, Psychology, Franklin College of Arts and Sciences*

As part of the Bipolar-Schizophrenia Network for Intermediate Phenotypes, clear distinctions within psychosis that are independent of diagnoses from the Diagnostic and Statistical Manual for Mental Disorders have been made. Rather than basing disorders symptoms solely on clinical measures, the Clinical and Cognitive Neuroscience Laboratory is aimed at uncovering etiological differences within this disorder and discovering biomarkers that create categories of psychosis that do not rely on preexisting diagnoses, such as schizophrenia and bipolar disorder. My research looks at these biotypes and how they differ both from each other and from healthy people in terms of cognitive ability and social functioning. I will be analyzing responses on the Birchwood Social Functioning Scale and the Brief Assessment of Cognition in Schizophrenia. I will also consider brain imaging data during resting state, and will aid in collecting electroencephalography data that records alpha wave activity when a participant engages in an auditory task independent of cognition. This task includes paired auditory stimuli that is exposed to the participant when asked to simply sit and stare at a cross on a computer screen in front of them. The paired stimuli will elicit an event-related potential, the power of which may differ among biotypes.

**Blood Transfusion Related Zika Virus Transmission**

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

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

**Investigation of SGS protein family in *Aedes aegypti* Mosquito**

John Richard Layman
*Dr. Donald Champagne, Entomology, College of Agricultural and Environmental Sciences*

Mosquitos are responsible for the proliferation of many vector-borne illnesses around the world. While management of these diseases—such as malaria, yellow fever, dengue fever, or zika—often focus on controlling vector populations, investigation of vector biology may yield novel targets for disease prevention or eradication. Vector saliva is a promising area of research, for a multiplicity of products of known and uncharacterized function, secreted by salivary glands, have a variety of implications for blood feeding and pathogen transmission. *Aedes aegypti* salivary extracts have been found to carry a T-cell apoptosis inducing function, which presumably modulates the immune response in vertebrate hosts. Our preliminary data suggests the hypothesis that the SGS32 protein, a member of the Salivary Gland Surface protein family which contains a gene ontology domain annotated with "regulation of T-cell apoptosis," is

responsible for this function. To test this hypothesis, we used Gibson assembly to clone a transcript encoding SGS32 into the pSLfa-Pub-MCS vector for expression in an *Aedes aegypti* AEG2 cell line. To test an additional hypothesis that the GO domain is sufficient for T-cell apoptotic activity, we used Gibson assembly to construct plasmids for expression of SGS1, which lacks the GO domain, and SGS1/SGS32 or SGS32/SGS1 chimeras, respectively with and without the GO domain. Correct assembly was verified by sequencing. The project is ongoing as we attempt to express and purify recombinant native and chimeric proteins, and bioassay for the T-cell apoptosis function.

**Investigating the Function of the Whinny Call**

Kristie Le
*Dr. Roberta Salmi, Anthropology, Franklin College of Arts and Sciences*

Primate calls develop to carry information that receivers can use to determine the caller's intentions efficiently. Western lowland gorillas (*Gorilla gorilla*) have a wide range of calls in their repertoire. The majority of this species' calls are used context specifically, while the rest are used in several behavioral contexts. We investigated the function of the whinny, a horse-like neighing, in a group of habituated wild western lowland gorillas. We hypothesized the whinny call is used by the male to keep cohesion with his females. We grouped whinny calls based on the activity performed by the individual male and the proximity to his females before and after the call was given. Of the 295 whinny calls recorded, 85% where emitted during stationary activities, especially in travel-pose. We found the distance of the nearest female becomes greater after the call, confirming the social context eliciting male whinnies is the increased distance from his females. However, average distance of all females to the male did not change before and after the call; therefore, its function is still unclear. We found some support the call was used to maintain cohesion, but more testing is warranted to better understand the full function of this vocalization. Exploring the mechanisms by which primates can maintain group cohesion and coordination gives clues into their social system and cognitive abilities. Understanding these mechanisms therefore leads us to understanding how humans evolved to have similar advantageous characteristics that can be seen in cooperation.

**Surveillance: Swine Influenza Virus in Nasal Washes**

Austin Gaines Leach
*Dr. Ralph A. Tripp, Infectious Diseases, College of Veterinary Medicine*

Swine influenza virus (SIV) can cause substantial morbidity in swine where infection is associated with delayed weight gain and hampered growth. Both inactivated commercial vaccines and autogenous inactivated vaccines are commonly used in swine as vaccination can curtail losses, however during mixed influenza A virus (IAV) infections the gene segments can reassort to yield novel epidemic and sometimes pandemic strains. Continuous surveillance of SIV is needed to understand SIV evolution and reassortment occurring on commercial swine farms. The objective of this study is to investigate circulating swine IAV and zoonotic human IAV in nasal washes from commercial swine farms. The goal is to isolate the strains, characterize their diversity using whole genome next generation sequencing, and understand the molecular evolution and phylogenetics of the circulating strains. Nasal washes were filtered to remove debris and bacteria then used to infect Madin-Darby canine kidney (MDCK) cells which are susceptible to IAVs. Samples with potential Influenza virus in the MDCK cell cultures were collected at various time points post-infection, processed for RNA, and analyzed for SIV using one-step reverse transcriptase-quantitative PCR (RT-qPCR) followed by subtyping of the SIV strains. The surveillance data show H1N1 strains dominate the swine herds in commercial farms followed by H3N2 strains. We also identified samples with mixed infections with both genotypes as well as human infections of swine (reverse zoonoses). These data emphasize the continued need to undertake SIV surveillance.

**Private Performance: Passion Devotion and Accessory Prayers in Medieval Books of Hours**

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

The aim of this research is to examine the occurrence and placement of a set of Passion-related prayers within a medieval Book of Hours in order to establish the influence of late medieval devotional culture within University of Georgia, Hargrett MS 836. The Hargrett Hours is a fifteenth century Parisian Book of Hours, a type of prayerbook, a with an unusual focus on the Passion. As one of the most popular forms of medieval devotional culture, Books of Hours allow us to look into the lives and religious practices of medieval laymen, each manuscript a unique display of the owner's spiritual needs. The inclusion of Passion narratives in late medieval Books of Hours marks a widespread preference for the Passion narrative in everyday devotion at the time, a practice which was thought to create a more intimate and emotional connection between the reader and the divine. The Passion could be incorporated into a Book of Hours through a sequence of miniatures depicting the crucifixion or stigmata, an additional Office, set of prayers, or gospel passages. Hargrett MS 836 is unusual because of the length and coherence of its Passion texts; it includes the long Office of the Passion, followed directly by the Gospel of John's account of the Passion, chapters 18 and 19 in their entirety, and seven prayers on the Passion, all of which takes up over half of the 85 folio manuscript. By placing Hargrett's prayer sequence within the context of other devotional practices through a survey of over 200 digitized Books of Hours, the texts suggest a devotional practice that follows contemporary trends towards the Passion while also tailored to a specific set of affective devotional needs grounded in the Sainte-Chapelle of Paris.

***Salmonella enterica* Response to Immune Active and Suppressed Environments Established by Plant Pathogen, *Pseudomonas syringae pv. tomato*, in Model and Crop Plant Hosts**

Samuel Lee
*Dr. Brian Kvitko, Plant Pathology, College of Agricultural and Environmental Sciences*

The colonization of fresh produce by enteric bacteria, such as *Escherichia coli* and *Salmonella enterica*, has led to an increase of food-borne diseases in the United States. Plants possess immune Pattern Recognition Receptors (PRRs) to detect non-adapted microbes by binding to conserved microbe-associated molecular patterns (MAMPs), activating an immune response known as Pattern Triggered Immunity (PTI). Therefore, even if enteric bacteria manage to invade plant tissues, they should not be able to proliferate while the plant immune system is working against them. However, the plant pathogenic bacteria *Pseudomonas syringae* pv. *tomato* uses a Type III Secretion System (T3SS) to deliver immune dampening effector proteins directly into plant cells. We hypothesize the dampened immunity from plant pathogens will allow enteric bacteria undergo opportunistic colonization of plant tissues. We co-inoculated multiple plant hosts including the model hosts *Nicotiana benthamiana*, *Arabidopsis thaliana*, as well as the crop host Collard (*Brassica oleracea*) for the capacity to be opportunistically colonized during plant disease. Plants were sampled three days post inoculation and the growth of *S. enterica* was evaluated for each condition. *S. enterica* strain DM10000 is unable to colonize *N. benthamiana* under immune suppressed conditions; whereas growth was observed in *S. enterica* strain 14082S. In contrast, both strains exhibit growth during PTI in both collards and *A. thaliana*. Our observations suggest there are strain and host specific factors that lead to the opportunistic colonization of *S. enterica* of plant pathogen colonized hosts.

**Magnetic Field Effect on Spin Dynamics of Crystalline and Amorphous Rubrene**

Bjorn Leicher
*Dr. Tho Nguyen, Physics and Astronomy, Franklin College of Arts and Sciences*

Organic semiconductors (OSCs) are solids, made primarily from carbon and hydrogen atoms, whose energy band gap and charge mobility can be chemically tuned for various opto-electric applications. While conventional semiconductors typically require the use of metals that result in a more efficient charge transport, OSCs often prove to be flexible and much easier to manufacture. OSCs find wide applications in the use of organic light-emitting diodes (OLEDs), organic solar cells, and more. Rubrene is a red-orange hydrocarbon often used for its semiconductor ability in OLEDs and organic field-effect transistors. Though Rubrene is widely used as emissive layers in OLEDs, it is unique in its tendency to have singlet fission where one singlet electron-hole pair with zero spin momentum can fission into two triplet electron-hole pairs with the spin momentum of 1. Such a tendency is very important for solar cell applications since one photon particle can generate 1 singlet electron-hole pair and hence 2 free electrons rather than one electron as seen in the current solar cell technology. In this study, we investigate how the singlet fission process depends on the morphology of the rubrene films: amorphous film vs. singlet crystal. Since singlet and triplet electron-hole pairs are sensitive to applied magnetic field, we use magnetic field effect on photoluminescence to evaluate the process. We hope to better understand this mechanism and gain insight into its applications.

**Effort-Cost Computation as a Transdiagnostic Biomarker of Avolition**

Nico Leis, Foundation Fellow, CURO Research Assistant
*Dr. Gregory P. Strauss, Psychology, Franklin College of Arts and Sciences*

Avolition has long been considered a core feature of schizophrenia (SZ), with descriptions of reduced engagement in and desire for conducting goal-directed behavior dating back to the pre-neuroleptic era. However, motivational symptoms are not pathognomonic of schizophrenia. Rather, they are a core characteristic of many DSM-5 psychiatric disorders (e.g., schizophrenia, schizoaffective disorder, and bipolar disorder). Although impairments in effort-cost computation (i.e., determining whether the benefits of an action outweigh the costs needed to obtain them) has been identified as a neurobiological substrate relevant to avolition, it is unclear whether abnormalities in this construct predict avolition transdiagnostically. The current study included outpatients diagnosed with schizophrenia, schizoaffective disorder, bipolar disorder, and demographically matched healthy controls who completed the Effort Expenditure for Reward Task (EEfRT) as an index of effort-cost computation and the Brief Negative Symptom Scale (BNSS) as a measure of avolition. EEfRT results indicated that schizophrenia, schizoaffective disorder, and bipolar disorder groups displayed reduced probability of selecting high physical effort options for high reward magnitude and high reward probability conditions relative to controls. Greater severity of avolition significantly predicted reduced effort expenditure for rewards across diagnostic groups. These findings indicate that effort-cost computation is a transdiagnostic marker of avolition.

**Resilience Among Youth Within Mixed-Legal Status Families**

Alma Angelina Lepiz Madrigal, CURO Research Assistant
Brenda Gavidia
*Dr. J. Maria Bermudez, Human Development and Family Science, College of Family and Consumer Sciences*

Latinos are the largest ethnic and immigrant group in the US. According to the Pew Hispanic Research Center (2017), 75% of these immigrants are here lawfully; however, it is common for many families to have mixed-legal status. The legal status of individuals in a family context is important to note because along with this mixed status comes potential risk factors (i.e. hostile anti-immigrant sociopolitical climate, low socioeconomic status, limited access to healthcare, unsafe environments, legal problems, language barriers, educational disadvantages). Although these risks are well documented, little attention has been given to the resilience noted among youth and their families, despite the risks and challenges.

The aim of this study is to explore and identify children's protective factors, in the face of adversity. These data will explore how parents and families maintain a sense of resilience and overall well-being for their children. In-depth interviews are being conducted to explore Latino parent's beliefs and perceptions about their children's well-being. Specifically, questions are targeted to assess educational, emotional, psychological, interpersonal, and overall health and well-being in their children. Parent interviews are conducted in Spanish, transcribed verbatim, and analyzed using a grounded theory approach to qualitative research methods. In this presentation, we aim to achieve the following: 1) discuss the sociopolitical context for these families of mixed-documented status, 2) explain the research method and process, 3) present preliminary findings from the parent interviews, and lastly, 4) discuss our experience as researchers.

**Analysis of Bereavement Programs for Children in the United States**

Lauren Lewis, CURO Research Assistant
*Dr. Melissa Landers-Potts, Human Development and Family Science, College of Family and Consumer Sciences*

Researchers have found there are many negative effects of parental suicide on adolescent development, including an increased risk for anxiety, depression, suicide attempt, and post-traumatic stress. Children and adolescents may not have yet developed adequate coping skills necessary to process a loss of this magnitude, and they may struggle to understand or make meaning from the death. Researchers have emphasized the need for quality, developmentally appropriate intervention programs to help children and adolescents understand parental suicide and cope with their conflicting emotions. Intervention programs have been correlated with better outcomes for children and adolescents bereaved by parental suicide. This research more broadly examines the resources available to children and adolescents impacted by parental suicide and all other parental deaths. By assessing the distribution of programs across states and urban/rural areas, types of programs offered, cost of programs, and program structure and affiliation, this study aims to determine the accessibility of intervention programs for children and adolescents who have experienced the death of a parent. Programs have been identified by the National Alliance for Grieving Children's website, and this data will be supplemented by each program's website. Quantitative data analysis will be conducted using SPSS. Specifically, descriptive statistics will be examined to access the availability of programs in the United States, and ANOVA will be utilized to determine a needs analysis of geographical areas without intervention programs. This research is significant because there is currently a lack of comprehensive analysis regarding the availability and accessibility of bereavement programs for children.

***In vivo* Imaging of *LF5***

Vanessa Renee Lewis, CURO Research Assistant
*Dr. Karl F. Lechtreck, Cellular Biology, Franklin College of Arts and Sciences*

Cilia are hair-like projections of/from cells that play a vital role in cell signaling and motility. Defects in ciliary growth and structure cause diseases that result in several phenotypes including eye, kidney and brain malformations. Our protein kinase of interest, CDKL5, is encoded by the *LF5* gene, and can be mutated in humans which causes adolescent epilepsy by an unknown mechanism. CDKL5 was studied by using the model organism, *Chlamydomonas reinhardtii*, by observing the effects of the *LF5* mutation, which changes the organism's swimming behaviors. To observe how the protein moves in cells and how the phenotype of the gene changes, the *LF5* gene will be cloned into a plasmid containing green-fluorescent protein (GFP). Once *LF5* is ligated to a vector, the completed plasmid may be inserted into bacteria via transformation, specifically, *Escherichia coli*. Because *E. coli* can reproduce and grow quickly, it can reproduce many copies of the desired LF5-GFP containing plasmid. Then, the plasmid will be isolated, linearized and transformed into *Chlamydomonas* for live observation and analysis. This will prepare the way to study the dynamics of CDKL5 with the goal of understanding the molecular mechanisms of cilia length regulation.

**The Interaction Between Environmental Exposures and Infectious Disease**

Jessica Liebich, CURO Research Assistant
*Dr. José F. Cordero, Epidemiology and Biostatistics, College of Public Health*

Unraveling the interaction of infectious agents and environmental exposures is a research area in which little data has been accumulated. Occupational and domestic environmental exposures are ubiquitous and some, such as organophosphate pesticides, are endocrine disruptors that have been associated with eliciting oxidative stress resulting in adverse birth outcomes. Preliminary data suggests that the rate of Congenital Zika Syndrome in Brazil is higher in rural areas compared to urban. One important geographic difference is the exposure to environmental agents such as pesticides. The goal of this study is to examine the effects of organophosphates in pregnant women on the outcomes of the Zika virus. The key question is examining if environmental exposures interact in the risks of the Zika virus to the mother and fetus. In order to support the objectives of the Zika in Pregnancy Study, a two-year international prospective observational cohort study, our team performed laboratory activities and conducted a review of scientific peer reviewed literature that examined potential adverse effects of environmental exposure on outcomes of infectious disease. Toxins have been found to negatively interact with the degrees and outcomes of infections. These negative interactions include reducing the threshold for infections, increasing the persistence of an infection, increasing pathogen shedding, and altering the severity of disease. Determining a relationship between environmental toxins and Zika outcomes can be used in the future prevention and management of Zika symptoms. Understanding the role of environmental exposures' impact on ZIKV infection is important to understand other potential mechanisms of infection-environment interaction.

**Mitochondrial Capacity of Distal and Midline Locations in the Vastus Lateralis**

Zach Liebowitz
Cameron Marie Liss
*Dr. Kevin McCully, Kinesiology, College of Education*

Muscle mitochondrial capacity is typically measured in one location in a muscle, commonly in the vastus lateralis muscle in the quadriceps muscle group. To measure and compare the mitochondrial capacity of two different locations, distal and midline, of the vastus lateralis muscle. The right vastus laterlis muscle will be tested in healthy subjects (N=12). Muscle mitochondrial capacity was measured as the rate constant of recovery of muscle metabolism from exercise (electrical stimulation) to rest. Metabolic rate will be measured using continuous wavelength near infrared spectroscopy (NIRS) during brief periods of ischemia. Electrical stimulation will be performed using two electrodes placed distally and proximally on the muscle; with a stimulation frequency of 6 Hz and current levels of ~50 mA. NIRS probes will be placed between the electrodes on the vastus lateralis muscle. Ischemia was produced will be produced blood pressure cuff inflated to 255 mm Hg. Four recovery curves will be analyzed with a custom MATLAB program. The resulting data from the two different NIRS device channels were then compared. Simultaneous data collection from the two sites were obtained, and the testing protocol was established. Data from the first two pilot tests suggest that there will be no significant differences between the distal and midline locations. This data will test whether the vastus lateralis muscle will have the same mitochondrial capacity throughout its entirety. If true, future research will not need to record and correct for specific locations in the vastus lateralis muscle.

**Maria Firmina Dos Reis' *Ursula* in 19th Century Brazilian Abolitionism**

Lorena Limongi, CURO Research Assistant
*Dr. Robert Henry Moser, Romance Languages, Franklin College of Arts and Sciences*

In 1859, a year before Machado de Assis published his very first play, Maria Firmina dos Reis published an abolitionist novel, anonymously, named *Ursula*. That made her the first person of African descent to do so in the history of Brazil. However, she never received recognition during her lifetime and her work remained under the shadows until 1979, when scholar Horacio de Almeida discovered the only known original copy of *Ursula*, under a pile of old books in a library in Maranhão. Since then, numerous editors published the book, but it never rose to prominence. This research plans on examining the external factors in Dos Reis' life when writing the novel *Ursula*, namely the abolitionist movement in Brazil, the last country to outlaw slavery in the West. That includes analyzing the literary movements of her time, with a focus on romanticism; the abolitionist movement in the north of Brazil and her part within it; and her relationship with her hometown of São Luís, Maranhão. Research was separated into three parts. First, the analysis of the history of Brazilian abolitionism, with a focus on São Luís and the impact it had on locals and scholars. Second, the analysis of the artistic and literary traditions that may have come out of 19th century Brazilian Abolitionism. Only then did the research narrow down its focus to Firmina and her book's role in the movement.

**Modeling the Attitude Determination and Control Subsystem (ADCS) for Pointing**

Alex Lin, CURO Research Assistant
*Dr. David L. Cotten, Geography, Franklin College of Arts and Sciences*

Attitude control—controlling the orientation of an object in space relative to a frame—is an important component of spacecraft. The stabilization and control of a satellite's orientation is necessary to point an antenna and relevant scientific instruments towards Earth so that accurate, interpretable data is collected for onboard experiments. In the case of one of the lab's satellite missions (the Multi-view Onboard Computational Imager, or MOCI) where reconstructed models of surface landmarks must be derived from images taken at near-perfect angles, attitude control is especially critical. The CubeSat must be able to determine its attitude from sensors accurately, derive the error given the measured attitude and the desired attitude, and apply torques using actuators– such as magnetorquers and reaction wheels– to minimize the error and reorient the spacecraft; collectively, this process comprise the ADCS. From understanding these capabilities of the system, the operation of the satellite in high-precision data gathering can be well-defined for success and errors accounted for. This research aims to model MOCI'S ADCS through computer simulations in order to understand the algorithmic and mechanical constraints for pointing configurations and determine data needed for the mission's pointing budget calculations. Configurations, such as pointing (idle, nadir, and detumbling) and point tracking are described and proven given the developed model and other unit parameters.

**Developing a Genetic Transformation Protocol for the *Mimulus guttatus* Species Complex**

Duncan Lindsey, CURO Research Assistant
*Dr. Andrea Sweigart, Genetics, Franklin College of Arts and Sciences*

The intentional genomic manipulation of an organism is one of the most effective techniques in concretely identifying a gene's function as well as discovering more about an organism's unique traits and genetic variation. The *Mimulus* genus provides an exemplary field of specimens with which to conduct such research. This genus consists of numerous species of monkeyflower with significant genetic diversity both between and within species. While taxa may be closely related, many are partially reproductively isolated and maintain specific and interesting adaptations to environmental conditions, making this a prime genus for the study of adaptation and speciation. This research focuses on the *M. guttatus* and species complex. Genetic transformation in this group has not been rigorously established across species and ecotypes. This research aims to develop a tissue culture-based transformation protocol to introduce novel genetic constructs into various *Mimulus* lines.

Success and efficiency will be tested under various media and growing conditions in order to develop a protocol that will create a robust, useful technique to answer important questions about the genus *Mimulus* as a whole.

**Scramblase's Ability to Alter Phosphatidylserine Distribution on the Cell Membrane**

Olivia Linn
*Dr. Melinda Brindley, Infectious Diseases, College of Veterinary Medicine*

Many research experiments have been devoted toward studying the mechanism of viral entry. This has led to advanced understandings, however, the role of the lipid bilayer in viral entry needs further investigation. Confirming the characteristics of the lipid bilayer would aid in how to prevent viral particles from entering cells. Phosphatidylserine is a phospholipid that serves as a marker for programmed cell death when it is exposed on the outer leaflet of the cell membrane. Viruses containing phosphatidylserine in their envelopes can enter the cell through apoptotic mimicry by disguising themselves as apoptotic debris. The Brindley lab is examining how certain flippases and scramblases, such as XKr8 and TMEM16f, are responsible for the movement of phosphatidylserine to the outer leaflet of the membrane. Additionally, we are examining the scramblase's role in aiding viral entry of enveloped viruses, specifically VSV-EBOV and VSV-LASV. Currently, I am characterizing scramblase knock-out cells' ability to alter phosphatidylserine distribution under apoptotic and calcium signaling. I am using annexin V cell staining and flow cytometry to measure the externalization of phosphatidylserine, with the expectations that the ΔXKr8 cells will show reduced amounts of phosphatidylserine in comparison to HAP1 cells and TMEM16f cells.

**Evaluating the Mitochondrial Capacity of the Rectus Femoris and Vastus Medialis Muscles in the Quadricep**

Cameron Marie Liss
Zach Liebowitz
*Dr. Kevin McCully, Kinesiology, College of Education*

The quadriceps muscles are commonly studied by exercise physiologists. However, typically measurements are only made on one muscle in the quadriceps (vastus lateralis). Determine if there is a difference in the mitochondrial capacity between the different muscles in the quadriceps. The right quadricep muscles in young, healthy adults will be tested (n=12). Measurements will be made on the rectus femoris and vastus medialis muscles. Data from the vastus lateralis collected in a different study will also be used for analysis. Each subject will be tested twice; once with the rectus femoris, and then once with the vastus medialis. These tests will be performed on separate days and with a balanced order. Mitochondrial capacity will be measured using four recovery tests, with the rate of recovery from exercise to rest reflecting mitochondrial capacity. Exercise will consist of 30 seconds of electrical twitch stimulation at 6 Hz with ~50 mA. Metabolic rate will be measured as the rate of change in oxygen levels measured with near infrared spectroscopy (NIRS) during brief periods of ischemia. Arterial occlusion will be produced by a blood pressure cuff placed on the proximal thigh inflated to ~255 mmHg. Data will be analyzed using a custom MATLAB program. The set-up of the NIRS device and the experimental protocol has been established. Pilot data has been collected and analyzed. The experiment is feasible and the study will test if one location is adequate to assess the metabolic capacity of the quadriceps muscle group.

**Paleoclimate Reconstruction of the Ten Thousand Island Region of Everglades National Park**

Marshall Liss, CURO Research Assistant
*Dr. Carla Hadden, Center for Applied Isotope Studies, Office of Research*

Restoration efforts in Everglades National Park, which aim to restore healthy ecosystem structure and function after centuries of intensive drainage and water re-routing, rely on robust paleoclimate records. American oysters (*Crassostrea virginica*) record in their shells geochemical information related to the temperature and salinity of the environment in which they lived. Archaeological specimens from the late Holocene were used to reconstruct the paleoclimate of the Ten Thousand Island (TTI) region of the Everglades for elucidating climate patterns and building a record of temperature and salinity in the past. Archaeological and modern oysters were sampled for $\delta^{18}O$ and $\delta^{13}C$, Mg/Ca and Sr/Ca ratios, and $^{14}C$ dating. The shells were subjected to high resolution sampling for $\delta^{18}O$ and $\delta^{13}C$ to create a time-series record of the water conditions in which they lived. Elemental ratios were measured over areas of shell in which extreme values of $\delta^{18}O$ and $\delta^{13}C$ were observed, and lastly, samples were taken from open area on the umbo of the shell for radiocarbon dating. Isotopic analysis resulted in average $\delta^{13}C$ and $\delta^{18}O$ measurements of -3.07±1.13 and 0.49±1.27 for archeological shells and -7.74±0.79 and 1.14±0.75 for modern shells. With support of the Mg/Ca ratios, the data suggests increases in freshwater input as well as a warmer climate compared to the late Holocene. This multi-proxy analysis provides a baseline climate for the TTI region of the Everglades, creating a historical record and aiding in ecological management and restoration efforts.

**Carbon Emissions Model of Athens-Clarke County, GA**

Leigh Anne Lloveras, CURO Research Assistant
*Dr. John R. Schramski, Environmental, Civil, Agricultural, and Mechanical Engineering, College of Engineering*

To maintain global temperature rise below 2°C, a temperature indicative of unprecedented habitat changes, civilization must reduce carbon emissions drastically. Rising $CO_2$ in the atmosphere is increasing global temperatures, which is already rapidly increasing global wildfire occurrences and melting the polar icecaps. Carbon emissions from cities are a significant contributor to $CO_2$ emissions. As such, cities around the world are pledging to massively reduce carbon emissions. This research is important to aid Athens-Clarke County, Georgia (ACC) in their development of a carbon reduction plan by building a carbon emissions model for ACC. Using data retrieved from the ACC and the University of Georgia

Office of Sustainability six sectors were analyzed including: Natural gas, transportation, airplanes, electricity, landfills, and wastewater treatment. Using analytical methods derived from the Intergovernmental Panel on Climate Change and the U.S. Environmental Protection Agency, this research found that carbon emissions from ACC total 1,598,000 tonnes of $CO_2e$. Emissions from electricity and natural gas comprise the two largest contributors with 701,000 and 809,000 tonnes $CO_2e$ respectively. Emissions from landfills, transportation, airplanes, and wastewater treatment were all less than 100,000 tonnes $CO_2e$. For an estimated population size of 125,691 this amounts to a per-capita carbon emission rate of about 13 tonnes $CO_2e$ per person per year. To put this in perspective, another study calculates the per capita $CO_2e$ emissions for Boise, Idaho, a comparable city with of 226,570, to be 16.3 tonnes per year.

**Rhetoric in the Political Sphere: Georgia's 2018 Gubernatorial Election**

Talia Locarnini, CURO Research Assistant
*Dr. Elizabeth Davis, English, Franklin College of Arts and Sciences*

Rhetoric, defined as "language designed to have a persuasive effect on its audience," is an integral component of any political endeavor: the way words and ideas are presented is of equal importance to the message they express. This truth is not specific to the political realm, but is especially applicable in situations such as Georgia's gubernatorial election in 2018. The race between candidates Brian Kemp and Stacey Abrams was incredibly close, with the outcome a matter of tenths of a percentage. Both campaigns targeted specific audiences within the voter body in an attempt to win the majority, and the intentional usage of rhetorical devices was one strategy in that endeavor. While the success of a campaign cannot be credited to rhetoric alone, it is a significant factor in understanding the choices made by the candidates based on the message they wanted to send. The platforms on which content is shared also influence how it is consumed, forcing the adaptation of different rhetorical strategies accordingly. The conceptual framework for evaluating this rhetoric, and the intersection of politics, media, and the online community is largely based on Barbara Warnick's research and the work of other experts in the field. Using that framework to analyze social media posts on platforms like Twitter and Instagram, content from the candidates' campaign websites, transcripts from television ads and online videos, and print media such as flyers, conclusions will be drawn as to what rhetorical choices were made by both campaigns and the reasoning behind them.

**The Quantification of Cellulose, Hemicellulose, and Pectin from Oak Leaves**

Kathryn Lockwood
*Dr. Parastoo Azadi, Biochemistry and Molecular Biology, Franklin College of Arts and Sciences*

The abundance of polysaccharides found in plant cell walls account for more than 100 billion metric tons of carbon dioxide produced by land plants every year. This makes plant biomass a critical renewable resource for the production of biofuels, chemicals, and other bioproducts. However, to understand the structural and molecular organization of plant cell walls, and how they could be used to contribute to more energy-efficient products, the amount of each constituent polymer of the cell wall must be identified and quantified. A few parts of the plant cell wall are soluble and can be read by gas chromatography mass spectrometry without sufficient preparation. However, most parts, such as cellulose, hemicellulose and pectin, are insoluble. These components can present difficulties when attempting to measure the amount of each polymer found in the cell wall. We have developed new protocols for the solubilization and structural analysis of these polymers, that includes derivatization to solubilize pectins prior to CG-MS. This method will allow for a more complete solubility, and subsequently, the a more accurate quantification of cellulose, hemicellulose and pectin from oak leaves. After quantifying these polymers that are mostly insoluble, we hypothesize that we will find high levels of all three polymers in oak leaves, making the leaves a suitable material for carbon-based bio-products compared to current products. This finding would greatly impact the advancement of technology in this field.

**Threats by *Acinetobacter* spp. in Domestic and Exotic Animals: Occurrence and Resistance Trends in the United States, 2013-2018**

Ana Lorton
*Dr. Susan Sanchez, Infectious Diseases, College of Veterinary Medicine*

*Acinetobacter* has become an opportunistic pathogen due to its ability to acquire antimicrobial resistance. Although it is known as a relevant human pathogen, *Acinetobacter*'s known role in veterinary medicine is scarce. Statistical modelling analysis was used to answer questions regarding the distribution of different species of *Acinetobacter* in exotic and domestic animals, antimicrobial resistance profiles, multidrug-resistance rates, and resistance trends between 2013-2018. MALDI-TOF was used for species identification and the minimum inhibitory concentration (MIC) was determined by Vitek-2. Isolates were identified as *A. baumannii* (n=83), *A. lwoffii* (n=47), *A. jonhsonii* (n=10), *A. radioresistens* (n=15), *A. ursingii* (n=4), and *A. junii* (n=2). *Acinetobacter* spp. was isolated from exotic and domestic animals, but it was more commonly isolated from domestic animals who could act as vectors of bacteria and resistance genes to humans. Phenotypic antimicrobial susceptibility analysis demonstrated resistance profiles associated with different *Acinetobacter* species emphasizing the importance of species identification and implementation of *Acinetobacter* species-specific MIC breakpoints. We observe that *A. baumannii* isolates were not resistant to the same antimicrobials that human isolates are usually resistant to. Multidrug resistance was more common among *A. baumannii* (72.1%) and *A. haemolyticus* (80%) isolates. All isolates were susceptible to Imipenem, which is one of the main antibiotics used to treat multi-drug resistant *Acinetobacter*. There was no significant increase or decrease of resistance between 2013-2018. In summary, *Acinetobacter* is emerging as an important pathogen in veterinary medicine calling for special attention in veterinary clinics.

### *Dazl* Expression in Brown Anole Germ Cells

Sherry Luo, CURO Research Assistant
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Primordial germ cells (PGCs), which are the precursors of sperm and eggs, form early during development and then migrate through embryo to arrive in the developing gonads. The regulation of this cellular migration, or movement within the embryo, is crucial for fertility in vertebrates. While this migration process has been well-studied in birds and mammals, we know relatively little about how this process works in squamates. To better understand reptile reproductive biology, we are investigating gonad development in the brown anole lizard, *Anolis sagrei*, and the embryonic expression pattern of the *Dazl* gene, which functions in the development of PGCs and in germ cell differentiation. PGCs were labeled using the alkaline phosphatase (AP) and immunofluorescence (IF) staining method. At stage 2 of lizard development, AP is first detected. We have determined that relative to mouse embryonic gonads, anole embryonic gonads are much larger in size but are found in a similar location along the body axis. Our findings also show that PGC migration and gonad development in the lizard occurs early in development, similar to other model organisms, like the mouse and chick. This work in the anole represents a significant step towards understanding embryonic germ cell migration and gonad development across vertebrate species.

### Regional Differences in Mitochondrial Capacity in the Finger Flexors of Piano Players

Katie Luquire, CURO Summer Fellow, CURO Research Assistant
*Dr. Kevin McCully, Kinesiology, College of Education*

Near-infrared spectroscopy (NIRS) has been used to measure muscle oxidative capacity, but regional differences have not been identified. To evaluate regional differences in mitochondrial capacity of the finger flexors muscles of controls and piano players. Controls (n = 13) and piano players (n = 8) were tested in a seated position on the right forearm. Piano players reported 10-30 hours of week of piano playing. Mitochondrial capacity was measured as the rate constant (Rc) of recovery of muscle metabolism after a short bout of exercise. Finger flexing exercise was performed with either the index finger or the last two fingers. Muscle endurance (all fingers) was measured using twitch accelerometry. Mitochondrial capacity (Rc) for the controls was 1.86±0.5 and 1.17±0.3 seconds-1 for the index and last two fingers, respectively. Mitochondrial capacity (Rc) for the piano players was 2.0±0.8 and 1.76±0.6 seconds-1 for the index and last two fingers, respectively. The difference between the last two fingers in the two groups was significant ($P < 0.01$). There was no difference in muscle endurance between controls (EI=73.0±17.3%) and piano players (EI=75.7±12.3%) ($p=0.71$). Piano players have significantly higher mitochondrial capacity of the finger flexors that control the last two fingers compared to controls. The lack of difference between groups in the index fingers and the overall endurance test suggests playing the piano trains produces training adaptations to the finger flexor muscles of the last two digits, which are rarely used by control subjects.

### Improving the Overall Efficiency of Electric Vehicles by Harvesting Drag Energy

Aman Luthra, CURO Research Assistant
*Dr. Tom Lawrence, Environmental, Civil, Agricultural, and Mechanical Engineering, College of Engineering*

In the summer of 2018, I initiated a research project with Dr. Thomas Lawrence and Dr. John Mativo to investigate novel methods of harvesting drag energy and converting it into additional electric power for electric vehicles to travel for greater times and distances. For the project, we chose to primarily focus on capturing energy from air flowing into the vehicle's engine compartment through the radiator. This airflow is needed for cooling purposes, but after passing through the radiator, it still has kinetic energy in the form of air movement that is wasted as drag. Our project entails estimating the potential of capturing some of that energy to generate extra electrical power that could be used to help recharge the battery in an electrically driven or hybrid car. As of January 2019, we are in the process of conducting trails to measure the airspeed for air moving through a test vehicle's radiator. The airspeed is measured by an anemometer connected to a data logger, and the trials are determining the airspeed at various vehicle velocities. We will then use this data to analyze the potential for capture some of this wasted energy and convert to electrical current for storage. The final step will be to conduct a technical and economic feasibility analysis, with this work being done later in 2019. We see this work as important as economical enhancements to the efficiency of electric vehicles will be critical to a sustainable future.

### Characterization of the *Vibrio fischeri* Flagellar Sheath

Vineet Madishetty, CURO Research Assistant
*Dr. Timothy Hoover, Microbiology, Franklin College of Arts and Sciences*

*Vibrio fischeri* is a gram-negative rod-shaped bacterium that is ubiquitous in marine environments. *V. fischeri* colonizes the light organ of *Euprymna scolopes*, or the Hawaiian bobtail squid. The bacterium uses a cluster of polar flagella for motility, which is required for colonization of the host. The flagella of *V. fischeri* are covered with a membranous sheath that is contiguous with the outer membrane. Cardiolipin (CL) is a glycerophospholipid that accumulates in regions of the membrane with negative curvature due to its unique shape. Since the flagellar sheath is a thin tube with an extensive degree of negative curvature, I examined the hypothesis that the sheath is enriched for CL. To address the hypothesis, the glycerophospholipid content of isolated flagellar sheaths from various *V. fischeri* mutants were analyzed by thin layer chromatography. Results from these studies suggested that CL is in the flagellar sheath, but is not a major component of the sheath. Moreover, the results indicated that CL is not required for synthesis of either the flagellum or the flagellar sheath. Interestingly, the flagellar sheath appears to be deficient in the glycerophospholipid phosphatidylserine (PS). The isolated outer membrane fraction *V. fischeri* cells was similarly deficient in PS, suggesting that PS is not transported efficiently to the outer membrane.

**PAD4 and Citrullinated Histone Markers in NET Formation**
Rebecca Maitski
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Neutrophils are defense cells that are the first responders to foreign attacks to the body. One procedure through which neutrophils break down invading cells is by the use of neutrophil extracellular traps (NETs) expelled out of cells. NETosis causes cell death and is facilitated by oxidative species, the PAD4 enzyme, and citrullinated histones, which are all good indicators of NET release. NETs are important components of cystic fibrosis research in order to identify novel therapeutic targets to prevent lung damage. Mucus build up leads to constant neutrophil accumulation and activation in the lungs. This ultimately leads to chronic inflammation that eventually leads to tissue damage and lung disease and to decreased antimicrobial effector functions of neutrophils. We are trying to identify the location and binding sites of NET-specific targets, including PAD4 antibody and citrullinated histone 3. The procedure begins with neutrophil isolation from blood via a Percoll gradient followed by immunofluorescence staining. The neutrophils undergo a fixation step using paraformaldehyde, and blocking with normal goat serum. DMSO is used as a control condition and ionomycin is used as the manipulated, experimental condition. Both the PAD4 and citrulliated histone 3 are used as primary antibodies. Our experiments aim to optimize the concentrations of these antibodies used. Cells are visualized with confocal microscopy. From our results, we have gathered that binding is most prevalent on cell surfaces in the ionomycin conditions. Citrullinated histone binding was seen mostly where the primary antibody, PAD4, was located.

**Varied Irradiance and Stable Isotopes in Siderastrean Corals**
Erin Malsbury
*Dr. Patricia Yager, Marine Sciences, Franklin College of Arts and Sciences*

The scleractinian corals found near the mouth of the Amazon River experience months of complete darkness annually due to their depth and seasonal coverage by the turbid Amazon River plume. Solar-irradiance determines whether habitat is hospitable for hermatypic corals, which provide spatial complexity necessary for tropical reef ecosystems. As scleractinian colonies grow, they deposit calciferous skeletons, and the $\delta^{13}C$ and $\delta^{18}O$ ratios in these skeletons can be used to assess the coral's dependence on photosynthetic zooxanthellae. In order to provide a baseline for assessing photosynthetic dependence in Siderastrea corals from the Amazon, I analyzed the stable isotope ratios in Caribbean Siderastrea siderea from a variety of depths, expecting $\delta^{13}C$ to decrease with depth and $\delta^{18}O$ to remain stable. $\delta^{13}C$ showed a negative correlation with depth, while the $\delta^{18}O$ remained constant. In addition to testing museum specimen, I am conducting an insolation experiment on live Siderastrea radians collected from the Florida Keys. An experimental group is receiving decreased irradiance for six weeks, while a control group is receiving normal levels of light. After six weeks, I will collect skeletal material for isotope analysis using the methodology applied to the museum specimen. I expect the corals exposed to lower levels of light to rely more heavily on heterotrophy and to contain greater proportions of $\delta^{13}C$ than the controls.

**Analysis of the Stabilizing Effects of Glycan Modifications of TSRs from ADAMTS13**
Rajashri Manjunath, CURO Research Assistant
*Dr. Robert S. Haltiwanger, Biochemistry and Molecular Biology, Franklin College of Arts and Sciences*

Peter's Plus Syndrome (PPS) is an autosomal recessive disorder caused by a variety of mutations in the enzyme β3-glucosyltransferase (B3GLCT). B3GLCT transfers a glucose to a fucose directly linked to serine/threonine residues in targeted proteins creating an O-linked glucose-fucose disaccharide (Glcβ1-3Fuc). Protein O-fucosyltransferase 2 (POFUT2) is responsible for adding the fucose to proteins containing Thrombospondin Type I Repeat (TSR) motifs which are found in many secreted proteins. Former studies with a single TSR from the protein Thrombospondin-1 (TSP1-TSR3)—a target of both POFUT2 and B3GLCT—shows that the fucose and subsequent glucose modification stabilize the folded state of the TSR in an additive manner. Both enzymes function in the endoplasmic reticulum as a non-canonical quality control mechanism where the glycan modification by each enzyme serves as a marker of properly folded TSRs. While POFUT2 is required for the secretion of all the tested protein targets, B3GLCT is only required for a subset of these targets. ADAMTS13 is one such protein that does not require modification by B3GLCT for proper secretion. We hypothesize that stabilization of properly folded TSRs from ADAMTS13 is not impacted by glucose modification. We are testing this hypothesis by performing reductive unfolding assays on fully modified (disaccharide), partially modified (fucose only) or unmodified TSRs from ADAMTS13. We predict our results will explain why the addition of the glucose does not impact the secretion of ADAMTS13, but does affect the secretion of other TSR containing proteins in PPS patients.
Supported by NIH grant HD090156.

**Fabrication and Characterization of Surfen-Loaded Nanoparticles**
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*Dr. Lohitash Karumbaiah, Animal and Dairy Science, College of Agricultural and Environmental Sciences*

Glioblastoma (GBM) is the most common primary brain tumor in adults with no current effective treatments. Surfen has been previously investigated by our lab as a potential anti-invasive agent against GBM by selectively interfering with cellular interactions with extracellular matrix components. Surfen has several limitations including poor aqueous solubility and non-selective biodistribution, which can be overcome by the synthesis of a biocompatible nanocarrier. We hypothesize surfen-loaded poly(lactic-co-glycolic acid) nanoparticles (PLGA-NPs) will sustainably release surfen within glioma tissue and restrict GBM invasion both *in vitro* and *in vivo*. PLGA-NPs were synthesized via a nanoprecipitation technique, after which sizing and polydispersity were measured using scanning electron microscopy. This method reliably synthesizes sub-200nm sized PLGA-NPs with a low polydispersity index (< 0.5).

Surfen loading and release experiments will be performed using UV-Vis Spectrophotometry and transmission electron microscopy, expecting both high encapsulation efficiency and ideal sustained release for 72 hours. Cytotoxicity experiments will be performed across 0-100uM surfen concentrations to validate a lack of toxicity as well as observe an inhibition of GBM cell migration. PLGA-NPs will be subsequently injected through intravenous administration into a rodent model of GBM to observe both targeting to glioma tissue and if any, accumulation in non-CNS organs. We expect the PLGA-NPs will localize within GBM tissue as result of leaky vasculature within tumor tissue. We hope to demonstrate incorporation of surfen in PLGA-NPs strongly inhibits invasion in GBM, and that these findings suggest promise for a novel, sustained delivery of anti-invasion therapeutics for patients with GBM.

**An Ecological Observation of Oyster Spat Densities Surrounding Wormsloe State Historic Site**

Morgan Marie Manning
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Coastal erosion poses an increasing threat to shorelines worldwide. To cope with this surge in erosion, walls and bulkheads are commonly deployed but are often costly and can pose a negative impact on the surrounding ecosystem. Living shorelines are constructed to encourage oysters to colonize an area and reduce excessive erosion while improving ecological function. Promoting the use of oyster reefs requires understanding the factors that currently limit reef establishment and growth. In 2018, Christopher Wisener developed a living shoreline suitability model for oysters in Skidaway Island, GA. My study aims to improve his initial model by adding another year of data collection. During 2018, we measured oyster spat densities at ten sites on three waterways around Skidaway Island that differ in sinuosity and bank elevation. We placed four one-meter, ¾ inch diameter PVC pipes per site upright in the water column and collected data in June and August. Spat densities were calculated for each stick at each location and were evaluated for correlation with site-level variables such as sinuosity and marsh presence. Preliminary results have shown a significant difference in spat densities between each of the three waterways and a negative correlation between oyster spat density and sinuosity, consistent with Wisener's model. By validating the living shoreline model for oysters and providing some direct estimates of how creek conditions are related to oyster spat densities, this research contributes directly to understanding oyster recruitment and its impact on the development of living shorelines and the conservation of Georgia's coastline.

**Pathways to Redress: Case Studies on the Inclusion of SVIC Provisions in Post-Conflict Resolutions**

Alexis Manson, CURO Research Assistant
*Dr. Maryann Gallagher, International Affairs, School of Public and International Affairs*

United Nations Security Resolution (UNSCR) 1325, passed in 2001, called for the implementation of a "gender perspective" during and after conflict. Implementation of a gender perspective includes that special attention be devoted to the occurrence of sexual violence in conflict (SVIC). Subsequent UN resolutions have specifically demanded that impunity end for sexually violent crimes, and have suggested that special protections be given to victims of such crimes. Prior research used agreements from the UN Peacemaker database to determine whether or not peace agreements signed since the passage of UNSCR 1325 have addressed SVIC and how they have done so. Provisions to end amnesty for perpetrators of SVIC, prosecute SVIC, provide support services for victims of SVIC, and establish truth and reconciliation commissions to address SVIC were noted as they occurred in peace agreements from 2001-2018. Findings demonstrated that there has not been an increase in the number of agreements mentioning SVIC since the passage of UNSCR 1325, nor is this number adequate. Additionally, it was found that a large number of the peace agreements that do address SVIC are passed to confront conflicts in Africa. This research involves a case study of four African countries (Cote d'Ivoire, Burundi, Uganda, and the Democratic Republic of the Congo), with varying numbers of SVIC provisions in their conflict resolution agreements, in order to determine the factors that contribute to this regional variance. Uncovering these factors would be useful in furthering the attention given to SVIC.

**Lipidomic Analysis of Media from Castration Resistant Prostate Cancer Cells**

Maryam Mansoura
*Dr. Brian Cummings, Pharmaceutical and Biomedical Sciences, College of Pharmacy*

Castration-resistant prostate cancer (CRPC) is a metastatic form of prostate cancer (PCa). Several treatment modalities have been approved during the past decade by the FDA for treating CRPC patients. Unfortunately, a high percentage of patients fail to respond to these treatments for several reasons, including developing resistance. One reason for these failures is inadequate methods that allow for accurate staging of PCa. This poses a diagnostic problem that limits our ability to create a patient-centered treatment plan. We addressed this problem by testing the hypothesis that an association exists between circulating lipids and clinical outcomes of CRPC. This hypothesis is based on recent studies demonstrating a correlation between plasma lipids and CRPC prognosis. To understand this correlation, we used *in vitro* models of non-cancerous, hormone-sensitive, and drug-resistant CRPC cell lines combined with quantitative lipidomic analysis to study the correlation between CRPC and lipid profiles. An untargeted approach indicated that media from hormone-sensitive cells (LNCaP), and CRPC cells (DU145) had lower relative abundance of glycerophospholipids, compared to a non-cancer cell model (PNT2). Drug resistant cells (DU145 DR) and their media had a higher abundance of glycerophospholipids such as phosphatidylinositol, phosphatidic acid, and phosphatidylserine as compared to parent control (DU145). These data confirm previous *in vivo* findings and suggest that the lipidomic profiles of PCa cells lines mirror lipidomic profiles in the plasma of

PCa patients. Further, these data provide an *in vitro* model to investigate the molecular mechanisms mediating lipidomic changes during the progression of drug resistant PCa.

**Design and Synthesis of Novel Drug Delivery Metal Organic Frameworks (MOFs)**
Xena Mansoura
Richard Dolder
*Dr. Richard Morrison, Chemistry, Franklin College of Arts and Sciences*

A metal organic framework consists of a metal inorganic node connected by organic linkers to form three-dimensional cage-like structures. They are a subclass of polymers, characterized by their porous features. The applications of MOFs include gas absorption, luminescence, drug delivery, and catalysis. The focus of this research is for use in drug delivery. More specifically, the MOF to be synthesized will have a zinc node and will be surrounded by carbonyl organic linkers such that when struck with UV light, the MOF will release drugs when necessary. The reaction consists of multiple separate steps, of which one individual goal is to attach a photolabile group in the meta position onto a two benzene ring system.

**Expression and Characterization of the Human Metapneumovirus Fusion Protein**
Dorna Mansouri, CURO Research Assistant
*Dr. Jarrod Mousa, Infectious Diseases, College of Veterinary Medicine*

Human metapneumovirus (hMPV) is a single-stranded RNA virus of the family *Pneumoviridae* and is a common cause of lower respiratory infection in young children and the elderly. Of the surface proteins on the virus, the fusion (F) protein is the sole target of neutralizing antibodies. The hMPV F protein has two distinct conformations, the pre-fusion and post-fusion states. Upon hMPV attachment to host cell receptors, the F protein undergoes a dramatic conformational change from the pre-fusion to the post-fusion state, which results in fusion of the virus and cell membranes. The long-term goal of this project is to isolate human monoclonal antibodies as therapeutics against hMPV. To accomplish this goal, we recombinantly express the hMPV F protein. Two major genetic lineages of hMPV have been identified, subtypes A and B, which have been divided into the subgroups: A1, A2, B1, and B2. My study has focused on subgroups A1 and B2, with a focus on expression of pre-fusion and post-fusion proteins. We expressed the hMPV F protein transfection into HEK293F cells, followed by protein purification and protein characterization by size exclusion chromatography. The anticipated conclusion is to utilize these proteins to isolate human monoclonal antibodies. These efforts have the long-term goal of designing the next generation of vaccines and treatments against HMPV.

**A Comparison of Bioarchaeological Adult Aging Techniques Utilizing Canine Teeth Radiographs from Italian Skeletal Remains**
Katey Mari
*Dr. Laurie Reitsema, Anthropology, Franklin College of Arts and Sciences*

Age-at-death (AAD) estimates are a piece of evidence gathered by bioarchaeologists to provide data on population dynamics when no written records are available. In response to difficulties differentiating younger from older adults due to broad age ranges provided by traditional osteological techniques, methods adapted by Sigrid I. Kvaal and Roberto Cameriere and colleagues use a combination of measurements on tooth x-rays to calculate more accurate AAD. This research utilized the Kvaal and Cameriere methods to create AAD estimates for 50 individuals, and a comparison was made to test which method produced more reliable age estimates when compared to osteologically derived AAD estimates. It was hypothesized that since the Kvaal method measurements are based on a combination of height and width ratios, and many of the ratios do not include the total tooth height, it could provide more accurate AAD estimation when the enamel has cracks, or when teeth are badly worn. Paired *t*-tests showed only a statistically significant correlation between skeletal morphological age category and AAD estimate by the Kvaal method ($p= 0.0354$), demonstrating its reliability when employed alongside traditional skeletal morphological AAD estimation techniques. The Cameriere method was not statistically significant overall ($p=0.1131$), however when broken down categorically by age, among old adult individuals, Cameriere's method produced more reliable AAD estimates. Calculating more accurate AAD estimates aids in developing a clearer understanding of population demographics, allowing bioarchaeologists to better understand social dynamics, disease prevalence, and effects of the overall aging process on specific populations.

**Examining the Relationship Between Stigma, Self-Esteem, Self-Efficacy, and Social Satisfaction in Young Adults with Autism Spectrum Disorder**
Alex Marion, CURO Research Assistant
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Autism Spectrum Disorder (ASD) is a common, widespread disorder effecting nearly one in 59 children. These individuals face a number of difficulties as a result of their diagnosis, including stigma, defined as characteristics individuals possess that convey an identity which is devalued in a particular social context. Although some research has examined affiliative stigma experienced by parents of children with ASD, few studies have investigated the specific ways in which stigma is detrimental to adults diagnosed with ASD. Appropriately, this study aimed to address this gap by investigating how experiences of stigma among young adults with ASD relate to their self-esteem, self-efficacy, and social satisfaction. Methodology included qualitative, semi-structured interviews using an interview guide developed through a literature

review of previous studies and their measurement tools. Currently, seven individuals with ASD have participated in interviews lasting from 40-80 minutes, and data collection will continue until saturation is achieved. Preliminary data analysis using Burnard's adaptation of Glaser and Strauss's grounded theory suggests individuals with ASD face a widespread lack of understanding of ASD ranging from family members to university counselors. Further, interviews suggest this limited understanding contributes to stigmatizing acts that are related to self-esteem, self-efficacy, and social satisfaction. If continued data collection and subsequent analysis yield similar findings, then results will suggest interventions to increase knowledge of ASD and reduce stigmatizing beliefs are necessary to help buffer the harmful effects of stigma experienced by young adults with ASD.

**Grow It Know It: Mapping the Critical Network of Sustainable Farm to School Programs**

Juliann Hoda Marmal, CURO Research Assistant
*Dr. Jennifer Jo Thompson, Crop and Soil Sciences, College of Agricultural and Environmental Sciences*

In Georgia, the food insecurity rate among children is 20.9%. In Athens-Clarke County (ACC) and Barrow County, respectively, 78% and over 70% of students are eligible for free and reduced school meals. At the same time, many schools have a high need for formal and informal education providing academic enrichment across the curriculum. In the last decade, Farm to School (FTS) initiatives have increasingly been adopted as an interdisciplinary approach to educational enrichment, environmental engagement, and healthy food promotion. Although many communities have strong resources to support FTS initiatives, many school districts lack the capacity to coordinate community resources to implement an effective and sustainable FTS program. Grow It Know It (GIKI) is making this the target mission. GIKI is a farm to school support program that helps teachers implement and sustain school gardens, food-based learning, composting, and food waste reduction through training, placing VISTAs in schools, and identifying/coordinating community partners. Through this work, GIKI aims to support students in improving their eco-food literacy, agriculture and environmental education, and overall healthy food practices. Our research aims to pilot a framework for disseminating this assets-based model. Toward this goal, we are asking: How does GIKI's theoretical model compare or differ to other FTS models? To answer this, we are developing a concept map to detail the intersecting "active" components of the project, their impacts and identifying the critical network of FTS relationships, their contributions to the whole, and what particular areas of support are needed to improve the program.

**Yolk Hormone Concentration as a Result of Genetics or Behavioral Profile of Hens**

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

Past studies have appeared to show that animals tend to fall into one of two behavioural categories: Reactive animals are tentative, slow explorers that are highly responsive to stress while proactive animals are bold, fast explorers that are more resistant to stress. Brown and white laying hens fall into these two categories. Brown hens are proactive and produce low hormonal responses to stress while white hens are reactive, exhibiting large fear responses and large hormonal responses to stress. These behavioural profiles may then program offspring behavioural profiles because white hens deposit significantly higher amounts of the stress hormone corticosterone into egg yolks compared to brown hens, however, it remains unclear whether these differences in yolk hormones results from the behavioural profiles or from a genetic difference between the strains. We will test this by examining yolk corticosterone concentrations in reactive and proactive hens in the same strain. To do this, we will conduct behavioural tests on a flock of 50 laying hens, identify the 20 most reactive and 20 most proactive hens, and then collect eggs to quantify concentrations of corticosterone in egg yolks. Results collected will provide evidence as to whether the differences in yolk hormone concentrations between brown and white eggs occurred due to a genetic difference, or in response to the reactive and proactive behavioural profiles of the hens.

**Active Drone Rotor Noise Cancellation in Human-Drone Verbal Interaction**

Davielle Ivelisse Matos, CURO Research Assistant
*Dr. Ramviyas N. Parasuraman, Computer Science, Franklin College of Arts and Sciences*

It is not far in the future where drones will be flying around giving us instructions either on a museum or a campus tour. However, currently, the sound of the rotors and propellers of the drone can be very loud and distracting from the audio instructions that are supposed to be heard in these scenarios. The purpose of this research is to create an active noise cancellation method to minimize the drone rotor noise at the human end in human-drone verbal interactions. We take inspirations from the vast amount of literature in active noise cancellation technologies at the target (e.g., headphones) and signal processing algorithms to minimize the influence of system noise. This project will include a drone, a set of microphones and speakers to create an anti-noise to cancel out the rotor noise. The sounds from the microphones will go through a python-based script including the least-mean-square (LMS) algorithm and an inverse algorithm to generate the anti-noise in real time and sent through the same speakers on the drone used for providing verbal interactions. We will conduct different experiments with different positions of the microphones, and changing the algorithms as necessary, and evaluate the reduction of the rotor noise at a target (human). The results are expected to significant abilities at the target human who could hear the desired audio with little to no rotor noise from the drone, thereby advancing research in human-robot verbal interactions.

**Resisting Eye Candy**
Aminah Matthews
*Dr. Michelle R. vanDellen, Psychology, Franklin College of Arts and Sciences*

Modern dating apps are reported to have over 57 million users worldwide. These sites typically require users to make an initial judgement on physical appearance while offering secondary information about a person. We are interested in understanding what drives people's decision-making process when selecting a romantic partner by assessing the attributes of the participant and the target. In a previous study, we conducted a friend speed-dating event to determine whether physical attraction is used as a cue for people with high self-control to investigate more deeply into a potential friend's qualities. In this replication study, we will create an online dating simulation that allows single, heterosexual participants to browse through photos of attractive (N=50) and unattractive (N=50) targets. They will swipe right if they are interested in meeting the person and left if they are not interested. Each participant will be evaluated using the Trait Self-Control Scale. Before selecting, they will have the option to swipe up for additional information about the target which will reveal either a high (N=50) or low (N= 50) self-control description. Attractiveness and self-control of targets will be crossed by randomization. We hypothesize that participants with high self-control will seek additional information on attractive targets at a higher rate than participants with low self-control. There will not be a significant difference in the frequency participants with low and high self-control reject an unattractive target. However, a person with high self-control will be more likely to choose an attractive target with high (vs. low) self-control.

**A Policy Analysis of the Nagoya Protocol**
Sydney Kenna Mattox, CURO Research Assistant
*Dr. J. Peter Brosius, Anthropology, Franklin College of Arts and Sciences*

The Nagoya Protocol, established in 2010 by the Convention for Biological Diversity, emphasizes the fair and equitable use of genetic resources and the traditional knowledge surrounding them. Over 100 countries are signatories to the Nagoya Protocol, yet many disciplines are largely unaware and unprepared for the profound implications that the Nagoya Protocol will have on the global research community. In support of the American Anthropological Association's initiative to understand the effects of the Nagoya Protocol, I aim to better understand the history, goals, and potential effects of the Nagoya Protocol for genetic resource-based research and how the anthropological community can prepare for this new research environment. To do this, I will conduct a thorough literature review and accompanying discourse analysis of relevant terminology and text relating to the Nagoya Protocol. Special attention will be given to the definition of "traditional knowledge" and its relationship to the Nagoya Protocol's policies. The historical genealogy of the term "traditional knowledge" will also be explored in the context of the Convention for Biological Diversity and other similar conventions. Analysis of how anthropology as a discipline is in a unique position to respond to the Nagoya Protocol's policies will also be included. Through this research, we hope to establish a clear understanding of the emerging regime surrounding "traditional knowledge" under the auspices of the Convention on Biological Diversity and the Nagoya Protocol for cross-disciplinary benefit and use. Ultimately, we hope this will enable the development of guidelines for researchers in both the natural and social sciences.

**The Role of Perceived Goal Commitment on Support Provision**
Carrie Diane Mauldin, CURO Research Assistant
*Dr. Michelle R. vanDellen, Psychology, Franklin College of Arts and Sciences*

The focus of our research is to delve into how people decide to provide goal support. We predicted that individuals who exhibit behaviors congruent with their stated goals are more likely to receive support from others, whereas people who exhibit incongruent behavior will receive less support. We conducted three separate studies to observe how perceived commitment to goals affects support provision across a variety of scenarios, such as health behaviors via providing healthy snack choices or providing advice to a high school student whose stated goal was to be admitted to a competitive university. Through our studies, we anticipate to learn how perceived goal commitment affects the amount of support a person receives from others. The studies suggest that both perceived commitment to and perceived likelihood of attaining a goal affect goal support, in opposing ways. These findings inform new ways in which individuals can successfully engage in pursuing their goals, by effectively recruiting help from others.

**The Relationship Between Emotional Neural Processing and Personality Traits in Individuals with Psychosis**
Mikalah Elise Maury, CURO Research Assistant
*Dr. Brett Clementz, Psychology, Franklin College of Arts and Sciences*

Psychosis is a term given to describe a loss in contact with reality in which hallucinations and delusions are experienced by an individual. Personality is comprised of an individual's feelings, thinking, and behavior, all of which may contribute to symptomatic outcomes in patients with psychotic disorders. Emotion represents an integration of feeling, action, appraisal, and wants at a particular time and location, and personality is the integration over time and space of these components. Because of the close cognitive processes involving personality and emotion, there may be a common biological mechanism over which these processes occur. This study seeks to determine if a relationship exists between personality traits and neural emotional processing in healthy individuals and people with psychosis. Participants completed the NEO Personality Inventory, which uses the Five Factor Model of Personality to measure five main personality dimensions: neuroticism, extraversion, openness, agreeableness, and conscientiousness. Electroencephalography was then recorded while participants viewed images from the International Affective Picture System (IAPS), which contains neutral, pleasant, and unpleasant images, and is used to assess emotional processing in the brain. A

canonical correlation analysis will be conducted to determine relationships between the five aspects of personality and neurological responses generated from the IAPS task. We expect that openness will be related to emotional processing and that this relationship will differ between healthy individuals and people with psychosis, as individuals who rank highly on openness are prone to fantasy and have difficulty distinguishing dreams from reality.

**Identification of New Glial Markers in Planarians**

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

A barrier to many medical treatments is the inability of human patients to regenerate their tissues after damage due to injury or illness. Studying regeneration is important because it could lead to new treatments and understanding of the regrowth of lost tissues or organs. The human central nervous system (CNS) possesses almost no ability to regenerate. We are interested in understanding regeneration within the CNS, including regeneration of neurons and also Glial cells, also known as glia. Glia make up most of the human CNS and provide support for neuronal survival, function, and development in many animals. Because mammals regenerate poorly, our goal is to understand CNS regeneration using an organism that regenerates well. Planarians, which are freshwater flatworms, have a remarkable regenerative ability, including regeneration of the CNS. Glia were recently described (Roberts-Galbraith et al., 2016), but little is known about their functions in behavior and in regeneration. We know only a few genes expressed in this cell type. My project seeks to identify and characterize novel planarian genes that we believe are expressed in glial cells of the planarian CNS. To identify new genes expressed in planarian glia, I first cloned candidate genes identified in single-cell sequencing experiments as being coexpressed with estrella (Fincher et al., 2018). I then used *in situ* hybridization to determine whether these genes are expressed in an estrella-like pattern. Of the 12 genes characterized, 4 are potentially expressed in glia.

**Analyzing the Peabody Archive**

Thomas Michael May, CURO Research Assistant
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The Peabody Awards Archive comprises more than 90,000 audio/visual submissions with thousands of accompanying supplementary materials dating back to 1940, many of which are the only surviving artifacts of the works. The sheer size and breadth of the collections invigorate my research project, an archival analysis that will provide the Peabody Media Center with a compiled reference of items that stand out as unique or rare artifacts—hidden gems—in the archive. To find and consider items, I reference databases maintained by the Special Collections Library that houses the Peabody Archive, browsing descriptions of housed items and calling up boxes containing large amounts of paper materials. I also consult faculty and staff who have worked in the collection, to assist in narrowing down the results and be advised by those most familiar with the materials. After narrowing a selection, my analysis of this research details a cultural context in which to situate the items so the significance and rarity of each can be easily acknowledged and succinctly understood. From here, this curated list will be handed over to the Peabody Media Center as leads for junior Peabody fellows, for informing its own institutional history as well as for promotion and special events. The project also serves as pre-production for a sizzle to highlight the archive and better inform winners that they have a home for their materials at the University of Georgia and the Peabody Awards Collection for future generations of scholars and the public.

**Spoken Thoughts: The Roles of Understanding and Language According to Augustine**

Emeline McClellan, CURO Research Assistant
*Dr. Erika Hermanowicz, Classics, Franklin College of Arts and Sciences*

This research project examines the relation between human understanding and verbal communication in Saint Augustine's writings. Famously, whenever Augustine tries to explain entities such as time, the human mind, or God, he feels that language cannot accurately convey his thoughts. Faced with this gap between understanding and communication, Augustine resorts to metaphor, which he believes more fully expresses the inner "vision" of understanding. Based on many passages from Augustine's corpus, especially from the Confessions and On the Trinity, I argue that his frustration with language arises from the reflexive nature of human thought about complex issues. To communicate the natures of time, the mind, and God, a speaker would require both perfect comprehension and perfect analysis. For Augustine, however, the mind cannot perfectly analyze (that is, reason through or break down) every issue. When a temporally-grounded mind thinks about time, for example, or when the mind thinks about itself, or when the creation thinks about its Creator, the object to be embodied in language is always deeply involved in the mental activities necessary for speech. For Augustine, this reflexive nature of communication makes perfect analysis impossible, since human beings can never fully analyze a piece of mental equipment that they are using. This reflexive process of putting thoughts into words, therefore, creates the well-known Augustinian gap between understanding and speech. This conclusion helps to explain Augustine's preoccupation with linguistic inadequacy and with metaphor—a tool that encourages the mind to speak through pictures, not through analysis.

**Establishing an *in vitro* Model to Elucidate Signaling Cascades of GH in Chickens**

Trevor Andrew McClure, CURO Research Assistant
*Dr. Laura Ellestad, Poultry Science, College of Agricultural and Environmental Sciences*

Pituitary growth hormone (GH) is a primary regulator of growth and body composition in all vertebrates. While GH signal transduction has been well-defined in other species, it remains largely uncharacterized in chickens, despite the immense demand to increase production efficiency within the poultry

industry. We are working to establish a model to test various components of the GH signaling cascade that have been demonstrated in other species. To this end, we are utilizing a dual luciferase assay in which the chicken hepatocyte cell line, LMH, is transfected with luciferase reporter plasmids, where luciferase expression is driven by pathway-specific response elements. Currently, these include components of the Jak/STAT pathways, as well as PKA, PKC, p38MAPK, ERK1/2 MAPK, and PI3K. As a part of this study, it is necessary to establish baseline pathway activity in LMH cells, as well as define positive controls to demonstrate the efficacy of each pathway and viability of the luciferase assay. We have demonstrated forskolin, EGF, and IL-6 as positive controls for their respective pathways, PKA, ERK1/2, and STAT3. Further, we are testing insulin, PMA, and anisomycin as controls for PI3K, PKC, and p38MAPK pathways. These positive responses will validate that these pathways are active and inducible within LMH cells, our model system. Establishing this is essential for using these cells as a tool for evaluating the role of these pathways in GH signaling going forward.

**Expression of Novel Membrane Dehydrogenase Complexes in the Model Archaean *Pyrococcus furiosus***

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

*Pyrococcus furiosus* (*Pf*) is a hyperthermophilic, anaerobic Archaea found growing around marine vents near 100$^0$C. Using the COM1 strain developed in our lab we are able to make *Pf* competent for foreign DNA uptake. Archaea are unique in that their respiratory complexes employ molecules other than oxygen as terminal electron acceptors and use various simple molecules not seen in higher ordered species for electron donation to this respiratory transport. We hope to isolate and study different types of dehydrogenase enzyme complexes from a variety of anaerobic Archaea. Our research seeks to understand the physiological, kinetic, and metabolic properties of these various complexes, especially for the carbon dioxide dehydrogenase (CODH) from *Thermococcus onnurineus*. With this understanding, we seek to create a strain of *Pf* that expresses the CODH complex, consuming inorganic atmospheric carbon to convert to organic formate, reducing carbon in the atmosphere. In addition, this complex has another benefit: it reduces protons as electron acceptors to produce hydrogen gas, a biofuel. By creating a strain of *Pf* that expresses the CODH complex through a knock-in process, we are able to store inorganic carbon while simultaneously producing clean hydrogen biofuels. However, the expression of this gene poses a simple problem in that the cells must be kept alive for the CODH complex to operate; with the extreme conditions required for *Pf* this might prove to be expensive in industrial settings. Therefore, we seek to add a 9x-Histidine tag to CODH to improve industrial purification and allow for detailed characterization studies.

**Vashti and a Rejected Narrative in Charlotte Bronte's *Villette***

Sara Pauline McCracken, CURO Research Assistant
*Dr. Richard Menke, English, Franklin College of Arts and Sciences*

In the middle of Charlotte Bronte's novel *Villette* (1853), the narrator and protagonist Lucy Snowe witnesses a performance given by an actress named Vashti. Prior to this scene, Lucy's choice of narrative details in the text primarily has primarily emphasized her own traditionally feminine qualities as they contribute externally to the rest of society. After this scene, however, I argue that the narrative style shifts, and the story becomes focused more on Lucy's internal characteristics. Her spiritual and mental state are emphasized in a direct rejection of and in contrast with the performative femininity embodied by Vashti. In my research, I will look closely at the criticism about narrative technique in *Villette*, and at the ways in which it interacts with concepts of theater and performance. I will analyze this turning point scene and look at past analyses of it, in order to better understand its significance; ultimately, I hope to create a detailed account of the ways it affects the narrative progression in *Villette*. This will be significant in its contribution to current discourse on the ways in which internal and external representations of the self occur in Bronte's *Villette*. On a broader scale, and taken with criticisms of other fictional texts, I hope that my work will help lend insight into the ways in which psychological development is portrayed in the Victorian novel.

**Haptic Touch: Examining Sensory Receptors in the Perception Process**

Terrence Reyes McHugh, CURO Research Assistant
*Dr. Tarkesh Singh, Kinesiology, College of Education*

Our research aims to investigate and parse the roles of sensory afferent neurons in the perception of an object's heaviness and length through the dynamic touch process. In this study, we specifically aimed to distinguish between the functions of two types of receptors: golgi tendon organs and muscle spindles. Male and female participants (N=16) wielded objects of identical lengths but with different masses and mass distributions. There were six total object conditions. These conditions were created by using rods made of either solid oak wood, hollow aluminum, or solid aluminum. Additionally, detachable weights were placed at one of two standardized locations on the rod, in order to manipulate the objects' moment of inertia. For each object condition, participants manipulated the rod in a vertical, oscillating motion at three different frequencies (static, 2 Hz, and 3 Hz) and at three different angle conditions (-10 degrees, 0 degrees, and 10 degrees). Our analysis showed that an object's moment of inertia impacted judgments of both heaviness and length. We also found that muscle spindle activity did not play a role in judgments of heaviness. In regards to the perception of object length, we found that long range cross-correlations contributed more to perception than the magnitude of any receptor's activity did. These findings have significant implications in the computational modeling of perception, as well as implications to the fields of prosthetics and augmented reality.

**Bifoveated Lizard: New Approach to Fovea Development in Response to PTU**

Bonnie McKinnon, CURO Research Assistant
*Dr. Douglas Menke, Genetics, Franklin College of Arts and Sciences*

Although most often associated with color diversity in animals, pigments also play a critical role in vision by protecting cells from harmful wavelengths of light. Pigmentation is also thought to be important for eye development—in particularly with the formation of the fovea. The fovea is a pit/depression found in the retina in a region where there is a high density of photoreceptor cells that is critical to a person's high visual acuity. When pigmentation is absent, a condition known as albinism, the fovea fails to develop and, in such individuals, vision is often extremely poor. Because current model systems to study eye development lack a fovea, it is unclear if pigmentation or genes involved with the melanin synthesis pathway are responsible for regulating fovea development. To address this, we have developed an egg drug-delivery system using in the Anolis sagrei lizard—a new foveated model system to explore the role of pigmentation in fovea development. 1-phenyl-2-thiourea (PTU) is a drug known to inhibit the enzyme, tyrosinase which is crucial for pigment formation. Developing lizard eggs were incubated in at varying concentrations of PTU and embryos collected at multiple time points throughout development. Loss of pigmentation was scored and PTU effects on fovea formation were assessed using morphological analyses. This approach is useful in exploring the mechanisms behind fovea development.

**Financial Payment Application Usage Among College Students**

Carlie Danielle McLaughlin
*Dr. Craig A. Piercy, Management Information Systems, Terry College of Business*

With the rise of fintech as a result in the surge of mobile application use, the question of trust and user security comes into play. Without user trust in an application, it is useless. Since college students are the newest mass entrants and consumers in the financial field as they enter the workforce, it is important to both gauge and capture their personal trust in technology use in this field. Additionally, technology is changing the landscape of the financial sector more and more every year, so consumers must be willing to conform despite reservations they may possess. These perceptions of fintech by college students will shape the way of the future of these technologies in all associated fields, particularly in mobile payments. Companies need to adapt and transform to these reservations of their consumers in order to see positive results in the future to sustain the current growth of the fintech industry. Although there are several sectors of the fintech industry such as hidden mobile payments, blockchain, and AI wealth management, we chose to focus this paper on the mobile payments industry to narrow the scope of our research. We target college students in this study since this demographic is stereotyped as being the most "tech-savvy" generation of today and will most likely be the generation to adopt these new technologies more fully and willingly than other generations. With that said, even this generation still holds reservations. The question we are trying to answer is if this demographic is adopting fintech mobile payments and what their major reservations are to adoption.

**The Effects of DHA on Blood Plasma Triglyceride and Cholesterol Concentrations in Piglets**

Matthew McMillin, CURO Research Assistant
*Dr. Hea Jin Park, Foods and Nutrition, College of Family and Consumer Sciences*

Docosahexaenoic Acid (DHA) is a polyunsaturated omega-3 fatty acid that is crucial for development and maintenance of brain function in human offspring. DHA is naturally found in breast milk and is highly recommended in pregnant and nursing women for efficient transmission to infants. DHA has been also observed to improve cardiovascular health by modulating levels of circulating blood lipids concentration. To further investigate the effect of maternal DHA intake on plasma lipid profile of offspring, sows were fed a control diet (n=3) and a diet containing DHA (n=5, 75mg/kg BW/d) from late gestation to lactation. Piglets weighing nearest the litter average were selected at birth and included in the study (n=14 and n=20 from the sows fed a control diet or a DHA containing diet, respectively). Blood was collected at weaning (21 days old) and plasma triglycerides (TG) and cholesterol levels were analyzed using calorimetric methods. Plasma TG levels tended to decrease in the DHA group (27.55±4.96 mg/dL) relative to those in the control group (40.76±5.34mg/dL) (p=0.0867). No significant differences in cholesterol levels were observed between the two groups. In conclusion, this study found that after 2-months supplementation of DHA from late gestation to lactation, DHA appeared to lower plasma triglyceride levels without affecting plasma cholesterol levels in the offspring.

**The Changing Definition of the Readymade**

Emma McMorran, CURO Honors Scholar
*Dr. Isabelle Wallace, School of Art, Franklin College of Arts and Sciences*

In 1917, the artist Marcel Duchamp created his groundbreaking piece *Fountain*, a urinal that Duchamp did not construct himself, but that he signed with an alias, called a piece of art, and entered anonymously into a contest in order to confirm its elevated status. Although the original is lost, the creation of Duchamp's Fountain is widely regarded as a pivotal turning point in art history, but, in a curious way, its effect was delayed. Duchamp himself coined the term "readymade" in 1915 to describe his works; decades later, American artists such as Jasper Johns and Robert Rauschenberg were reviving the strategy of readymade-ness in their paintings and mix-media works. But, rather than work with readymade objects such as a urinal, a bottle rack, or a comb, they worked with readymade images, some of which they executed themselves. Most famously, Johns' *Flag*, a painting of 1954, which is, in some sense, a readymade, but only on the level of design because he painted a rendering of the American flag. He constructed *Flag*, whereas Duchamp did not construct *Fountain*. Through the close analysis of texts on readymades such as reviews, exhibitions, and interviews, this research investigates the implications of the readymade's revival and transformation in

mid-century America. Although this research is still ongoing, preliminary findings support the argument that the definition of the readymade evolved from Duchamp's conception of the term to include pieces that are readymade only at the level of design.

**Mysteries of the Museum: Uncovering the History of the Georgia Museum of Natural History**
Megan McPherson
*Dr. Suzanne Pilaar Birch, Anthropology, Franklin College of Arts and Sciences*

The Georgia Museum of Natural History (GMNH) at the University of Georgia houses over 7 million specimens, but little is known about the origins and history of the museum itself. The museum's collections were not formally recognized by UGA until 1978, despite being in existence since the early 1800s. By working with the Special Collections Library to locate documents related to the earliest origins of the museum through to the present day, I am uncovering who was in charge of the collections and when, as well as the various whereabouts of the collections and how these spatial relationships changed over time. The collections were often moved around North Campus as different buildings served as the University's library and museum during the early years. They survived the Civil War, multiple moves, and more than one funding crisis. Throughout this research, I have discovered many important names of professors involved in the natural sciences and their contributions to the collections over the last 200 years. This study offers a glimpse into the initial years of the GMNH by looking at the who, what, where, and when of this rich cabinet of curiosity and considers its legacy at the University of Georgia.

**Optimization of *in vitro* IDO Assay as a Surrogate for T-Cell Suppression**
Jack McRae, Foundation Fellow, CURO Research Assistant
*Dr. Ross Marklein, Chemical, Materials, and Biomedical Engineering, College of Engineering*

The inherent characteristics of mesenchymal stromal cells (MSCs) varies widely between cell lines, and very few quantitative measures of potency exist, presenting a large problem in their implementation into human models. Preliminary evidence suggests that the enzyme indoleamine 2,3Dioxygenase (IDO) plays a significant role in the mechanism of action of MSCs for treatment of immune diseases. The activity IDO is often correlated with T-cell suppression as an *in vitro* measure of this potency; however, more rigorously controlled studies are necessary to fully demonstrate the predictive value of IDO for MSC immunosuppression. In this study, we will optimize and validate an *in vitro* assay for IDO activity through quantitative assessment of the presence of L-kynurenine with a colorimetric assay. Following the optimization of this assay, the IDO activity of multiple MSC lines derived from different sources will be assessed for their IDO activity, and these results will then be compared to a well-established T-cell suppression assay. If a strong correlation does exist, the IDO assay will serve as a surrogate potency assay for T-cell suppression as the IDO assay can be performed more rapidly and more cost-effectively than the T-cell suppression assay.

**Capturing the Essence of Cultural Landscapes: Most Effective Graphic Representations**
Braden T. Meadows
*Prof. Cari Goetcheus, Environment and Design, College of Environment and Design*

On a daily basis, people are surrounded by and interact with cultural landscapes. These landscapes—the result of interactions between humans and nature over time—are physically manifested in many forms but in all cases represent what distinct cultures hold valuable. Cultural landscapes range in scale from the National Mall, where numerous Presidents have been inaugurated, to the acreage of a rural homestead in South Georgia. Understanding and "reading" a cultural landscape allows one "to see" into a culture - whether that be a national culture or an individual family. My research focuses on the manner in which professionals and amateurs document the many aspects of cultural landscapes. The breadth of graphic representations included in this research ranges from ink on mylar film to advanced three-dimensional, measured digital data of landscapes and structures. Through this research, efforts will be made to identify and distinguish which forms of graphic representation most effectively communicate the defined features of a cultural landscape. Because there will be significant overlap between the professions of landscape architecture, horticulture, engineering, architecture, historic preservation, and graphic design, an effort will be made to synthesize from these professions the best graphic communication examples, to better promote interdisciplinary contextual design in regard to cultural landscapes. One final intent of this research is to make suggestions to improve current documentation systems and procedures to better protect, document, and represent cultural landscapes.

**Language Development Outcomes for Young Children who are Deaf or Hard of Hearing in the State of Georgia**
Elizabeth Medlock
Stacey Agadoni, Lucette Rivera, Madilyn Patterson, Kelley Ngo, Gabrielle Herman
*Dr. Sandie Bass-Ringdahl, Communication Sciences and Special Education, College of Education*

The positive impact of early identification and intervention of hearing impairment on language development is well documented in the literature. Children who are identified and receive intervention at young ages, in general, perform better on measures of language development than those identified later. The identification of hearing impairment and the provision of intervention services represent primary functions of state early hearing detection and intervention programs. One such early intervention provider of birth to 3 services is the Georgia Parent Infant Network for College of Educational Service for children who are deaf or hard of hearing (DHH), or Georgia PINES. The current investigation represents a collaborative effort between The Pediatric Auditory and Early Speech Development Laboratory at the University of Georgia and Georgia PINES. The language development outcomes for a select group of children enrolled in Georgia PINES is examined and compared to national data sets. Variables influencing

performance, and recommendations based on the findings will be provided.

**The Relationship Between Pregnancy-Associated Malaria to Adverse Pregnancy Outcomes and Maternal Antibodies: A Systematic Review and Meta-Analysis**

Mansi Mehta, CURO Research Assistant
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Pregnancy-associated malaria (PAM) is a subtype of *Plasmodium* sp. infection that has been associated with adverse pregnancy outcomes such as preterm birth (PTB) and low birthweight (LBW), which are among the leading causes of infant mortality globally. Rates of PTB and LBW are high in countries with a high burden of malaria, including sub-Saharan Africa. PAM may be a contributing factor to adverse pregnancy outcomes, but is understudied. To investigate the relationship between PAM and adverse pregnancy outcomes, specifically PTB and LBW, we conducted a systematic review. The title and abstract of all studies was screened by two reviewers for possible inclusion, and the full text of selected studies was reviewed to ensure they met inclusion criteria (primary data, cohort study, reported number of PTB and LBW births among women with and without PAM) Our search terms yielded 2,232 articles, of which 13 met our final inclusion criteria. Six studies examined associations between PAM and PTB and LBW, respectively (population size ranging from 35 to 923 women). The overall risk of LBW was 73% higher among women with PAM compared to women without PAM (95% confidence interval [CI]=1.31-2.28). Risk of PTB among women with PAM was marginally increased (relative risk=1.13, 95% CI=0.94-1.35) compared to women without PAM. This meta-analysis demonstrated that infection with PAM during pregnancy is a risk factor for adverse pregnancy outcomes, specifically LBW. Further studies of PAM and its harmful effects on birth outcomes is warranted in an effort to improve the health of pregnant women.

**Establishment of a Light Sheet Imaging Protocol for Studies of Lizard Limb Development**

Megh Mehta, CURO Honors Scholar, CURO Research Assistant
*Dr. Douglas Menke, Genetics, Franklin College of Arts and Sciences*

The question of how vertebrate morphology evolves and is controlled by various genes is still shrouded in mystery. A deeper understanding of morphological evolution is very much a topic of interest, but requires the study of additional species. For this purpose, *Anolis* lizards are an interesting and potentially revolutionary model, as the limb skeletons of different *Anolis* species are adapted for movement across diverse terrains. However, there is, as of yet, no consistent protocol for analyzing the structural morphology of anole lizard embryos in 3Dimensions. While 2Dimensional imaging of these skeletal structures is routine, capturing 3Dimensional images of this complex skeletal structure would be a powerful approach for the analysis of limb morphology. In order to establish such a protocol, I will combine light sheet microscopy and alizarin red skeletal staining techniques to efficiently image the embryonic limb skeletons of brown anole lizards in three dimensions. This will be accomplished through adjusting and combining published protocols relating to staining, preserving, and imaging similarly staged embryos of other species. The ultimate objective of this study is to establish a robust imaging protocol and apply it to brown anole embryonic mutants to detect morphological changes that differ from wild type animals. This will help us better understand which genes drive the development and evolution of the vertebrate limb skeleton.

**Solid Waste Assessment of Jordan**

Hannah Meise, CURO Research Assistant
*Dr. Jenna Jambeck, Environmental, Civil, Agricultural, and Mechanical Engineering, College of Engineering*

According to research conducted by Dr. Jambeck in 2015, 60% of the plastic waste in Jordan is mismanaged and ends up in the environment. In site observations conducted in 2017, the polymer PET in water bottles is a significant source of plastic pollution within the country. The PET in the environment in Aqaba, Jordan, along the coastline of the Red Sea is likely a contributor to Ocean Plastic. But there is a potential opportunity to collect this PET for recycling into new, durable, products working the NextWave Plastic consortium of companies. This research will develop a baseline of the plastic and PET mismanaged in Aqaba by applying a circularity assessment protocol and synthesizing existing data. The feasibility of developing a collection and recycling system to bale and export PET for recycling will be assessed. We will work with the port, the US Embassy and NextWave plastics partners on this project. Anticipated findings from this research will quantify the plastic waste production and leakage occurring of these plastics into the ocean from Aqaba, Jordan. This data will contribute to a larger scope of defining how much plastic is entering our oceans as well as the required criteria for a recycling facility.

**The Male Domain: Digital Game-Based Learning for HPV Vaccination Among Young Males**

Debbie Mekonnen, CURO Research Assistant
Shemar Little
*Dr. Gabrielle Darville, Health Promotion and Behavior, College of Public Health*

HPV is the most common sexually transmitted disease (STD) with highest infection rates among those sexually active under 25. Although vaccination can reduce HPV cancers among men, public health interventions have primarily targeted females. Increased gaming rates among men provide innovative opportunities to motivate behavior change. This study sought to explore which game development and design strategies are most effective in a HPV / sexual health digital game. We also sought to capture information relevant to preferred gaming platforms and game mechanics (health messages, avatars, and visual imagery). Interviews (n=22) were conducted with experts in the field of sexual health, cancer prevention, health education, game design, technology and health communication to collect qualitative data. Using grounded theory, interview data was coded and emergent themes were identified. Game Mechanics most mentioned included role-playing, social

interaction, narrative and rewards. Experts felt as though it was important to keep the game in context of the target audience as well as integrate the game into an existing game/game scenario or application. Pertaining to sexual health, they felt as though the game should link to external resources and enlist partnerships or collaborations with external health agencies. Moreover, while there are benefits to each gaming platform, games on mobile phones and tablets are most appropriate. Digital games are a non-confrontational approach to discussing HPV and can increase knowledge/ awareness and positively influence behavior change towards vaccine uptake. Digital games present a safe environment for role-play through simulated activities without real-world consequences.

**Anything but Ironic: Robert Schumann's *Drei Fantasiestucke***
Sarah Mendes
*Dr. Emily Gertsch, Music, Hugh Hodgson School of Music, Franklin College of Arts and Sciences*

Following Robert Schumann's "chamber music year" of 1842, he began to produce Hausmusik such as *Drei Fantasiestücke Op.73*. In this paper I will discuss how the application of narrative analysis applies to the second movement of Schumann's *Drei Fantasiestücke Op.73*. Using the narrative method of Byron Almén results in a romantic reading of the piece. More specifically, my analysis reveals a romantic narrative applied to a fantasy piece. I would argue from my listening perspective that fantasy pieces usually fall under the archetype of irony, as fantasies are highly improvisatory, akin to the somewhat disjunct nature of irony. This romantic narrative consists of the victory of an idealized element (order) and has certain characteristics, including the temporal presence of one theme over another, and the presence of nostalgia. Unlike the first movement of this work, the second movement has integrated fantasy topics into both the positively viewed order and negatively viewed transgression including metrical dissonance, drifting key areas (especially bVI), and improvisatory motives that all contribute to "freedom of action" in fantasies. I argue that an order-imposing hierarchy consisting of metrical dissonance, the tonic key of A major, and complete phrases is victorious over the transgressive elements of metrical consonance, key areas outside of A major, and improvisatory independence, thus creating a romantic narrative when mapped across the first movement of *Op.73*. The integration of these fantasy topics shows a progression towards fantasy as positively viewed in direct contrast to its tragic context in the previous movement.

**Transcriptome Analysis of Perennial Rygrass for Heat Stress Tolerance**
Nikhil Menon, CURO Research Assistant
*Dr. Ali Missaoui, Crop and Soil Sciences, College of Agricultural and Environmental Sciences*

Perennial ryegrass (*Lolium perenne*) is used as a forage crop, but does not typically tolerate high heat conditions. This study aims at finding the genetic basis of heat tolerance in perennial ryegrass using transcriptome analysis. Seven populations of perennial ryegrass evaluated for their persistence, and biomass yield—Remington, RemingtonNEA2, BG-34, GDP 14019, GTP14021, GPT14023, and Banquet II—are initially grown in the greenhouse and then tested in the growth chambers for heat tolerance. Two sets of plants, treatment and control, each containing five replications of the seven cultivars are placed in separate growth chambers. The heat treatment group are exposed to 38°C day and 33°C night temperature, while the control group is placed under 23°C day and 18°C night temperatures keeping other conditions similar. After four weeks, leaf tissue samples are collected, frozen in liquid nitrogen, and stored at -80°C. RNA is isolated and sent to Georgia Genomics and Bioinformatics Core (GGBC) for RNA library preparation and sequencing (RNA-Seq). Subsequent transcriptome analysis is performed using a bioinformatics pipeline called Trinity. From the analysis, we will determine the differentially expressed genes in response to heat stress. We expect that there are differences in gene expression between the treated and untreated plants. These genes will have potential to improve the heat stress tolerance of perennial ryegrass and its suitability to Georgia's environment.

**Improving Healthcare Experiences for Cambodian Refugees Through Bridging Western and Traditional Medicine**
Johanna Mercurio, CURO Research Assistant
*Dr. Denise Clark Lewis, Human Development and Family Science, College of Family and Consumer Sciences*

Cambodian refugees comprise approximately 25% of Southeast Asian refugees in the United States and have continued to utilize traditional healthcare approaches from their home country. The hierarchy of health-care strategies are distinct for aging refugee populations, and this reflects the difference in experience between populations who have undergone international resettlement and populations who have not. To explore this issue through the lens of Cambodian refugees, we asked two questions: 1) how are illnesses defined in Cambodian refugee populations and 2) how do Cambodian refugees treat these illnesses. To answer these questions, we conducted a literature review using the Household Production of Health framework and reviewed personal narratives obtained through in-depth interviews with Cambodian refugees that document sentiments towards utilizing traditional Cambodian medicine compared to Western biomedicine in treating a variety of ailments, particularly chronic illness related to aging. We found that Cambodian refugees are shown to have a general mistrust of Western medicine and healthcare, which can cause inadequate treatment among refugees for diseases such as hepatitis B and type 2 diabetes. In response to our findings, a culturally responsive manual discussing traditional medicinal treatments has been created and will be distributed to healthcare providers that see a significant Cambodian refugee population. The manual has a particular focus on ailments common in aging populations. The manual aims to supplement existing healthcare practices with Western biomedicine while respecting existing cultural practices and will serve as a tool to bridge the gap in the healthcare experience for Cambodian refugees.

**Neural Morphometry Impacting Sexual Risk Decision-Making in Young Adult Gemales: A Pilot Study**

Delaney Metcalf, CURO Summer Fellow
*Dr. Lawrence Sweet, Psychology, Franklin College of Arts and Sciences*

Due to a high volume of sexual risk behavior, Sexually Transmitted Infections (STIs) are greatly impacting the lives of many women. The present study included 25 young adult women from the southeastern United States. Participants reported on sexual risk behaviors, specifically a history of STIs, completed a novel sexual Stroop task, and underwent functional magnetic resonance imaging (fMRI) to acquire estimates of regional brain volume and functioning. This study analyzed the relationship between prior frequency of STIs and performance on a novel sexual Stroop task to measure cognitive interference. Findings include significant relationships between STIs and both average number correct responses to sexual words and average reaction time for sexual words. This study also examined the relationship between STIs and neural morphometry in regions that have been associated with risky decision making, such as the insula, superior frontal cortex, rostral middle frontal cortex, and the lateral orbitofrontal cortex. Results indicate a significant negative correlation between frequency of STIs and left insula thickness, right superior frontal thickness, and left lateral orbitofrontal volume. Further research is warranted and should include a larger more inclusive sample size. This study suggests that interventions aimed at improving cognitive functioning or strengthening neural development may reduce STI prevalence.

**Félix González-Torres's *Portrait of Ross* in L.A.: Unmaking Binary Laws**

Julianne Miao
*Dr. Nell Andrew, School of Art, Franklin College of Arts and Sciences*

Felix González-Torres's *Untitled (Portrait of Ross in L.A.)* [1991] uses its unconventional medium and presentation to reveal holes in the limited language of the traditional art historical narrative. Composed of a pile of metallic-wrapped candy, the work of art ideally weighs 175 pounds, but its mass depletes as visitors are invited to take pieces from the pile. Exhibitors of the candy pile are tasked with replenishing the candies when deemed necessary. The artwork serves as a portrait of the artist's passed lover, Ross Laycock, who died from AIDS-related complications. The work creates an accessible narrative that parallels Ross's body's deterioration from AIDS with the candy pile's slow depletion. However, binary descriptions of form and content limit insight on the work of art's performative dimension. Research on Georges Bataille's early twentieth-century theory of the formless reveals parallels between the philosopher's interest with the base and invisible elements as valuable parts of the whole work. Applying Rosalind Krauss and Yves-Alain Bois's contemporary examples and reconsiderations of the term, this paper demonstrates how *Portrait of Ross*'s most grotesque aspects reveal itself through intangible features such as taking, eating and gravity. Repetitive and mundane candies bring the work of art closer to everyday life while allusions to devouring the dying body of Ross reveal its morbidity. *Portrait of Ross*'s unorthodox characteristics focus on deconstructing equivocal form in art-making rather than creating concrete definitions of what works of art mean.

**Characterizing NET Release Stimulated by Cystic Fibrosis Clinical Isolates of *Staphylococcus aureus***

Arthur Miller, CURO Research Assistant
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Cystic fibrosis (CF) is a genetic condition characterized by recurrent airway infections leading to decline in lung function and quality of life. One of the ways neutrophils (PMNs), the most abundant type of white blood cells in the body, attempt to fight off pathogens is through the formation of neutrophil extracellular traps (NETs). While NETs released from neutrophils trap and kill extracellular pathogens, increased NET formation in CF patients is correlated with lung disease severity. It is believed that NETs may be detrimental to the condition of CF patients. *Staphylococcus aureus* is a common pathogen present in the CF lung, it adapts to neutrophil defenses and leads to CF lung disease progression. Laboratory strains of *S. aureus* have been characterized for their abilities to induce NETosis in PMNs, however, information about CF clinical strains of *S. aureus* and their effect on NETosis remain unclear. Healthy human PMNs were exposed to 10 different CF clinical isolates of *S. aureus* obtained from collaborators at the Emory University CF Center, and NET release was measured by the membrane-impermeable DNA-binding dye, Sytox Orange. Tested *S. aureus* strains (10 motility of infection, *S. aures*:neutrophil ratio) induced significant NETosis ($p = 0.00003$). SA-24, SA-25, and SA-47 had the highest NET activation. Almost all CF clinical strains of *S. aureus* induced significant NET formation, and more trials are under way. Overall, our *in vitro* data indicate that *S. aureus* could serve as a clinically relevant NET-inducer in CF airways.

**Neural Networks for Political Sentiment Classification on Social Media**

Eric Nathan Miller, Ramsey Scholar
*Dr. Ismailcem Budak Arpinar, Computer Science, Franklin College of Arts and Sciences*

A recent trend in the field of data science is the integration of scientific theory in the collection of information. Additionally, the concept of the semantic web (a proposition for the conversion of web-based information into more organized datasets) prompts the creation of online data that can be understood not only by humans, but also by machines. At the intersection of these two fields is the use of neural networks to classify and categorize human language and sentiment online, especially on social media sites. Our research aims to provide an interface for predicting the political alignment of users on Twitter through entry into a neural network. Our test data consists of the posts of both Democratic and Republican politicians, through a variety of neural network types in order to determine which method yields the most reliable results on our test data (a more general population). Additional tools include natural language processing programs, used for the conversion of words and sentences to quantified data. Through this interface, we intend to deliver a more consistent mode of

detecting political ideologies, allowing for broader (through the immensity of available data on social media) and more automated data collection for purposes such as political science surveys and studies.

**_Scandal_: The Hyper-Sexualization of Black Women in Network Television**

Alyssia Mitchell, CURO Honors Scholar
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In contemporary network television dramas, Black women are rarely represented in major roles. Black actresses are often cast in supporting roles, and often, the characters they play do not capture the strengths and abilities of Black women. Actresses such as Kerry Washington and Viola Davis have recently broken this mold through their lead roles in primetime television. Although barriers are being broken in terms of representation, less understood is whether controlling stereotypes still remain prevalent. This study will focus on understanding the portrayals of Black female characters, specifically analyzing the romantic relationships that black women experience in major roles on primetime television. This will be executed by completing a close analysis of episodes from the ABC drama *Scandal*. *Scandal* is an American political television series starring Kerry Washington as Olivia Pope. The show takes place in Washington, D.C. and focuses on Olivia Pope's crisis management firm and its staff, as well as staff at the White House and the surrounding political scene. Examining this contemporary television show, I will chart the various relationships between characters, specifically Olivia Pope, and analyze the frames of racial representation. I expect to find that the Black woman is increasingly sexualized and partakes in more deviant relationships as opposed to the development of more domestic and hegemonic relationships among white characters. This research will demonstrate that although Black women are now performing in transformative roles that are strong, intellectual, and independent, rather than caricatures, contemporary network television still reinforces historical racial stereotypes.

**The Watershed Learning Network: Engaging Communities in Freshwater Science Through Community-University Partnerships and Service Learning**

Madison Monroe
*Dr. Krista Capps, Ecology, Odum School of Ecology*

Urban watershed management is critical to support the structure and function of freshwater systems and well-being of human populations throughout the globe. The aging and obsolete water infrastructure of urban watersheds are prone to flooding, potentially exposing both the watershed ecosystems and the people living in affected neighborhoods to pollution and pathogens. To effectively engage in efforts to manage urban watersheds, monitor water quality, and mitigate the effects of flooding and/or failing water infrastructure, community members need new educational resources to bolster their understanding of watershed ecology and the environmental impacts of urbanization. Here, we will describe the Watershed Learning Network (WLN), a project developed as a collaboration between Environmental Community Action (ECO-Action), American Rivers, and a service-learning class in urban ecology at the University of Georgia. The purpose of the WLN was to take the lessons and tools developed through the Atlanta Watershed Learning Network and develop an online resource for communities living in urban watersheds throughout the world. We are excited to continue enhancing the WLN and will also share ways in which participants can contribute to the network through original research, writing, and class assignments.

**Good Lab Practice Standards and Its Effects on Job Satisfaction in an East African Medical Research Center**

Emily Moody, CURO Research Assistant
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In order to obtain the funding necessary for malaria research labs to function well, it is necessary to first become Good Lab Practice (GLP) certified. The National Institute of Medical Research (NIMR), Amani Centre is a malaria lab funded by the World Health Organization (WHO), located in a rural town one hour from the East African coast. NIMR is currently in the process of becoming GLP certified in order to continue to receive funding from WHO. In the summer of 2018, our team travelled to NIMR and conducted surveys and interviewed the employees to discuss job satisfaction and current knowledge of GLP standards. I will discuss the implications of GLP, how it affects the employees, and some hopeful results of GLP standards regarding the future of the lab. Conclusions of this project are ongoing, so rather than offer additional feedback for the employees' job satisfaction in regards to GLP, we will instead focus on how the lab may improve with GLP and some aspects pertaining to employees job satisfaction that may be fulfilled should GLP be achieved. I hope that this poster will highlight the benefits of GLP certification in an East African malaria lab setting, and that employees in these scenarios will see the positive impacts GLP can have on their workplace by reviewing this project.

**Exposure to Community Violence Among Youth: The Buffering Effects of Parenting Strategies**

Avery Knight Moore
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Community violence is a public health concern that significantly affects youth risk for psychopathology. Youth exposed to community violence are at higher risk for internalizing psychopathology (often displayed as fear, anxiety, depression, or withdrawal) and externalizing problems (aggression or delinquency). Some youth who are exposed to adversity pursue positive developmental trajectories, a defining characteristic of resilience. The current study aims to examine whether a) youth exposed to community violence during early adolescence are more likely to develop internalizing or externalizing problems, and b) parenting behaviors exacerbate or reduce the development of internalizing or externalizing behaviors in youth. These analyses will be done on a large longitudinal national data set (the LONGSCAN- Longitudinal Studies of Child Abuse and Neglect). The Child Behavior Checklist will be

used to assess internalizing and externalizing behaviors. The LONGSCAN measures for Neglectful Parenting Behaviors (a Likert scale measuring frequency of needs met), Interparental Conflict Strategies (assessed using the Conflict Tactics Scale), and Parental Monitoring (monitoring of extracurricular and social whereabouts) will be used as moderators for the History of Witnessed Violence measure for youth aged 12-14. It is hypothesized that a) exposure to community violence will increase both youth's internalizing and externalizing problems over time, and b) parental monitoring and effective interparental conflict strategies will buffer the effect of community violence on internalizing or externalizing problems whereas neglectful parenting behaviors will exacerbate this effect. Identifying the effects of these parenting behaviors will help to develop useful resources and interventions for conflict-affected youth.

**Job Satisfaction in an East African Medical Research Center**
Fransuave Moore, CURO Research Assistant
*Dr. Malissa Clark, Psychology, Franklin College of Arts and Sciences*

Industrial Organizational Psychologists have studied numerous human behaviors in organizations and workplaces, however, comparably few studies have been done outside the western setting. Our research team utilized interviews as well as surveys to explore job satisfaction at a medical research center in East Africa. Due to the site being culturally and geographically different than where I/O Psychology research is typically conducted, we decided on an inductive approach to explore themes. The participants for this study were 30 employees out of the 36 total employees at the site. All ranged in age from 18-65, 23 were male and 7 were female, all were citizens of the East African country where the site is located, and all had a primary language of Swahili. All materials were administered in the Swahili language. The primary data collection tool was a semi structured interview. A survey with Likert-scale questions was administered to each individual after completion of their semi-structured interview. Open ended questions rooted in responses from the semi-structured interviews and surveys were administered to a focus group of twenty-two of the thirty participants. The findings include a want for further education and training, high levels of perceived organizational support, and the expression of cooperation being a source of satisfaction. Education, training, and perceived organizational support are known to be correlated to job satisfaction. Cooperation being a source of satisfaction may be a gap in the literature. This study increases our understanding of job satisfaction in a context that has not been heavily investigated.

**A Qualitative Examination of Workaholic Partner's Perspective-taking**
Fransuave Moore, CURO Research Assistant
Tatiana Anthony, William Allen, Janicka Crocker
*Dr. Malissa Clark, Psychology, Franklin College of Arts and Sciences*

Workaholism is defined as an inner compulsion to work beyond what is expected and has been shown to negatively impact the family unit. The present study utilizes a qualitative methodology to examine one possible factor in the relationship between workaholism and family outcomes: spousal perspective taking. Specifically, we examined the degree to which spouses attempted to take their workaholic partner's perspective in order to understand why he/she worked so excessively, and how perspective taking attempts resulted in positive and/or negative outcomes for the spouse and/or workaholic. To answer these research questions, a total of 55 self-identified spouses of workaholics were interviewed. Participants were recruited via social media, and eligibility (e.g., spouse exhibited characteristics typical of workaholics) was determined through a short online screening questionnaire. Interviews were conducted using Skype, and each interview was recorded and transcribed. Average interview length was 30 minutes. An iterative, inductive approach was used to code interview responses into relevant themes. Three undergraduate research assistants independently coded each interview response, and an initial list of codes/preliminary themes was created. Initial findings suggest perspective taking results in a mix of positive and negative outcomes. For example, while some spouses report perspective taking enables them to be more understanding of their workaholic spouse, others report that perspective-taking engenders negative emotional reactions, such as frustration and anger. Future iterations of coding will focus on factors influencing these divergent outcomes. This study is significant because it investigates the effects of perspective taking on the participant and/or the workaholic, allowing for a unique examination of workaholism through qualitative means.

**A Deleuzian Interpretation of Biosemiotics**
Miles Morgan, CURO Research Assistant
*Dr. O. Bradley Bassler, Philosophy, Franklin College of Arts and Sciences*

The goal of this paper will be to compare the philosophical underpinnings of Code Biology and similar fields in Biosemiotics with those of Gilles Deleuze. The general idea of Code Biology is that the genetic code is indeed a code which is not entirely reducible to chemical analysis. Certain large claims such as those regarding the basis of the evolution of life are based on the idea that semiosis is not reducible to universal laws. Another large claim to be evaluated is whether the use of semiotics allows for the introduction of novelty. As is pointed out in work by Marcello Barbieri, certain approaches to this problem yield arguments employed by supporters of intelligent design and I evaluate to what extent biosemiotics and intelligent design are compatible. In addition to the two current paradigms of autopoiesis and natural selection, my work examines the existence and viability of Code Biology as a third paradigm. Thus, the expected methodology of this this research will be comparative analysis. In this work I anticipate finding that Code Biology provides a more natural explanation for evidence than a purely physicalist approach. Deleuze, throughout his work, draws on a philosophical approach which can only benefit from new and empirical scientific developments.

**Early Childhood Language Experiences: Exploring College Students' Knowledge and Perspectives**

Katie Grace Morge
Katie Spathelf, Haley Hosty, Hannah Reuther
*Dr. Jenny Brown, Communication Sciences and Special Education, College of Education*

Children's language development is largely influenced by their language environment. Differences in child language outcomes have been attributed to differences in the quantity and quality of language input from parents and other caregivers. The impact of language environment on child language outcomes is particularly important in the infant and toddler years. Early language environments have been associated with future academic, social, and language performance. Despite its importance, knowledge and perspectives vary on which factors contribute to enriching early language environments. Previous research has demonstrated that many parents have limited knowledge about the important role of responsive parent-child interactions in supporting current and future language development. The purpose of this study was to explore college students' knowledge and perspectives on early language experiences. Our research team interviewed college students through semi-structured individual interviews. Questions addressed topics ranging from the role of media, impact of toys, and influence of caregivers on children's language development. All interviews were audio recorded and transcribed verbatim. We qualitatively analyzed the data through an iterative process of developing codes and grouping data by common codes into themes. Thematic analysis findings will be presented through written descriptions and graphical illustrations. Future applications and research implications will be discussed.

**Investigating a Putative Membrane Transport System in *Helicobacter pylori***

Sam Weber Morris, CURO Research Assistant
*Dr. Timothy Hoover, Microbiology, Franklin College of Arts and Sciences*

*Helicobacter pylori*, and a subset of Gram-negative bacteria, synthesize a flagellar sheath that surrounds the flagellum. The components that make up the flagellar sheath have not been identified, but is thought to be an extension of the outer membrane. Our lab has identified cardiolipin as a critical component for flagellar synthesis, and due to its intrinsic negative curvature, may be localized to the inner leaflet within the sheath. Although the exact role of cardiolipin during flagellar synthesis has yet to be discovered, we hypothesize it is required to be inserted into the outer membrane and is a major phospholipid in the flagellar sheath. Its absence can prevent flagellar synthesis and severely reduce motility in *H. pylori* G27 and B128. A translocation system of cardiolipin from the inner membrane to the outer membrane has yet to be identified. Our lab discovered an operon (HP1486-1489) encoding a putative cardiolipin transport system in *H. pylori*. When HP1489, which encodes a TolC-like outer membrane efflux protein, is deleted we observed a significant reduction in motility. However, the wild type version of G27 has recently experience decreased motility in the laboratory setting. In order to combat to this, a more motile version of G27 called G27M was transformed with a previously constructed plasmids pGEM-T easy 1488: *kan-sacB* and 1489: *kan-sacB*. Using G27M will hopefully give results that are more statistically significant and provide more evidence of the group of genes' involvement in flagellar biosynthesis. In addition to this side project, another goal of this research is to determine how deletion of HP1486 and 1487, which each code for an ABC-2 type transporter located in the inner membrane, affects motility and flagellar biosynthesis in *H. pylori* G27M and B128.

**State Influence in Presidential Primaries**

Brett Daniel Morrison
*Dr. James E. Monogan III, Political Science, School of Public and International Affairs*

The aim of this study is to analyze and quantify the relative amounts of influence yielded by individual states in the Democratic and Republican Presidential primaries over the last forty years. An individual state's amount of influence can be defined as the ability of said state to affect a candidate's platform. By measuring the relationship between a candidate winning a given state and winning the primary, this study can discern which states are most important to win (and thus most influential). The central goal of this research study is to quantify the relationship over time between victory in a state primary and victory in the overall primary. This study additionally seeks to find correlations between that variable and variables including demographic composition, per-capita GDP, and position in the primary schedule. Through correlating these variables, this study seeks to determine whether states with earlier primary dates, higher per-capita GDP, or other advantages are more important for candidates in winning the overall primary.

**The Effect of DHA and Lutein Supplementation during Pregnancy on Reproductive Performance in a Pig Model**

Cara Morrison, CURO Research Assistant
*Dr. Hea Jin Park, Foods and Nutrition, College of Family and Consumer Sciences*

Docosahexaenoic acid (DHA) is an omega-3 fatty acid. Previous research suggests that DHA may have a role in preventing pre-term births and low birth weight. Lutein, a carotenoid is recommended to be included in the maternal diet due to its antioxidant and anti-inflammatory properties. Both DHA and lutein have been shown to benefit neurodevelopment of the offspring and thus recommended during gestation. This study aimed to investigate the impact of supplementation of DHA and/or lutein during the late gestation period on the reproductive performance in a pig model. Pregnant sows were provided the following diets during the last trimester of gestation: Control (C), Lutein only (L, 2.2 mg/kg/d), DHA only (D, 75 mg/kg/d), and a combination of DHA and Lutein (DL, 75 mg/kg/d DHA and 2.2 mg/kg/d lutein). The average gestation length across all of the sows was not significantly different between the groups (116.3±0.9, 115.0±0.6, 116.0±0.8, and 115.0±0.5 days in C, L, D, or LD, respectively). The average birthweight

of piglets showed no significant difference (1.5±0.1, 1.3±0.1, 1.5±0.2, and 1.3±0.1kg in C, L, D, LD, respectively). Number of piglets born alive/dead were similar between groups (11.3±2.2, 15.7±1.5, 9.4±2.5, 11.0±2.1 born alive, 1.0±0.6, 1.3±0.9, 1.8±0.1, 0.4±0.3 born dead in C, L, D, or LD, respectively). Gender ratio (male/female) was also similar between groups (0.7±0.0, 1.3±0.2, 1.8±0.8, 1.5±0.5 in C, L, D, or LD, respectively). In conclusion, dietary supplementation of DHA and/or lutein at the selected dose during late gestation did not exert significant effect on the reproductive performance of the sows.

**The Relationship Between Mouthguard Use and the Perceptions of Safety and Concussions in Collegiate Club Ice Hockey Athletes**

Tourner Moseley, CURO Research Assistant
*Dr. Robert C. Lynall, Kinesiology, College of Education*

Mouthguards are common practice as safety equipment in many sports where sports-related concussions and facial injuries occur. Though previously required as protective equipment with penalties for non-compliance, the National Collegiate Athletic Association (NCAA) and American Collegiate Hockey Association (ACHA) now only recommend mouthguards be worn. The purpose of this study was to determine mouthguard usage in ACHA hockey players and understand player perceptions about the potential for mouthguards to reduce head, face, and dental injuries. A survey regarding athlete mouthguard perceptions was distributed to 190 Division III ACHA athletes via email. We hypothesized that most players would not wear mouthguards and most players would not believe wearing a mouthguard would reduce the likelihood of sustaining a concussion. Of the athletes who responded, 35.7% (30/84) reported wearing a mouthguard in some fashion while playing ice hockey; 96.7% (29/30) of those who reported wearing a mouthguard reported wearing them as directed by the manufacturer. 69.4% (59/85) of players believed properly wearing a mouthguard would reduce the likelihood of sustaining a concussion and 67.1% (57/85) of players believed properly wearing a mouthguard would reduce the severity of a concussion. The majority of survey participants perceive mouthguards to reduce the likelihood/severity of concussions, but only 36% wear a mouthguard during collegiate ice hockey. Several contributors to non-compliance may be discomfort and the inability to talk while mouthguards are in place.

**Biological Nitrogen Fixation is Dynamic Following Disturbance in Southern Appalachian Forests**

Jessie Motes, CURO Research Assistant
*Dr. Nina Wurzburger, Ecology, Odum School of Ecology*

Anthropogenic disturbances have greatly altered terrestrial ecosystems, making it critical to understand natural disturbance-recovery mechanisms. One such mechanism is the emergence of trees capable of symbiotically fixing-nitrogen. In the southern Appalachians, logging and the chestnut blight in the early 20$^{th}$ century were disturbances that triggered forest regrowth. In this region, black locust, *Robinia pseudoacacia*, a dominant, early-successional tree species, supports biological nitrogen fixation (BNF). The goal of this study was to quantify BNF by black locust across a forest chronosequence and determine its relative investment towards BNF and stem growth. We hypothesized that BNF would peak around two decades post-disturbance when black locust dominates the canopy, and then decline over time as N becomes less limiting. To test this hypothesis, we quantified BNF by 118 stems of black locust across 11 stands ranging from 3-75 years post-disturbance using nodule sampling and paired acetylene reduction assays and $^{15}N_2$ incubations. Aboveground biomass was estimated from stem diameter and tree height using species-specific allometry. We found that BNF by black locust peaks within the first decade following disturbance. Our results also revealed a time lag between peak BNF and aboveground growth following disturbance. As a result, we found that the relative investment of BNF decreased exponentially with time. The shift in relative investment towards BNF and the early age at which BNF peaks highlights the importance of studying early successional forest dynamics and nutrient cycling when assessing long-term legacy effects of disturbance.

**Determination of the Expression Timeframe of Tbx1 in the Third Pharyngeal Pouch**

William Mudd, CURO Research Assistant
*Dr. Nancy Manley, Genetics, Franklin College of Arts and Sciences*

The thymus is a lymphoid organ in which T cells mature while the parathyroid glands regulate blood calcium levels via the secretion of parathyroid hormone. Each organ originates from the third pharyngeal pouch within mouse and human embryos. *Tbx1* is found within the center of the regulatory network that dictates the lineage decisions of cells within the third pharyngeal pouch. The loss of *Tbx1* expression has been associated with the DiGeorge Syndrome phenotype in which hypoplasia of the third pharyngeal pouch occurs, while ectopic *Tbx1* expression suppresses thymic epithelial cell differentiation. Initially, *Tbx1* is expressed throughout the third pharyngeal pouch but later in development, its expression localizes to the parathyroid domain of the pouch as it differentiates. While phenotypic results of various *Tbx1* expression levels within the third pharyngeal pouch have been studied, the timeframe of *Tbx1* expression within the third pharyngeal pouch has yet to be elucidated. This project aims to determine the time point of *Tbx1* expression within the third pharyngeal pouch for future study of the pouch's development. Immunohistochemistry staining of paraffin fixed and sectioned mice embryos will be used to identify the embryonic age when *Tbx1* expression is halted within the third pharyngeal pouch. Characterization of the expression timeframe of *Tbx1* within the pouch will provide a framework for future study of the role *Tbx1* plays in the determination of parathyroid vs. thymus cell fate.

**Investigation of Chromosome Breaks in Canine Ocular Neoplasms of Melanocytes**

Adrea Mueller, CURO Honors Scholar
*Dr. Paige Carmichael, Pathology, College of Veterinary Medicine*

In veterinary and human pathology, melanocytoma refers to benign neoplasms of melanocytes originating from the epidermis in the skin. These benign neoplasms originate from dermal melanocytes and can progress to malignancy.

Ocular melanocytic neoplasms originate from a different population of melanocytes. In veterinary pathology, melanoma and melanocytoma have been used interchangeably, and in dogs, ocular melanocytic neoplasms rarely progress to malignancy. The goal of this study is to evaluate the presence of chromosome breaks in ocular melanocytic neoplasms compared to dermal melanocytic neoplasms and non-neoplastic tissue. Our hypothesis is that in dogs as in humans, ocular and dermal melanocytes represent two different populations and that terminology used for human and canine melanocytic neoplasms may be incorrectly extrapolated to the eye. Canine ocular and dermal melanocytic cases previously submitted to the Diagnostic Ocular Pathology Service were evaluated histopathologically for criteria that would allow categorization into either melanoma or melanocytoma. A series of unstained histology slides were cut from each case block and the slides stained immunohistochemically to identify chromosome breaks. Diamidinophenylindole was used to identify the location of the nuclei within the cell. Tissue containing non-neoplastic melanocytes from both the eye and skin serve as controls. Chromosome breaks that occur in nuclei will be observed for each. Our expectations, based on previous literature, are that malignant melanomas will contain significantly more chromosome breaks than the benign and non-neoplastic cases. The results of this study will allow for better pathology-based prognosis of ocular melanin-containing neoplasms.

**Characterization of the Effects of Peter's Plus Syndrome Mutations on the Structure, Activity, and Localization of Beta-1,3-glucosyltransferase**

James Logan Mull
*Dr. Robert S. Haltiwanger, Biochemistry and Molecular Biology, Franklin College of Arts and Sciences*

Peter's Plus Syndrome (PPS) is a rare, autosomal recessive disorder that is characterized by a number of developmental defects, including brachydactyly, intellectual disabilities, craniofacial abnormalities, and Peter's Anomaly (an anterior segment dysgenesis of the eye). PPS is caused by mutations in B3GLCT, a gene that encodes β3-glucosyltransferase (B3GLCT). B3GLCT is believed to participate in a non-canonical quality control pathway in the endoplasmic reticulum by adding a glucose via a β-1,3 linkage to an O-linked fucose on a serine/threonine residue in a consensus sequence (CXX(S/T)C) within a thrombospondin type I repeat (TSR). Point mutations in the catalytic domain of B3GLCT are predicted to result in loss of function or decrease in catalytic activity of the protein. We hypothesize that some mutations in B3GLCT could lead to secretion of B3GLCT and subsequent disruption of the glycosylation pathway since B3GLCT is normally retained in the endoplasmic reticulum. We are interested in characterizing the effect point mutations identified in PPS patients have on B3GLCT structure, activity, and localization. In order to the determine these characteristics, we are introducing mutations into plasmid constructs containing the B3GLCT gene. These mutant constructs will be used to transfect mammalian cells so that activity assays can be performed on expressed B3GLCT. Additionally, secretion assays will be used to quantify retention of expressed mutant B3GLCT protein in mammalian cells. Our results will help us understand how PPS mutations affect B3GLCT function and lead to the manifestation of classic PPS symptoms. This work was supported by NIH grant HD096030.

**Histochemical Characterization of Globule Leukocytes in Bovine, Feline, and Marsupial Models**

Alisha Muscatwala, CURO Research Assistant
*Dr. Buffy Howerth, Pathology, College of Veterinary Medicine*

Globules leukocytes (GL) are deemed to be intraepithelial mucosal mast cells found along the respiratory and digestive tract and increase in response to certain hypersensitivities, such as helminth infections and food allergies. The role of this subtype of mast cell in mucosal immunity is poorly studied in domestic animals, but an essential step is to be able to consistently and accurately identify them in tissue sections. In this study, histochemical staining was used to characterize GL in marsupials, cattle, and cats. The tissue samples containing GL were found by a search of the College of Vet Med pathology database searching for the keyword "globule leukocyte." Corresponding HE slides were evaluated to confirm that GL were present and then serial sections were stained with the following histochemical stains: PTAH, PAS, LUNA, toluidine blue, alcian blue, and giemsa, to highlight chemical and morphological differences between GL, other immune cells, and GL of different species. In all giemsa and toluidine blue stained sections, GL did not contain metachromatic granules as mast cells do. GL granules consistently stained similar to eosinophils in LUNA stained sections. Among all PTAH stained sections, GL granules stained dark blue while granules were mostly negative in PAS stained sections. Yet, in bovine PAS sections, granules were positive. GL granules were negative in alcian blue among all species. In order to make conclusions as to origin, and possible function, of GL this study will expand to include electron microscopy and immunohistochemical staining.

**The Influence of Islamic Garments on Social Interactions**

Mesk Mohammed Nafea, CURO Research Assistant
*Dr. Pablo Lapegna, Sociology, Franklin College of Arts and Sciences*

Clothing plays an important role in establishing how we see ourselves through the eyes of other and conveys ideas or morals that we consider important for our identity and sense of self. This study explores how the wide range of garments that Muslim women wear can influence their social interactions in a Western society. Undergraduate female Muslims from the University of Georgia participated in short, semi-structured interviews to share their experiences of social interactions in the United States. Interviews sought to probe whether or not they think their garments influence quotidian interactions; if so, in which ways; and what they think are the sources of the ways in which others (particularly non-Muslims and Muslims not wearing specific clothing) perceive them. The study builds on sociological and psychological research that also investigates the effects of wearing specific garments on everyday interactions (for instance, how certain clothes are perceived as signaling an African American identity). Beyond the specific case of Muslim women, the study thus aims to contribute to

research connecting dress and social interactions on various ethnic, racial, or religious groups. This study suggests that there are external forces that influence the specific forms that these interactions take—we argue that the media, in particular, plays an important role in shaping the biases that can occur regarding dress's effects on social interactions.

**Variations in Coparenting and Parenting Functioning Among At-Risk Couples Following Participation in Couples Relationship College of Education**

Rachael Leigh Nagy, CURO Research Assistant
*Dr. Ted Futris, Human Development and Family Science, College of Family and Consumer Sciences*

Couple relationships directly affect parenting practices, which in turn affect outcomes for children. More so, at-risk couples are more prone to exhibit conflictual relationships, elevated parenting stress, and behaviors that increase their children's vulnerability to negative physical, emotional, and behavioral outcomes. Couples relationship education (CRE) programs have been found to positively influence couple functioning, which in turn has been linked to improved parenting behaviors. Supported by a federal grant, Project F.R.E.E.(www.ugaprojectfree.com) provides CRE to at-risk parents engaged in child welfare services in order to improve couple and co-parenting functioning. This presentation will share results from a study examining changes among a sample of married and unmarried couples in self-reports of coparenting quality, parenting stress and parenting behaviors. Variations in change based on parents' gender, marital status, and developmental timing of program delivery will be explored.

**Antimicrobial Resistance Prediction Using Plasmid and Total Bacterial DNA Sequencing by Oxford Nanopore MinION**

Christian Nam, CURO Research Assistant
*Dr. Susan Sanchez, Infectious Diseases, College of Veterinary Medicine*

Current detection of antimicrobial resistance phenotypes is time consuming, delaying delivery of antimicrobial therapy. The bacterial ability to acquire resistance occurs mainly via plasmids. Plasmid DNA is separable from bulk chromosomal DNA, but total cellular DNA extractions may ineffectively extract plasmids. This study developed workflows for acquisition of total and plasmid DNA sequences using MinION to rapidly identify pathogens and antimicrobial resistance genes. We then compared total cellular DNA vs. plasmid DNA to assess which method predicts antimicrobial resistance in a reliable and rapid way that suits the setting of the clinical laboratory. Total cellular DNA and plasmid DNA were extracted from *Acinetobacter junii*, *Enterobacter cloacae*, *Escherichia coli* and *Klebsiella pneumoniae*. The extractions were sequenced by MinION using an ultra-rapid barcoding library kit. Gene annotation was performed using Resfinder and the Comprehensive Antibiotic Resistance Database. In addition, we compared the gene annotation data with resistance phenotypes obtained from traditional phenotypic testing. The total number of reads were sufficient to provide 73x to 290x sequencing coverage depth of all isolates for total DNA sequences, while for plasmids from all isolates the coverage depth was between 66x and 465x. Preliminary analysis revealed that a higher number of resistance genes were obtained from the total cellular DNA than from plasmid sequences. Comparison with results of phenotypic susceptibility demonstrated that resistance genes, from both total DNA and plasmids, were detected corresponding to all categories of phenotypic resistance. Further work will compare the gene annotation from MinION with Illumina sequencing.

**The Effect of Light Intensity on Analyzing Peanut Maturation**

Shivani Nanda, CURO Research Assistant
*Dr. Zion Tse, Electrical and Computer Engineering, College of Engineering*

Georgia is the largest exporter of peanuts in the country, and in 2014 Georgia farmers harvested 591,000 acres of peanuts for a yield of 2.4 billion pounds. With the massive amount of peanuts being produced every year, farmers need an effective method to optimize harvest dates and maximize peanut quality. Current strategies require manual effort and are too time consuming. This task can easily be automated by creating a smartphone application that will be able to detect peanuts and grade them on their maturity based on their RGB value of the mesocarp, the middle layer of the peanut shell. Currently the app is able to detect the peanuts and its maturity but the application runs into a problem when it's used at different light intensities. The RGB color changes with light intensity and so it messes up the maturation analyzation. We want the application to be able to run smoothly regardless of the amount of light in an area. A possible solution to this problem is to use HSV to detect the color of the peanuts or to use a different colored backdrop on which the peanuts are laying. Prototypes of peanuts will be used throughout the process and data will be collected on how effective these methods are when using the phone application. If we are able to find an optimal way to detect color, farmers will be able to analyze peanuts efficiently and accurately.

**Fiber Optic Sensors for Soft Robotics**

Hamza S. Naqawe
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When thinking of robotics, the common idea is a hard-wired masterpiece of metal and electricity that senses and interacts with the world. "Soft robotics" is a less common term, so there is not yet a general idea of what it is. The spreading field of Soft Robotics takes the idea of Robotics and uses soft instead of hard shells and inflatable airways instead of wires to achieve the same effect. To continue that one step further, this study implements Fiber Bragg Gratings in fiber optic cables to sense changes in the soft robot's environment. This experiment uses silicon gel casts of a soft robotic gripper of 4 "fingers" using 3D printed molds. Airways and air pockets are also defined in the mold to allow for inflation of the gripper using an air compressor in order to "grab" objects when inflated. The fiber optic cable is embedded on the gripping side of the robot in a sine wave form, and data regarding wavelength and power return is recorded. The Fiber Bragg Grating in the fiber

optic cable is designed to return a specific wavelength when white light is passed through. The returned wavelength shifts depending on the weight of the ball and power shifts depending on whether the gripper is holding a ball or not. Further analysis in the future will hopefully be able to determine weight of a held object or temperature of a given setting.

**Classifying Protein-Drug Interactions with Machine Learning**
Navam Narula, CURO Research Assistant
*Dr. Khaled Rasheed, Computer Science, Franklin College of Arts and Sciences*

Our goal is to use machine learning techniques to accurately classify drug interactions with abnormally regulated kinases in diseases. While several kinases have had their structures identified through manual analysis, the large number of kinase structures (~3500) presents a challenge in defining the features associated with activation. We anticipate this project to result in a model for characterizing the expected interactions between novel drug protein pairs. This will be achieved through testing several different classification methods with sets of known drug-kinase interaction data and comparing accuracy rates. Having an in depth understanding of these unlabelled protein-drug interactions will allow future studies to better pick test cases and investigate drugs with a higher probability of beneficial results.

**From Easy Breezy to Existentialism: Self-Expression Enhances the Authenticity of Beauty Work**
Haley Naylor, CURO Research Assistant
*Dr. Rosanna K. Smith, Marketing and Distribution, Terry College of Business*

Although consumers increasingly invest time and money into their physical appearance, prior research has found that consumers who engage in beauty work can be subject to negative assessments of their authenticity. In this article, we draw on theoretical work distinguishing two conceptualizations of authenticity: essentialist (the true self is natural and innate) vs. existentialist (the true self is in one's choices), and demonstrate that framing beauty work as an act of self-expression enhances authenticity perceptions and beauty product evaluations. We propose that self-expression frames the true self in existentialist terms, leading the chosen (vs. the default natural) appearance to be seen as more authentic, and thus, beauty work enhances authenticity. To test this theorizing, we examined social media content (N = 3723) generated by consumers on Instagram before and after a major cosmetics brand underwent a significant rebrand in which they emphasized the self-expressive capacity of makeup. We found that this brand shift enhanced a variety of consequential consumer outcomes: consumers wore both higher levels and more varied kinds of makeup, and were more likely to disclose their use of makeup post the rebrand. This is suggestive that framing beauty work as self-expression ameliorates the negative attributions of inauthenticity that often come with beauty work. Our work holds theoretical implications for the role of authenticity in consumption and practical implications for brands.

**Understanding the Role of Intrinsic Disorder in Proteins**
Wyatt Nechtman, CURO Research Assistant
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Proteins are simply a chain of amino acids that fold into an ordered structure. The sequence-function-structure dogma states that the folded state is essential for the function of a protein. Still, in many proteins, some regions of the chain never fold into ordered structures. These intrinsically disordered (ID) segments were believed to be nonfunctional. Recently, our lab has shown that an ID segment can generate an entropic force that can alter the structure of a protein and increase its binding affinity for an inhibitor. It is not known if this function is a general feature of ID segments in other proteins. To test this, we have introduced ID segments into the enzyme dihydrofolate reductase (DHFR). DHFR is an ideal model system to test our hypothesis because the structure is well known and the dynamics have been extensively studied. We have inserted disordered loops into those regions of DHFR that are known to have a change in dynamics upon ligand binding. Using spectroscopic techniques, we will evaluate the affects of ID segment insertions on substrate affinity. Molecular dynamics simulations will be preformed to identify changes in dynamics as a result of adding ID segments. We expect the change in dynamics in the site of insertion to have a long range effect that alters the affinity for substrate. Our work will show if nature can use ID segments to tune protein function, which may explain the persistence of these elements in the evolution of proteins.

**Correlating Gene Prevalence and Biofilm Formation in Diagnostic Colibacillosis Cases Caused by Avian Pathogenic *Escherichia coli* (APEC)**
Darby Madeline Newman
*Dr. Catherine M. Logue, Population Health, College of Veterinary Medicine*

Colibacillosis is a disease of poultry caused by the organism avian pathogenic *E. coli* (APEC) that results in multi-million-dollar losses annually to the poultry industry. Here, we assessed the relationship between strains of *E. coli* recovered from different tissues of diseased chickens submitted to the poultry diagnostic research center (PDRC) and their ability to form biofilm as well as the relationship with virulence traits they harbor. A total of 48 isolates were assessed for the presence of 39 virulence-associated genes with multiplex PCR and each isolate was also screened for its ability to form biofilm, which was categorized as negligible, weak, moderate, or a strong biofilm former. Tissue site of isolation was also correlated to biofilm formation and the number of pathogenic genes detected. Overall, 47 strains were able to form biofilms and only one strain formed a negligible biofilm. The number of virulent genes increased as the strength of the biofilm increased. The data found that almost all strains showed the presence of genes associated with the ColV plasmid. Tissue of isolation and virulence gene prevalence results found that the average number of virulence genes was lower in particular tissues compared to others. The use of a multiplex panel to screen for

APEC has shown good correlation with pathogenesis, and tissue source and correlates well with invasive strains. This path panel provides significant value to APEC pathogenesis screening.

**Biofabrication of 3D Benchtop Tissue Models to Analyze Cellular Responses in Bone-Density Diseases**

Taylor Ng
Dominique Thompson
*Dr. Karen J.L. Burg, Small Animal Medicine and Surgery, College of Veterinary Medicine*

More than 3 million people are affected by bone diseases such as osteoporosis and osteoarthritis. The objective of the research is to create living tissue models that will help facilitate a better understanding of these bone-density diseases and their treatments. This will be done through the refinement of a tissue biofabrication system that will be used to produce 3Dimensional benchtop tissue models. The produced models will be designed to emphasize the biologically important elements of specific clinical conditions, such as regions of reduced bone density in osteoporosis. The system will use drop-on-demand fabrication to deposit materials, including bone-like granules, in a patterned fashion to create the tissue models. These models can be used to grow mesenchymal stem cells, which can result in the formation of bone matter. The creation of the benchtop tissue models will help to further develop the understanding of the controlled laboratory conditions required to efficiently seed and grow mesenchymal stem cells. Ultimately, the tissue models can also be used to study different aspects of diseases, such as their progression and can assist in the development of treatments and diagnostic procedures. The creation of the models allows for repeatability and reproduction of experiments amongst the scientific community.

**The Correlations Between Core Self-Evaluations and Demographic Characteristics Among Agricultural Opinion Leaders**

Tina Nguyen, CURO Research Assistant
*Dr. Kevan Lamm, Agricultural Leadership, Education, and Communication, College of Agricultural and Environmental Sciences*

Overestimating oneself is present on a daily basis, and not only might it bring inconvenience for co-workers, but might also result in unwanted events. Being able to assess one's own self would help avoid such circumstances and bring benefits to his or her life and work. In industrial-organization psychology, core self-evaluations is a concept in which self-esteem, self-efficacy, neuroticism, and locus of control are combined, and it has been evaluated for the relation to satisfaction and success in life and work. With the purpose of serving as an informational resource for researchers in core self-evaluations, this paper explores the relationships between demographic characteristics and core self-evaluations of agricultural opinion leaders. The results found indicate positive effects of age and organizational level on core self-evaluations among agricultural opinion leaders. Such finding implies the older and higher-level-employee an individual is, the more likely that that individual has high core self-evaluations. On the other hand, gender, educational attainment, and region were not found to have any significant relationship with core self-evaluations, which implies that having these demographic characteristics in research involving core self-evaluations might not be useful.

**The Role of Spatial and Temporal Scales in Determining Equitability of Access to Green Spaces in Charlotte, North Carolina**

Aileen Nicolas
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Benefits of urban green spaces are not limited only to the environment which includes increased air quality and mitigation of soil pollution but also extend to public well-being such as increased rates of physical activity and greater mental health. By acknowledging that proximity to positive landscape structures allows for certain associated benefits, we must acknowledge that some people are not in the proximity to partake in the benefits. We studied accessibility to urban green spaces in the city of Charlotte, North Carolina for the years 1990, 2000, and 2010 and compared rates of access across spatial scales. Using GIS for geospatial analysis, we assessed equitability of access by measuring the proportion of people by race who have access to parks and comparing it to the actual population proportions. From our research, we understand that the Hispanic population within Charlotte has experienced equitable access between 1990 and 2010, while the Black population has experienced an increase in access from inequitable to equitable between that same time frame. Meanwhile, the White and Asian populations do not exhibit significant positive or negative trends of access. While the results are not enough to show trends throughout the entirety of the South or even within the entire state of North Carolina, the value of this information is important because it allows us to inform public officials of Charlotte of the impacts of their decisions and encourage them to act in ways that promote equitability in accessing green spaces across the city.

**The Effect of an 8-Week Dietary Intervention Using a Novel High Protein Diet Template in Recreationally Resistance Trained Females**

Abigail Niersbach
*Dr. Nathan T. Jenkins, Kinesiology, College of Education*

Dietary protein is integral to health, performance, and development and retention of lean mass, especially in individuals engaged in resistance training. The daily reference intake for protein is 0.8 g/kg/day. Recent research suggests that this value is insufficient for lean mass retention while dieting, recommending a nearly double intake amount of 1.4-2.0g/kg/day. To determine the effects of a novel high protein diet template on body composition during an 8-week dietary intervention in recreationally resistance trained females. Participants completed baseline and post 8-week intervention dual-energy X-ray absorptiometry (DEXA) scans and anthropometrics (n=7, Age=21.7±2.14 yrs; %BF=30.7±3.90). Participants were instructed how to follow a novel high protein dietary template (1.5-1.6 g/kg/day), and asked to continue

resistance training. Changes in study outcome variables were evaluated with paired *t*-tests. Significant changes were observed in body fat percent (Pre: 30.7±3.9%, Post: 28.3±3.0%), waist circumference (Pre: 77.0±4.7 cm, Post: 74.4±5.2 cm), and waist-to-hip ratio (Pre: 0.77±0.04, Post: 0.76±0.04), ($p<0.050$), with observed decreases in total body weight (Pre: 67.5±6.7 kg, Post: 65.5±5.3 kg; $p = 0.076$) and fat mass (Pre: 19.7±3.7 kg, Post: 18.6±3.0 kg; $p=0.062$) approaching significance. Changes in bone density and lean mass were not statistically significant. These data suggest that following a high protein diet while resistance training may lead to favorable improvements in body composition, especially preserving lean mass and bone density in women who concurrently strength train while on a fat loss diet.

**Gene Deletion Mutants in *Bordetella* species**

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

How does gene deletion affect the virulence of certain *Bordetella* species? Several species of *Bordetella* can cause severe respiratory illness in a plethora of host organisms. Toxins within these species are the cause for adverse effects in hosts. The genes that encode the proteins releasing these toxins are the key to understanding how these species infect and cause illness. One way to identify these genes and their role in the infection process is to construct gene deletion mutants. These mutants, when compared to their wild types, expose the role of the "deleted" gene. These mutants are not only important in identifying the role of each gene, but also in determining how the bacteria as a whole works to infect. Through pipe vector technique, gene deletion mutants were able to be created. Once used to infect mice, virulence factors were assessed.

**Nitric-Oxide Releasing Poly(hydroxybutyrate)/Poly(l-lactic acid) Nanofibers Increase Antimicrobial and Antiplatelet Activity for Stent Application**

Megan Norman
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The advent of stenting has significantly improved clinical care for cardiac patients, allowing for the treatment of blocked blood vessels and restoration of blood flow to the body. However, bare metal stents still face both short-term and long-term clinical problems such as thrombosis, delayed healing, and chronic inflammation. Drug-eluting stents have been fabricated in order to alleviate some of these side effects, but still are associated with delayed re-endothelialization and late stent thrombosis. These persistent issues have pushed researchers to search for and develop alternative biodegradable materials to coat the stents which contain properties that promote total healing while reducing the risk of thrombosis. Nitric oxide (NO) is a signaling molecule in the body that is responsible for regulating numerous biological processes and has antiplatelet, wound-healing, and anti-inflammatory properties. Additionally, NO is produced by macrophages to combat Gram-negative and Gram-positive pathogenic bacteria. In this study, S-nitrosoglutathione (GSNO), an endogenous NO donor, was combined with poly(hydroxybutyrate) (PHB) and poly(l-lactic acid) (PLLA) to create NO-releasing electrospun nanofibers for stent applications. Stress-strain measurements and NO-releasing kinetics were measured to optimize the nanofibers. Bactericidal properties, antiplatelet activity, and cytotoxicity were assessed *in vitro* to determine the therapeutic efficacy of the nanofibers. The incorporation of GSNO into biodegradable nanofibers was able to effectively reduce bacterial viability while reducing the risk of thrombosis that is commonly associated with stents.

**Developing a Drug-Eluting Film for Canine Orthopedic Implants**

Sydney Christina Nuckles
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Post-operative infection occurs in approximately 7% of dogs who have undergone tibial plateau leveling osteotomy (TPLO). In many cases, a second surgery must be done to remove the implant due to infection, which is not cost efficient for the owner and subjects the animal to further discomfort. The objective of this project is to develop a drug delivering, biodegradable polylactide film that will be implanted during surgery to reduce infection in dogs that undergo TPLO surgery. The experimental goal is to develop a nontoxic film that has controlled release of antibiotic over a two-week period. During the development of films, liquid bovine serum albumin (BSA) is used to model antibiotic because it is less expensive and the release is simple to measure. Polylactide films were cast with liquid BSA. A film was placed between the tibia and the bone plate on each of the three tibia models and they were submerged in phosphate buffered saline (PBS) and incubated. For a two-week period a bicinchoninic (BCA) assay was performed on aliquots of the PBS to determine the respective concentrations of BSA. Current results suggest that the proteins in the bone marrow of the tibia interfere with the BSA concentration detected. Further studies will be conducted with a modified approach to account for the interference of possible residual proteins. Once the film processing is optimized, an antibiotic will be introduced and tested.

**The Multidimensional Nature of Workaholism**

Pryce Nwabude
William Allen
*Dr. Malissa Clark, Psychology, Franklin College of Arts and Sciences*

What happens when someone's work goes beyond just "paying the bills" and turns into a compulsion that detrimentally affects impacts one's health and/or relationships? This inner compulsion to work beyond what is expected reflects the construct of workaholism. A growing number of studies have shown detrimental effects of workaholism on oneself and one's family, but confusion remains surrounding what exactly workaholism is and how observable it is by others. The current study utilizes a qualitative methodology to gain a better understanding of the construct of workaholism and its dimensions from the perspective of the spouses of workaholics. A total of 56 self-identified spouses of workaholics were

recruited through social media and interviewed using skype. Each interview lasted on average 30 minutes. Each interview was recorded and transcribed. Drawing from prior research on the multidimensional nature of workaholism, participants were asked to reflect on whether their spouse exhibited signs of 1) an inner compulsion to work, 2) having excessive thoughts about work, 3) feeling negative emotions when not at work, and 4) excessive work behaviors. Spouses were asked to provide detailed examples of each of these signs as well as any other relevant signs of workaholism. Initial findings support the multidimensional nature of workaholism. This information provides an in-depth understanding of common workaholism signs that are observable by one's spouse and can be used to create future theoretical models and guide future research.

**Crisis Pregnancy Centers in Alabama**

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Crisis pregnancy centers (CPCs) are non-profit organizations with a mission of promoting childbirth among pregnant women. Studies show they frequently are not transparent about their mission and provide misleading and inaccurate health information. Reproductive health indicators are poor in Alabama. The aim of this study is to describe the number, location, and types of services CPCs provide in Alabama and to describe state policies that might influence the presence of CPCs in Alabama. This research examines the number, location, and types of services that CPCs provide (information only, limited medical services) in Alabama. We also explore geographical locations of the centers (e.g., urban vs. rural areas) to understand the intersectionality of social factors and geographic location of CPCS. These findings may be useful for increasing social awareness about CPCs and better understanding factors related to the quality of reproductive healthcare in Alabama.

**Development of FRET Biosensors to Detect Kinase Activity in Living Cells**

Jenny Okáľová, CURO Research Assistant
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G-protein-coupled receptors (GPCRs) are a large group of membrane receptors that induce intracellular signaling cascades to interpret various external signals. The p38 mitogen-activated protein kinase (MAPK) pathway plays a key role in inflammatory responses found in chronic lung disease. The GPCR-dependent p38 activation deviates from the typical activation pathway in the cells lining the surfaces of blood vessels. This atypical pathway involves the transforming growth factor-β (TGFβ) activated kinase-1 binding protein-1 (TAB1) to bind directly to p38, ultimately inducing p38 auto-activation, autophosphorylation. Atypical p38 activation induces inflammation; therefore, there is a need to understand the regulation of p38 signaling to identify targets for anti-inflammatory drugs. We will develop two fluorescence resonance energy transfer (FRET) biosensors which consist of two fluorescent proteins, cyan fluorescent protein and yellow fluorescent protein (CFP and YFP), joined by a linker peptide that changes shape upon phosphorylation. These FRET biosensors measure physical energy transfers between a "donor" fluorophore to an acceptor "fluorophore" when they are within a proximity of one another. Real-time measurement of the fluorescent ratios enables us to sense p38 activity. We are cloning subcellular, targeting motifs onto the 3-prime end of the FRET sensors to target them to the endosome, nucleus, or cytosol. This will reveal the signaling kinetics of this atypical p38 activation. This is a significant advancement to our fundamental knowledge and will enable the screening of small molecule inhibitors of the pathway to regulate the progression of chronic lung disease.

**Identifying the Community Cultural Wealth of Academically Successful Black Science Students**

Omowunmi Oni, CURO Research Assistant
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The number of Black students who pursue undergraduate degrees has increased over the years; however, this increase does not resolve the underrepresentation of Black students in science. Researchers have identified factors that contribute to underrepresentation like high school quality, lack of parental support, and unfavorable college conditions. Those studies focused on why students of color do not persist in science. In this study we used a different approach, the anti-deficit achievement approach. We studied academically-successful Black science majors in their senior year (n=20). We examined their community cultural wealth, which consists of the capital (including knowledge, skills, abilities and contacts) that students of color can use for educational success. We asked the research question: What forms of capital do Black students possess, which allow them to be successful in science majors? We answered this question by conducting two interviews with each participant and analyzing the data using a qualitative method called content analysis. Through our analysis we found evidence of all six forms of previously identified capital and novel capital in the data. We also uncovered themes common to participants. For example, many students discussed a deeper calling not only to give back, but to also pay it forward to the Black community. This deeper calling contributed to their persistent motivation to succeed. We will use our data to raise awareness about the capital Black science majors possess.

**Dual-Task Performance in Children with and Without Cerebral Palsy**

Aliya Othman, CURO Research Assistant
*Dr. Christopher Modlesky, Kinesiology, College of Education*

Cerebral palsy (CP) is a movement disorder that affects a child's ability to perform daily activity. The degree of their movement impairment may be exacerbated by a concomitant cognitive deficit, which is common in children with CP. This study will determine the effect of a cognitive deficit on movement in children with CP by assessing their mobility while performing another task (i.e., dual-task). Typically developing children

will be included in this study to serve as controls. Typically developing children (age: 5-11yrs; body mass index: 5th-95th percentiles) and children with CP (ages 5-11yrs) will participate (n=5/group). Participants will be asked to perform the timed-up-and-go (TUG), a clinical assessment of mobility. The TUG requires an individual to stand from a chair, walk three-meters, turn around, and return to his/ her chair. Performance of the TUG is assessed by time to complete the task. This study will also assess biomechanical outcomes during TUG performance utilizing 3D motion capture and integrated force plates. Cognitive performance will be assessed by asking individuals to complete a digit-span test. This test requires an individual to repeat a series of numbers, starting from a few, increasing by one digit, with each correct response. The number of correct responses will serve as the assessment of cognitive performance. The study will also assess the time to complete the task (motor performance). Biomechanical outcomes will be reported.

***Bunyamwera Orthobunyaviruses* of the Americas: A Comprehensive Review**
Isabel M. Ott
*Dr. Daniel Mead, Population Health, College of Veterinary Medicine*

Several divergent viruses belonging to the *Bunyamwera orthobunyavirus* (*BUNV*) species are endemic to North, Central, and South America. These viruses circulate stably between wildlife reservoirs and mosquito vectors, and serological surveys indicate that they regularly infect domesticated agricultural species and humans. Outside of severe cases, disease caused by most of these viruses is infrequently reported. Given that few diagnostic panels include these viruses, however, reporting data is likely inaccurate, and the full prevalence and significance of mild *BUNV* infections is unknown. The potential for genetic material exchange between these viruses is poorly characterized, despite extensive overlaps in host species and geographic ranges; *BUNV* members endemic to the African continent have previously exchanged genetic material to produce a notably more pathogenic virus. A comprehensive literature review of the ecology, pathology, and molecular biology of members of *BUNV* and other closely related species endemic to the Americas was undertaken in hopes of highlighting the significance of these understudied viruses for human and animal health. Ideally, this work will help promote the development of animal infection models and diagnostic tests for these viruses.

**Comparative Transcriptomics of Wild and Domesticated Sunflower Species to Identify Mechanisms of Stress Tolerance**
Niki Padgett, CURO Research Assistant
*Dr. John Burke, Plant Biology, Franklin College of Arts and Sciences*

Understanding the effects of combinatorial stress (i.e., multiple simultaneous stresses) on plants has the potential to inform plant breeders aimed at producing crops that are resilient under a variety of realistic field conditions. Previous studies suggest stress-tolerance may have been lost during the domestication of crop plants due to selection for high performance under ideal agricultural conditions. In this study, we are comparing the phenotypic and transcriptomic responses of cultivated sunflower (*Helianthus annuus* L.) and its wild relatives (wild *H. annuus* and wild *Helianthus argophyllus*) grown under varied salinity and nutrient treatments. After three weeks, plant tissue was collected from four treatments (control, individual stresses [salt and low nutrient], and the combination of the two) for RNA extraction and sequencing, and overall biomass production was determined as a measure of plant performance. Following RNA sequencing, we will construct gene co-expression networks and identify genes that are differentially expressed in response to the various stress scenarios in both wild and cultivated sunflowers. By comparing the identities of these genes across genotypes, we hope to identify genetic mechanisms of stress tolerance that might have been lost, or otherwise modified, during the wild-to-crop transition, thereby identifying potential targets for future improvement.

**Extension of a Braitenberg Model to a Quadcopter in 3D**
Karthik Paladugula, CURO Research Assistant
*Dr. Ramviyas N. Parasuraman, Computer Science, Franklin College of Arts and Sciences*

Braitenberg models provides seamless sensing intelligence to vehicles by directly connecting sensor outputs to motors (actuators). They are simple to implement and convert any agent into an intelligent agent. Although they have been extensively studied in 2D vehicle control and robotics theory (because it does not need computation capabilities), little research has been done to extend the application of Braitenberg models to 3D vehicles. In my research, I design and apply the Braitenberg concept to control and navigate a quadcopter robot using LIDAR/SONAR/WiFi data for seamless 3D obstacle avoidance. Specifically, I investigate the location of sensors such that maximum obstacle detection coverage can be obtained with a smaller number of sensor resources. Obstacle avoidance algorithms based on equations of motion derived from quadcopter kinematics relating to its 6 DoF (translational and angular velocities) are being developed and tested through extensive simulation and real-world experiments. The results are expected to provide insights into the relation between sensorial inputs and the resulting complex behavior of the quadcopter platform in three dimensions for effective obstacle avoidance and source seeking strategies. The research outcome will significantly influence further research into the application of Braitenberg models in multi-dimensional vehicles.

**The Influence of Perceived Pressure from Stakeholders to Conceal a Concussion on Student-Athletes' Reporting Intentions**
Kelley Anne Palfrey
*Dr. Julianne D. Schmidt, Kinesiology, College of Education*

The purpose of this study is to determine if perceived pressure from stakeholders to conceal a concussion (coaches, teammates, parent/guardians, sports medicine professionals, athletic administrators, and sport fans) predict collegiate student-athletes' concussion reporting intentions (indirect and direct). Student-athletes from three universities were

invited to complete a survey via Qualtrics (n=341/1183, response rate=28.8%, age=19.91.53, male=35.8%). Student-athletes completed a 32-item survey based on a six-point Likert-scale (1=never, 6=very frequently) on perceived pressure from stakeholders to conceal a concussion. Additionally, participants completed a second, previously validated survey assessing indirect (8 items) and direct (3 items) concussion reporting intentions. Items were based on a seven-point Likert-scale (1=strongly disagree, 7=strongly agree). Two separate multivariate regression analyses were conducted to examine how perceived pressure for each of the six stakeholder groups (coaches, teammates, parent/guardians, sports medicine professionals, athletic administrators, and sport fans) predicted indirect and direct concussion reporting intentions. The results indicated that perceived pressure from stakeholders to conceal a concussion did not predict significant variance in concussion reporting intentions (n=338/341; indirect: F(6,331)=1.118, p=0.312, $R^2$=0.021; direct: F(6,331)=1.889, p=0.082, $R^2$=0.033). Our findings suggest that collegiate student-athletes' direct and indirect reporting intentions were not significantly influenced by perceived pressure from stakeholders to conceal a concussion. The sample was limited to three universities in the state of Georgia as well as being predominantly female, therefore, these findings may not be generalizable to a national sample. Future research should focus on other psychosocial factors that may influence concussion reporting such as communication styles, and rapport between stakeholders.

**Investigation of Glycan Structure and Function of Pneumococcal Serine-Rich Protein (PsrP)**

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

*Streptococcus pneumoniae* is a Gram-positive bacteria that normally lives in the nasopharynx of healthy children and adults. Typically, it does no harm to its host when residing in the nasopharynx, but upon contact with lung cells, it has the capacity to enter the bloodstream and cause various forms of invasive pneumococcal disease, including pneumonia. Currently, pneumonia is a major health concern worldwide as one of the world's leading causes of child mortality. Current vaccines target the capsular polysaccharide (CPS) of *S. pneumoniae*, and while effective for certain serotypes (antigenically distinct variations) of the bacteria, they run into issues with cost and adequate coverage in different locations and age groups. Our research focuses on investigating possible alternative pneumococcal antigens for more effective vaccines not suffering from the weaknesses of the current vaccine. In particular, we focus on the glycosylation and glycan structure of Pneumococcal serine-rich protein (PsrP) and their role in the development of pneumonia. PsrP is a heavily glycosylated, high molecular-weight surface protein adhesin of *S. pneumoniae* that plays a significant role in the ability of several serotypes of *S. pneumoniae* to cause pneumonia. By utilizing knockout strains in annotated genes SP_1758, SP_1765, SP_1768, and SP_1771, we are currently exploring the different disease-causing potentials of variably glycosylated strains of *S. pneumoniae*. Ideally, this research will be able to yield a new possibility for *S. pneumoniae* immunogens and eventually assist in the development of the next-generation pneumonia vaccine.

**Identifying Sorting Signal Peptide of Exosome-Associated LAMP-2b Protein**

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

Exosomes are extracellular vesicles that cells release to facilitate cell-to-cell communication. They've recently become the focus of research as a potentially effective therapeutic delivery shuttle for transporting RNA, DNA, and proteins to cells in the body. LAMP-2b is an exosome-associated protein that, in previous studies, has been used to aid in the delivery of small nucleic acids through LAMP-2b-targeted exosomes for cellular uptake. There has been no research published on which specific peptides in the LAMP-2b protein are responsible for its uptake, but isolating the specific signal peptides would create a more useful and efficient LAMP-2b tool that could deliver larger molecules due to its smaller size. The goal of my project is to narrow down and identify the specific region of LAMP-2b that serves as the sorting signal to exosomes. To accomplish this, I am performing truncation experiments and making a series of constructs harboring different domains of LAMP with mEGFP as a reporter in cells expressing vectors. These constructs will be transiently transfected into 293T cells and the cells' exosomes will be collected to screen for the LAMP-2b exosome signal peptides. This project aims to generate a potential genetical tool that can be used to deliver proteins and nucleic acids into exosomes with a higher efficiency when compared to the whole LAMP2b protein. This tool can also be used to facilitate the *in vivo* delivery of therapeutic drugs and contribute to the field of gene therapy and regenerative medicine.

**Probabilistic Localization of Multiple Robots Using Wi-Fi Signals**

Ravi Parashar
*Dr. Ramviyas N. Parasuraman, Computer Science, Franklin College of Arts and Sciences*

The localization of robots in unknown and unstructured GPS-denied environments is still a relevant and major research challenge in the robotics field. Applications of such research can be found in search and rescue missions or surveillance, where multiple robots or robotic sensors need an efficient solution for simultaneous localization so that they can effectively cooperate and coordinate tasks amongst themselves. This study aims to design, test, and implement a novel method for simultaneously estimating positions of multiple robots in a distributed manner. Specifically, the approach we propose is to exploit the measurement of directionality of Wi-Fi signals in cooperative localization. We design a Gaussian probabilistic framework in which multiple robots connected to a single Wi-Fi access point (AP) can localize against each other. First, the robots will use the Wi-Fi signal direction of arrival to estimate their location with respect to the AP. This localization data is then integrated with data from other robots to gain information

about their relative positions. We evaluate the proposed method in terms of accuracy and computational efficiency using extensive experiments in real-world experimental settings. The results are expected to compare well with the literature on multi-robot localization and the research outcome will complement other localization methods in indoor and challenging environments.

**The Impact of Translation on Theatrical Performance**

Zachary Pareizs, CURO Research Assistant
*Prof. George Contini, Theatre and Film Studies, Franklin College of Arts and Sciences*

This research asks how modern translation impacts performance of classic plays, specifically those of Russian playwright Anton Chekov. I was first introduced to Chekhov in high school through a production of *The Seagull*. I instantly fell in love with the play's humor, emotional resonance, and occasional soap opera-esque qualities. While I loved *The Seagull*, my friends all found it boring, mostly due to the stuffy, outdated language. I was disappointed by their reactions, so I asked myself, 'is it possible to create new translations of Chekhov's plays, translations that revitalize the work for new audiences?' My research explores this possibility for artistry in theatrical translations through translating several of Chekhov's short plays and workshopping them with actors. I have taken several Russian classes here at UGA, which helped me with literal translation, but I also had to research Russian culture and history in order to translate the semiotics and humor of Russian society into something accessible for modern American audiences. The more modernistic my translations, the more the actors and audiences seemed to enjoy themselves, discovering moments and beats that they didn't find when interacting with the more classic translations. Our conceptions of Chekhov's writings have been fed to us through literal English translations, and I think that more modern and liberal adaptations may offer fresh perspectives on this important playwright. The works of Chekhov are essential to understanding modern realism in theatre, and I believe newer translations can breathe life into these important pieces of the theatrical canon.

**Developing a Queer Sensibility and Artistic Identity**

Zachary Pareizs, CURO Research Assistant
*Prof. George Contini, Theatre and Film Studies, Franklin College of Arts and Sciences*

This research examines the development of the queer narrative through different, international works, specifically asking 'What is a Queer Sensibility?'. This research examines the dramatic expression of the queer narrative through international theatrical texts and performance. I am particularly interested in intersectional queer narratives and how they navigate production and reaching audiences. What is a queer identity, and what does it mean in relation to the audience? How do queer texts and performances change depending on their location? Hopefully I will be able to define Queer Sensibilities and identify them in different narratives and artistic mediums, culminating in an application to my own writing and performance.

**The Correlation Between College GPA and Eye Tracking Task Performance**

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

Many correlational studies examine the relationship between college grade point average (GPA) and various factors such as high school GPA, SAT and ACT scores, high school rankings, etc. If there is a correlation between GPA and these factors, then it is also possible for a correlation to exist between GPA and performance on saccadic eye movement tasks. Saccades assess processes of cognitive control demands which support flexible behavior in order to meet current goals and are needed to achieve high academic performance, measured by GPA. We conducted several eye tracking tasks and recorded GPA on 142 healthy undergraduates at UGA. The eye tracking tasks that we focused on are prosaccades, which requires the student to directly look at the stimulus after a few seconds, and antisaccades, which requires the student to look on the mirror location from the stimulus after a few seconds. We focused mainly on whether there is a correlation between GPA and performance on saccadic eye movement tasks and predicted that there could be a similarity in correlation of GPA to the two saccadic eye movement tasks, but a stronger correlation in antisaccades as it requires more cognitive control. The hypothesis is if the correlation between GPA and the saccadic eye movement tasks is strong, then it could be possible to predict college academic performance based on eye tracking tasks. By being able to make this prediction, we could predict GPA not only from standardized testing and performance, but also from saccadic eye movements.

**Understanding the Specificity of a Glycosyltransferase Through Structure**

Soroosh Parsa, CURO Research Assistant
*Dr. Christopher M. West, Biochemistry and Molecular Biology, Franklin College of Arts and Sciences*

Timely protein degradation is necessary for cell cycle progression and regulation. In eukaryotes, the formation of the SCF (Skp1, Cullin1, F-Box) complex catalyzes poly-ubiquitination of targeted proteins and subsequent degradation by the 26S proteasome. Skp1 is an adaptor protein that links Cul1 to the F-box protein. In the model organism, *Dictyostelium discoideum*, Skp1 is hydroxylated and modified by a pentasaccharide via enzymes including Gnt1. Gnt1 transfers the first sugar, N-acetylglucosamine, onto hydroxyl-Skp1. Emerging evidence suggests that the pentasaccharide helps formation of the SCF complex by enhancing Skp1 binding to the F-Box protein. Crystallization trials for Gnt1 were unsuccessful, leading us to reexamine its purity. After Superdex200 purification our results showed that Gnt1 eluted as a single peak with an apparent MW of a monomeric species. SDS PAGE gel analysis shows bands of lower mass, in addition to a major band of the predicted molecular weight of Gnt1, that have a similar elution profile as our purified protein. This indicates that Gnt1 is co-eluting with other proteins but the mechanism is

unknown and this may interfere with crystallization. Here, we propose to further purify Gnt1 so that crystallization trials can be enhanced. With the use of an antibody specific to Gnt1, we can run a Western Blot to assess breakdown products. We can then put Gnt1 through a Strong Anion Exchange Column (Q) for further purification. Obtaining the structure of Gnt1 will give us better insight into why it has high specificity towards solely hydroxyl-Skp1 in the cytoplasm.

**Ignorance Is Bliss: The Current State of Septic Systems in the U.S. and the Risks They Pose to Freshwater Systems**

Becca Parsons, CURO Research Assistant
*Dr. Krista Capps, Ecology, Odum School of Ecology*

Septic systems are a fundamental component of global wastewater infrastructure. In the United States, one in three residences relies on septic systems for wastewater treatment, but the vast majority of these systems are poorly documented and maintained. Improperly managed septic systems can fail and lead to groundwater and surface water contamination through increases in nutrient concentrations and the release of potentially harmful pathogens and contaminants. However, most municipalities have limited information regarding the total number, location, age, and maintenance history of septic infrastructure in their jurisdiction. Here, we discuss the important role that septic systems play in wastewater infrastructure in the U.S., summarize the policies governing the installation, maintenance, and oversight of septic systems, and describe the potential risk factors failing septic systems pose to freshwater systems in the U.S. We use septic data collected by Athens-Clarke County, Georgia--a county that has invested significant effort in accurately accounting for and regulating septic systems in their jurisdiction--to highlight important information gaps faced by counties throughout the U.S. We identify some methods stakeholders can employ to overcome information gaps and predict the potential impact of septic systems on in-stream water quality.

**Kitchen Midden Scallops as a Key: How Climate May Affect Calusa Occupation of the Pineland Site (~800–1500 AD), Southwestern Florida**

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

The Calusa Indians left extensive shell mounds throughout southwestern Florida, the shells of which can be used to interpret season of occupation as well as provide insights in how climate change affects site occupation and food resource collection. The purpose of this study is to determine whether Pineland kitchen midden scallops can provide key paleoenviromental information as to climate and productivity. This study is focusing on three climatically sensitive-time periods; The Medieval Warm Period (A.D. 800-1025), The Warm Period Maximum (A.D. 1230-1260), and The Wolf Minimum (A.D. 1340-1410). This study will use modern scallops from the same area to compare taphonomic, isotopic, and climatological data to the scallops from the three earlier time periods. For this research two scallops per time period; more if time permits, will be analyzed by drilling transects along the shell to retrieve powdered calcite that will be analyzed for $\delta^{18}O$ and $\delta^{13}C$ stable isotopes, yielding climate and productivity information, respectively, as well as season-of-capture data. Physical characteristics of the shell like the taphonomic grade as well as human-induced chipping seem to reveal how the scallops were deposited, used, and preserved by the Calusa, while change in the occurrence of biota present on the shell as well as the size of a full-grown adult shifted with the known climatic periods. The hope is to understand not only season of capture but also where the scallops were being harvested in relation to changing climates that altered sea level, especially during colder climates when sea levels were lower.

**A Search for Truth**

Jessica Pasquarello, Foundation Fellow, CURO Research Assistant
*Dr. David S. Williams, Religion, Franklin College of Arts and Sciences*

For millennia, scientists, philosophers, and religious thinkers have actively searched for greater meaning beyond the visible reality. This search can essentially be described as a pursuit of Truth. However, no person or research group has successfully been able to accurately explain all of the seemingly incomprehensible phenomena that define life, death, and the universe. Questions such as "Why are we here?", "Why do we die?", and "Does the universe have a plan?" have plagued humans' minds for generations. Part one of this research (conducted in fall 2016) attempts to answer such questions by synthesizing various theories deriving from quantum physics, philosophy, and several religious traditions - particularly Buddhism, Hinduism, and Judaism. Part two of this project (completed in spring 2018) delves deeper into the topic by understanding Christian and Islamic perspectives and analyzing the Bible and Qur'an. Overall, this research suggests that, although our human vision is tainted by illusion, we can come close to comprehending Truth by meditating on the interconnectedness of the universe and the concept of Love. Yet, the ultimate goal of this project is to foster further thought about the possibility and components of an immutable reality and encourage further discussion on the subject.

**Examining the Role of Gestational Hypertension and Eclampsia on the Birth Weight of Babies Born in Georgia**

Arohi Patel
Mehar Anand, Bennett Rissier, Rushan Momin
*Dr. José F. Cordero, Epidemiology and Biostatistics, College of Public Health*

The objective of this study was to investigate the association between gestational hypertension (GH) and hypertension eclampsia (HE) on low birth weight (LBW) babies in Georgia. In Georgia, the rate of LBW births is higher than the national rate and has increased slightly in recent years to close to 10%. LBW babies are more likely to have health problems as infants and adults, including infections and chronic diseases. Data from 2014 to 2015 Georgia Birth Certificates were used to assess the role of GH and HE on LBW babies. Logistic regression analysis, adjusting for potential confounders, was conducted to

estimate odds ratios and 95% confidence intervals. Attributable risks were determined to calculate how LBW babies would be reduced if GH and HE were eliminated. In our study population (n=262,109), 25,017 (9.54%) babies were born LBW. Among the LBW babies, 3,219 (12.87%) mothers had GH and 158 (0.64%) mothers had HE. Those with GH were 3.392 times more likely to have a LBW baby (95% CI: 3.251 - 3.540). Those with HE were 6.870 times more likely to have a LBW baby (95% CI: 5.608 - 8.417). The rate of LBW births could be reduced 15% if GH in pregnancy was eliminated and 31% if HE in pregnancy was eliminated. Our results suggest that women with GH and HE in Georgia are at increased odds of delivering a LBW baby compared to women without.

**The Effect of 2D Micropatterned Chondroitin Sulfate Glycosaminoglycan Surfaces on Mesenchymal Stem Cell Morphology**

Bianca Patel, CURO Honors Scholar
*Dr. Lohitash Karumbaiah, Animal and Dairy Science, College of Agricultural and Environmental Sciences*

Mesenchymal stem cells (MSCs) are bone marrow-derived multipotent stem cells that possess promising therapeutic potential for immunomodulation, tumor targeting and regenerative medicine. These activities are largely regulated through paracrine signaling mechanisms including binding interactions with the extracellular matrix (ECM). There is still developing research regarding morphological changes in MSCs in response to ECM cues and their effect on cell function. Since sulfated glycosaminoglycans are an important ECM constituent in the bone marrow stem cell niche with binding affinities reliant on sulfation patterns, we hypothesize that alterations in chondroitin sulfate glycosaminoglycan (CS-GAGs) sulfation will induce changes in MSC morphology. Two approaches will be utilized for surface functionalization: In the first approach, glass-slides will undergo piranha cleaning, followed by overnight (3-Aminopropyl)triethoxysilane (APTES) coating. CS-GAGs' carboxyl group will undergo activation with 1-Ethyl-3-(3Dimethylaminopropyl)-carbodiimide (EDC) and N-hydroxysuccinimide (NHS), followed with micro-pattern creation on modified glass surfaces. The second approach will involve the biotinylation of CS-A and CS-E. Both approaches will have three CS-GAG concentrations (5mg/mL, 10mg/mL, 20mg/mL) and two time points of evaluation (0 hours, 72 hours). CS-GAG surface functionalization will be verified via Alcian blue and CS-56 antibody staining. MSC morphology on CS-GAG functionalized glass-slides will be imaged using stochastic optical reconstruction microscopy (STORM). Findings are expected to show distinct MSC morphological changes for CS-A and CS-E functionalized glass-slides, with CS-A preferential binding. The evaluation of a superior and efficient approach can aid in establishing a systematic method of assessing MSC morphology on 2D surfaces, aiding in predicting their performance through well-defined morphological characterizations.

**Steady State Thermal Analysis of the 3U SPOC Satellite in Ansys Workbench**

Nir Alpesh Patel, CURO Research Assistant
*Dr. David L. Cotten, Geography, Franklin College of Arts and Sciences*

The University of Georgia Spectral Ocean Color (SPOC) mission uses boards with significant heat loads. The boards in consideration for research are the Ultra High Frequency (UHF) board and the S-Band Transmitter since these components use an RF transmitter chip with respective heat loads of 5.1 watts and 4.6 watts. The issue in these loads lies in the lack of thermal energy distribution across the surface area in connection to these boards on the SPOC satellite. Prior simulations run through ANSYS Workbench have shown that the load temperatures on these boards rises above the maximum operating temperature with an ambient temperature of 30 degrees C, specified in the hot case-scenario. Research will be placed on the topic of how to run these boards in such a manner that they do not exceed the maximum operating temperature. The methods used will be analysis of multiple types of heat straps varying in size, length, and manufacturing type. The significance of this research will assist creating two satellites in the Small Satellite Research Laboratory capable of orbiting and operating in low earth orbit without overheating.

**Effect of Side Preference and Brain Lateralization on Recovery Following Traumatic Brain Injury**

Shahil Patel, CURO Research Assistant
*Dr. Lohitash Karumbaiah, Animal and Dairy Science, College of Agricultural and Environmental Sciences*

Traumatic brain injuries (TBI) may result in severe cognitive and sensorimotor impairments. It remains unknown whether brain lateralization (i.e. the functional dominance of one of the two brain hemisphere) affects the recovery outcomes following TBI and how it may play a role in future clinical treatments. In our lab, rats will be subjected to a cortical impact-induced TBI to the right side of their brain (rostral forelimb area, M1 cortex), targeting a motor deficit in the left limb usage. Their rate of recovery will be monitored through behavioral performance. The Skilled Reach Task is used to assess the forelimb coordination of rats when retrieving food pellets. From this, we can identify forelimb dominance (preference training: two limb retrieval allowed) as well as training ability during forced side conditions (forced training: one limb retrieval allowed) to behaviorally quantify brain lateralization. Using baseline results from preference and forced training, we will separate rats into groups with (left or right) and without brain lateralization of forelimb motor control. Following training, rats will be subjected to TBI, and we will quantify motor impairment as well as longitudinal recovery in correspondence with their initial side preference. We hypothesized side preference will influence forced side training and that some measures of performance (success rate, efficiency, limb usage and task duration) might correlate with training, TBI impairment and post-TBI recovery. We expect that brain lateralization following TBI will provide valuable insight for understanding the change in brain neuroplasticity following injury and future clinical treatment.

**Comparative Genomic Investigation of Sex Chromosome Evolution Within the Genus *Asparagus***

Tejal Patel
*Dr. Jim Leebens-Mack, Plant Biology, Franklin College of Arts and Sciences*

Whereas most flowering plants are bisexular, producing male and female reproductive organs within "perfect" flowers, garden asparagus (*Asparagus officinalis*) plants are unisexual. Garden asparagus and its closest wild relatives typically produce separate male and female plants, a condition defined as dioecy. Dioecy is hypothesized to have evolved just once within the genus *Asparagus*. I will collect and analyze gene capture sequence data to test this hypothesis as part of my directed research program. Wet lab work will include DNA isolation, construction of shotgun genome sequencing libraries, and enrichment of libraries for single-copy genes to be used in phylogenetic analyses. Computational work will involve estimation of single-copy gene trees and species relationships through phylogenetic analyses. Reproductive strategies (bisexuality vs. dioecy) will be mapped onto the resulting species phylogeny in order to test whether dioecy has evolved once or multiple times within the genus *Asparagus*.

**One Day at a Time: Tracking Recovery and Return to Learn After Concussion**

MaryClare Hyacinth Patterson, CURO Research Assistant
Cydney Braumuller
*Dr. Katy H. O'Brien, Communication Sciences and Special Education, College of Education*

A concussion is a mild traumatic brain injury caused by a jolt, bump, or hit to the head or body that causes rapid movement of the brain within the skull creating chemical changes in the brain. Although most people recover from concussions within 2 to 4 weeks, concussion can cause symptoms that make returning to school difficult, especially for college students. The primary goal of this study is to survey college students' experiences around returning to the classroom following concussion and to determine how return to activity either exacerbates symptoms or contributes to resolution as students engage with peers and familiar activities. Currently, we are testing the feasibility of this protocol with uninjured college students and a pilot sample of students who have sustained a concussion within the last 14 days. Data collection includes a brief survey of symptoms and activity levels administered three times daily for three weeks. Data is currently being collected on both groups. It is hypothesized that participants will complete at least 75% of surveys, and that morning surveys will have the lowest rate of response. Across the three weeks of surveys, we expect the lowest rate of response during week 2, when the survey response prompts are no longer novel as in week 1, and not yet routine as in week 3. This study will provide further insight into measurement of the return to learn process for college students in the acute period following a concussion to develop better management recommendations in the future.

**An Economic Analysis of Drug Crime and Policy in America**

Sofiya Payne, CURO Research Assistant
*Dr. David B. Mustard, Economics, Terry College of Business*

This project is an economic analysis of drug offenses within the American criminal justice system in which I answer the question; would reforms in American drug policy be economically advantageous to society? I determine the economic impact of reforming aspects of the prison-industrial system to minimize the proportion of incarcerated non-violent drug offenders and thus reduce America's prison population. This project compares the societal impact of incarcerating people to address the national drug health crisis vs. the impact of investing in alternative programs, which aim to keep drug offenders out of prison and treat drug addiction. To accurately analyze the current national drug policy in comparison to the alternative policy I research the direct costs of incarceration, the effectiveness of incarceration in terms of recidivism, and treatment of drug addiction. I also compare national drug addiction statistics with tough-on-crime policies to determine if these policies effectively deter drug usage. To analyze drug reform policies I examine the cost of implementing such reformation programs, as well as analyze the effectiveness of these programs in terms of recidivism rates and how many people are "cured" of addiction. To accurately assess the cost of illegal drugs to America I assess the indirect societal cost associated with drug use, such as the cost to victims, the cost of attempts to stop the influx of drugs, and the cost of addiction.

**Investigating the Function of Cell-Cycle Related Kinase in the Hedgehog Pathway**

Jessica Perciaccante
*Dr. Jonathan Eggenschwiler, Genetics, Franklin College of Arts and Sciences*

Hedgehog (*Hh*) signaling determines cell fates in developing mammalian embryos. Signal transduction by the *Hh* ligand occurs predominantly within the primary cilium. Cell cycle-related kinase (CCRK) has been shown to be a key factor in the regulation of *Hh* signaling and ciliogenesis. CCRK deficient cells lack control of cilium length and mutant embryos express developmental defects associated with inappropriate regulation of *Hh* signaling. We hypothesize that CCRK regulates the efficient transportation of *Hh* pathway regulators to the cilium. We will test our hypothesis by comparing the ciliary localization of *Hh* transducer Smoothened (*Smo*) in mutant mice cells that lack CCRK with wild-type mice cells. The presence or absence of *Smo* in the cilium will be assayed by immunofluorescent microscopy after different time periods of exposure to the *Hh* pathway agonist (SAG). We will categorize the localization of *Smo* to the cilium as complete, absent, or partial. In cells exposed to SAG for short time periods, we expect mutant cells to have a greater reduction of ciliary localizations in comparison to controls. To further asses the role of CCRK in the *Hh* pathway, we will test whether reducing actin polymerization with cytochalasin D enhances this ciliary localization defect. Additionally, we will assess whether overexpressing CCRK expedites the recruitment kinetics of SAG-induced ciliary localization of *Smo*. By assaying these transport rates, we will

determine whether the function of CCRK in regulating ciliary transport of *Hh* pathway components is actin- and dosage-dependent.

**Aquaponics: A Survey of Georgia County Extension Agents**
Natalie Perkins
*Dr. Kris M. Irwin, Forestry, Warnell School of Forestry and Natural Resources*

Currently, there is not a central clearinghouse resource to provide vital how-to knowledge to extension agents, which they can share with citizens interested in aquaponics. Knowledge gaps in this topic have been found for both teachers and growers, but no research has been done on how extension agents can be better equipped to handle aquaponics' new approach to agriculture. Very little is known about the level of knowledge extension agents possess regarding aquaponics, but it is known that aquaponics is not a topic covered in-depth as part of extension agent training. As a result, extension agents must turn to individuals within the Warnell School of Forestry and Natural Resources, and beyond, to get answers for the questions posed to them. Therefore, it is essential to better understand the knowledge and skill deficiencies of agriculture extension agents before any effective method can be used to address their needs. To do this, I am conducting a survey of Georgia Agriculture Extension agents to assess their knowledge and skill needs. Armed with this data, I will then evaluate opportunities to address critical needs for content and training. The work done in this study can directly inform future efforts to establish support materials, not only for extension agents, but also for the interested parties that call them. Given that there is a master's assistantship program beginning shortly at UGA which aims to develop resources for multiple stakeholders invested in aquaponics, this information will be invaluable for that project.

**Cognitive Reserve as a Potential Mediator of the Relationship Between Physical Activity and Short-Term Memory in Older Adults**
Robert Petcu, CURO Research Assistant
*Dr. Steve Miller, Psychology, Franklin College of Arts and Sciences*

The literature consistently correlates aerobic exercise and improved short-term memory in older adults. Cognitive reserve (CR) describes how some individuals may compensate for age-related changes in memory. College of Education, occupational attainment, and exercise are components of CR. We examined CR as a mediator for the relationship between physical activity and short-term memory in 32 older adults (M=72.19 years old, SD=5.91). Physical activity was determined by average daily steps (SA) and average daily activity (AA). CR was determined by a composite of z-scores for years of education (M=17.25 years, SD=2.00), highest salary (M=$87171.87, SD=$65554.04), and occupational difficulty, ranging from 1-9 (M=7.09, SD= 1.47). Short-term memory (STM) was the total of Trials 1-5 Free Recall (T1-T5FR) of the California Verbal Learning Test-II. A simple linear regression with one-tailed p-values showed a positive correlation between both SA and AA to STM, (SA: $F(1,30)=2.74$, $p=0.05$; AA: $F(1,30)=1.63$, $p=0.11$). In step 1 of the mediation model, the regression of SA on STM, ignoring the mediator (CR), was not significant, $b= 0.00$, $t(29)=1.69$, $p=0.10$. Step 2 showed the regression of SA on the mediator was not significant, $b=0.00$, $t(30)=1.36$, $p=0.18$. Step 3 showed the regression of the mediator on STM, controlling for SA, was not significant $b=-1.53$, $t(29)=-0.45$, $p=0.66$. Step 4 revealed that controlling for the mediator, SA was not a significant predictor of STM, $b=0.00$, $t(29)=1.69$, $p=0.10$. The mediation analysis for AA yielded non-significant results for all pathways and the overall mediation. Although there was a correlation between SA and STM, CR did not mediate the relationship between physical activity and short-term memory.

**Zinc Oxide Nanoparticles Topcoated on Nitric Oxide Donors to Increase Antimicrobial Properties**
Arianna Petersen, CURO Research Assistant
*Dr. Hitesh Handa, Chemical, Materials, and Biomedical Engineering, College of Engineering*

One major concern regarding surgery is the risk of infection. Naturally, developing antimicrobial coatings for surgically implanted materials will greatly reduce the potential for infection. In this project, we will study the antimicrobial properties of nitric oxide (NO) topped with a zinc oxide nanoparticle topcoat against bacteria *Staphylococcus aureus* and *Pseudomonas aeruginosa*. NO is known to be an antimicrobial agent, so this project specifically studies how the zinc oxide nanoparticles act as a catalyst to promote the activity of the NO. The topcoat is applied on a polycarbonate-based polyurethane (CarboSil) containing S-nitroso-N-acetylpenicillamine (SNAP), which supplies the NO. The sample containing the nanoparticle topcoat is expected to have a sustained and substantial nitric oxide release lasting multiple weeks, whereas the sample with no topcoat is expected to only release nitric oxide for approximately 24 hours. Additionally, the topcoat is hypothesized to prevent SNAP leaching compared to the control sample. Ultimately, the zinc oxide nanoparticle topcoat will greatly increase the ability of SNAP to prevent the growth of both *Staphylococcus aureus* and *Pseudomonas aeruginosa* while remaining nontoxic to mammalian cells.

**The Role of Medication Adherence in Hospital Readmissions of Veterans with Heart Failure**
Justin Kyle Petway, CURO Research Assistant
*Dr. Lilian Sattler, Clinical and Administrative Pharmacy, College of Pharmacy*

Heart failure (HF) is one of the leading causes of hospital readmissions and is associated with reduced patient quality of life and societal burden in the form of U.S. healthcare expenditures. Even with evidence-based medical HF therapy, the risk of hospitalizations and mortality in advanced HF patients is very high. Although rates of readmissions at Veterans Administration (VA) and non-VA hospitals have been at comparable levels, little is knowns about (1) Veteran's readmission rates at acute care non-VA hospitals, and (2) the role of medication adherence in acute care hospital readmissions when compared between Veterans and Civilians. Therefore, the proposed cohort study will examine the role of

medication adherence in hospital readmissions of Veterans as compared with Civilians with a diagnosis of HF. This study will be conducted as part of a larger cohort study examining the effect of nutritional intake, food insecurity, and medication adherence in hospital readmissions of HF patients. Eligible study participants will be recruited at Piedmont Athens Regional Medical Center and will visit the UGA Clinical and Translational Research Unit for data collection. Readmission information will be obtained via telephone follow-up. Findings from this study will provide key knowledge of strategies to address readmissions in Veterans.

**Singlet Fission and the Magnetic Field Effect on Rubrene/Alq3 Films**

Terry Sheng Phang
*Dr. Tho Nguyen, Physics and Astronomy, Franklin College of Arts and Sciences*

Rubrene is an organic molecule which exhibits singlet exciton fission, a process in which one photo generated singlet exciton can divide into two triplet excitons. Consequently, the two triplet excitons have a longer lifetime and are therefore more likely to dissociate into free charge carriers such as electrons and holes. Because the implications of this process could revolutionize applications in Organic Photovoltaic devices, it is of great interest in this area of research. For example, this mechanism could theoretically increase the power conversion quantum efficiency of Organic Solar Cells from 100% in current technology to 200%. In this project, we investigate the effect of several spin dependent processes such as charge triplet interaction and triplet-triplet annihilation on single fission processes. We will grow amorphous Rubrene crystals in a Vapor Deposition apparatus. In order to isolate the photo-generated singlet excitons from the intermolecular interaction, we will create a composite composed of 98% Alq3 and 2% Rubrene. The Alq3 will be deposited via e-beam and thermo-evaporation techniques. The rate of interaction will be controlled by the temperature-dependent magnetic field effect on photoluminescence. This study will allow us to gain a deeper understanding of singlet fission processes.

**Modern Pregnancies and Their Ties to a History of Hate**

Sydney Phillips, CURO Honors Scholar
*Dr. Sherell McArthur, Educational Theory and Practice, College of Education*

Racism is no stranger to American history nor the modern American world—particularly in the American South. Within the African American community, the internalization of racism has been found to increase susceptibility to chronic stress. This stress in a prenatal context can manifest physiologically, thus increasing the likelihood of pregnant women experiencing adverse birth outcomes including low birth weights, pre-term birth, and infant mortality, with black infants dying at more than twice the rate of white infants. However, it is important to recognize the distribution and spread of women suffering adverse birth outcomes across the state of Georgia. It is thought that counties in which overt discrimination has been prevalent historically will likely see a larger number of black women experiencing these adverse birth outcomes in recent years. In an effort to determine the historical role of the issue in modern years, a correlation coefficient can be calculated between counties in the state with occurrences of historic hate crimes and the number of black women who have experienced adverse birth outcomes recently. Both a Pearson and Cohen correlation between the two variables will be calculated. From this study, a moderate correlation is expected. But, if a strong correlation is found through this research, then it can be said with confidence that in certain geographical areas with a history of racism, African American women are more likely to experience adverse birth outcomes, and changes can be made towards remedying adverse birth outcomes for black women in the state of Georgia.

**Sex-Trafficking and Peacekeeping in Post-Conflict Countries**

Heather Pieper, CURO Research Assistant
*Dr. Danny Hill, International Affairs, School of Public and International Affairs*

While UN Peacekeeping Operations seek to restore order and protect civilians in the wake of the most severe conflicts, their presence is associated with sharp increases in human sex trafficking. In light of the wave of scandals revealing peacekeeper involvement in prostitution and sexual exploitation, this association must be seriously examined. To further explore this seemingly contradictory relationship between peacekeeping and human trafficking, this study examines the confounding factor of post-conflict criminal economies that develop in response to institutional breakdown. If peacekeeping operations are sent to only the worst conflicts, then the institutional breakdown would be the most severe in those areas, and criminal economies would flourish more. On the same token, in areas where peacekeeping operations are successful at establishing a positive peace producing institutional rehabilitation, one would expect a lesser increase in illicit markets like sex-trafficking. To test this theory, this study evaluates the level of peace established and the increase in sex-trafficking in all post-conflict countries since 2002. Countries are then differentiated by the presence of a successful, unsuccessful, or no peacekeeping operation, and sex-trafficking rates are compared across those categories. Through this, I anticipate finding that the level of peace established after a conflict is responsible for the variation in sex-trafficking rather than the presence of peacekeepers alone. If this were not true, then the UN's method of promoting peace would at the same time directly combat its efforts to promote human rights, and significant reform would be in order.

**Discrimination Between High and Low Osteogenic Potency MSCs**

Taylor Pigg
*Dr. Luke Mortensen, Animal and Dairy Science, College of Agricultural and Environmental Sciences*

Mesenchymal stem cells (MSC) therapies have the potential to treat metabolic bone diseases, including osteoporosis and osteogenesis imperfecta. However, despite the therapeutic potential of MSCs, there are no approved therapies. One of the current limitations of MSC therapy is the ability to identify

efficacious cells without full differentiation. This experiment seeks to define the minimal means necessary to discriminate between high and low osteogenic potency donors. Here, we induce osteogenesis in two MSC lines with house-made osteogenic media of varying strength for three weeks. Each week, we assessed osteogenesis of MSCs by quantifying mineralization, ALP production, and collagen secretion with histological stains. In addition, the expression of osteogenic genes was quantified with RT-qPCR. All results were normalized to the number of cells using PicoGreen. Using multivariate analysis, we will determine the time-point, osteogenic conditions, and appropriate measures necessary to discriminate between high and low osteogenic potency MSCs. Through this analysis, we hope to determine the optimum measures necessary to determine efficacy early in cell life.

**More Than a Cup: Analysis of a Fungal Pathogen in Shade Grown *Coffea Arabica***

Hannah Pike, CURO Research Assistant
Luana Oliveira
*Dr. Amanda T. Rugenski, Ecology, Odum School of Ecology*

*Coffea arabica* is among the most valuable legally traded commodities from the developing world. As temperature and precipitation patterns change, tropical economic plants, such as coffee, may be at risk for decreasing yields. One cause of decreasing yields is fungal diseases, such as *Mycena citricolor*. Given that fungal incidence may be influenced by changing climate patterns, it is important to quantify how this fungus is related to moisture and shade. We studied fungal incidence, soil moisture, and canopy cover on twenty juvenile coffee plants grown in a plot on the UGA Costa Rica campus. We also studied these factors in ten juvenile coffee plants in the premontane wet forest ecosystem on campus. In a one-month wet season span, the percent of leaves with fungus grew greatly in plants already infected, while leaves on plants with no fungus remained unaffected. We found percent soil moisture had a significant negative relationship to percent of leaves with fungus ($p = 0.035$, $r^2 = 0.37$). We also found a significant negative relationship between canopy cover and percent of leaves with fungus ($p < 0.001$). This study found shade grown coffee practices may serve as protective factors against Mycena citricolor. This finding has important implications for agriculture practices in the tropics considering changing climate patterns and may serve to reveal another benefit of shade grown coffee practices.

**Role of Packing Defects in the Regulation of Human UDP-Glucose Dehydrogenase**

Brittany Pioso, CURO Research Assistant
*Dr. Zachary Wood, Biochemistry and Molecular Biology, Franklin College of Arts and Sciences*

Glucuronidation is an important drug metabolism pathway that can produce drug resistance in some cancers. This drug resistance can be inhibited by limiting the availability of the essential glucuronidation substrate, UDP-glucuronic acid. Human UDP-Glucose dehydrogenase (hUGDH) oxidizes UDP-glucose to produce UDP-glucuronic acid. Understanding how hUGDH is regulated could lead to new therapies for combatting drug resistance. hUGDH activity is regulated by an allosteric switch that controls the structure and activity of the enzyme. The binding of UDP-glucose induces the enzyme to slowly isomerize (hysteresis) into an active conformation (E state). In contrast, the binding of the inhibitor UDP-xylose induces the allosteric switch to change conformation and produce an inactive, horseshoe shaped enzyme complex (Eomega). The movement of the allosteric switch appears to require cavities in the protein core which, when filled, restricts movement of the allosteric switch and prevents isomerization between the two different states (E to Eomega). To lock hUGDH in the Eomega, a cavity specific to this state was filled by two different substitutions (hUGDHI109V+A136M) to lock the protein in the Eomega state. For I109V, the structure formed when I109V was crystallized with UDX was in the Eomega conformation. Another solved crystal structure shows formation of the E* conformation as well. Kinetics indicate a lack of hysteresis in this enzyme. This shows that this substitution stabilizes hUGDH and lock the allosteric switch in the targeted conformation and prevents the movement of the allosteric switch fully into the E conformation.

**Effect of Hormone-Ligated Toxins and Endosomal Disruptive Agents on Prostate and Pituitary Cancer Cells**

Tj Venkata Pothuraju, CURO Summer Fellow
*Dr. Ramesh Selvaraj, Poultry Science, College of Agricultural and Environmental Sciences*

This undergraduate research work will study the efficiency of ligand-toxin and ligand-endosome disrupter in inducing apoptosis in a prostate cancer cell line and pituitary cancer cells. We propose to simultaneously and separately target an endosome disruptor and cytotoxic compound in the cancer cells, resulting in a highly specific and efficacious targeted treatment strategy that can be applied to treat both local and metastatic prostate cancer. We propose to optimize the application of gonadotropin releasing hormone receptor (GnRHR) and gastrin releasing peptide receptor (GRPR) ligands to independently and simultaneously target both a toxin and an endosome disrupter to ablate prostate cancer cells. By using toxins that are sensitive to endosomal degradation, this strategy improves specificity, with efficacy limited to only those cells that express both the GnRHR and GRPR. The improved specificity encourages the use of toxins that result in cell death (cytotoxic) rather than inhibitors of mitosis (cytostatic). Moreover, it allows for the use of toxin molecules that are effective at very low concentrations. To test this, we ran 72-hour apoptosis assays on cells *in vitro* against different toxin conjugates. The cell lines used were PC3 (prostate cancer) and Alpha T3 cells (pituitary cancer). After the trial was conducted, we analyzed the results through a flow cytometer. Our initial results show that certain toxins are able to kill pituitary cancer cell lines at a higher rate than others, and the toxin/endosome combination had higher apoptosis rates than either compound individually.

**Physical Disability Representation in Theater, Film, and Television**

Taylor Potter, CURO Research Assistant
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This research performs an inspection of theater, film, and television from 2010-present day featuring people with physical disabilities. Through cross-medium exploration, this research uncovers the various ways in which characters and actors with disabilities are commonly (and stereotypically) depicted as well as the many ways they are left out entirely from the world of entertainment. This multi-medium analysis questions whether or not the role of a character with a disability should only be allowed to be portrayed by an actor with the same or a related disability. Additionally, it concerns itself with the varying levels of emphasis that are placed on characters' disabilities—is the character's level of ability their defining attribute, or does the creative work have a purpose unattached to the character's level of ability? Lastly, this project considers how these types of representation reflect the public's perception of people who are differently abled. While ongoing, this research project should result in the development and analysis of a cultural understanding of the representation of people with physical disabilities in theater, film, and television.

**A Network Analysis of the 'Haves' and the 'Have-Nots' in Litigation**

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The theory of 'Haves' and 'Have-Nots' describes the existence of a power differential that dichotomizes litigants into separate groups—one group that possesses the resources and organizational capacity to be successful, and another that is under-equipped in both regards and is more often unsuccessful. Although widely acknowledged and accepted, empirical tests of this theory lack in one essential regard; they do not directly test the implications of litigants' positional structure relative to the positional structure of their opposition. Using a dataset of 1038 Appellate Court cases from 1997—2007 in which nodes are litigant types, ties represent adversarial appearance of litigant types in a case, and self-ties represent a litigant type suing the same litigant type, this research investigates whether a network-defined classification of litigant types can predict success. The empirical validity of the following three research questions regarding the effect that positional structure has on success in courts was tested. The three questions were as follows: 1) Do structurally unique blocks of litigant types exist? 2) Does the network of litigant types have an identifiable core-periphery structure? And, 3) Is there a spectrum of litigant type strength? An analysis of the data confirmed each of these speculations and indicated that networks may play a potentially influential role in litigant outcomes. Importantly, this study confirmed that a litigant type's network position can indicate case success. Consequently, there is strong support for a network-based approach to redefining and further testing theories about the 'Haves' and 'Have-Nots'.

**Goal Orientation and Individual Characteristics**

Alyssa Powell
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This study examined the three dimensions of goal orientation: learning (LGO), performance-prove (PGO-P), and performance-avoid (PGO-A) and related various demographic characteristics (age, gender, educational attainment, organizational level, and geographic region). Measures of goal orientation were collected using VandeWalle's 14-item work domain goal orientation instrument, and were self-reported from a sample of adults in the United States and Canada. The data were analyzed and descriptive statistics were calculated for demographic characteristics; additionally, a one-way ANOVA was conducted to analyze potential relationships between the goal orientation dimensions and demographics. Results found significant relationships between LGO and gender, PGO-P and age, LGO and organizational level, PGO-A and organizational level, and PGO-P and geographic region. These findings hold important implications for further research as well as practical implementations for higher education and industry professionals. The findings suggest that certain demographic characteristics can be predictors of an individual's goal orientation disposition, which is useful knowledge for implementing motivational strategies depending on audience characteristics.

**Phylogenetic Analysis of Family 1 Glycosyltransferases Among *Caenorhabditis elegans*, *Homo sapiens*, *Arabidopsis thaliana*, *Drosophila melanogaster*, and *Saccharomyces cerevisiae***

Ganesh Prabakaran
*Dr. Natarajan Kannan, Biochemistry and Molecular Biology, Franklin College of Arts and Sciences*

Family 1 Glycosyltransferases (GT1's) are a class of enzymes that enhance the usage of important macromolecules within the body in order to perform everyday metabolic processes in the body to maintain homeostasis. GT1's are most similar to those of humans and thus, by investigating the evolution of these enzymes across five different organisms, target genes that evolved for species specific functions can be identified. In order to accurately and effectively track changes in sequences among these organisms to perform a phylogenetic analysis, multiple sequence alignment tools were used to compare all the GT1's within each family together. Each of their binding domains were obtained and through the NCBI database and online software's known as Multiple Alignment using Fast Fourier Transform (MAFFT) and T-Coffee, the anaylis was completed, obtaining the multiple sequence alignment. Another software, AliView, was utilized in order to visualize the alignments and see the degree of variability between each sequence. Once final sequences are aligned and there is confidence in the distribution of results, a phylogenetic tree will be created in order to fully visualize the clades and distributions of the orthologous groups within the organisms.

**The Use of Heterologous Sigma Factors for Over Expression of ncRNA for Structural Studies**

Amanda Prater
Mary Forester
*Dr. Cory Momany, Pharmaceutical and Biomedical Sciences, College of Pharmacy*

Non-coding ribonucleic acids (ncRNAs) are a newly identified class of RNA that regulate various cellular processes. The functions of most of these molecules are unknown, but increasing evidence has indicated that many control or partially influence gene expression. Gene sequences associated with ncRNAs typically do not code for specific proteins because they lack an open reading frame, but they are able to modify chromatin structure and interact with proteins that regulate transcription, which ultimately have effects on gene expression. Non-coding RNA molecules have well-defined atomic structures that are associated with their specific functions, however, these structures cannot be easily studied because RNA is difficult to produce in large quantities. Using PCR and an NEBuilder® HiFi DNA assembly cloning kit, we have created RNA expression plasmids that produce sigma factors not naturally found in *E. coli* that recognize the sigma-factor-specific promoters for inducible expression of ncRNAs. Using these plasmids, we may identify better ways of making RNA through the manipulation of organisms for *in vivo* RNA production or alternatively using recombinant RNA polymerase to perform *in vitro* RNA synthesis.

**Ty1 Mobility and Copy Number Control in Naturally Passaged *Saccharomyces paradoxus***

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Retrotransposons are mobile genetic elements that replicate through an RNA intermediate. Transposition events can cause mutations and genome rearrangements as well as an overall increase in copy number. To inhibit these effects, organisms evolved defense mechanisms to lower the rate of transposition. *Saccharomyces cerevisiae* and its sister-species *S. paradoxus* restrict Ty1 movement by a copy number control (CNC) mechanism that is based on the autogenous restriction factor p22. Ty1 transposition rates have been calculated indirectly using elements tagged with the indicator gene *his3-AI*. To obtain the rate of Ty1 transposition directly and test the effects of CNC, an *S. paradoxus* strain with one functional Ty1 in its genome was allowed to naturally transpose for more than 2000 generations by transferring single-colonies over 150 times. Lineages were established for several independent isolates. CNC was determined by comparing the mobility of Ty1*his3-AI* introduced into different lineages with that of the starting strain. We performed Southern blot analyses to determine Ty1 element copy-number, and found fluctuation in the location and number of Ty1 copies. Transposition rates were based on the number of new Ty1 insertions in a lineage and the number of cell divisions required to form a colony on rich medium. Our study suggests that Ty1 retrotransposition and loss by recombination occurs at much higher rates than previously reported, and CNC was established as copy numbers increase. Whole genome sequencing will be used to further characterize Ty1 mediated events in the lineages.

**Does Exposure to Low Doses of Neonicotinoids Reduce Monarch Butterfly Flight Performance?**

Cody Prouty, CURO Research Assistant
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Neurotoxic neonicotinoids are persistent insecticides that provide broad systemic protection to crops and ornamental plants. Because they are long-lasting, potent, and can spread from the site of application, neonicotinoids can cause lethal and sub-lethal harm to beneficial insects such as honeybees and butterflies. Monarch butterflies are famous for their long-distance migration from the Eastern US and Canada to overwintering sites in Mexico. Monarch numbers have declined during the past two decades; causes of the decrease are complex and might include exposure to pesticides. In this study, I examined whether neonicotinoids reduce monarch development and flight performance. I predicted monarchs exposed to sub-lethal concentrations of neonicotinoids at the larval stage would show slower development to the adult stage and would have reduced flight distance and speed. To test these predictions, offspring of wild migrant monarchs were fed low doses (5 and 25 ppb) of clothianidin and imidacloprid added to their diet of milkweed plants. Surviving adult monarchs were flown on a tethered flight mill to record the total distance, time in flight, and initial, average, and final velocity. Results showed that at these concentrations, negative effects of neonicotinoids on monarch flight were not detected. This study suggests monarchs might tolerate doses known to be harmful to bees. Given scientific knowledge of the sub-lethal effects of neonicotinoids on bee flight and foraging behavior, further work is needed to determine whether, and at what doses, these chemicals alter flight and behavior in monarchs and other butterflies.

**The Feasibility and Reproducibility of a 5-Minute Endurance Test of the Diaphragm Muscle**

Ellie Pryor, CURO Summer Fellow
*Dr. Kevin McCully, Kinesiology, College of Education*

Better clinical tools to assess diaphragm muscle function are needed, especially for respiratory failure in patients. Electrical stimulation and accelerometer-based mechanomyography have been used to identify the endurance index of various muscles, but not of the diaphragm. Test the feasibility and reproducibility of an endurance test of the diaphragm muscle using electrical stimulation of the phrenic nerve. Fifteen healthy subjects (21.3±1.0 yrs) were tested in the supine position on two separate occasions within one week. Stimulation electrodes were placed on the left (n=13) or right (n=2) phrenic nerve. The stimulation intensity to induce a vigorous contraction was determined. An accelerometer was placed on the abdomen. The endurance test consisted of 5 minutes of 5 Hz stimulation, with a sampling rate of 400Hz. The average acceleration per minute was used to calculate an endurance index (ending value/peak value*100). A series of practice tests were performed before data collection. A successful test indicates that the full 5

minutes of stimulation was complete. The test was successfully completed 30/36 times. The time to find the phrenic nerve was 42.2±36.6s for the first 7 participants and 14.0±10.0s for the last 8 participants. The endurance index for trial 1 and 2 were 72.5±9.4% and 70.8±11.6%, respectively (between days, p=0.47, CV=9.5%, ICC=0.67). The time to find the phrenic nerve decreased with practice. The endurance test was reproducible and did not have an order effect. With additional training and testing, the diaphragm endurance test is a promising method of evaluating clinical populations.

**The Makeup of Gifted and Talented in Georgia**
Sebastian Puerta, Foundation Fellow
*Dr. Josh Kinsler, Economics, Terry College of Business*

Gifted education in Georgia consists of a differentiated curriculum, often through a pull-out class system, where students of a "high degree of intellectual and/or creative ability, [who] exhibit an exceptionally high degree of motivation, and/or excel in specific academic fields" are provided "special instruction and/or special ancillary services to achieve at levels commensurate with his or her ability." Gifted education procedures, such as the selection process, are left to the discretion of local school systems. Although the state's gifted guidelines promote universal screening for gifted education to combat implicit bias against underrepresented groups, there is a large disparity among class and race in gifted programs. How large these gaps are and the extent to which these gaps are caused by discrimination, however, are unknown. Here I show the size of these discrepancies and create a model that may explain their cause. The data reveal a gifted system that selects against students of certain races and socioeconomic status. These results are especially alarming in a state that is becoming increasingly racially and ethnically diverse.

**Personality and Music Preferences: A Role for Music in Self-Discrepancy Reduction?**
Tristan Pugh, CURO Research Assistant
*Dr. W. Keith Campbell, Psychology, Franklin College of Arts and Sciences*

Are music preferences emblematic of one's striving to reduce the discrepancy between who they are and who they want to be? Previous research suggests personality plays a role in the type of music we choose to listen to (Rentfrow, Goldberg & Levitin, 2011). The purpose of the present research is to explore music preferences through the lens of self-discrepancy theory, which states disparities between the ideal and actual self will cause negative emotions which motivate us to reach a condition in which our self-concept matches our personally relevant "self-guides," often predicated on the attainment of goals (Higgins, 1987). Utilizing trace data collected from Spotify, we seek evidence individuals exhibit certain music preferences—the music we tend to listen to when faced with a multiplicity of alternatives—to enhance efficacy in goal-related behaviors. Specifically, we examine the discrepancy between self, ideal, and artist-targeted ratings of personality in order to quantify the magnitude of perceived similarity between artists and their audience members, with respect to the "ideal selves" of listeners.

**Evaluating Carbon Intensity, Economics, and Abatement Cost of Electric and Gasoline-Powered Cars Across the United States**
Austin Pyle
*Dr. Puneet Dwivedi, Forestry, Warnell School of Forestry and Natural Resources*

In 2016, the transportation sector emitted 28% of the overall greenhouse gas (GHG) emissions in the United States. The federal government is providing up to $7,500 in the form of a tax credit towards the purchase of all-electric vehicles assuming that the use of all-electric cars relative to gasoline cars will reduce GHG emissions and the economic burden of vehicle ownership nationwide. It is essential to understand GHG intensity and economics of all-electric vehicles relative to a typical gasoline car for evaluating the efficacy of all-electric vehicles. We first estimated GHG intensity of an all-electric car driven over 100 km for each state. We also estimated the GHG intensity of driving an equivalent gasoline car over the same distance. Then, we determined the cost of driving an all-electric car compared to a gasoline powered car on a per 100 km for all the states. The carbon intensity of all-electric car was higher for 41 states relative to a gasoline-powered car, as the majority of generated electricity in these states came from fossilized fuels. The cost of ownership of an electric car was nearly twice that of a gasoline-powered car on an average across states. Our study suggests that one has to undertake an integrated economic and carbon accounting for ensuring the purchase of an all-electric car is contributing to the attainment of national policy goals.

**Autophagy-Related Protein Ulk1 is Necessary for Maintaining Muscle Quality with Age**
Anita Qualls, CURO Summer Fellow, CURO Research Assistant
*Dr. Jarrod A. Call, Kinesiology, College of Education*

Ulk1 is a protein kinase that activates autophagy, a cellular recycling mechanism that maintains homeostasis via degradation of damaged organelles, proteins, and infectious agents. Inadequate autophagy is associated with the aging process and the pathophysiology of common diseases (i.e. Alzheimer's, cancer, sarcopenia) due to the disruption of physiological processes necessary for proper cell function and survival. The objective of this study is to investigate the role of autophagy in aging skeletal muscle using a Ulk1 knockout (Ulk1 KO) mouse model. To assess skeletal muscle strength, *in vivo* ankle dorsiflexion torque was measured longitudinally in Ulk1 KO mice and their littermate controls (LM) from 12 to 22 months of age. Ulk KO mice demonstrated a greater reduction in dorsiflexion torque than LM mice (-50% vs. -36%, p=0.026). After 22 months of aging, *in vitro* peak-isometric force testing of isolated extensor digitorum longus (EDL, predominantly fast-twitch) and soleus (SOL, predominately slow-twitch) muscles were performed. Peak isometric torque was reduced in the EDL of Ulk KO mice compared to LM mice (168 vs. 204 mN/cm2?), p=0.027), while no significant difference between genotypes was measured in the SOL (p=0.237). This supports the literature that fast-twitch fibers are the principal target for aging-related skeletal muscle dysfunction and suggests Ulk is necessary for the maintenance of muscle function during aging. To assess skeletal muscle mitochondrial

function, rates of oxygen consumption were measured from permeabilized gastrocnemius fibers. Ulk1 KO mice experienced greater mitochondrial respiration rates than LM mice when normalized to muscle fiber mass (p=0.001), suggesting insufficient autophagy alters mitochondrial quality and/or quantity. Consequently, our lab will conduct enzyme activity assays, histological studies of the neuromuscular junction, fiber typing, and cross-sectional area measurements of the tibialis anterior (TA) to further investigate the effects of Ulk1-mediated autophagy on age-related skeletal muscle dysfunction.

**PLGA Nanoparticle Encapsulated DM-1 Prodrug for Enhanced Radiosensitization in Lung Cancer Cells**

Mohammed Rezwan Racin, CURO Research Assistant
*Dr. Jin Xie, Chemistry, Franklin College of Arts and Sciences*

Widespread usage of tobacco and increase in air pollution has advanced Lung cancer as the leading cause of cancer mortality in the United States and around the world. In the past, inadequate treatment options caused an alarming rise in mortality rate and economic loss. However, Mertansine (DM1) conjugated with specific antibodies has shown promising results in targeting gene receptors that play important role in Lung cancer progression. Despite the fact, some studies demonstrated that Multidrug resistance (MDR) is a common issue in DM-1 radiation therapy as can decrease the effectiveness of chemotherapeutics. In this study, we synthesize Nitric Oxide DM-1 (DM-1 NO) conjugation to enhance the radio-sensitization property of the free drug. Previous research has shown Nitric Oxide (NO) to reduce multidrug resistance by reacting with Reactive Oxygen Species (ROS) to decrease oxidative stress. Nitric Oxide species do not directly attack tumor cells. However, in presence of radiation, NO can react with 1O2 radicals and form peroxynitrite. Peroxynitrite can lead to the deamination of DNA bases such as guanine and cytosine, thus causing tumor apoptosis. To minimize side effects and toxicity of free drug, DM1-NO complex is encapsulated inside FDA approved biodegradable copolymer, Poly(lactic-co-glycolic acid) (PLGA) nanoparticles. Efficacy of the formulation is assessed through γ-H2AX analysis and Superoxide dismutases (SOD) activity. γ-H2AX and SOD formation are initial repair mechanisms for DNA damage. As such, γ-H2AX foci count and % SOD activity directly correlates to the degree of damage the prodrug will do to tumor cell lines.

**A Novel Regulator of Muscle Function and Myoblast Differentiation**

Simran Rajput, CURO Research Assistant
*Dr. Takahiro Ito, Biochemistry and Molecular Biology, Franklin College of Arts and Sciences*

Skeletal muscle is vital for movement, breath, and metabolism of the body. Because skeletal muscle consumes a lot of energy, mitochondria quality and quantity are critical to muscle function. Our previous work shows that mice with knockout (KO) of a gene named M2 have less exercise performance in a treadmill assay, suggesting M2 is important for normal muscle functions. We hypothesize that M2 regulates muscle function and/or development. Preliminary data shows M2 expression in mitochondria. Other data show that M2 loss impairs myoblast cell differentiation in vitro. We hypothesize that M2 regulates muscle by regulating mitochondria and myoblast differentiation. Future study will focus on two approaches: the impact of M2 KO on mitochondria function and biogenesis and the mechanism of M2 regulating myoblast differentiation. Findings of this new pathway may provide targets for treatment of myopathies or improving muscle function to improve health.

**Outlet for Opium: Content Analysis and Eye Tracking Data on Tweets About the Opioid Crisis**

Charan Ramachandran, CURO Research Assistant
*Dr. Bart Wojdynski, Journalism, Grady College of Journalism and Mass Communication*

With politics becoming more and more freely discussed over social media, it is no coincidence that they are sought after as a prime advertising platform for campaigning. Deaths involving opioid overdoses have been rising exponentially, so state departments of health have been using Twitter as an outlet for their stance. The purpose of this research is to draw conclusions as to what keywords/phrases or parts of an image are most impactful to the reader's understanding of the opioid epidemic. Participants will be given a pre-reading questionnaire, read randomly selected tweets, and answer a post-reading questionnaire. In order to see what specific details of the tweet triggered the response, the participants' eye movement will be monitored, returning a heat map of the parts of the tweet they gravitated towards. Prior to experimentation, each tweet used for testing will be classified based on whether or not an image is shown, what is the call to action if any, and what emotions are portrayed. Content analysis of the tweets and the participants' responses will allow for insight on how to structure and word public service announcements to maximize effectiveness.

**Bridging the Gap: Improving Health Status by Facilitating Client-Provider Connections**

Vineet Raman, Ramsey Scholar, CURO Summer Fellow, CURO Research Assistant
*Dr. Rebecca Ann Matthew, Social Work, School of Social Work*

The community health worker (CHW) model has been used successfully in the US since the 1950s to enhance access to and quality of health and social services. Lazos Hispanos, an interdisciplinary community health worker research project, consists of 9 community partners/service providers and 5 CHWs, who are able to leverage their linguistic and cultural backgrounds to connect with hard-to-reach, underserved clients in Athens-Clarke County. The community faces several barriers to access healthcare such as lack of health insurance options and limited Spanish-language resources. This project entails a descriptive analysis of health screening data taken from health surveys of the CHW's clients. These health surveys are taken at the initial CHW-client contact CHW with subsequent 3-month follow ups taken for up to a year later. The health survey is drawn from the CDC's Healthy Days, a standardized questionnaire used to measure health-related quality of life. The surveys and follow ups can give insight into the impact

of the referrals made by the CHWs. The descriptive analysis will be contextualized with qualitative data from an ongoing focus group on the main barriers to successful referrals and completing the health screening. The results of the analysis and focus groups will be further contextualized with that of existing literature pertaining to the role of promotoras in resource-poor environments and healthcare systems wherein the regional political moment is anti-immigrant. Literature will also be examined regarding the impact of similarly broad-trained CHWs and the barriers faced in making connections and completing health screenings.

**Mission Emission: Increasing Accountability Through Carbon Cost Evaluation**

Tarun Ramesh, Foundation Fellow
Teddy Vincent, Emma Tucker
*Dr. Quint Newcomer, Ecology, Odum School of Ecology*

With the effects of anthropogenic climate change becoming more apparent every year, there has never been a more crucial time to work towards curbing greenhouse gas emissions. The University of Georgia produced 319,000 tonnes of carbon dioxide in the 2014 fiscal year. While plans have been made to reduce carbon emissions, an evaluation of these plans and other carbon mitigation, offset, and reduction strategies from various college campuses is crucial for a better understanding of carbon costs. With institutions of higher learning responsible for ~2% of annual U.S. greenhouse gas emissions, college campuses present a valuable and often-overlooked opportunity for sustainable policy implementation and education. While internal carbon pricing initiatives and other carbon mitigation strategies have been studied at small private universities, interventions tracking student participation, future careers in sustainability, faculty engagement, and socialized integration into every-day decisions have been sorely lacking. Focusing on these metrics will equip larger, public universities with the necessary information to understand public choice theory in the context of emission reduction and to engage students in environmentalism through a whole systems approach. The objective of this project is to reduce carbons emissions at a large, public university, involve the general student body in sustainability practices, and study the political methodology of public choice theory at a university. Evaluating the possibility of a carbon pricing policy will further UGA's goals for a more sustainable future by increasing accountability, decreasing emissions, and placing UGA at the forefront of environmentally conscious universities.

**Unsupervised Semantic Segmentation of Dynamic Cilia Boundaries**

Sonia Rao, CURO Research Assistant
*Dr. Shannon Quinn, Computer Science, Franklin College of Arts and Sciences*

In recent healthcare advancements, computer algorithms are proving to be an inexpensive supplement to doctors' diagnoses. One such example is the proposed use of computer vision techniques in expediting identification of ciliopathies, which are harmful genetic disorders of cellular cilial anchoring structures, the basal bodies, or ciliary function. With video data from medical professionals containing cellular and ciliary movement, we hope to create a neural network architecture capable of delineating moving cilia boundaries. Previous work by Quinn Research Group has shown that training a stacking model using a ground truth segmentation map and temporal pixel behavior, known as optical flow fields, produces over 85% accuracy for varying degrees of ciliary health. However, we must be able to robustly segment ciliary boundaries without depending on pre-defined segmentation maps, a process known as unsupervised semantic segmentation. This presentation focuses on the use of spatial and temporal video object features in creating an unsupervised segmentation deep learning architecture.

**Strength, Power, Work Capacity, and Fatigue Resistance are Enhanced in High Intensity Functional Training Athletes**

Kelsey Rene Rasheed
*Dr. Nathan T. Jenkins, Kinesiology, College of Education*

To assess differences in power (watts), strength (N.m.), fatigue (%Δ) and aerobic capacity (VO2max) in recreational athletes from cross country (END), Powerlifting and Olympic lifting (STR) and High-Intensity Functional Training (HIFT) backgrounds. Twenty-one participants (STR=7, HIFT=7, END=7) completed an incremental ramped, maximal aerobic capacity test and a 3-Minute All-Out test (3MAOT) on a cycle ergometer to determine VO2max, gas exchange threshold, peak power (PP), and end power (EP). PP was the maximum power output during the first 6 seconds and EP was the average power output during the last 30 seconds of the 3MAOT. Participants completed a maximal isometric knee extension test on a Biodex at 60°, 75°, and 90° of knee flexion. An accelerometer was placed on the right vastus lateralis to measure %Δ in movement during 11-minutes of electrical stimulation. $VO_{2max}$ was significantly different among groups (END:55.6 ± 5.2, HIFT: 43.5±1.8, STR: 35.6±3.9ml/kg/min, $p<0.01$). PP was significantly higher in STR compared to END (964.7±136.8, vs. 645.3±105.8W, $p<0.05$). EP was significantly higher in HIFT and END compared to STR (242.9±38.5 & 241.6±55.3 vs. 151.2±32.1W, $p<0.01$). STR and HIFT had significantly higher torque outputs compared to END ($p<0.05$). STR exhibited significantly higher fatigue (%Δ in movement) during the electrical stimulation test compared to HIFT and END (61.9±10.0 vs. 23.7±16.4 & 32.4±22.7%, $p<0.05$) indicating STR were more susceptible to fatigue. HIFT athletes exert maximal power outputs and absolute torque production analogous to strength specialists while also exhibiting sustainable power output and fatigue resistance comparable to endurance specialists.

**PDMS Well Fabrication for the Integration of High-Content Imaging and MALDI Analysis of MSCs**

Robert E. Ratajczak III, CURO Research Assistant
*Dr. Luke Mortensen, Animal and Dairy Science, College of Agricultural and Environmental Sciences*

Mesenchymal stem cells (MSCs) have great potential as a cell-based therapy due to their natural anti-inflammatory properties, but they have failed to translate. The national cell manufacturing consortium established four critical quality

attributes (CQA) that are necessary for a successful cell therapy and this project aims to address the CQA of identity. We aim to use high-content imaging and Matrix Assisted Laser Desorption/Ionization (MALDI) to characterize high and low MSC donors and determine key characteristics that define MSCs of varying potency. The combination of MALDI and imaging require a special set of constraints, which are not commercially available, such as culturing MSCs on an indium tin oxide (ITO) slide with removable and customizable wells. To address these issues, we made a polydimethylsiloxane (PDMS) well specifically designed for the correct size and depth for cell culture. The mold for the wells were made in TinkerCAD and fabricated on a 3D printer. The wells were created by pouring PDMS into the 3D printed mold. The mold allowed us to remove the wells without damaging them after being cured. Once the wells were made, they were adhered to ITO plates using a PDMS glue. MSCs were then introduced to the wells and allowed to grow before being imaged and sent to collaborators at Georgia Tech for MALDI analysis to be performed. The well design has led to the first ever successful experimental run of a combined imaging and MALDI analysis on MSCs to bring MSCs one step closer to an immune therapy.

**Exploring the Relationships Between Resilience and Student Performance in an Engineering Statics Class**

Davis Faircloth Ray, CURO Research Assistant
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Many studies have identified resilience as a key personal trait for success in both life and the workplace. Generally thought of as positive adaptation, it's not hard to understand that resilience is of great value to the academic world. Resilience may be described as a professional skill that students can start developing in the classroom to prepare them for successful careers. This professional skill is crucial for achieving academic success and comprehensive cognitive retention, particularly in technically demanding disciplines such as engineering. Despite this, few studies have examined how resilience impacts the academic engagement, performance, and retention of engineering students. Conducted by a unique cross-disciplinary research group, this study is a part of an ongoing, broader effort to begin mapping academic resilience with academic performance. It is hoped that this effort will help identify students at risk of dropping out of engineering while also adding value to the professional formation of all engineering students. We will look at a preliminary part of this study, in which we examined the relationship between resilience and engineering student performance in statics (ENGR 2120), as well as compared self-assessments of resilience among high and low performing students. Students completed an online survey where they self-assessed five measures of resilience (adaptability, self-sufficiency, self-control, optimism, and persistence); these results were compared to their learning performance in statics. Academic achievement was based on three traditional measures of achievement in statics (exam performance, homework performance, and class participation, over the course of the semester).

**A Distributed Algorithm to Construct Multi-Agent Connectivity Graphs in ROS**

Parisha Ramesh Reddy, CURO Research Assistant
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Graph theory is used in several applications from modeling circuits to connect people on social networks. Specifically, it is used to represent the communication network topologies in a dynamic time-evolving multi-agent (robot) system, where the connectivity graph is a fundamental requirement that enables control algorithms for agent coordination in performing various tasks. In this research, we develop a distributed algorithm that can construct connectivity graphs in the most efficient way possible. We use Python to implement these graphs as it has good compatibility with the widely-used Robot Operating System (ROS). Although Python does not have a class or data type for graphs, dictionaries, which stores key-value pairs, can be used. The keys are the nodes, and its corresponding values are all of the nodes that are connected to it by an edge. We conduct experiments on both simulated nodes as well as real-world dynamic multi-robot networks. ROS has a Computation Graph level that we will be utilized to evaluate the proposed algorithm. Results from this research are expected to benefit the robotics and multi-agent community.

**Synthesis and Properties of an $H_2$ Evolving Hydrogenase Mimic**

Amelia Grace Reid
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The on-demand and safe production of hydrogen gas ($H_2$) by electrocatalytic proton ($H^+$) reduction is of interest as a future renewable energy source. Today, platinum (Pt) is used as an electrocatalyst for these reactions because of its high turnover frequency (TOF) and low overpotential. However, due to its low abundance and high cost, the present focus is on the design and construction of catalysts using earth-abundant and affordable metals such as nickel (Ni). In nature, [NiFe]-hydrogenase ($H_2$ase) catalyzes the reversible reduction of $H^+$ to $H_2$ in anaerobic bacteria with Ni acting as the electron-transfer cofactor in the enzyme. Reported in this work is the construction of a low molecular weight model complex of the Ni site in $H_2$ase that bears electron-deficient thiolate-S-donors, namely $(Et_4N)_2[Ni(SPh\text{-}p\text{-}CF_3)_4]$ (**1**; where SPh-*p*-$CF_3$ = 4-(trifluoromethyl)benzenethiolate). Complex **1** is a functional $H_2$-releasing model of [NiFe]-$H_2$ase under electrocatalytic conditions in polar organic solvents. The synthesis, spectroscopic, electrochemical, and theoretical properties of **1** in relation to $H_2$ evolution will be discussed in this work.

**Gender and China-Africa Relations: How Female Migrants Navigate Changing Gender Norms Within Chinese and African Societies**

Rara Reines, CURO Honors Scholar
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China-Africa relations have gained increasing attention within the International Relations (IR) field as China has steadily increased involvements throughout the African continent in

recent decades. Research institutes and initiatives as well as consulting firms have been established to track and analyze China's involvements across Africa with a primary focus on trade, development finance, investments, land deals, and bilateral aid in the framework of South-South Cooperation. An issue that has gone under-examined across formal China-Africa policy frameworks, media coverage, private sector reports, and academic research is the influence of gender in the experiences of African migrants in China and Chinese migrants in Africa. Far from the mainstream view of being marginal, gender is central within the IR field and plays an important role across all levels of China-Africa relations. This research seeks to investigate how gender is employed as a social navigation tactic by African female migrants in China, specifically Guangzhou, and Chinese female migrants in Johannesburg, South Africa. This research postulates that Chinese women are able to exert more agency in African countries than in China while African women are further marginalized in China due to racialized power differentials. Due to a lack of literature on this topic, this research will primarily rely on qualitative data in analyzing social navigation tactics and the lived experiences of African female migrants in China and Chinese female migrants in Africa.

**Distribution of Spotted Sea Trout and Atlantic Croaker in the Duplin River of Sapelo Island**

Bailey Reins
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The teleost fish family Sciaenidae, commonly known as drums and croakers, are well known for their ability to produce sound. They do this using sonic muscles located laterally along either side of the swim bladder which contract at a rapid rate and vibrate the walls of the swim bladder. Two recreationally and commercially important members of the sciaenids that are present along the coast of Georgia are the spotted sea trout, *Cynoscion nebulosus*, and the Atlantic croaker, *Micropogonias undulatus*. The sounds that these species make can be used to locate them in the environment. One way to locate these species is through the use of passive acoustics by using a hydrophone to collect the calls of the sciaenids. In this experiment, I used passive acoustics, water depth and quality readings, and bathymetry to determine if there were any environmental conditions that affected the distribution of both spotted sea trout and Atlantic croaker in the Duplin River, located between Sapelo Island and Little Sapelo Island, and its connecting creeks. In this study, I show that the water depth and bathymetry of the Duplin River had the highest influence on the location of *Cynoscion nebulosus* and *Micropogonias undulatus* populations. Given that both species of sciaenids are important fisheries in the state of Georgia, the methods and data from this study can be used by fisheries management organizations such as the Department of Natural Resources to better control output of local fisheries along the Georgia coast.

**The Resilience of Appalachian Topography: A Geophysical Analysis of the Root Structure of the Southern Appalachians**

Trezevant Adair Rice
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The Appalachian Mountains are a product of Alleghanian (Permian) collision and Jurassic/Triassic extension. Once reaching the same height as the Rockies, the Appalachians have weathered to a present-day maximum height of 6,684 feet. This height is curiously tall for such an old mountain belt, especially when compared to similarly aged mountain belts such as the Ouachita Mountains in Arkansas, a sister mountain belt with a maximum height of only 2,753 feet. Previous work on active source wide-angle reflections and passive source receiver function analysis has shown a thickening of the crust under the Appalachians, as the Moho depth increases from 30 to 35 kilometers beneath the coastal plain to a maximum depth of 55 to 60 kilometers beneath the highest elevations of the Blue Ridge Mountains. This suggests the mountains are locally compensated. Building on previous work, this study will take a more detailed look at the root system beneath the southern Blue Ridge with a focus on obtaining more accurate, localized estimates of P-wave velocities to gain a better understanding of this "ice cube isostasy" and the root material. Using seismic data from the Southeastern Suture of the Appalachian Margin Experiment (SESAME) array as well as data from stations in the U.S. Transportable Array (TA), this study will focus on using wide-angle reflections generated by distant earthquakes to analyze the mechanisms responsible for the longevity of topography and its supporting root by constraining the velocity, density, and thus the metamorphic grade and fluid content of the root material.

**The Role of Intensive Parenting Beliefs in the Transition to Parenthood**

Amanda Nicole Richards
Nikita Tallapally
*Dr. Anne Shaffer, Psychology, Franklin College of Arts and Sciences*

The transition to parenthood entails lifestyle shifts and the potential for positive adaptions or troublesome issues for new parents. There have been social trends towards intensive parenting beliefs, including beliefs that mothers are the essential parent, that parenting is inherently self-sacrificing, and that it should involve a high level of investment. This study investigates how these beliefs relate to marital satisfaction, parenting confidence, and mental health of first-time parents. Mothers and fathers (n = 80 couples; total n = 160) were recruited via online advertising (e.g., parenting forums on social media, parenting newsletters), face-to-face (baby stores), and snowball sampling. Parents completed online assessments, providing demographic data and measures of intensive parenting (IPAQ), marital satisfaction (QMI), anticipated parenting confidence (KPCS), and mental health (EPDS). Beliefs that mothers are essential parents, and that parenthood would be challenging, were related to lower parenting confidence for fathers, but not mothers. Beliefs that parenting would be personally fulfilling were positively related to marriage quality among mothers ($r$ = 0.263, p = 0.018), but not fathers ($r$ = 0.207,

p = 0.065). Marriage quality was related to parenting confidence in both mothers ($r$ = 0.368, p = 0.001), and fathers ($r$ = 0.294, p = 0.009). Parenting confidence was negatively associated with symptoms of anxiety among mothers ($r$ = -0.271, p = 0.015). This study extends the literature on intensive parenting beliefs by including father reports and reports on marital relationships and has implications for supporting couples in the transition to parenthood.

**Human IgG Concentration Changes in Individuals Vaccinated with 2017 Seasonal Influenza Vaccine**

Robert Alexsander Richardson, CURO Research Assistant
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Influenza is an RNA virus that infects millions of people across the world every year. The virus's primary membrane-bound protein, hemagglutinin (HA), has become the leading candidate for the influenza vaccine due to its immunodominance over the other influenza proteins and high expression on the membrane of the virus. An issue with HA is that the determinates on its globular head mutate rapidly causing previous HA specific antibodies to be unable to bind to the new strains of the protein every season. Influenza vaccines are used so that when a vaccinated individual comes in contact with influenza, they can have a heightened adaptive immune response to the particular strain of virus without being previously exposed to its infection. The main focus of this research is to determine how the seasonal strains found in the 2017 vaccine, California/09, Hong Kong/14, B. Phuket, and B. Brisbane/08, can change the concentrations of HA strain specific human subtypes of IgG day 0 pre-vaccination and day 21 post-vaccination. By studying vaccinated individual's serum through enzyme-linked immunosorbent assays (ELISAs), the vaccine's effectiveness toward different populations of individuals can be quantified and further understood. The anticipated findings for this study are the change in concentrations of IgG in the human serum will be greater in younger individuals than elderly individuals because of age effects on adaptive immunity. Studying the differences between the young and elderly will help future vaccines be further geared to the specific recipient it is given too.

**Thymic Epithelial Cell Reprogramming and Co-Culture with T-Cell Progenitors**

Isabelle Olivia Riddle, Foundation Fellow, CURO Research Assistant
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The thymus is a lymphoid organ found in the neck region of vertebrates that produces T-cells critical for the adaptive immune system. However, thymus involution relatively early in the aging process leads to a deterioration in immune function. This experiment is a preliminary step geared towards achieving the overarching goal of boosting long-term maintenance of adaptive immunity over the typical aging process or following therapeutic immune depletion. Specifically, the objective is to show that disparate cell lineages can be reprogrammed—both morphologically and physiologically—using the forced expression of a transgene into components of a functional thymus and that these induced components can perform normal thymic duties, such as facilitating the maturation of T-cell progenitors into Helper and Cytoxic T-cells. The methodology of the experiment includes successfully reprograming mouse embryonic fibroblast cells (MEFs) into induced thymic epithelial cells (iTECs) using plasmid transfection to force the expression of transcription factor Foxn1, a master regulator of TEC development. A co-culture of the iTECs with early T-cell progenitors (ETPs) was generated, and after six days flow cytometry was employed to observe if any of the ETPs differentiated into mature T-cells, as would be expected of an *in vivo* system. Although the MEFs were successfully transformed into iTECs and partially-matured T-cells developed after co-culture, the cells were not robust enough to support significant generation of fully-developed T-cells. Additional experiments are underway to refine the process and further investigate the therapeutic functionality and gene expression profiles of the system.

**Benthic Macroinvertebrate Communities in Carolina Bay Wetlands**

Nyree Mone't Riley, CURO Honors Scholar
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Wetlands are important as they protect and improve water quality, provide habitats for wildlife and fish, and store floodwaters. Carolina Bays are elliptical-shaped depressional wetlands scattered along the East Coast of the United States, including Georgia. The purpose of this study was to identify the biotic relationships among and factors affecting benthic macroinvertebrate communities in depressional wetlands. The data sampling occurred in March, July, and November, in nine wetlands located in a Georgia Wildlife Management Area in east-central Georgia each year. To sample, a D-net was used to collect sediments, leaf litter, and invertebrates at each of the wetlands, which was placed into a bag filled with 95% ethanol to preserve the benthic macroinvertebrates. The samples were then processed in the lab, separating the organic and inorganic material from the benthic macroinvertebrates. The benthic macroinvertebrates were classified to family or genus. The data were then analyzed via correlation analyses using R statistical software, which assessed the biotic relationships among different invertebrate groups such as predation (predators vs. prey) intraguild predation (predators vs. predators), and competition (prey vs. prey), each examined by season. After all of the results are compiled, we plan to draw conclusions about how each of the biotic relationships may play a role in shaping the benthic macroinvertebrate communities. In doing so, we will be able to assess how biotic interrelationships contribute to the maintenance of invertebrates and overall ecology of Carolina Bay Wetlands.

**Examining the Role of Gestational Hypertension and Eclampsia on Preterm Birth in Georgia**

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

The objective of this study was to investigate the association between gestational hypertension (GH) and hypertension eclampsia (HE) on preterm birth (PTB) in the state of Georgia. In 2018, Georgia's preterm birth rate remained higher than the national rate (9.9%) at 11.4%. Preterm birth is the largest contributor to infant death. Babies who survive PTB often face serious and lifelong problems such as developmental delay, chronic respiratory problems, and vision and hearing impairment. Data from 2014 to 2015 Georgia Birth Certificates were used to assess the association between GH and HE on PTB. Logistic regression analysis, adjusting for potential confounders, was conducted to estimate odds ratios and 95% confidence intervals. Attributable risks were determined to calculate how PTBs would be reduced if GH and HE were eliminated. In our study population (n=262,109), 28,181 (10.75%) infants were born preterm. Among those born preterm, 3,729 (13.23%) mothers had GH and 173 (0.63%) mothers had HE. Those with GH were 3.610 times more likely to have a PTB (95% CI: 3.456 - 3.760). Those with HE were 7.079 times more likely to have a PTB (95% CI: 5.793 - 8.650). The rate of PTBs could be reduced 18% if GH in pregnancy was eliminated and 33% if HE in pregnancy was eliminated. Our results suggest that women with GH and HE in Georgia may be at increased odds of delivering preterm compared to women without.

**Implementing Fault Tolerance and Radiation Hardening for an Accelerated Computing Platform in Low Earth Orbit**

James H. Roach, CURO Research Assistant
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Satellite data gathering capabilites have improved enormously in the recent past. With vast amounts of data being gathered, satellites are increasingly being bottlenecked not by their ability to gather data, but by their ability to transmit that data to earth to be processed and analyzed. One solution to this bottleneck is to provide satellites with the capability to process and analyze this data onboard while in orbit. However putting the accelerated computing platforms required for such processing into space presents a myriad of new problems. One of the biggest such problems is ensuring correct operation in a high radiation environment. This paper shall focus on the techniques that the engineers of the University of Georgia Small Satellite Research Lab will use to mitigate the effects of radiation on the Nividia Jestson TX2i Graphs Processing Unit that will be launched into low earth orbit in 2020 aboard the Air Force Research Lab funded mission MOCI (Mulitview Onboard Computatinal Imager). Such techniques include but are not limited to implementing triple modular redundancy, various watchdogs, modifying the filesystem, modifying the bootloader, and monitoring power levels.

**Involvement of Monoaminergic Transmission in the Anterior Cingulate Cortex in Chronic Pain**

Nicole Ronczkowski
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The anterior cingulate cortex (ACC) is located in the front-most part of the mammalian cingulate cortex and has been shown to play a role in sensory, memory, emotional, and cognitive functions as a part of its involvement in the corticolimbic system. Of specific interest in this investigation is the ACC's role in pain. In both acute and chronic pain, the ACC is thought to be mainly responsible for the affective component of pain, and its excitation is painful or aversive. The role of monoaminergic transmission in the ACC in relation to chronic pain is not well known, especially because many of the neurons in this region receive inputs of glutamate and release GABA. In this experiment, a model of persistent injury and chronic pain, induced by Complete Freund's Adjuvant (CFA), was used and resulting behavioral suppression was observed. Levels of monoaminergic neurotransmitters was then measured using HPLC, including dopamine, serotonin, and norepinephrine. It was expected that compared to animals receiving 9 days of saline administration, animals receiving CFA would have increased excitability in the ACC due to decreased dopamine signaling, increased norepinephrine signaling, and decreased serotonin signaling as seen in past models of behavioral suppression. In this experiment, however, no significant results were found. It would be of interest to perform more experiments to shed light on which monoamines are present in the ACC and how chronic pain can affect these levels.

**Generating CRISPR/Cas9 Knockouts of UGT Genes in *Caenorhabditis elegans***

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Hailey Goldberg, John Doll
*Dr. Art Edison, Genetics, Franklin College of Arts and Sciences*

The purpose of this study is to create a *Caenorhabditis elegans* mutant by using CRISPR/Cas9 to knock out a UGT gene. In *C. elegans*, UGT genes regulate the glycosylation of environmental toxins allowing for survival of the nematode. CRISPR/Cas9 is a powerful gene-editing system allowing for a Cas9 endonuclease to induce a double strand break in the DNA, rendering non-homologous end joining between the broken DNA. As a result, that particular gene in the DNA is knocked out and a mutant is created. In this study, a single guide RNA (sgRNA) is manipulated to direct the Cas9 endonuclease to a UGT gene of interest. The Cas9 and the sgRNA will be microinjected into the gonads of the *C. elegans*. As a model organism with an extensive genomic background, *C. elegans* provide insight on the metabolomics of parasitic nematodes, which are a threat to third world countries. Manufacturing drugs that target the glycosylation system in parasitic nematodes could be a potential solution for their elimination. Generating UGT mutants through CRISPR/Cas9 will be the first step of many to provide viable insight into the nematodes glycosylation mechanisms. The CRISPR/Cas9 protocols established for UGT knockouts will allow future undergraduate students to partake in CRISPR/Cas9 genetic research in

the Edison Lab and continue producing UGT mutants for metabolomics analysis.

**The Effect of In-Group/Out-Group Bias on the Perception of Robots**

Fiachra Rottinghaus
*Dr. Adam Goodie, Psychology, Franklin College of Arts and Sciences*

In-group/out-group bias is the phenomenon in social psychology where participants will favor individuals who have been designated as part of an "in-group" and act with hostility towards members of a designated "out-group," regardless of other differences or similarities between the individuals. In this study, I investigated whether in-group bias would still apply if the participants were dealing with a robot instead of a human. The participants in the study were randomly divided into two groups, who both watched videos of a small robot navigating around an obstacle. One group viewed the video with a UGA logo in the corner, while the other group viewed the same video with an Auburn logo in the corner. Participants were then asked to rate the robot by selecting adjectives from a list and marking their comfort with it on a sliding scale. Demographic information was collected from participants to control for variables between the groups. Participants who did not follow UGA sports were ignored, with the assumption that they would have no strong bias towards the logos used in the videos. I anticipate that participants will rate the "in-group" (UGA) robot more favorably than the "out-group" robot, and that participants who self-report as being uncomfortable with robots will have increased comfort when viewing the UGA robot. This research will yield important insights into whether the addition of a simple in-group marker will cause people to be more comfortable around or positive toward robots.

**The Genetic Basis of Reproductive Isolation via Drought Adaptation in *Mimulus***

Sydney Beatrice Rowell
*Dr. Andrea Sweigart, Genetics, Franklin College of Arts and Sciences*

Adaptation to abiotic conditions is thought to be an important driver of speciation. With strong adaptation to local environments, hybrids formed through interspecific gene flow are likely to be maladapted to parental habitats, selecting for the maintenance of species boundaries. Although sister species *Mimulus guttatus* and *M. nasutus* frequently grow sympatrically, they are often observed in distinct microhabitats within streambeds, with *M. nasutus* growing in the drier, rockier areas, whereas *M. guttatus* grows in deeper, wetter areas. Previous work has shown that *M. nasutus* plants set more seed under simulated drought conditions than their *M. guttatus* counterparts, likely due to increased developmental rate in *M. nasutus* in response to drought. However, the genetic basis of these differences, and other potentially important phenotypes are unknown. Here, in order to understand the genetic basis of divergent drought response between *M. guttatus* and *M. nasutus*, which may lead to restricted gene flow in the field, we use a custom mapping population of hybrid individuals grown in a common garden under both well-watered and drought conditions. While phentoypes with a simple genetic basis may easily introgress between species, those that require multiple adaptive alleles to manifest are likely to contribute to the ongoing isolation between these species.

**Determining Key Immune Components in the Clearance of *Bordetella* spp.**

Lily Rubin, CURO Research Assistant
*Dr. Eric T. Harvill, Infectious Diseases, College of Veterinary Medicine*

*Bordetella pertussis* is the causative agent of the respiratory illness known as whooping cough. The current whooping cough vaccine is considered ineffective due to its inability to eradicate infection in the nasal cavity, amongst other reasons. Therefore, there is an imperative need to develop a new vaccine. By disrupting bacterial immunomodulatory pathways, we identified a novel vaccine candidate that is unable to manipulate host immune response. Vaccination with this mutant provides cross-protection and sterilizing immunity against classical *Bordetella* spp. By evaluating anti-*Bordetella* spp. IgG titers, we discovered that the bsr mutant induces a rapid (day 7 post-infection) and robust (3-fold increase) IgG response. Importantly, immunocompromised mice (TLR-4 deficient) infected with the mutant strain were also able to induce IgG antibody response by day 7, indicating this could potentially be a safe vaccine. Preliminary data suggest that this vaccine also elicits a higher mucosal protection measured as IgA, which will be of high interest as this is a respiratory pathogen. Overall, these results demonstrate that by disrupting bacterial immunomodulatory pathways we provide a robust antibody protection which is greater than that conferred by natural infection.

**Primary Outcome of Youth Obesity Undergraduate Research and Extension (YOURE) Fellowship**

Hannah Rucker
*Dr. Silvia Giraudo, Foods and Nutrition, College of Family and Consumer Sciences*

The Youth Obesity Undergraduate Research and Extension (YOURE) Fellowship was designed as an intervention to teach undergraduate students how to conduct research through a nontraditional, nonacademic model. One of these studies was conducted through the Youth Obesity Undergraduate Research and Extension (YOURE) Fellowship in summer 2018. The participants were middle-school children (n=56) all over the state of Georgia attending a Georgia 4-H summer camp at Fortson 4-H Center. The research goals where to investigate what factors are taken into consideration when they do grocery shopping. When conducting this research, students participated in a game created by the researcher. Students were able to spend up to $50 on any healthy or non-healthy foods of their choice. After reviewing the results, the researcher found that the students based their decisions on affordability and convenience. Results found from this survey revealed that more students factor in price than convenience, while the majority consider both factors. Future studies should examine the amount of healthy vs. non-healthy foods that the students choose based on affordability and convenience.

**IDO Activity Assay Based on MSCs**
Kejie Rui
*Dr. Luke Mortensen, Animal and Dairy Science, College of Agricultural and Environmental Sciences*

FDA approved mesenchymal stem cell (MSC) therapies have been elusive since the discovery of their potential to modulate immune responses. This failure is due in part to the loss of immune modulatory activity after the high degree of expansion required to make an adequate dose of MSCs for clinical use, and an inability to monitor MSC immune modulatory potential during the expansion process. MSCs regulate T-cell function through indoleamine-2,3Dioxygenase (IDO), which is the first and rate-limiting enzyme that catabolizes tryptophan, a promoter of T-cell activity, into L-kynurenine. IDO is regarded as the immune checkpoint in most immune system tests. Here we aimed to measure IDO activity in MSCs over several passages. In addition, we evaluated the potential of cell morphology imaging to predict the immune modulatory potential of MSCs during the expansion process. We tested high and low potency donors that were activated with IFN-gamma to simulate an inflammatory stimulus or untreated. We wanted to see 1) how MSC morphology relates to IDO, and 2) how IDO and morphology change with passage number. In the end, the concentration of L-kynurenine was analyzed in the unit of pg kynurenine/cell/day indicating MSC IDO activity. As a result, we developed a general model of IDO activity in MSCs related passage. Success could provide key insights into potency metrics that would allow for monitoring and selection of high potency MSCs. This would greatly increase the efficacy of MSC therapies and provide much needed relief to patients suffering with immune diseases.

**Assessment of Photomorphogenesis and Heat Tolerance Responses of *Arabidopsis* DNA Methylation Mutants**
Callan Russell, CURO Research Assistant
*Dr. Bob Schmitz, Genetics, Franklin College of Arts and Sciences*

DNA cytosine methylation is important for the formation of highly compact chromosome material called heterochromatin, which is associated with transcriptional silencing. Population level analyses of the model plant, *Arabidopsis thaliana*, have identified small, but significant correlations between environmental variables, such as average annual temperature and photoactive radiation and genome-wide cytosine methylation levels. The goal of this research was to determine is DNA methylation is directly required for photomorphogenesis and heat tolerance in *A. thaliana*. To do so, plants mutant for various enzymes required for DNA methylation were assed in two separate assays. To assess photomorphogenesis, hypocotyl lengths were compared between mutant and wild-type plants after growth under red, far red, and white light. To assess heat tolerance, percent survival rates were compared between mutant and wild type plants following heat shock. While individual trials found differences between mutant and wild type plants for both experiments, no consistent significant differences were identified. This indicates that the DNA methylation machinery are not directly required for heat tolerance or photomorphogenesis under the conditions studied, and the relationships between environmental variables and DNA methylation on the population level may be indirect in *A. thaliana*.

**Crime and Punishment in the Papal States**
Tom Lennon Russell
*Dr. Steven Soper, History, Franklin College of Arts and Sciences*

Crime and Punishment in the Papal States gives an in-depth look into the criminal practices of the Papal States throughout the first half of the 19th century as reported by the London Times and other English news sources at the time. The goal of this research is to better understand Crime and Punishment within the Papal States, and how these practices were influenced by the constant domestic and international turmoil to which the country was inflicted. On the same vein, this research will determine how much of this domestic and international turmoil was caused by the Papal State's Punishment Practices, the likes of which were far harsher than the majority of early-modern Europe. My research is derived from a variety of online Databases, most notably the London Times Database and other English Newspapers of the time. I've developed a dependence on these English databases for my research because the majority of sources on the subject are in Italian, a rather interesting language that I have no idea how to read. Of course any source that comes from a foreign country is bound to have biases, so I have adapted my research so as to account for and analyze these biases. I've observed patterns on how these English sources depict the Catholic Faith, the imperial subjects of the Papacy, and the Pope himself, and will create a conclusion as to how the British Media depicted the Papacy and the Catholic religion. As of now there are no definite results to my research.

**Role of AGMAT Pathway in Myeloid Leukemia Cells**
Sabrena Rutledge
*Dr. Takahiro Ito, Biochemistry and Molecular Biology, Franklin College of Arts and Sciences*

Myeloid leukemia is a cancer originating in bone marrow's myeloid cells and is further classified depending on its growth pattern. Combined, there are approximately 28,000 new cases per year and 12,000 deaths caused by myeloid leukemia. Specific intra-cellular metabolic pathways have previously shown to increase myeloid leukemia cell growth. We looked at a 'non-conventional' intra-cellular metabolic pathway: Arginine is converted to Spermine via Agmatine and Putrescine. The AGMAT enzyme aids the conversion from Agmatine to Putrescine. To determine if this pathway is important in myeloid leukemia, we studied the effect of AGMAT inhibition on cell growth in human leukemia cell lines. First, colony formation assays determined if a chemical inhibitor impacted cell growth. Then, qPCRs were conducted to analyze gene expression of the AGMAT gene in three different myeloid leukemia cell lines: K562, MV4-11, and HL60. MV4-11 cells expressed AGMAT 35-fold more than the other lines. Therefore, MV4-11 was chosen to study combinations of inhibitor, Agmatine, and Putrescine in a colony formation assay. Higher doses of AGMAT's inhibitor almost completely inhibited colony formation. Meanwhile,

Putrescine seems to promote cell growth, but Agmatine seems to diminish growth. Gene knockdowns of AGMAT can show whether the Spermine pathway is influential in leukemia growth or if the results were from toxic side-effects of the inhibitor and compounds. If the former is true, then additional studies can determine if this gene and its enzyme can be selectively targeted without affecting non-cancerous cells. Ultimately, treatments for myeloid leukemia can be developed from this information.

**Greek Life Influence on The Presence of Racism on 21st Century College Campuses**

Vanessa Sachs, CURO Honors Scholar
*Dr. Dawn T. Robinson, Sociology, Franklin College of Arts and Sciences*

Greek life organizations have been affiliated with universities since the early 17th century and have been creating social networks within these schools ever since, installing a totem pole for classes of students to fill and climb the ranks of every year. This means that the traditions, ideals, and morals of these organizations are passed down through the classes of students as they filter through the university. Through the intricate establishment of dense, tight, star-shaped social networks, sororities and fraternities have been able to exclude those that do not fit their specific criteria. A heavy part of this criteria is the stark racism that has persisted from nearly the beginning of Greek life organizations on college campuses. It is proposed in this paper that through selective pressures and dense ties of fraternity and sorority member social networks, upperclassmen install ideas of racism, which are likely to be condoned by underclassmen with little power in the social network. Thus, when racist ideas are presented in the fraternity or sorority, there are little to no anti-racist remarks made, further reinforcing racism ideals within the social structure. This builds off the idea that nodes, or characters, in the social network act a certain way, likely resulting in other nodes to behave in the same manner. If the social network is in the shape of a star, and upperclassmen with racist ideals are sitting in central positions, it is found that the nodes situated around these central actors will conform to their beliefs and behaviors. Some limitations of this theory include that most data come from southern schools with prominent Greek organizations rather than northern or smaller Greek populations so generalization must be taken with caution.

**UHF Half-Duplex Telecommand and Telemetry for Successful and Accurate Satellite Communication**

Mateen Saki, CURO Research Assistant
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How will it be possible to receive accurate and secure information between a satiate and its corresponding ground station? In order for optimal communication between UGA's second cubesat, MOCI, and the ground station, a proper communication protocol must be designed and implemented. When dealing with AX.25 protocols, it is quite common to lose information when either the ground station or satellite transmits and receives. To prevent this from occurring, a communication protocol must be used. When successfully designed, this will provide minimal overhead, optimize Half-Duplex communication for this application, and provide the necessary data integrity needed for the project. The primary method of research for this project will be UHF and S-band communication with our mission control software COSMOS. UHF communication ranges from 300 MHz to 3 GHz while S band ranges from 2 GHz to 4 GHz. Thus, this allows for testing from many different frequencies.

**Personality Effects on Group Performance in Undergraduate STEM Courses**

Sanjana Samineni
Robert Torgerson, Marisa Sheres, Nuzat Zehra-Momin, Noah Elliott
*Dr. Erin Dolan, Biochemistry and Molecular Biology, Franklin College of Arts and Sciences*

Group work is an instructional strategy increasingly used to promote student learning in undergraduate STEM courses. Working in groups has been shown to have a positive effect on student performance and success. However, not all groups are created equal and some function better than others. Research conducted in workplace settings indicates that the configuration of personalities in a group affects the group's performance. Whether these same patterns are observable in undergraduate STEM courses is unknown. We are addressing this gap by examining how the personality configurations of groups in undergraduate STEM courses relate to group performance, measured by grades. We collected personality and grade data from ~250 groups of students enrolled in STEM courses using a Likert-scale survey based on the "big five" personality model (Openness, Conscientiousness, Extraversion, Agreeableness, Neuroticism). We are conducting regression analyses to determine the extent to which group-level personality values (i.e., mean values for each of the five traits) predict group performance. We will present the results of this analysis.

**The Role of *dnmt1* in Milkweed Bug Embryo Development**

Zachary C. Sanchez, CURO Research Assistant
*Dr. Trish Moore, Entomology, College of Agricultural and Environmental Sciences*

Mammals such as humans possess highly methylated DNA: however, DNA methylation in insects is usually at low levels or undetectable. It has recently been found that *Oncopeltus fasciatus* (milkweed bugs) have a significant level of methylation. It is known that *dnmt1* is the main gene responsible for maintaining methylation through cell divisions. Previous studies have revealed that females treated with *ds-Dnmt1* have reduced fertility, inability to produce fully-formed eggs, and an abnormal cellular presentation of the follicular epithelium which envelops the oocyte development. To understand the developmental phenotype, an investigation was launched to understand the role of *dnmt1* in embryos. I believe that *DNTM1* is essential for the development of embryos prior to gastrulation. By examining the embryos

of RNAi treated females before and after gastrulation, I will be able to see a difference in viability. Development will cease shortly after blastocyst formation and not be able to continue to gastrulation. The analysis will be performed with confocal microscopy to look at the embryo itself and real-time Real-Time qRT-PCR will be used to quantify the presence or absence of *dnmt1* expression in these embryos. I speculate that methylation plays more of a role in the development of embryos rather than as a transcriptional regulator as seen in mammalian systems.

**The Fate of Degraded Biotites in the Deep Critical Zone: Implications for the K-Uplift Hypothesis**

Sophia Chason Sanders
*Dr. Paul A. Schroeder, Geology, Franklin College of Arts and Sciences*

The Calhoun, South Carolina Critical Zone (CCZO) research site provides valuable insight into the interactions between all biotic and abiotic components of an area. The critical zone encompasses the span from the top of the bedrock to the top of the trees. Biotites ($K(Mg,Fe)_3AlSi_3O_{10}(OH)_2$) collected from a deep core in this research site are able to reflect the cycling of potassium, a factor of plant nutrition, at various depths. As biotite weathers and iron in its composition oxidizes, potassium is released from the mineral in order to satisfy a charge balance. More intensely weathered biotite is hypothesized to contain lower relative abundance of potassium due to higher levels of oxidation. Potassium content of biotite near the surface will be less abundant, as these layers are more heavily weathered. Using the electron microprobe sand-sized biotite grains were analyzed for chemical composition using energy dispersive spectroscopy (EDS). Notably, weathered biotite grains displayed "frayed" ends when viewed perpendicular to the principle c-axis. Analysis of these weathered ends in comparison to less weathered grains yielded less relative percentage of potassium. Evidence for fixed potassium in biotite supports the notion that reservoirs are available to supply shallow rooted zones as uplift and chemical erosion proceeds. Although the loss of potassium occurs, persistence of lower amounts of potassium in the near surface suggests that the degraded biotite can still serve as a stock for nutrient cycling. The leads to a new idea whereby these degraded biotites to act as refugia for potassium in the near surface.

**Impact of Autophagy on Vesicular Stomatitis Replication in Vero Cells**

Christopher Paul Santa Maria
*Dr. Melinda Brindley, Infectious Diseases, College of Veterinary Medicine*

Autophagy is a stress-induced cellular recycling mechanism, it enables cells to degrade and reuse some of their components to maintain homeostasis. Many viruses take advantage of autophagy for efficient replication, however, the specific cellular requirements for optimal virus growth are not well defined. To better understand how viruses, utilize cellular autophagy, we utilized a panel of drugs that are known to induce or inhibit cellular autophagy to observe the effects on viral replication. We hope to use these results to further our understanding of how a natural cellular process can be manipulated to inhibit viral replication. We used vesicular stomatitis virus (VSV-G) and vesicular stomatitis virus pseudo particles expressing the Lassa virus glycoprotein (VSV-LASV) to determine if the autophagy inducers/inhibitors altered virus production in Vero cells. Our first experiments used a reporter gene, luciferase, as a surrogate of virus infection to screen 94 compounds. Approximately 15 compounds decreased luciferase activity below 10% of control. To confirm they inhibit virus replication and not just prevent reporter gene expression, secondary screening examined the ability of the compounds to decrease VSV titers. Once confirmed to block VSV replication, we will perform time-of-addition assays to determine the step in the viral life cycle that the drug is inhibiting. These studies are currently on-going. This will ultimately provide sufficient data to determine wherein the viral life cycle our drugs are inhibiting viral production and provide further insight into how the virus uses the autophagy process during replication.

**Testing the Role of Sleep in the Mechanism Between Child Maltreatment and Youth Psychopathology: A Gender Informed Examination**

Jeri Sasser, CURO Research Assistant
*Dr. Assaf Oshri, Human Development and Family Science, College of Family and Consumer Sciences*

Childhood maltreatment is a severe stressor that engenders vulnerability for the development of psychopathology in adolescence. Although research has consistently documented the link between negative family environments and youth problem behaviors, scarce research has examined the pathways by which this risk is conferred, as well as demographic factors that may impact these associations. Child maltreatment is associated with sleep disturbances in adolescence. Further, patterns of sleep behaviors are hypothesized to play a role in adolescent mental health, especially in the context of chronic stress (e.g., adverse rearing environments). Thus, sleep problems may partially explain the relation between early life stress and adolescent psychopathology. The present study aims to investigate the indirect effect of child maltreatment on internalizing and externalizing problems via sleep behaviors, and to examine the moderating role of gender in this indirect link. This study utilized data from a longitudinal (two waves) sample of youth between 9-12 years old (N = 101; 52.5% female). Childhood maltreatment was measured via parent report at wave 1. Sleep behaviors and internalizing and externalizing symptomology were measured via child and parent report, respectively, at wave 2. To test the study hypothesis, a path analysis model was run using Mplus 7.4. The findings revealed that child maltreatment was indirectly associated with both internalizing and externalizing symptomology via sleep somnolence (e.g., daytime sleepiness among girls, but not boys). The results of this study provide important implications for the design and targeting of future preventive interventions for youth who experience maltreatment.

**A Longitudinal Investigation of Protective Factors for Bereaved Maltreated Youth**

Jeri Sasser, CURO Research Assistant
*Dr. Assaf Oshri, Human Development and Family Science, College of Family and Consumer Sciences*

Maltreated youth are at an elevated risk for the development of problem behaviors across the lifespan. Coping with the death of a family member or close friend during adolescence, referred to as bereavement, is a stressful event that could potentiate risk linked to maltreatment. However, developmental research suggests that youth adjustment is a product of multiple risk and protective factors. Although maltreated youth who experience loss may be particularly vulnerable to behavior problems, personal and contextual factors may attenuate or exacerbate youths' risk for internalizing and externalizing psychopathology. The objective of this study is to uncover individual, family, and community-level protective factors for maltreated youth who experience bereavement. We used a longitudinal sample of maltreated youth (N = 800, 52.4% female, 45.1% African-American) to examine the effect of bereavement on internalizing and externalizing psychopathology, and to investigate the role of multi-level protective factors in the link between close loss and adolescent psychopathology. To test the study hypotheses, path analysis models were run using Mplus 7.4. The findings of this study revealed that maltreated youth who experienced significant loss were at increased risk for externalizing symptoms compared to non-bereaved maltreated youth, but not for internalizing symptoms. In addition, future orientation for family, parental monitoring, and neighborhood collective efficacy each significantly buffered the pathway between bereavement and externalizing symptoms. These results have implications for future interventions aimed towards reducing problem behaviors in bereaved adolescents with a history of child maltreatment.

**Using Strategies to Enhance Learning from Video Lectures: The Role of Explaining or Drawing on Paper While Learning from Varying Video Formats**

Pavan Sastry
Janette Jester, Nidhi Patel
*Dr. Logan Fiorella, Educational Psychology, College of Education*

This study tested how two note-taking strategies (explaining and drawing) help students learn more meaningfully from varying video lecture formats (static and dynamic). College students (n = 136) studied a lesson on the human kidneys that presented images being drawn dynamically or presented statically while taking verbal (explanations) or pictorial (drawings) notes. Students were randomly assigned to one of the four conditions, static and draw, static and explain, dynamic and draw, and dynamic and explain. After watching the video all participants took a post-test which assessed their ability to remember what they learned from the lesson and apply that knowledge to new situations. Analyses have not yet been conducted; however, according to prior research on learning from instructor-drawn and static images, we expect students in both dynamic conditions to significantly outperform students in the static image conditions (video format hypothesis). Due to prior evidence supporting the coherent construction of a mental model when combining verbal and visual information, we expect students who explain on paper to significantly outperform students who draw on paper (strategy type hypothesis). Overall, findings from this experiment will provide evidence for the format in which students should receive video lectures and effective self-directed strategies for learning from such videos.

**Resilience and Wellbeing Among Young Adults from Mixed-Documented Status Families**

Lauren Schermerhorn, CURO Research Assistant
*Dr. J. Maria Bermudez, Human Development and Family Science, College of Family and Consumer Sciences*

Emerging adulthood is a relatively new stage of life, between the ages of 18 and 25, in which individuals experience an in-between phase of prolonged adolescence and delayed adulthood. During this period, many young adults will delay normative adult roles and explore future possibilities. This life-stage has not been explored in the context of young adults who grew up with the challenges associated with their families having mixed-legal status in the US. These challenges are related to unequal access to healthcare, educational and work opportunities, safe neighborhoods, and legal challenges, among others. In this study, we aim to examine resilience among young adults between the ages of 18 to 30 who identify as being resilient in the face of challenging familial and sociopolitical context. We are using a mixed-method design in which we will use 3 measures related to individual resilience, overall well-being, and demographic data. In addition to quantitative measures, we will ask open-ended questions specifically related to risk and resilience in the context of mixed-status families. Data will be analyzed using descriptive statistics and thematic analyses. The aims of this presentation will be the following: 1) to bring awareness about the larger sociopolitical context that affects the risk and wellbeing of Latinx young adults from mixed legal status families; 2) discuss the rationale for the study and our process of preparing the IRB proposal; and 3) present anticipated findings based on our understanding of the literature related to Latinx youth and resilience.

**Rapid Visuomotor Integration as a Window into Multisensory Processing**

Margaret Frances Schrayer, Ramsey Scholar, CURO Summer Fellow, CURO Research Assistant
*Dr. Tarkesh Singh, Kinesiology, College of Education*

Neurological conditions including Parkinson's Disease (PD) cause changes in subcortical and cortical brain structures, affecting interactions between the dorsal and ventral visual streams. The dorsal stream processes the location of objects in the visual workspace, while the ventral stream identifies objects. We expect that, in individuals with PD, motor deficits will result from disruptions in online interactions between the two streams. In the experiment, participants identify the shapes of moving or stationary objects, and make accurate reaching movements to the objects. Our hypothesis is that deficits in online interactions between the two visual

streams in PD patients will contribute to slower processing of somatosensory feedback during reaching movements. A behavioral experimental paradigm was developed on a KINARM robot integrated with eye-tracking and virtual-reality. During each trial, one circular or elliptical target appears in the workspace. Participants are asked to rapidly reach toward circular targets, avoiding elliptical targets. A green or red circle is shown following each trial, indicating a correct or incorrect hit or miss. Hand kinematics are recorded as participants perform movements, allowing us to record temporal and spatial behavioral characteristics. A pilot exam (300 trials) with a healthy participant showed average peak hand speeds of 93.01 m/s (dynamic condition) and 68.72 m/s (static condition). Correct target hit rates were 26% (dynamic condition) and 30.67% (static condition). This paradigm will contribute to our understanding of how visuomotor networks interact during planning and execution of fast movements and how these interactions are disrupted during PD.

**Comparison of Methods for Estimating White Shark Abundance**

Mischa K. Schultz, CURO Research Assistant
*Dr. Steven B. Castleberry, Forestry, Warnell School of Forestry and Natural Resources*

Dorsal fin photo-identification has been used in mark-recapture studies of marine mammals to identify unique individuals in a population for monitoring populations and residency patterns. Few studies have assessed the efficacy of dorsal fin photo-identification in other aquatic species. I compared accuracy and efficiency of manual identification with dorsal fin recognition software packages DARWIN and FinFindR for white shark fin identification. This is the first study to use the FinFindR software to match fin ID's for white sharks. Dorsal fin images were collected in Mossel Bay, South Africa June and July of 2019. I assessed photo quality, based on photo elements (focus, contrast, angle at which the fin is captured, partial being the amount of fin submerged in water, and distance), before photos were entered into the software recognition programs. To reduce false positive and false negative matching errors, images with a low-quality score were not used in the identification process. DARWIN and FinFindR were ranked by the number of correct identifications made on the systems first suggested match and the time taken to match a set of fins. The accuracy of the matching process was not affected by the photo quality or fin distinctiveness. Manual identification had the highest probability of match success while DARWIN and FinFindR did not differ from each other. The difference among methods of creating matching queries and capture histories appears to have an influence over abundance estimates.

**Quantitative Phase Image Analysis of MSC Extracellular Vesicle Production**

Madeleine Schwab
*Dr. Luke Mortensen, Animal and Dairy Science, College of Agricultural and Environmental Sciences*

Mesenchymal stem cells (MSCs) are cells found in the human body that are known to suppress and regulate inflammation. Previous research suggests that there is a correlation between the quantity of extracellular vesicles (EVs) released from MSCs and the ability of MSCs to minimize inflammation within the body. Neutral sphingomyelinase has been linked to MSC EV production and we hypothesized that treatment with sphingomyelinase would promote greater quantities of EVs, which will improve the efficacy of MSC immune suppression. High and low potency MSC donors were cultured for 24 hours in four different treatments with grayscale images taken every 30 minutes by a quantitative phase microscope. A protocol for image analysis was developed and optimized in Fiji for consistency across all data sets. Images were segmented to isolate EVs from the surrounding background and cells by utilizing size exclusion. The number of identified EVs were then normalized to the number of cells within the image field of view and the results were compared across treatment groups and donors. We were able to identify that the neutral sphingomyelinase + interferon-gamma treatment resulted in the highest quantity of EVs in both high and low potency cells. Ultimately, the goal is to enhance MSC anti-inflammatory potency to generate new stem cell therapies that will be delivered to patients with autoimmune illnesses, such as Graft vs. Host Disease. Success in this endeavor could provide inflammation relief for suffering patients and eliminate the need for daily medication.

**The Role of Phosphatidylserine Receptors on Cell Membranes in Zika Virus Entry**

Jenna Scott, CURO Research Assistant
*Dr. Melinda Brindley, Infectious Diseases, College of Veterinary Medicine*

Arbovirus, short for arthropod-borne virus, is a generic term for viruses transmitted by arthropod vectors such as mosquitos or ticks. The arbovirus known as Zika virus (ZIKV) has become a popular subject for research and media reports alike due to the latest re-emergence having links to Guillain-Barré syndrome and congenital Zika virus syndrome. Considering the significant global health implications that ZIKV involves, it is important to understand the ways in which ZIKV infects both mammalian and mosquito cells. As a member of the flavivirus family, ZIKV is a single-stranded positive-sense RNA virus that enters the host cell through clathrin-mediated endocytosis. Past studies have revealed that ZIKV entry in mammalian cells utilizes phosphatidylserine (PS) to bind with PS receptors on the host cell in a process known as viral apoptotic mimicry. This study aims to discover the role that PS plays in ZIKV entry in mosquito cells. For this study, both mammalian (Vero) and mosquito (C6/36) cells are incubated with increasing concentrations of PS liposomes. We expect the liposome to compete with the virus for available PS receptors on the host cell membrane. If PS is important for ZIKV entry into mosquito cells, we expect to see a decrease in ZIKV entry as the concentration of liposomes increases. Because the replication cycle of ZIKV requires it to have the ability to infect both humans and mosquitoes, the ways in which ZIKV enters mosquito cells is important knowledge with implications for disease control.

**MobileGyro: Android Application for Bluetooth Gyroscope Tracking with Potential for Impact in Rehabilitative Processes**
Noah Briar Scott, CURO Research Assistant
*Dr. Zion Tse, Electrical and Computer Engineering, College of Engineering*

According to CDC, 795,000 Americans are diagnosed with a stroke each year. The Inertial Measurement Unit (IMU) is growing in recognition and use as a tool to track gait of a patient. These are often used as wearable sensors for rehabilitation, with their small size and cost effectiveness. The purpose of this research is to detail the innovation of an android application with the ability to receive IMU data and present it through significant visual displays. The data from a device is received via Bluetooth, and transmitted in terms of the planes roll, pitch and yaw. The application displays data to allow the user to track the position of the IMU in live time. The medical professional has the ability to input desired angles, and track the proximity of a device to its target. The data is presented visually through coronal, transverse & sagittal planes. When roll and pitch angles from the app were compared to angular values measured on a protractor, the average difference was +/- 0.366° and +/- 0.436°, in roll and pitch respectively. Along with less than 0.5° difference, the application has the ability to track 3 IMU devices simultaneously. The data can be stored and exported. The greatest limitation is signal latency. This work has the potential to catalyze creation of apps that can track high number of devices simultaneously, with high accuracy and low signal latency. The ability to track and position wearable IMU sensors using smartphone or tablet offers an exciting future in rehabilitation.

**Forensic Entomology: The Correlation of Fly Larvae Growth and Development to Stage of Decomposition Through Photography**
Keiyanna Sealey, CURO Research Assistant
*Dr. Marianne Shockley, Entomology, College of Agricultural and Environmental Sciences*

The development of carrion insects, particularly the larvae of *Sarcosaprophorus* (flesh fly) and *Calliphoridae* (blow fly), on a pig carcass, provides a detailed understanding of the evolution of carrion insects' life cycle as well as time since death. As the most abundant species, blow flies and flesh flies are key to understanding the differences between the stages of decomposition. Influenced by external factors, such as weather and temperature, larvae development encourages other carrion insects to arrive for continuous decomposition of the carcass. According to Jerry Payne, there are six stages of decomposition: fresh stage, bloated stage, active decay stage, advanced decay stage, dry stage, and remains stage. At least four of the six stages of decomposition can be identified during the decay of a pig carcass, where the growth and development of fly larvae determines how long the carcass has been decaying. Decomposition is a continuous process where external factors and subtle changes can only be observed through round the clock observation. As an objective medium, film and photography of a decaying pig carcass can serve as a reference database to estimate stage of decomposition. The correlation between larval growth and development to stage of decomposition is confirmed through the filming and photography of a pig carcass.

**Saharan Dust Alters the Microbial Community Structure of Near Surface Marine Aerosols Following Trans-Atlantic Transport**
Roland Francis Seim, CURO Summer Fellow
*Dr. Erin K. Lipp, Environmental Health Science, College of Public Health*

Annually, nearly one billion metric tons of dust from the Saharan desert is launched into the atmosphere, along with large quantities of microorganisms that reside in the soil. These dust aerosols from the Sahara cross the Atlantic and are deposited far downwind in the Caribbean and the southeastern US in pulses throughout the summer months. Bacteria residing in the waters of these regions, such as *Vibrio*, proliferate in response to these dust events as they are able to capitalize on the sudden influx of nutrients, mainly iron, present in Saharan dust. While previous studies have demonstrated that microorganisms are also capable of surviving the journey across the Atlantic Ocean, there is little information on the diversity or stability associated with the aerosolized community in the near-surface marine air layer, which may play an important role in surface marine community dynamics especially during dust events. Here we show a high level of diversity across microbial communities collected over a 22D time series of near-surface aerosols in the Florida Keys (USA). Microbial communities were highly variable between sequential 24-h composite samples but were compromised of taxa typical of both marine and terrestrial systems. Days with heavy dust influx (defined as measured dust flux > 10 μg $m^{-2}d^{-1}$ and dust aerosol optical thickness estimates of >0.075 μg $m^{-1}$) corresponded with significant shifts in the microbial community composition and lower overall alpha diversity (p-value = 0.021) and notable similarities in beta diversity among heavy dust days (p-value = 0.027). Taxa significantly represented in dust-event samples included *Aerococcaceae*, *Bacillaceae*, *Hyphomicrobiaceae*, and *Micrococcaceae*. These results show near surface marine aerosols are highly dynamic but large-scale dust deposition events can exert significant and consistent shifts in the airborne microbial community, which could play an integral role marine processes in the surface waters of the Florida Keys.

**Research by Women in Precision Agriculture**
Haley Katherine Selsor, CURO Research Assistant
Taylor Ogle, Selyna Gant, Kaelyn Deal, Amanda Yi
*Dr. Takoi Hamrita, Electrical and Computer Engineering, College of Engineering*

In the field of precision agriculture, the work of women is often overshadowed by the work of men. This has led Dr. Takoi Hamrita to edit a book that will compile and highlight the research conducted by women in the field of precision agriculture from around the world. As research assistants, we will be working with a team of other undergraduate women to assist Dr. Hamrita in completing this project. Through communicating with researchers, writing, and editing, we aim to present the contributions women researchers have

accomplished in the field of precision agriculture. We expect that their work may be more challenging to find than the work of males, but we also expect their work to be noteworthy contributions to developing precision agriculture to what it is today. We discovered that precision agriculture increases efficiency, reduces environmental impacts, and can increase food production for a growing global population. The major trends in precision agriculture include an increased use of advanced technology and more farmers implementing precision agriculture techniques. While we have discovered these advantages and trends, we expect to find application of the technology and its benefit beyond what we already have learned. The goal of this research is to collaborate with women who have done work in this field to produce a book that will present a holistic approach to precision agriculture. This is significant because it highlights the work women have already done while laying the foundation for future women researchers to build upon their work.

**Building Smartphone/Tablet-based Engineering, Science, Math, Art, and Technology Modules**

Cameron Shadmehry, CURO Research Assistant
*Dr. Yiping Zhao, Physics and Astronomy, Franklin College of Arts and Sciences*

SESMART stands for Smartphone/tablet-based, Engineering, Science, Math, Art, and Technology. The goal of SESMART is to create portable and affordable educational labs for different STEM courses. We believe it is possible to create cheap, lightweight, compactable labs for students by utilizing 3D printing and smartphone technology. So far, we have been focusing specifically on labs related to Optics. We have designed and 3D printed instruments to demonstrate the laws of reflection and refraction, as well as a monochromator that uses sunlight to produce different wavelengths of light. We have also tackled the issue of stabilizing smartphones in order to take reliable pictures to be used in data analysis, this is important for students collecting data from the instruments. Along with the lab instruments we have 3D printed, we have also been printing smartphone mounts and cases to complement our labs. We hope that SESMART modules will one day assist students of all STEM courses by giving them access to comprehensive and affordable labs.

**Intragroup Conflict and Formation of Student Networks in the Biology 1108 Undergraduate Labs**

Aarati Shah, CURO Research Assistant
*Dr. Peggy Brickman, Plant Biology, Franklin College of Arts and Sciences*

Group work is often used in STEM classes to enhance learning through cooperative efforts. There is evidence that group work teaches students how to communicate, helps build teamwork skills, and enhances learning. However, these benefits may not be realized, and conflicts can be more evident if groups are designed poorly. There is a knowledge gap in research about the most beneficial approach to setting up groups in order to increase the academic performance of students. This study is designed to understand whether students work more effectively in self- selected or random groups. More specifically, we collected data to see how students chose group members, how they characterized "good" or "bad" group members and whether conflicts were more prevalent in certain groups based on preconceptions. We will be conducting the study in 35 sections of an undergraduate biology 1108 laboratory (n=814). In half of the sections, students are randomized into working groups, and in the other half, students were able to self-select groups. In the fifth week of lab, all students will be allowed to choose their own groups to complete a group project. Students will complete surveys about their group mates at the end of each lab period for the first seven weeks. This qualitative and quantitative data will be used to identify what compels students to choose certain members of the class. We will identify whether clusters of groups form based on social, racial, gender or economic differences, and if conflict is greater in self-selected or random groups.

**The Utility of Mapping Functional Areas of the Brain for Understanding Neurological Deficits**

Aly Shakoor, CURO Honors Scholar
*Dr. Tarkesh Singh, Kinesiology, College of Education*

The exact ways in which the brain operates is one of the least known areas of biological research. It is also a research area of great significance to society, not in least part due to the ways neurological deficits may impair some of the brain's function. Researchers have the ability to further study brain function by developing paradigms to initiate this function and then scanning the brain in real time using techniques like functional Magnetic Resonance Imaging (fMRI). One area of interest in brain function is motion processing. For example, researchers have used visual coherence tests involving dots moving on a screen to map the middle temporal (MT) and medial superior temporal (MST) areas of the brain. These areas are utilized for a host of visual motion processing tasks, such as object recognition and goal-directed hand movements. We are interested in using variations of the classic moving dots paradigm to learn more about how the MT/MST areas function. We are developing this paradigm using the Psychtoolbox package in MATLAB. Subjects will use a joystick to indicate the general direction of the dots that are moving coherently, even if there is "noise" in the test caused by randomly moving dots or movement of the whole dot field (as opposed to individual dots). Furthering our understanding of the brain areas responsible for these functions may help us understand how deficits in these functions arise or could potentially be managed.

**Development of a Digital PCR Method for Highly Precise Determination of *var2csa* Gene Copy Number in *Plasmodium falciparum***

Sachi Shastri, CURO Honors Scholar
*Dr. David Peterson, Infectious Diseases, College of Veterinary Medicine*

Despite global efforts toward elimination, malaria continues to pose a significant public health risk for pregnant women in Sub-Saharan Africa. Placental malaria (PM) is a severe

manifestation of malaria infection caused by the parasite, *Plasmodium falciparum*. Binding of parasite infected erythrocytes within the placenta is mediated by a protein known as VAR2CSA, a member of a multigene family of highly diverse adhesion proteins. Previous work in the lab has demonstrated a high degree of sequence polymorphism in the *var2csa* gene. In addition it has been found that *var2csa* gene copy numbers vary between parasites found in women who have no immunity to placental malaria vs. women who have developed immunity to this disease syndrome. Dr. David Peterson's laboratory is interested in exploring the relationship of *var2csa* copy number to immunity and investigating the mechanism of acquisition of additional copies, their heritability, and chromosomal location. My work involves using both quantitative and digital PCR to accurately identify *var2csa* copy numbers in diverse samples to address the hypothesis that there is a selective advantage for parasites with multiple copy numbers when infecting women who have developed malarial immunity. Ultimately we will determine heritability patterns of the multiple gene copies and utilize pulsed field gradient gel electrophoresis to identify chromosomal locations of multiple *var2csa* gene copies. The implications of this study will aid in the creation of novel interventions to alleviate the adverse pregnancy outcomes faced by women devastated by placental malaria.

**Rainfall as a Mechanism Driving Seasonality in Parasite Abundance**

Caroline Laura Shearer, Foundation Fellow
*Dr. Vanessa Ezenwa, Ecology, Odum School of Ecology*

Parasite burdens are known to vary seasonally in wildlife, but the range of mechanisms driving this variation is not fully understood. Rainfall may act as one of these key mechanisms, since average rainfall is often used to define seasonality, especially in tropical regions of the world. This study examined how gastrointestinal parasite infections in a wild ungulate host are impacted by seasonal changes in rainfall. Using parasite data collected from male Grant's gazelles (*Nanger granti*) from 2009-2012, we compared monthly rainfall to the presence and intensity of three different parasites. Rainfall can have direct effects on parasitism rates by affecting parasite survival and movement in the environment or it can have indirect effects by impacting host susceptibility to parasites through changes in body condition. Given this, we looked at how parasite infection varied in relation to both direct (concurrent) and indirect (delayed) effects of rainfall. This was accomplished by comparing parasite abundances to rainfall from three different time periods: the month of sampling, one month prior to sampling, and two months prior to sampling. Our results show that abundance of all three parasites is negatively correlated with rainfall and that indirect delayed effects were more important than direct effects. Our findings support the idea that rainfall affects parasitism rates via indirect effects on host body condition. Additionally, they demonstrate the importance of rainfall as a mechanism driving seasonality in parasite burdens.

**Investigating the Role of the Serine-Threonine Kinase, Tpl2, in Plasmacytoid Dendritic Cell Development and Functions**

Neeti Nikhil Shirke, CURO Research Assistant
*Dr. Wendy Watford, Infectious Diseases, College of Veterinary Medicine*

Systemic lupus erythematosus (SLE) is a chronic autoimmune disease with an increased prevalence in young women. It results from a disruption in normal immune tolerance mechanisms leading to activation of autoreactive T cells, expansion of autoreactive B cells, circulating autoantibodies and immune complex deposition. Immune cells from most SLE patients are imprinted with a type I IFN gene signature. Plasmacytoid dendritic cells (pDCs) are specialized immune cells that induce rapid and robust type I IFN production in response to nucleic acids and are the major IFN source *in vivo*. Importantly, pDCs and type I IFNs have been causally linked to SLE disease, and blockade of type I IFN signaling or depletion of pDCs ameliorates disease in murine models. Despite the important immunological functions of pDCs, little is understood about their molecular 'wiring' regulating IFN production. Tpl2, also known as MAP3K8, is a mitogen-activated protein kinase previously implicated in the regulation of interferon production. In this study, we evaluated the role of Tpl2 in the development and function of murine pDCs *in vitro* and *in vivo*. Flt3L-induced pDC development was similar between wild type (WT) and *Tpl2-/-* bone marrow cells. However, pDC-derived IFN-$\alpha$ production *in vivo* was significantly reduced in *Tpl2-/-* mice treated with CpG-A. Examination of intracellular signaling pathways demonstrated that Tpl2 promotes mTOR/S6 kinase pathway signaling within pDCs, which has been linked to IFN-$\alpha$ production. These findings identify Tpl2 as an important component of pDC signaling networks, which could potentially be targeted therapeutically to modulate interferons.

**The Assessment of GABA Levels in Motor and Visual Learning by MRS in Parkinson's Disease**

Naureen Sial, CURO Research Assistant
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Parkinson's disease (PD) is a neurodegenerative disorder where the cells responsible for producing dopamine become depleted in the motor areas of the brain. The ensuing impaired transmission of signals from the brain to the rest of the body often result in symptoms of muscle tremor, gait imbalance, and slowed movement. However, while most research on PD has focused on dopamine, there are other neurotransmitter systems involved in motor function that may be interconnected to PD. In particular, animal and human studies have shown a strong connection between the inhibitory neurotransmitter GABA and motor function. To pinpoint the relationship between GABA, motor function, and PD, we will assess the utility of using magnetic resonance spectroscopy (MRS) coupled with spectrum editing methods to non-invasively measure GABA in healthy humans and in patients with PD. We first provide an overview of how MRS has previously been used to quantify changes in GABA in PD. We then provide an approach for using MRS to investigate the relationship between GABA levels and motor and visual learning in healthy subjects and PD patients. It is

anticipated that MRS spectral data will show that GABA levels are increased in PD in comparison to healthy controls, and that GABA levels will correlate with motor learning in multiple motor areas of the brain. This new framework can allow for a stronger understanding the pathophysiology behind visual and motor symptoms of PD, which can ultimately aid in improving the quality of life in PD patients.

**MRI Brain Tumor Image Analysis Using Matlab Software**
Peter Sigmon
*Dr. Ramana Pidaparti, Environmental, Civil, Agricultural, and Mechanical Engineering, College of Engineering*

It is estimated that around 30,000 people were diagnosed with primary brain cancer in the United States and also some metastases cases where the cancer spreads from elsewhere in the body. Brain tumors are the 10$^{th}$ leading cause of death in women. Glioblastoma (GBM) is the most aggressive type of brain tumor in adults, accounting for 50% of all malignant brain tumors. In this study, we investigate based on MATLAB software a technique for area/volume reconstruction from multiple layers of the MRI scans of brain tumors of injured lab rats (data set from Dr. Karumbaiah's lab at UGA). The tumor region in the brain tissue is estimated using segmentation techniques and from there the area of the tumor portion is estimated across each slice of MRI. A good correlation was found between the estimated tumors volumes to those obtained experimentally.

**The Impact of Personality Type as Measured by the Myers-Briggs Type Indicator (MBTI) on Response to Music in Music Majors**
Olivia Silva, CURO Honors Scholar
*Dr. Alison Farley, Music, Hugh Hodgson School of Music, Franklin College of Arts and Sciences*

Regardless of what music genre people prefer, it is widely believed that music has the unique ability to express emotions and impact lives. Music has the power to elicit a strong reaction in many people and is tangible in several capacities, whether physical, emotional, or cognitive. Personality type is an influential factor that contributes to our consciousness and understanding and has a significant impact on how we perceive the world around us and react to certain situations. Because of the role that personality type plays in our lives, I will investigate the impact that personality type makes on conscious responses to music, specifically among music majors, through a self-examination of listener reactions and the Myers-Briggs Type Indicator (MBTI). The MBTI explores people's preferences between four dichotomies in order to find patterns between personalities and behaviors and will allow for a clear comparison between personality traits and listener responses. The results of this study could provide insight into the connections between music and the brain, and could help music educators become more aware of how to better connect with students and utilize their strengths within the classroom.

**The Relationship Between Growth Differentiation Factor 11 (GDF11) and Heart Function**
Abby Simon
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Cardiac hypertrophy, the abnormal enlargement of cardiomyocyte size and left ventricular wall thickness, remains one of the leading causes of cardiac problems worldwide. Recent research has shown that the circulating protein growth differentiation factor 11 (GDF11) is a major regulator of this issue. However, most of the existing data has been collected in a single mouse strain, and it remains unclear whether GDF11 predicts heart function in a genetically diverse population. In this study, we measured serum GDF11 levels and evaluated cardiovascular function via echocardiography in a model of human genetic diversity, the Diversity Outbred (DO) mouse stock. Echocardiography has allowed us to thoroughly assess left ventricle mass, left ventricular wall thickness, ejection fraction, and other highly informative indicators of cardiac hypertrophy. We expect this data to clarify the true relationship between GDF11 and heart function in a genetically diverse population - and to support future longitudinal studies of heart function in this model.

**Girls' Perceptions of Health and Well-Being: An Exploration of Factors that Impact Recruitment into the Biological and Health Sciences**
Tatiyana Sinkfield, CURO Research Assistant
*Dr. James C. Anderson, Agricultural Leadership, Education, and Communication, College of Agricultural and Environmental Sciences*

Girls in low-income, inner city or rural areas are at a disadvantage related to healthcare knowledge and resources. There is high precedence of malnutrition, disease, and mental illness among this population. An open dialogue is needed with girls in these areas to provide them with what is needed to lead healthy lives and acknowledge their full potential. This research provides an understanding of what girls in these areas know about women's health, their perceptions of healthcare support, and options for careers. This comparative study serves as a continuation of a previous study of girls participating in a STEM-related community-based program (CBP) in order to glean insights on best-practices for outreach programs geared toward enhancing the knowledge and interests of girls from disadvantaged areas. I executed data collection using the focus group approach of middle schoolers who have not participated in a STEM-related CPB in the aforementioned locations, and analysis of data collected. Objectives guiding this project are: 1) Determine participants' knowledge about female health issues (e.g., nutrition, mental health, reproduction, disease); 2) Determine participants' perceptions on support related to health and wellbeing; and 3) Determine participants' perceptions about biological and health sciences careers. This research gained information on girl's interests and support related to engagement in health sciences related activities; as well as obstacles that they face that may obstruct them from engaging in health sciences related activities.

**Reconstructing the Interface of *C. Elegans* UDGH to Affect UDP-Xylose Binding Affinity**

Tiffany Sirmans, CURO Research Assistant
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Glucuronidation is a component of phase II drug metabolism, which involves the covalent linkage of UDP-glucuronic acid to target compounds. Human UDP-glucose dehydrogenase (hUGDH) is critical in glucuronidation because it produces the UDP-glucuronic substrate. hUGDH is a homohexameric enzyme that is regulated by the feedback inhibitor UDP-xylose through an atypical allosteric mechanism. A buried allosteric switch connects the active site to the hexamer-building interface between two adjacent monomers of the hexamer. Binding of UDP-xylose to the active site induces isomerization of the allosteric switch which causes a conformational change in hUGDH. This changes the structure of hUGDH from an active 32 symmetry hexamer to an inactive horse-shoe shaped complex. A homologous enzyme, *Caenorhabditis elegans* UGDH (cUGDH), conserves both this allosteric mechanism and the active site for UDP-xylose; however, it shows a ~10 fold decrease in UDP-xylose binding affinity. Because of the connection to the allosteric switch, we hypothesized that sequence differences between hUGDH and cUGDH interfaces are the source of the shift in UDP-xylose binding affinity. To test this, interface residues in cUGDH were mutated to mimic those observed in hUGDH. Steady-state kinetic analysis of the Chimeric cUGDH, $cUGDH_{chimera}$, showed a decrease in UDP-glucose KM but no significant change in $k_{cat}$ or UDP-xylose binding affinity. The crystal structure of $cUGDH_{chimera}$ was solved to identify additional mutations for a second $cUGDH_{chimera}$ ($cUGDH_{chimeraV2}$). Understanding the role of the interface in the allosteric mechanism of UGDH can aide in the development of biologics that target this area to regulate function.

**Relationship Between Resolved Delusory Parasitosis Cases and Patient Perceived Symptom Causes**

Elizabeth Slater
*Dr. Nancy C. Hinkle, Entomology, College of Agricultural and Environmental Sciences*

Delusory Parasitosis is a multifaceted delusional disorder in which an individual believes that they are victims of parasitic arthropods, which may include spiders, mites or worms, among others. Sufferers of this condition often experience both visual and tactile hallucinations that result in self-mutilation of the affected areas, which can be difficult for doctors to diagnose due to a lack of entomological training and awareness of this condition. Furthermore, once a diagnosis is made, convincing a patient that the cause of the sensations is a delusion can be very difficult considering the stigma and misinformation regarding mental illnesses. This project aimed to determine the relationship between resolved sensations and purported causes of the infestation, and was conducted through phone interviews and testing of environmental samples provided by the individual. We predict that online misinformation and miscommunication between sufferers and medical professionals has led to many resolved cases being seen as insect infestations as opposed to a mental health condition. By understanding the relationship between the patient's coping methods for their condition and disease progression, strategies can be created to help medical professionals identify and treat the symptoms of Delusory Parasitosis for their patients.

**Variation in *Wolbachia* Titer in *Drosophila recens* and *Drosophila subquinaria* and its Relationship to *Wolbachia*-Induced Phenotypes**

Madeline Snipes, CURO Research Assistant
*Dr. Kelly Dyer, Genetics, Franklin College of Arts and Sciences*

*Wolbachia* is a maternally inherited endosymbiont, which infects approximately half of all insect species. On an evolutionary time-scale *Wolbachia* can invade, and become established in, novel host species. *Drosophila recens* and *Drosophila subquinaria* are two co-occurring and hybridizing fly species; one of which (*D. recens*) is infected for *Wolbachia*, whereas *D. subquinaria* is not. In the laboratory, *D. recens* and *D. subquinaria* vary in the strength of their *Wolbachia*-induced phenotypes. *Wolbachia* titer in the host has been posited as a source of variation in the strength of these phenotypes for many *Wolbachia*-infected taxa. I plan to investigate this relationship between *Wolbachia* titer and strength of *Wolbachia*-induced phenotypes in the native host, *D. recens*, and a non-native host, *D. subquinaria*. I will use qPCR to measure *Wolbachia* titer from isolated DNA of individual flies from each species. Amplifying a single-copy host gene and Wolbachia gene will give an estimate of the relative copy number of *Wolbachia* within the host. After titer measurements have been recorded, analyses regarding phenotypic strength in association with titer within the two species will be made. I hypothesize that the strength of *Wolbachia*-associated phenotypes is a function of *Wolbachia* titer in the hosts, thereby explaining the variation in strength of *Wolbachia*-induced phenotypes in the novel vs. native host species. No direct study has been conducted on *Wolbachia* titer within these focal species, and the resulting data will contribute to future experiments on the effects of *Wolbachia* and how novel host-*Wolbachia* interactions manifest.

**Expression of *Callicellulosiruptor bescii* Pectin Degrading Genes: *Thermoaneaerobacter ethanolicus* Implications for Microbial Conversion of Plant Biomass to Ethanol**

Noor Kawal Sohal, CURO Research Assistant
*Dr. Janet Westpheling, Genetics, Franklin College of Arts and Sciences*

The over consumption of fossil fuels, a finite energy source, and its impact on the environment has lead to greater interest in alternative sources of energy. Biofuels produced from plant biomass is an appealing option as a carbon neutral and renewable source of energy. Current technology for the use of plant biomass as a substrate involves pretreatment to facilitate deconstruction and that accounts for a significant portion of the cost. It is, in fact, the major impediment to an economic industrial process. Our goal is to use genetic tools to create a strain of bacteria with the ability to break down the plant cell walls of unpretreated biomass and metabolize the products directly to ethanol efficiently. While pectin exists

in low abundance in most plant cells walls, it is critical to the structural integrity of plants. Cellulolytic bacteria such as *C. bescii* encode pectin degrading enzymes to weaken the architecture of plant cell walls to gain access to sugar substrates. Recent studies have implicated pectinase degrading genes in conjunction with CelA, a multidomain cellulase, both of which are found in *C.bescii*, in biomass deconstruction. *T. ethanolicus* is highly efficient in producing ethanol but cannot utilize complex plant biomass. We are attempting to make *T. ethanolicus* cellulolytic by introducing genes from *C. bescii* to facilitate biomass utilization.

**Do Low Expectations of Others Increase Momentary Gratitude?**
Annie Somerville, CURO Research Assistant
*Dr. Michelle R. vanDellen, Psychology, Franklin College of Arts and Sciences*

This study examines whether perceived self-control of the benefactor affects the gratitude a recipient feels following a benefactor's action or favor. In the study, a participant described one of their roommates and reported on their roommate's personality and self-control, as well as their relationship with their roommate. They also reported positive interpersonal emotions toward their roommate including gratitude, admiration, and respect. Next, participants were randomly assigned to one of two conditions: the favor condition and the control condition. Participants in the favor condition recalled and described a time when their roommate performed a favor for them. Participants in the control condition described a forthcoming interaction with their roommate. Next, all participants reported momentary positive interpersonal emotions toward the roommate. Participants then reported on their own self-control and personality traits. With permission from participants, we followed-up with their roommate and asked their roommate to report on their own self-control, allowing for an assessment of reliability of participant reports of roommate self-control. A preregistered sample size of 400 will be collected (current N = 340). We hypothesize that although people may more feel more general gratitude for roommates with higher self-control, they will have more momentary gratitude toward roommates with lower (vs. higher) self-control when roommate favors are salient.

**Investigations into the Stabilization of Rce1p**
Nicholas Sorensen, CURO Research Assistant
*Dr. Walter K. Schmidt, Biochemistry and Molecular Biology, Franklin College of Arts and Sciences*

Rce1p is of interest as a chemotherapeutic target due to its control over the formation of an active oncoprotein in Ras. The structure and function of Rce1p are not well characterized as it is a membrane protein that loses activity during detergent solubilization, preventing detailed biophysical and biochemical studies and hindering its development as a target. Curiously, wild-type Rce1p remains active when membrane-associated, but a cys-less mutant (cysΔ) is inactive in this form. We hypothesize that cysΔ is more susceptible to denaturation than wild-type Rce1p during the membrane isolation procedure. With this idea, it was further hypothesized that cysΔ could be used as a sensor to probe the effectiveness of buffer supplements which have been reported to either restore proper folding or prevent unfolding in the first place. Such stabilizing supplements, if identified, could then be used to aid in the purification of wild-type Rce1p. This hypothesis was investigated using protein stabilizing supplements during different stages of Rce1p enrichment in an attempt stabilize cysΔ Rce1p and promote activity. Three main classes of supplements, osmolytes, kosmotropic salts and macromolecular crowders, were the main focus of this study. The activity of the membrane-associated mutant Rce1p in the presence of supplements was assessed *in vitro* using a fluorescence-based reporter. Unfortunately, none of the 35 supplements were found to restore cysΔ Rce1p activity.

**The Dialectic Between the First and Sixth Amendments**
Ashley Soriano
*Dr. Jonathan Peters, Journalism, Grady College of Journalism and Mass Communication*

I plan to research how the news media affect criminal trials in Georgia state courts. While this is a broad issue, I plan to select a few cases, such as Tara Grinstead's, to analyze in depth, referencing scholarly articles. I will document the news media's evolution from the 1990s (small online presence) to the present (large online presence), and I will compare how news coverage has changed since the 1990s and the implications of those changes for criminal trials. For instance, Grinstead's case was the subject of a popular podcast that discussed suspects at length. By law, defendants are presumed innocent until proven guilty, but such discussions can invert that presumption before a trial has even begun. As a result, a kind of dialectic exists between the First and Sixth Amendments, neither of which, constitutionally, is superior to the other. However, I expect my research to conclude that in some cases the First Amendment takes precedence, and in others the Sixth Amendment does. I also expect my research to show generally that criminal defendants are judged negatively based on news coverage of them, with the effect of prejudicing the outcome of their trials.

**The Genetics of Parallel Evolution of Hybrid Male Sterility in *Mimulus***
Drea Sotelo, CURO Summer Fellow
*Dr. Andrea Sweigart, Genetics, Franklin College of Arts and Sciences*

Hybrid incompatibilities, causing the offspring of closely related species to be inviable or sterile, are a common form of reproductive isolation and essential to the process of speciation. However, the evolutionary mechanisms and molecular genetic basis of many hybrid incompatibilities remain unknown. Previous work has shown that hybrid male sterility between inbred lines of two closely related yellow monkeyflower species (*Mimulus guttatus* and *Mimulus nasutus*) is caused by an incompatibility between two genetic loci: hybrid male sterility 1 (*hms1*) and hybrid male sterility 2 (*hms2*). Follow-up studies showed that the sterility-causing allele at *hms1* is geographically restricted in *M. guttatus*, suggesting that additional cases of hybrid sterility between these species might have a distinct genetic basis. My research aims to determine

the genetic basis of the parallel evolution of hybrid sterility between inbred lines of *M. guttatus* and *M. nasutus* from the Catherine Creek population (CAC). By measuring pollen viability and genotyping *hms1*- and *hms2*-linked markers in a large F2 hybrid population (N = 431) I have determined that *hms1* and *hms2* are not associated with hybrid male sterility at CAC. Moving forward, I will generate markers throughout the genome (using a genotyping-by-sequencing approach) and perform quantitative trait locus mapping to identify the genes that cause CAC *Mimulus* hybrid sterility. Investigating hybrid male sterility will increase our understanding of plant fertility, a trait of fundamental importance to agriculture.

**Humidity's Impact on *Anopheles* Mosquito Ability to Transmit Malaria-causing Parasites**

Lilith South, CURO Summer Fellow
*Dr. Courtney Murdock, Infectious Diseases, College of Veterinary Medicine*

Malaria is an infectious disease caused by *Plasmodium* and transmitted by *Anopheles* mosquitoes. Both mosquito and disease behavior are influenced by climate, causing unpredictable disease transmission across variable landscapes. With the changes in climate from urbanization in developing countries and global warming, mosquito vector life traits are bound to change which could have significant impacts on malaria transmission. Many statistical and empirical models of malaria transmission identify the importance of relative humidity in predicting disease incidence, however the mechanisms for how relative humidity affects the transmission process is not well known. Relative humidity is known to impact the lifespan of mosquitoes, with increases in relative humidity resulting in increased lifespan and activity. This in turn should result in longer infectious periods, more eggs produced, and more biting opportunities, all of which will contribute to malaria transmission. This study will determine the impact of relative humidity on *Anopheles stephensi* mosquito life history traits that are relevant for malaria transmission.

**Comparing Classical Christian Views of Salvation Among Catholicism, Protestantism, and Orthodoxy**

Jacob Sparks
*Dr. Jason Roberts, Religion, Franklin College of Arts and Sciences*

All major denominations of Christianity believe that eternal life has been brought to humanity by Jesus of Nazareth. However, there remains much debate regarding the nature of this salvation and how Jesus' life and death accomplished this. Some of the major views to develop include Orthodox thought on deification, Catholic thought on justification by faith, and Protestant thought on penal substitutionary atonement. Through examining the writings of the Eastern Church Fathers, the Catholic Council of Trent, and the Protestant reformer John Calvin's writings, the views of salvation of these three major Christian branches can be rediscovered and brought into dialogue. The view of the Eastern Fathers can best be described as an ontological view in which Jesus the God-Man willingly enters into death on behalf of humanity in order to destroy mortality itself. The view of the Council of Trent can be summarized as a view of ongoing justification through the acceptance of Christ's saving passion by faith and the continuing work of good deeds and participation in the sacraments. John Calvin's view can be characterized by the legal punishment of sin being put on Christ in order to save humanity from the punishment of the Father. Though these views all have different emphases, the Eastern Fathers and the Council of Trent agree about salvation as an ongoing process, and the Eastern Fathers and Calvin agree on Christ as a ransom unto death. These commonalities can be used to develop common ground in joint theological statements in the future.

**Designing and Fabrication of a Biological Photo-Voltaic Cell for Electricity Generation Using Photosynthesis**

Thomas Spoerer, CURO Research Assistant
*Dr. Ramaraja P. Ramasamy, Chemical, Materials, and Biomedical Engineering, College of Engineering*

Recent studies in photo-bioelectrochemical cells (PBEC) and microbial fuel cell (MFC) technology have demonstrated that harnessing electricity from sunlight using photosynthetic microorganisms can be used as an alternative energy resource. However, average current and power densities generated by conventional MFC designs are often too low to be utilized for significant electrical applications. Genetic engineering of photosynthetic microorganisms and improvements to MFC design are two strategies that can be used to increase the energy harvested from these systems. In our laboratory, we have successfully demonstrated the increase in photocurrent densities generated by PBEC using genetically-engineered cyanobacterial cultures. In the current work, our goal is to use these organisms as photo-biocatalysts in a novel solar-powered, flat-plate, continuous-flow MFC stack. This new flat-plate continuous flow MFC was designed using Auto CAD, and computer numerical control (CNC) machining was used to fabricate transparent flat-plate fuel cells that operates under continuous flow for varied light/dark cycles. Additionally, a ferricyanide reduction assay and conventional electrochemical experiments were conducted to reveal the maximum power density produced by the solar MFC during light and dark cycles, respectively. It is expected that this solar powered MFC will be able to produce higher power densities than conventional MFC's at low cost since no external energy input is required for the cell to function. This device will not only be an environmentally conscious alternative to conventional silicon-based photo-voltaic devices, but also offer completely carbon-neutral energy and will therefore play a major role in the future development of clean alternative energy solutions.

**The Influence of Maternal Supplementation of Lutein and DHA on Colostrum DHA Concentration in a Pig Model**

Ruby J. Stacholy, CURO Research Assistant
*Dr. Hea Jin Park, Foods and Nutrition, College of Family and Consumer Sciences*

Docosahexaenoic acids (DHA) and lutein play critical roles in the neurocognitive development of the infant brain. Breast milk is a highly bioavailable source of DHA and lutein for infant development when supplemented in the diet.

This study investigated the connection between maternal supplementation of DHA and lutein and delivery to the neonates. We hypothesized supplementation of DHA and lutein during late gestation (74 day) and lactation would result in an increase of DHA concentration in the colostrum. Sixteen sows were randomly assigned to the following treatments from late gestation through lactation: control (C), lutein (L, 2.2 mg/kg/d), DHA (D, 75 mg/kg/d), and DHA plus lutein (LD, 2.2 mg/kg/d lutein and 75 mg/kg/d DHA). Colostrum was collected within 12 hrs after farrowing and DHA concentration was analyzed using gas chromatography. DHA and EPA (Eicosapentaenoic acid) concentration of the colostrum from D (2.63-3.88%, 0.38-0.62% of total fatty acids, respectively) and LD (1.91-4.65%, 0.37-0.85% of total fatty acids, respectively) were greater ($p<0.05$) than those of C or L. No differences in DHA and EPA concentration were found between D and LD. Alpha-linolenic acid concentrations were not different between groups. In conclusion, dietary supplementation of DHA during pregnancy increased DHA concentration in colostrum and lutein did not affect the DHA concentration. This study is part of a study investigating the effect of lutein and DHA during pregnancy on neurological development in piglets.

**Undergraduate Biology Student Ideas About Biochemical Pathway Dynamics**

Austin Stack, Ramsey Scholar
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Biochemistry students must understand a variety of conceptual topics and be able to communicate using visual language. In order to facilitate biochemistry education, we investigate ways undergraduate biology students think about the biochemical concept of pathway dynamics and regulation and associated visual language. We performed a qualitative investigation in which 22 students were interviewed and asked to discuss their ideas about concepts and visuals while taking an assessment addressing metabolic pathway dynamics. Recurring student ideas in the interview recordings were labeled. The frequency of and correlations between these labels informed our cataloging of trends in student thought. As introductory-level students, they were relatively inexperienced in the assessment topics. Still, the trends in student ideas cannot be entirely attributed to a lack of conceptual knowledge. Students' interpretations of the pathway visual heavily influenced their ideas about the pathway. Visuals were more ambiguous than anticipated; students exhibited many diverse, alternate interpretations about a visual representation of feedback inhibition. Many students chose the "correct" answers on assessment questions while still displaying non-canonical reasoning. Additionally, they focused disproportionately on metabolic compounds at the end of the pathway, rather than considering the pathway as a unified whole. These results suggest several new directions for the improvement of biochemistry education, including further investigation into the intuitiveness of metabolic pathway visuals, greater educational emphasis on holistic consideration of metabolic pathways, and a shift to focus learning assessments on student reasoning over "correct" answers.

**Screening for Specific Inhibitors of the *Plasmodium* Protease, ClpP**

Dylon Stephens, CURO Summer Fellow
*Dr. Vasant Muralidharan, Cellular Biology, Franklin College of Arts and Sciences*

*Plasmodium falciparum*, the causative agent of malaria, contains a group of parasitic genes that come from prokaryotic origins known as the Clp family proteins. One of these proteins, the ClpP protease, localizes to the metabolic center of the parasite; the apicoplast. While little is known about the apicoplast, it has been shown that drugs that target this non-photosynthetic plastid are clinically effective. The ClpP protease has been shown to be essential to the asexual blood stages of the parasite by forming a complex with other proteins to regulate cellular processes through the degradation of proteins. Through using genetic approaches, a conditional mutant was generated in order to knock down protein levels of ClpP in the parasite by over 95%. Using this cell line as a tool, small molecules from chemical libraries such as the Pathogen Box, a small library of 400 compounds, developed by the Medicines for Malaria Venture, are screened against parasites. Compounds from this library are known to be effective against multiple infectious diseases such as malaria, tuberculosis, and dengue fever, but many of their targets are unknown. It is hypothesized that when knockdown is achieved, the small molecules that are specific to the ClpP protease will be more effective at killing the parasites than when knockdown is not present. With this method, several chemical compounds have been found to potentially be specific to this bacterial protease and these compounds are now being validated.

**Implications for Cultural Similarities and Female-Inclusive Peace Processes**

Stephanie A. Stewart, Foundation Fellow, CURO Research Assistant
*Dr. Andy Owsiak, International Affairs, School of Public and International Affairs*

Despite recognition that women's equal inclusion in peace processes render agreements more durable and comprehensive, there has been little substantive progress towards equitable peacebuilding. Significant attention has been given to the conditions under which mediations are successful and to extant barriers to women's participation. There remains, however, a void within the literature regarding which factors have positively contributed to the inclusion of women in peace negotiations. The policy implications for this oversight cannot be understated: 20 years of work on Women, Peace, and Security has not resulted in a coherent strategy for systematically increasing women's representation across all stages of peacebuilding. This paper, therefore, explores the theoretical implications of the cultural similarities between mediating triads on women's inclusion in peace processes. Research demonstrates that bias — including what can be considered cultural bias — contributes constructively to positive mediation outcomes. Cultural similarities between parties are assumed to reduce risks of miscommunication and implicitly clarify intentions; here I argue that similarities can be leveraged to

promote female inclusion in peace negotiations. Through a qualitative study of existing work, I explore the potential role of culture in female inclusion in peace processes. Conclusions are then applied to a case study of Oman's role in mediating the Yemeni civil war, which is supplemented by interviews conducted in Oman. Future quantitative work can complement this research and determine empirically how cultural similarities have, to this point, affected female inclusion in peace talks.

**Time Trial Running Performance in Female Athletes Following a Caffeine Mouth Rinse**

Anna Claire Stietenroth, CURO Research Assistant
*Dr. Jamie A. Cooper, Foods and Nutrition, College of Family and Consumer Sciences*

Previous research has shown that rinsing the oral cavity with caffeine (CAF) and/or carbohydrate (CHO) may activate reward centers in the brain that could impact athletic performance. This is part of the Cephalic Phase Response (CPR), which is the innate physiological response to sensory signals in preparation for the digestive process. To investigate the effects of CAF MRs both alone, and when combined with CHO, on endurance running performance in women. Endurance-trained women completed 4 separate 12.8 km running time trials (TT) in this randomized, double-blinded, placebo-controlled study. At each of the TT, participants were administered MRs containing CHO alone, CAF alone, CHO+CAF combined, or a water placebo treatment. At the beginning and every 12.5% interval thereafter, participants were asked to swish and expectorate the mouth rinse. Heart rate, completion time, and rating of perceived exertion were measured. To date, 7 females have completed all 4 TTs. There was no significant difference in completion times between treatments A, B, C, and D (1:10:42 ± 00: 03:39; 1:11:54 ± 00: 03:45; 1:09:19 ± 00: 03:52; 1:11:15 ± 00: 03:15, respectively.) There was also no difference in average heart rate between treatments. On 7 participants tested thus far, no significant differences have been found. However, recruitment is ongoing and an additional 5 women will be completing the study this year to determine if CAF MRs can be used as an ergogenic aid for female endurance runners.

**Tumor-Associated Carbohydrate Antigens and Immune Suppression**

Sasha Stogniy, Foundation Fellow, CURO Research Assistant
*Dr. Fikri Avci, Biochemistry and Molecular Biology, Franklin College of Arts and Sciences*

Understanding differential cell signaling in cancer—the mechanisms by which cancer cells can "turn on" pro-inflammatory checkpoint mechanisms or "turn off" antibody-dependent cytotoxic pathways—is a crucial part of understanding the overall immune response to the disease. By elucidating how glycosylation affects these pathways, immunotherapy mechanisms for modulating the immune system to target cancer cells can be discovered. Using a tumor-bearing mice model of murine breast cancer, we aim to characterize the CD301b$^+$ immune cells that accumulate in the tumor microenvironment, determine the role of Tn antigen in accumulation of the CD301b$^+$ cell population/developing cancer, and overcome cancer progression through inhibition of Tn-CD301b$^+$ interactions. To obtain a more detailed immune profile of the CD301b$^+$ cells, they will be further characterized in the context of cancer as compared to analogous suppressor cells. Flow cytometry will be used to sort cells based on extracellular markers such as CD4 expression, along with an enzyme-linked immunosorbent assay for quantifying relevant proteins and antibodies. The gene expression of cytokine arrays will be analyzed to reveal whether the cells are producing greater levels of cytokines than is usually expected, and the polymerase chain reaction will be employed to screen for changes in this gene expression. We anticipate finding that the CD301b$^+$cell phenotypes will resemble those of other suppressor cells, producing cytokines known to be immunosuppressive such as IL-10 among other indicators.

**Relationships Between Circulating Factors and Heart Histology in a Genetically-Diverse Mouse Population**

Emma Lauren Strauss, CURO Research Assistant
*Dr. Robert Pazdro, Foods and Nutrition, College of Family and Consumer Sciences*

Cardiovascular disease (CVD) remains one of the leading causes of death worldwide. Studies have shown that patient survival is predicted by the degree of cardiac hypertrophy, abnormal thickening of the heart muscle. Consequently, there is considerable interest in cardiac hypertrophy, its underlying mechanisms, and new methods of treating it. More recent studies showed that the circulating protein growth differentiation factor 11 (GDF11) reverses cardiac hypertrophy in inbred mice, but it is unclear whether GDF11 has the same impact in a genetically diverse population. To address this research gap, we quantified circulating GDF11 levels in a large sample (n=225) of Diversity Outbred (DO) mice, which model human genetic diversity. We also assessed histological measures of cardiac hypertrophy, including left ventricular wall thickness, cardiomyocyte cross-sectional area, and fibrotic area. We expect that statistical analyses and genetic mapping will reveal novel genes and pathways responsible for cardiac hypertrophy, as well as potent therapeutic targets to reverse its progression.

**Stress Analysis of Infrastructural Walls of Nuclear Power Plants**

Carley Ann Suarez
*Dr. Ramana Pidaparti, Environmental, Civil, Agricultural, and Mechanical Engineering, College of Engineering*

The goal of last semester's research was to investigate the stresses and strains that lead to cracking or failure in structural materials under severe operating environments. This was simulated through a series of cases with different trials in ANSYS, a finite element analysis software for stress analysis. The walls were composed of a holes material, which occurred sporadically throughout the wall, and a solid material. It was predicted that when the holes material properties were manipulated, it would experience higher peak stresses than the solid materials therefore leading to failure or cracking. CAD models were created using MatLab based on microstructural

images. Four different models were created for this project. I then imported two of models into ANSYS and completed twenty simulations on each model, my colleague Jackson Willis completed the simulations on the other two models. There were four cases of the models. The first being the original data given with an R value (the ratio of the Young's Modulus' of the two materials) of 1.08. The Young's Modulus of the holes material was then lowered to give R values of 0.9, 0.8, and 0.7. Five different trials which consisted of 100 MPa of stress applied in the +x then in the +y directions, 100 micrometers of deformation in the +x then the +y directions, and a trial of 100 MPa of shear stress applied in the +y direction were completed on each case. The findings correlated well with the beginning expectations, meaning that preventative measures can be taken to prevent dangerous situation involving infrastructure at nuclear power plants.

**Afro-Pessimism in Colson Whitehead's *The Underground Railroad***
Grant Sublette-Urry
*Dr. Peter Desmond O'Neill, Comparative Literature, Franklin College of Arts and Sciences*

My research centers on the depiction of race in Colson Whitehead's 2016 novel, *The Underground Railroad*. I argue that Whitehead's portrayals of Blackness and white civil society evoke the iconoclastic framework of Afro-Pessimism, an emergent interpretation of race that understands Blackness as a paradigmatic position coterminous with social death. I reach my conclusion by closely examining the various societies Whitehead describes throughout the novel, interrogating the power structures and regimes of discipline present in each, and exploring how and why they operate upon Black bodies. Specifically, I consider how Whitehead incorporates Orlando Patterson's three constituent elements of social death - openness to violence, natal alienation, and general dishonor - into the novel. Additionally, I read *The Underground Railroad* against the corpus of Afro-Pessimist texts, using the writings of scholars such as Frank B. Wilderson III, Saidiya Hartman, and Hortense Spillers to elucidate the ways in which Whitehead constructs the complex interplay between Blackness and white civil society. A rigorous reading of Whitehead's novel through the lens of Afro-Pessimism sheds new light on the portrait of Blackness lying beneath its temporally unmoored narrative.

**The Rituals of Great Peace: Popular Religious Practices' Influence on Taiping Christianity**
Christian Michael Sullivan
*Dr. Ari Levine, History, Franklin College of Arts and Sciences*

As a Christian millenarian movement, the Taiping Heavenly Kingdom promised to bring about a "great peace" by replacing the weakening Qing Dynasty and expelling European imperialism from China. However, this movement of "great peace" spectacularly imploded, instead plunging the Chinese countryside into a fourteen-year total war later recorded as the Taiping Rebellion, killing around 30 million Chinese peasants. Although a strange occurrence in Chinese history considering Christianity's minimal presence in China, the Taiping Rebellion from 1850 to 1864 was a response to ongoing shifts and currents present in Chinese popular peasant culture and religious practices. This research aims to determine the Taiping Heavenly Kingdom's origins in popular peasant culture, especially within localized Daoist and Buddhist rituals and popular religious practices as a case study of how popular culture fuels collective action which transforms into political change. Through analyzing eighteenth century primary sources and extensive historiography of secondary sources detailing Taiping ritual practices and local records on peasant culture, the proper causal relationship between popular culture and political movements both within past, present, and future societies.

**Searching for Causality in Suspected Case of Malignancy-Induced Lymphedema**
Sam Skye Summers
*Dr. Mandi M. Murph, Pharmaceutical and Biomedical Sciences, College of Pharmacy*

Melanocytes are intrinsically designed to withstand onslaughts like ultraviolet radiation, but sometimes cells within this population may transition to a premalignant state. Since the underlying molecular mechanisms facilitating this transition are not understood, we designed a study to explore possible mechanistic shifts. Herein, we hypothesized that triggering the lysophosphatidic acid 3 receptor expression among normally null-expression melanocytes would result in a molecular shift to a premalignant state. For this study, we virally-transduced melanocytes with either lysophosphatidic acid 3 or 6 receptors, and then subcutaneously implanted spheroid matrigel engraftments onto the flanks of nude mice to establish pre-malignant lesions and monitor development for 6 months. Some of the melanocytes were exposed to a single, activating ultraviolet B radiation treatment to enhance the possibility for malignant transitioning. After six months, mice were euthanized, and lymphedema was observed in several mice. Therefore, we want to address the high level of lymphedema observed by quantifying genes associated with lymphedema and epithelial to mesenchymal transition. Targets of interest include epithelial to mesenchymal transition markers, FLT4, FOXC2 and leukotriene $B_4$. FLT4 and FOXC2 are highly expressed in primary lymphedema, which is hereditary, while a high level of leukotriene $B_4$ corresponds with secondary lymphedema, which often results from surgery or malignant disease. The anticipated results could correspond with secondary lymphedema and are expected to be divergent in comparison to mice with no observed lymphedema. Furthermore, this retrospective analysis may refine future directions of the research and elucidate mechanisms of transitioning to a premalignant state.

**Characterizing Planarian Laminin G Domain-Containing Proteins and Their Role(s) in Planarian Regeneration**
Jada Summerville
*Dr. Rachel Roberts-Galbraith, Cellular Biology, Franklin College of Arts and Sciences*

For many organisms, including humans, stem cells are required for the repair and regeneration of tissues. Planarians, aquatic flatworms, have stem cells that enable regeneration of their

entire bodies. The signaling mechanisms that underlie stem cell proliferation and differentiation are not entirely understood. This project examined 21 planarian genes that encoded proteins containing Laminin G domains. Laminins and related proteins are typically localized in the extracellular matrix or at the cell surface, providing structure and relaying signals. Because Laminin G domain proteins have been previously observed to function in signaling, we tested to see whether proteins containing at least one Laminin G domain played a significant role in planarian regeneration. We used *in situ* hybridization to examine the expression pattern of each Laminin G domain-containing gene in the animal. We utilized RNA interference (RNAi) to test whether these genes are responsible for successful stem cell function. Surprisingly, we found that most of these genes were not necessary for planarian regeneration. We did identify one gene that affected tissue homeostasis in the planarians, this gene leading to lysis. We are currently investigating whether small related groups of Laminin G domain proteins work together to contribute to regeneration. Our results will help us to understand how planarian stem cells are triggered to regenerate and differentiate and how stem cells could possibly work in humans.

**Evaluating a New Analysis Protocol for Measuring Muscle Mitochondrial Capacity**

Max Sumner
Ellie Pryor
*Dr. Kevin McCully, Kinesiology, College of Education*

Near-Infrared Spectroscopy (NIRS) has been used to measure muscle mitochondrial capacity. The current method requires as many as 22 short ischemic occlusions to generate a recovery curve for mitochondrial capacity. To determine the effectiveness of using a 6-occlusion analysis protocol to study muscle mitochondrial capacity. Two independent, unidentified data sets were analyzed (bicep n=48, forearm n=41) from previous studies using a NIRS device (Artinis, Ltd.). Both data sets had two recovery tests that included 22 ischemic occlusions. A recovery rate used to indicate mitochondrial capacity was calculated two different ways (simultaneously). Each sample was analyzed with a MATLAB program; with a curve-fit for the 22 ischemic occlusions and curve matching for the first six ischemic cuffs and an end resting value. The two resulting rate constants were compared using correlations, both for the two data sets, good and bad fitting data, using the best 5 of 6 points for the 6 cuff approach. The rate constants were not significantly different between the 22 cuff and 6 cuff for the total data sets: bicep (1.43+0.32min-1, 1.44+0.35min-1, p=0.56), forearm (1.94+0.42min-1, 1.95+0.44min-1, p=0.76). The average bicep rate constants, when compared to each other, had an equation of y=1.07x-0.09, $R^2$=0.90. The average forearm rate constants, when compared to each other, had an equation of 0.98x+0.02, $R^2$=0.93. The 6-Cuff analysis provided the same results as the longer 22-cuff. The 6-cuff approach is both shorter in time and uses less ischemic occlusion periods, increasing the practicality of the NIRS mitochondrial capacity test.

**The Characterization of Antibody Binding to the Swine 2015 North Carolina Influenza Virus (H1N2)**

Lui Suzuki-Williams, CURO Research Assistant
*Dr. Ted M. Ross, Infectious Diseases, College of Veterinary Medicine*

With high antigenic variability and mutability, the influenza virus has significantly impacted for decades individuals, communities, and even countries. With traditional vaccinations for the pathogen, people are unable to receive complete protection against future mutated strains. Thus, the development of broadly-reactive vaccines could be the trump card necessary to combat the influenza virus. In the last decade, the Swine Flu has posed various health scares across the nation, including the 2009 flu pandemic. My work involves the vaccines developed to counter the 2015 North Carolina Swine H1N2 Type A Influenza strain (SW/NC/15). Although various experimental vaccines were found to provide measured protection against the pathogen, the Ross lab has yet to confirm antibody-mediated protection due to binding to the hemagglutinin (HA) surface protein. Since the vaccine contains several components (HA and neuraminidase), I aim to confirm that antibodies bind to SW/NC/15's HA glycoprotein by producing a recombinant protein utilizing molecular cloning methods. Preliminary data suggest that the protection afforded by the experimental vaccines was not induced by antibody interaction with the HA receptor binding site, but I aim to determine if antibodies are binding to other virus neutralizing HA sites. If no binding is observed, then the protection may not be antibody mediated. With the conclusion of this project, this data will further elucidate the adaptive immune response mechanism against swine influenza strains.

**Resveratrol and Family B Polymerases**

Justin David-Li Swaby, CURO Research Assistant
*Dr. Paul Xie, Electrical and Computer Engineering, College of Engineering*

Resveratrol is a trans-stilbene that has been commercialized for numerous health benefits such as protection from inflammation, atherosclerosis, carcinogenesis, platelet aggregation, and for our interest, malignant cell lines/cancer. Resveratrol has been shown to inhibit DNA polymerase in cancer cells and it can be a strategy for cancer treatment and possibly aging. According to a previous study, the IC50 of Resveratrol on DNA polymerase α and δ are 3.3 and 5 μM. It has the ability to arrest cancerous cell growth by halting the replicative cell cycle in S-phase where the DNA typically duplicates before cell division. DNA polymerase α and δ are members of Family B polymerases which play roles in DNA repair and replication. Our goal is to find the mechanism by which Resveratrol binds to these replicative polymerases. Using Maestro Schrodinger Docking simulation, we were able to find the site where Resveratrol bound to DNA polymerase α. As for DNA polymerase δ, no crystallized structures of human have been published so SwissModel will be used to create a model structure. Since DNA polymerase α and δ should be structurally similar, we will dock a human DNA chain onto the model structure. Next we will look for the site where Resveratrol binds to DNA in DNA polymerase δ and compare this to our previous

results for DNA polymerase α. The implications of this data go as far as a consensus targeting site for any drugs that are produced with the purpose of preventing DNA replication.

**Water Quality of Different Sources along the Georgia Section of the Appalachian Trail**

Caleb Nathaniel Sytsma, CURO Research Assistant
*Dr. Daniel Markewitz, Forestry, Warnell School of Forestry and Natural Resources*

The Appalachian Trail attracts over two million visitors annually, many of whom begin in Georgia to hike northward. While the importance of following proper waste disposal methods are stressed to hikers, trail visitors have been shown to negatively impact vegetation and soil quality. This can negatively impact hikers in turn, as human pollution can adversely affect water quality of the nearby streams and springs that hikers depend on as water sources. Prior studies have found Escherichia coli levels exceeding government standards in streams within the Great Smoky Mountains National Park, but little to no data exists on surface water quality along Georgia's section of the Appalachian Trail (AT). Nutrient, trace metal, and *Escherichia coli* levels will be measured for 21 sites along the Georgia AT, which will consist of official AT water sources and streams directly along the trail. Initial data collection will occur in March to coincide with the greatest influx of hikers, with two more planned collections later on. Trace metal data for all sites will be compared to historic precipitation chemistry and groundwater chemistry data to evaluate source water flow paths as either deep or shallow. Thereafter, nutrient and *E. coli* concentrations will be evaluated between the different types of assessed sites for low water quality. All sites will be analyzed spatially for relationships between quality and proximity to trails, campsites, and privies. General recommendations will be made on the types of treatment best suited to different source types based on identified relationships and types of contamination.

**Association Between HIV Viral Load, White Blood Cell Count, and CD4 Count in the Presence of Mosquito-Borne Disease Co-Infection: A Systematic Review**

Shreya Tailor
Joseph Mcdaniels, Keshni Kokilakumar
*Dr. José F. Cordero, Epidemiology and Biostatistics, College of Public Health*

Human immunodeficiency virus (HIV), a virus spread through bodily fluids that attacks CD4 cells in the immune system, affects over 36.7 million people globally. In the past 40 years, an increase in the number of well-known mosquito-borne diseases has occurred, including but not limited to Chikungunya (CHIKV), Dengue, (DENV) Zika (ZIKV) viruses, and malaria. HIV is prevalent in developing countries where mosquito-borne diseases are common; therefore, determining the relationship between HIV viral load and the presence of mosquito-borne disease coinfection is vital. To address this gap in the literature, we conducted a systematic review examining studies that evaluate the relationship between CD4 count, white blood cell count, viral load among individuals diagnosed with both HIV and mosquito-borne diseases. The systematic review was conducted following PRIMSA guidelines, using the PubMed database. This was done in tandem by two reviewers and all discrepancies were resolved by a third reviewer. We made no restrictions based on language, country, or mosquito-borne disease. First, the title and abstract of each study was screened. Included studies were then reviewed in full to ensure that the used primary data collection, were prospective, and were not review articles. Of those that met our inclusion criteria, we abstracted data on viral load, CD4 count, and white blood cell count among those with HIV and both with and without mosquito-borne disease co-infection. The references of each included study were reviewed for additional sources. Our original search terms yielded 1,638 articles. After full text review, 11 studies met our final inclusion criteria. The majority of studies examined DENV (N=4) or malaria only (N=4). Two additional studies reported on multiple mosquito-borne diseases. The total number of patients in each study ranged from approximately 200 to 18,000. Our results indicate that those diagnosed with DENV and HIV have decreased viral load. Our results provide preliminary evidence that viral load, CD4 count, and white blood count vary among individuals diagnosed with both HIV and mosquito-borne diseases compared to those without co-infection. Understanding the interaction between HIV patients and mosquito-borne diseases co-infection is vital in countries where HIV is prominent and mosquito-borne diseases are endemic. Therefore, more research in this field is recommended.

**Teaching the Ancients to Type: Better Unicode Text Entry for Ancient Greek**

Steven Tammen, CURO Summer Fellow
*Dr. Benjamin M. Wolkow, Classics, Franklin College of Arts and Sciences*

While native speakers of a language have little problem picking up a second keyboard layout designed specifically for a different alphabet and system of phonetics, people who do not type as much face many hurdles related to memorability and consistency. In particular, typists of ancient Greek find themselves in the unfortunate situation of needing to type a complex language with many diacritics, a language that is no longer spoken. After taking a survey of Classicists (N=184) to inform design decisions, I developed a new keyboard layout for typing ancient Greek alongside English. With design proceeding under the twin considerations of layout mnemonics and the so-called "principle of least astonishment," this project created a keyboard layout for ancient Greek that is easy to use without compromising on functionality. Memorable letter placements, intuitive and predictable entry of diacritical marks, intuitive backspacing of diacritical marks, and minimal interference with English computer usage are all project features stemming from this user-focused design. An emergent benefit of intuitive foreign-language keyboard layouts is more efficient digital humanities, language pedagogy, and computer-aided language learning (CALL). Even more than this though, in an increasingly global and interconnected world, such layouts have the potential to improve outcomes in both business and

government: people who must type languages like Russian, Hebrew, and Farsi can do so more efficiently and with less training. In the long term, the design processes employed by this project can be extended to other languages that do not use the Latin script.

**Liquid-Infused Nitric Oxide-Releasing Port Catheter for Enhanced Bactericidal and Antiplatelet Activity**

Nicole Veloro Tayag, CURO Research Assistant
*Dr. Hitesh Handa, Chemical, Materials, and Biomedical Engineering, College of Engineering*

Implantable chest ports are commonly used to administer chemotherapy drugs for cancer treatment. Located under the skin, ports allow for easy access to the blood stream, bypassing the need for a new intravenous needle (IV) for each treatment. Although safer and more viable than an IV, chest ports must be flushed with saline and heparin between each use or every four weeks if not used to ensure patency and prevent biofilm formation. Still, infection occurs, resulting in increased risk of morbidity and mortality. Because chest ports are commonly used in immunosuppressed patients, infection outcomes are even more dire, and in most cases necessitates port excision. Recent reports have shown that liquid-infused materials result in superior antifouling properties, but are limited by their ability to reduce the viability of pathogens. Nitric oxide (NO) is a gaseous molecule released in the body which helps modulate vasodilation, blood coagulation, and wound healing. NO is released by macrophages to target both Gram-positive and Gram-negative bacterial pathogens. NO-releasing materials have been fabricated to significantly decrease the viability of adhered bacteria and increase antiplatelet activity. Therefore, in this work, the NO donor S-nitroso-acetylpenicillamine (SNAP) and silicone oil were incorporated into a chest port septum via a solvent swelling process as an antimicrobial measure to reduce risk of infection. NO-releasing kinetics and leaching were assessed over a 75-day period. Antibacterial activity was measured *in vitro* by exposing the synthesized materials to bacterial and fungal pathogens commonly associated with device-related infection.

**White Blood Cell Counts Post-Stroke in Yucatan Minipigs: Male vs. Female**

Abby Temple, CURO Summer Fellow
*Dr. Franklin Delano West, Animal and Dairy Science, College of Agricultural and Environmental Sciences*

Stroke is one of the leading causes of serious long-term disabilities in the United States. 87% of strokes in America are ischemic in nature, resulting in decreased blood flow to parts of the brain and neural degeneration. One of the main causes for this neural degeneration is brain inflammation post-stroke, which occurs as a result of the primary and secondary immune responses. Stroke disproportionately affects women, with there being approximately 500,000 more female stroke survivors than male survivors currently in the United States. This discrepancy may be the result of differences in differential leukocyte counts between the sexes. Neutrophils, pro-inflammatory immune cells that also play a role in discarding cell debris, are responsive to estrogen, which may affect their responsiveness to neural injury in females. It has also been shown that women have higher levels of lymphocytes, responsible for recognizing antigens and producing antibodies, than their men counterparts. Understanding these differences is essential when developing stroke therapeutics in order to design the most effective therapy. In this study, stroke was achieved through middle cerebral artery occlusion in a porcine model. Differential leukocyte counts were examined pre-stroke, at 4, 12, and 24 hours, and at 3, 8, and 27 days post-stroke. To do this, blood samples were taken at each of the aforementioned time points and used to make a blood smear. These smears were analyzed under a microscope and the differential leukocyte count was determined for each smear. This data should reveal a higher post-stroke neutrophil: lymphocyte ratio compared to the pre-stroke data due to the inflammatory response that occurs post-stroke. In terms of gender differences, female post-stroke neutrophil: lymphocyte ratio should be lower than the male ratio, as females naturally have a higher lymphocyte count. Assuming these expectations are corroborated by the data, potential therapies could decrease this ratio to limit the pro-inflammatory effect of neutrophils post-stroke. Pre-stroke counts could also help elucidate innate differences between males and females that could contribute to increased stroke risk for females. Overall, these findings will aid in determining sex differences in response to stroke to help develop more effective stroke therapeutics.

**The Evolution of Redox Regulation by Fructosamine-3-Kinase**

Niral Thaker
*Dr. Natarajan Kannan, Biochemistry and Molecular Biology, Franklin College of Arts and Sciences*

Glycation refers to the non-enzymatic formation of a covalent bond between a reducing sugar and a biomolecule. It leads to the accumulation of Advanced Glycation End products (AGEs), which have been implicated in the pathogenesis of chronic diseases such as renal failure, cardiovascular disease, diabetes, and Alzheimer's. The Fructosamine-3-kinase (FN3K) family of enzymes is responsible for the deglycation of lysine residues in proteins and does so through the phosphorylation of fructoselysine residues on glycated proteins. This produces an unstable phosphodiester that can undergo a beta-elimination reaction to regenerate the lysine residue, thereby restoring the original structure and function of the protein. Previous studies have shown variation of substrate specificity in FN3K orthologs; however, the regulation of this enzyme family has yet to be identified. Crystal structure and biochemical assay analyses of FN3K in *Arabidopsis thaliana* reveal enzyme regulation through redox systems. Redox regulation of the *A. thaliana* was illustrated through the transition in structure from a dimer formed by two disulfide bridges under oxidizing conditions to a thiol monomer under reducing conditions *in vitro*. The P loop cysteine was found to be most critical for redox sensitivity. We hypothesize that the P loop cysteine is responsible for redox regulation of FN3K in *Nostoc punctiforme* and *Nitrosomonas europaea*. The FN3K orthologs will be purified and the enzyme will be assayed under redox conditions using PKLDH coupled

assays and nonreducing gels to determine if the conserved P-loop cysteine plays a key role.

**How Canadian Leave Policies Change Overtime with Regards to Labor Market Opportunities**

Tony Thawanyarat, CURO Research Assistant
*Dr. R. Vincent Pohl, Economics, Terry College of Business*

This research project explores the effect of different Canadian leave policies on the labor market opportunities of cancer patients and their families. In essence, these leave policies may be able to help cancer patients and the families of these cancer patients as they may not have to end employment to care for their sick family member. Across the ten provinces and three territories of Canada, each province establishes their own independent Employment Standards Act/Code or Labor Standards Act. Across a timeline of the year 2000 to current day, these Employment Standards and Labor Standards have been updated and changed periodically. These changes may demonstrate a correlation to changes in labor market opportunities for cancer patients and their families. Specifically, changes in these Employment and Labor Standards may include the introduction or specialization of new leave policies to better pinpoint and serve individuals. This often is seen as Sick Leave, Family Responsibility Leave, Compassionate Care, and many more. Along with this variation, duration of leave is also varied over time as some can range from a few days to half a year. Lastly, within these durations there are opportunities where some provinces distinguish between leaves that are paid and unpaid which may also contribute to an affect on the labor market opportunities of these individuals. This study utilizes public data from each provincial and territorial website of Canada and the Canadian Legal Information Institute.

**Isolation of Microbial Cultures from Different Carbon Sources to Assess Organic Matter Stability in Soil**

Josh Thedford, CURO Honors Scholar
*Dr. Aaron Thompson, Crop and Soil Sciences, College of Agricultural and Environmental Sciences*

Soil organic matter is comprised of many different types of carbon and different sets of microbes have adapted to decompose that carbon. I am working on a study with the longterm goal of understanding how organic matter persists in soils. One of the main mechanisms appears to be the association of organic matter with minerals, in particular small, high-surface area iron minerals. My project's broad outline involves making co-precipitates of iron and organic matter that likely reflect these persistent forms of organic matter in soils and then measuring the microbial availability of that organic matter. In order to accomplish this, I am conducting the key step of isolating microbes that can decompose different types of organic matter. I will then test these microbial isolates ability to decompose carbon in the iron-organic co-precipitates. I will measure the decomposition through the production of $CO_2$(g), as that is the end-product of microbial decomposition of the organic matter. I will determine the growth rates and general behavior of the microbial communities that I isotope from the soil using different carbon sources and also quantify the microbial communities using 16s DNA sequencing. First, I will isolate a microbial culture from an active, carbon-rich rooting zone by placing them in solutions of selective media with either 1mM or 3mM of glucose, sucrose, or lactate. Microbial growth will be measured using optical density measured every 12 hours over a 3Day period. After this, I will test the rate of decomposition of the iron-organic co-precipitates by these different isolated communities and also use 16s DNA sequencing to identify the microbial community members. Overall, my work will help identify which microbial communities are best suited to decompose the most persistent and resistant organic matter in soils.

**The Methodological Issues Associated with Studying Gender in a Society Focused on Gender as a Salient Identity**

Jessica Bailey Thompson, CURO Honors Scholar
*Dr. Jody Clay-Warner, Sociology, Franklin College of Arts and Sciences*

We recently conducted research with human subjects through an experiment involving gender as a primary variable of investigation. Debriefing responses have revealed that some subjects had suspicions about the role of gender in the study. Given the importance of gender in this experiment, we are considering re-running the study with new participants. This presentation will focus on the difficulties of studying implicit gender biases when gender is so prominent as an identity in society. To target implicit biases, some form of deception is usually necessary, but this can be difficult given the role gender plays in day-to-day interactions. In addition, issues such as social desirability bias may impede the collection of accurate data; even if participants are fully aware that their responses are confidential, they may provide answers they believe are "socially acceptable". However, while gender may be difficult to study, it is critical that we continue to examine the mechanisms by which gender bias occur.

**Theosis and Sanctification: Christian Paradigms of the East and West**

Sarah Kathryn Thompson, CURO Research Assistant
*Dr. Sandy Dwayne Martin, Religion, Franklin College of Arts and Sciences*

I will attempt to address the following question: how do Anglo-American Wesleyans and Eastern Orthodox Christians understand and practice likeness to God as a route to salvation? Both the Anglo-American Wesleyan concept of sanctification and the Eastern Orthodox concept of theosis present anthropological and soteriological systems within which humans may attain likeness to and union with God; however, Methodist and Orthodox definitions of likeness and union, as well as the mechanisms through which these goals may be actualized, remain distinct. Through a qualitative discursive analysis of primary texts by figures including John Wesley, St. Athanasius, St. Irenaeus, and St. Cyril of Alexandria, a historical analysis of doctrinal developments within Methodism and Eastern Orthodoxy, and an evaluation of modern theological scholarship from figures including Timothy Ware and Vladimir Lossky, I identify points of convergence and divergence between

two hopeful interpretations of human purpose and potential. In exploring the sects' respective teleologies and methodologies, I find that Methodist dialogue emphasizes sinlessness, emotional connection to God, and guidance from the Holy Spirit, while Orthodox dialogue emphasizes consciousness of sin, knowledge of God, and a more enduringly trinitarian participation with the Godhead, especially as mediated by the bodily presence of Christ in the Eucharist. Through this research, I aim to elucidate two paradigmatic belief systems around which Anglo-American and Eastern Christians organize private and public life, thereby demonstrating diversity within the Christian tradition and facilitating inter-branch and international understandings.

**Investigation of the Excited-State Dynamics of Photo-ODIBO Using Transient Absorption Spectroscopy**

Will Thompson, CURO Research Assistant
*Dr. Susanne Ullrich, Physics and Astronomy, Franklin College of Arts and Sciences*

Photo-click chemistry utilizes photoreactive molecules, inert molecules in which reactivity can be induced by specific wavelengths of light. Photo-ODIBO contains a cyclopropenone functional group which undergoes photodecarbonylation upon irradiation of 350 nm light. The resulting cyclooctyne is highly reactive and subsequent cycloaddition of an azide provides for ample applications such as labeling of biomolecules for imaging. The details of the photodecarbonylation mechanism are not yet understood and are the subject of the present study. As the dynamics of photoactivation take place on a femtosecond time scale, ultrafast transient absorption spectroscopy is ideally suited to investigate the underlying photochemical processes. Transient absorption spectroscopy is based on a pump-probe technique that employs an ultrashort pump pulse for photoexcitation of the sample and a time-delayed white-light probe pulse to monitor the excited state dynamics in real time. A transient absorption spectrum is acquired by scanning an optical delay between the pump and probe beams and measuring the transmitted spectrum of the white-light probe in a fiber-optic spectrometer. An optical chopper blocks alternate pump pulses to differentiate between ground and excited state absorption and a liquid flow cell ensures that each pump pulse photoexcites unreacted photo-ODIBO. The transient absorption spectra are analyzed to extract timescales and spectral signatures which provide insight into the underlying photochemistry. The absorbance decay is of multi-exponential nature suggesting a stepwise procession of the photo-ODIBO relaxation and dissociation dynamics. To help distinguish spectral signatures associated with these two processes additional transient absorption measurements are performed directly on the photoproduct ODIBO.

**Effect of RNAi Control on *Diachasmimorpha longicaudata* Entomopoxvirus in Parasitoid Wasps**

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

As a parasitoid wasp, *Diachasmimorpha longicaudata* completes part of its life cycle within a host, usually a tephritid fruit fly, that it eventually kills. *D. longicaudata* also has a unique symbiotic relationship with DIEPV (*Diachasmimorpha longicaudata* entomopoxvirus), that the wasp utilizes to weaken the immune system of its larval host. Unlike pathogenic viruses, the pattern of replication for DIEPV is tied to wasp development and is also tissue specific, meaning that it may be under control of its wasp host. Previous research shows that DlEPV virus replication in *D. longicaudata* plummets at one day past emergence, but the mechanism of control is unknown. This research will focus on answering the question, "Is there control on the part of the *D. longicaudata* wasp to regulate DIEPV replication using RNAi from the Argonaute-2 protein?" Argonaute-2 is produced by *ago2*, the gene at the key step in the RNAi pathway. To reduce Argonaute-2, *ago2* was knocked down to observe what happens to virus replication in the wasps as a result. The methods pursued are to first create a RNAi knockdown of *ago2* by the injection of dsRNA into wasps, then to use quantitative PCR to check for knockdown in dissected venom glands, and finally to quantify viral replication by checking the number of genome copies, as well as the transcription of key viral genes. This is significant because it would allow us to identify how wasps are controlling virus replication to maintain mutualism.

**Hybrid Texts of Literature and Photography: The Modern Civil Rights Movement**

Lauren Tolbert
*Dr. Barbara McCaskill, English, Franklin College of Arts and Sciences*

Under the mentorship of Dr. Barbara McCaskill, I studied hybrid texts of literature and photography from the civil rights movement from the 1950s to the 21st century. Due to the ongoing pursuits of the modern civil rights movement, this period of time remains significant. The study of hybrid texts during this period offers an entryway into issues of race and gender, introducing significant topics such as the influence of this particular medium; the importance of visual and literary representation; and the need for diversity in artistic spheres. Additionally, in the 21st century, the widespread use of technology has made multi-genre texts increasingly accessible, stressing the significance of the genre moving forward. To investigate these issues, I studied 3-4 works every two weeks and analyzed primary sources with a 2-3-page report each. I supplemented my research with the study of secondary sources considering each artist and text. Based on my analysis, I concluded that the artists in question turned to hybrid texts because the genre allows them to respond to a dearth in representation; to give a human face to often overlooked social issues, invoking an emotional response; and to provide physical evidence of historical developments. My research culminated in a booklet of interviews, photography, and analytical writing about modern civil rights issues in Georgia. This piece utilizes techniques studied throughout the semester. Focusing on the subjects of race and gender, I conducted interviews and photo sessions with ten students at UGA and present these interviews in my final project.

**Cellular Density Reporter Screening**
Julianne Toms, CURO Research Assistant
Bronwyn Bennett
*Dr. Haini Cai, Cellular Biology, Franklin College of Arts and Sciences*

The cellular response to culture density reveals important regulatory mechanisms in relation to cellular growth, structure, and physiology. Our research focuses on the development of a density-responsive reporter to use in high-throughput screens in the *Drosophila* and human cells. Previous research in the Cai lab has confirmed that an RFP reporter gene is strongly induced in a cell density-dependent manner. We have isolated three populations of *Drosophila* cells that respond to cell density with high, medium and low RFP expression. Our goal is to purify single clones of cells with large increase in RFP level upon crowding. Since these cells require a minimum density to survive, we will plate individual or a small number of RFP cells into wells of non-RFP (dark) cells. We will chart the changes of RFP clones as they multiply and increase in density. Once clusters are identified, we will hand pipet to isolate the RFP clones and use Fluorescence-Activated-Cell-Sorting (FACS) to eventually purify these clones. The new RFP clones will be used in RNAi gene knock-down experiments to validate the screening platform.

**The Antimicrobial Effects of Hypothiocyanite Against *Streptococcus pneumoniae***
Estie Toth, CURO Research Assistant
*Dr. Balazs Rada, Infectious Diseases, College of Veterinary Medicine*

*Streptococcus pneumoniae* has a high disease burden, and it is the cause of many illnesses in humans including pneumonia, septicemia, and meningitis. Due to the many different serotypes of *Streptococcus pneumoniae*, it is difficult to produce an effective vaccine. Therefore, there is a need for new ways to protect the population against *Spn* infections. One immune defense mechanism against this pathogen is the antimicrobial anion hypothiocyanite produced by the $H_2O_2$/LPO/$SCN^-$ system. DUOX1, an oxidase enzyme found in the airway epithelium, produces hydrogen peroxide. This, along with the catalyzing peroxidase enzyme lactoperoxidase (LPO) and the compound thiocyanate (SCN), produces hypothiocyanite ($OSCN^-$). The ability of this anion to inhibit bacterial growth was tested in cell-free conditions by exposing *S. pneumoniae* bacteria to $OSCN^-$ and measuring colony forming units on agar plates and by measuring the optical density of bacteria in a kinetic plate killing assays. Hypothiocyanite showed a robust killing effect on T4, D39, and MNZ41 Spn strains, as well as the mutant strains JBL01 and Spxb. Catalase, a hydrogen peroxide scavenging enzyme, prevented hypothiocyanite-mediated bacterial killing. In order to further elucidate the mechanism of action of this anion, bacteria were exposed to $OSCN^-$ and then observed with electron microscopy. A characteristic bulging-out of the bacterial wall was observed, suggesting that bacterial lysis may be responsible for the killing effect of hypothiocyanite. Overall, the results of this study have shown that the $H_2O_2$/LPO/$SCN^-$ system effectively kills Spn bacteria *in vitro*.

**Factors that Affect Concrete Bridge Deck Cracking**
Alex Evan Trammell, CURO Research Assistant
*Dr. Mi Geum Chorzepa, Environmental, Civil, Agricultural, and Mechanical Engineering, College of Engineering*

Concrete is an extremely useful material in the design of bridges as it proves to be quite effective in transferring the applied loading and requires little maintenance. It does have its flaws though as it is weak in tension requiring reinforcement and additionally cracks due to shrinkage and expansion. In the United States, bridge deck slabs have been showing high dosages of cracking, alerting to many issues regarding the integrity of the bridge deck. Many aspects cause this cracking to occur including the heat of hydration, creep, and aggregate used. This review will focus on what causes these cracks to form and how they can be managed to increase the durability of these bridge decks.

**Petrographic Analysis of Altered Units in the Bishop Tuff, Bishop, CA**
Patrick Trent
*Dr. Christian Klimczak, Geology, Franklin College of Arts and Sciences*

The Bishop Tuff (BT) is a 0.767Ma rhyolitic nonwelded to densely welded volcanic tuff that shows evidence of post emplacement alteration. This tuff is located adjacent to the Long Valley Caldera, CA, atop the Volcanic Tableland. The Volcanic Tableland is a 200m thick deposit of layers of volcanic ash (ignimbrites) that represents a major volcanic outflow sheet of the BT. Peculiar mounds in the Volcanic Tableland show strong indications of fumarolic activity because analysis of the rock samples reveals that they were subjected to welding, devitrification, and subsequent mineral alteration. The mineralization associated with the formation of fumaroles reflects the original nature of the ash and subsequent interaction with hot fluids and gasses. I observed the mineralogy and texture of a total of 8 thin sections prepared from samples from two units of BT, the lower and upper emplacement units. I recorded the composition of large crystals, contrasts between units, and a description of the types of alteration. I created orthoimage maps of the thin sections using a petrographic microscope under 5x magnification. I observed large feldspar and quartz crystals that showed signs of alteration. Altered portions of the tuff are noted by an abundance of microcrystalline quartz in the matrix and are more indurated than unaltered portions. The main difference between the lower and upper units is that the lower unit is welded and devitrified while the upper unit is glassy and altered. These results reveal the heretofore undescribed nature of fumarolic alteration of the BT.

**Comparison of Blood Lipid Responses from Diets Enriched with Cottonseed Oil vs. Olive Oil**
Laura Triana
*Dr. Jamie A. Cooper, Foods and Nutrition, College of Family and Consumer Sciences*

Previous research has shown that a diet rich in cottonseed oil

(CSO) improves cholesterol levels in healthy adults compared to a diet rich in olive oil (OO). To test the impact of a CSO-enriched diet against an OO-enriched diet on blood lipids profiles and lipid metabolism in adults with hypercholesterolemia. 64 adults with high cholesterol, ages 50-75, will be recruited for a single-blind, randomized, control trial. Subjects are randomized into either the OO or CSO group for an 8-week diet intervention. The study consisted of 3 testing visits (pre-, mid- and post-diet intervention). For the diet intervention, 45% of energy was derived from fats, and the only difference between diets was the type of oil used (OO or CSO). On test visits anthropometrics, resting metabolic rate, and a fasting blood draw was completed. Participants consumed a high-saturated fat meal challenge and indirect calorimetry was performed for a 3.5h period following meal ingestion. Blood draws occurred every 30 to 60 minutes for 5 hours postprandially. Two participants have completed the study in the CSO group. Changes in blood lipids from baseline were as follows: Total Cholesterol -14±24.7mg/dL, LDL -19.5±22.3mg/dL, HDL -1±10.6mg/dL, and triglycerides 34.5±83.1mg/dL. Postprandial fat metabolism did not change from pre- to post-diet intervention (AUC: 0.2215 fat/g*3.5h; 0.1444 fat/g*3.5h, respectively). The results are inconclusive, but CSO may lead to a decrease in total and LDL cholesterol. More data collection is needed before definitive conclusions can be made.

**Stochastic Multi-Depot Vehicle Routing Problem for Gleaning Opportunities of Post-Harvest Food Losses**

Angela Lily Tsao, Foundation Fellow, CURO Research Assistant
*Dr. Liz Kramer, Agricultural and Applied Economics, College of Agricultural and Environmental Sciences*

Approximately 10% of all produce grown is lost on farms--inputs are applied, the plants mature, and they may even be harvested, but nobody consumes them. Meanwhile, 15% of Georgians are food insecure. We analyze the state's agricultural budget data in order to quantify in-field food losses at the county level and consider the potential for recovery of surplus production (significantly, a diversion of waste). The Georgia Food Bank Association operates across seven regional food banks, facing a mismatch of urban consumers and rural agricultural production. This project combines several variable factors of the Vehicle Routing Problem (VRP) and related Traveling Salesman Problem in application for a direct solution to food waste and food insecurity. The VRP has been extensively studied, with solutions from exact approaches to heuristics in order to optimize the creation of routing for multi-vehicle pickup and delivery. However, gleaning with the 55+ fleet of semi-trucks from the Georgia Food Bank Association is a routing problem with stochastic customers, fixed multiple depots, and hard time constraints. This coalescence of variables renders traditional branch-and-bound techniques less effective. We conduct a county-level geospatial analysis of food loss proximity to Georgia's food banks, in order to demarcate discrete depot routing regions. We develop a genetic algorithm to optimize the waiting heuristic for dynamic re-optimization after an a priori best route is established with stochastic pickup information.

**The Stages and States of Multiteam Systems in NASA's Mission Control Center**

Sarena Tseng, CURO Research Assistant
*Dr. Dorothy Carter, Psychology, Franklin College of Arts and Sciences*

As challenges arise throughout the history of an organization, teams must constantly learn and evolve in order to address changing task and teamwork demands. Oftentimes, work teams hold team-level, proximate goals while simultaneously working interdependently with other teams towards a collective, higher-level superordinate goal. Teams of teams working in such an interdependent configuration towards a superordinate goal are operating in an organizational form known as a multiteam system (MTS). Within NASA, present-day MTSs have been shaped by previous obstacles and successes. The present study examines how space flight multiteam systems adapted and overcame the unique challenges of NASA over time. This was accomplished using a case-study approach by identifying and analyzing archival documents originating from within NASA and other sources. These documents included NASA oral histories, government reports, and mission logs. The information in these documents were coded to identify and extract major themes relating to teamwork and multiteamwork processes. We determined there to be three past eras of spaceflight, each differentiated by major challenges and goals within that timespan. These were 1) an era of Early Exploration, 2) an era of Experimentation, and 3) an era of Habitation. NASA is currently on the cusp of a fourth era of spaceflight, focused on Long Duration Exploratory Missions (LDEMs) that will require NASA to combine the lessons of past eras with future adaptations. We conclude by providing recommendations for countermeasures aimed at facilitating effective spaceflight MTS relations during LDEMs, and discussing the application of similar qualitative approaches to other organizational contexts.

**Labor on Campus: University Labor Unions in the United States**

Hogan Tuell, CURO Research Assistant
*Dr. Pablo Lapegna, Sociology, Franklin College of Arts and Sciences*

In February 2018, educators went on strike statewide in West Virginia. Since then, education workers in Arizona, Colorado, California and several other states have captured national media attention with their collective actions. Throughout the United States, education workers have been securing substantial increases in pay and benefits. However, the same results have not been seen at the college and university level. Building on labor studies and drawing from concepts of social movement theory, this study seeks to identify what issues United Campus Workers of Georgia (UCWGA) is addressing and why related organizations have been successful at some institutions while less successful in others. UCWGA, founded in 2017, is a local chapter of Communications Workers of America which has chapters on campuses across the country. Semi-structured interviews and the analysis of documents and media articles will be used to investigate this organization and its strategies, placing them in the context of recent education labor struggles across the United States. Audio recordings of interviews will be transcribed for use in analysis. This study

draws connections to recent education labor struggles across the United States.

**Bridge Preservation Methods and Techniques**
Abuzar Turabi, CURO Research Assistant
*Dr. Mi Geum Chorzepa, Environmental, Civil, Agricultural, and Mechanical Engineering, College of Engineering*

Recent bridge collapses have prompted researchers to evaluate ways to counter this issue. A literature review was conducted on the recent collapse in Florida Department of Transportation (FDOT), primarily the FIU Bridge collapse. It analyzed the cracking that arose during the bridge erection and provided recommendations to solve these issues so that they do not occur again. A depreciation curve was also evaluated based on Bridge Preservation Guide to evaluate the conditions of the bridge and seek a balanced approach to replacement and bridge maintenance/preservation also referred to as asset management. Preventive Maintenance was also considered closely which discusses on how the life cycle of bridges can be extended through cyclical activities which include but are not limited to cleaning and washing of bridge, joints, and sealing concrete. The results of this study can be used to improved service-life of bridges to reduce future costs.

**Cytokine Levels in Serum Following High-Fat Feeding in Rats**
Anna Turlej, CURO Summer Fellow, CURO Research Assistant
*Dr. Krzysztof Czaja, Veterinary Biosciences and Diagnostic Imaging, College of Veterinary Medicine*

The content of our diet causes changes to our weight set-point that are not completely understood. Our lab's previous studies revealed that high-fat (HF) diets induce inflammation in vagal innervation, impairing gut-brain communication and leading to obesity. The goal of the current investigation has been to determine whether feeding rats a high (45%) fat diet for 4 weeks induces systemic circulation revealed by elevated levels of cytokines in blood circulation. Blood serum collected from rats during regular and HF diet intake was analyzed for cytokines and insulin using enzyme-linked immunosorbent assay (ELISA). Body composition and food intake data was acquired throughout the experiment. After HF feeding, the rats' food intake (FI), body weight (BW), and fat mass (FM) significantly increased. Circulating insulin levels also increased, which often means development of insulin resistance. All of these effects are associated with the obese state and suggest that the rats were obese. However, cytokine levels were not significantly different after HF feeding. Therefore, the results indicate that inflammation must primarily travel through the vagus to the brain and not through circulation at the 4-week point. It could also be inferred that increased FI, BW, and FM occur before systemic inflammation, but the explanation may be more complicated. Increase of serum cytokines could have been delayed because we may have had obesity-resistant rats, which gain less weight and exhibit lower diet-induced inflammatory states. Further research is needed to confirm why symptoms of the obese state were observed yet no increase in systemic inflammation.

**How Uncertainty Affects Motor Planning in Older Adults**
Elizabeth Ruby Turner, CURO Research Assistant
*Dr. Tarkesh Singh, Kinesiology, College of Education*

In previous studies, it has been shown that the time of human motor response increases with an increase in the number of possible movement directions. An increased level of uncertainty prolongs the creation of motor plans which can have consequences for elders when performing everyday tasks such as walking and driving. We created a protocol to determine whether the degree of uncertainty about an anticipated task altered the preparation for movement, specifically in relation to motor planning in neurological disorders. An uncertainty reaching task was developed using SIMULINK on the KINARM® robot. Data were collected from the robot on arm movements as well as eye movements. We expect slower saccadic and arm reaction times, larger movement errors and deteriorated hand-eye coordination in older adults.

**Facilitating Collaborative Engineering Analysis Problem Solving in Immersive Virtual Reality**
AJ Tuttle, CURO Research Assistant
*Dr. Kyle Johnsen, Electrical and Computer Engineering, College of Engineering*

This work addresses barriers to the adoption of immersive virtual reality within engineering education. A virtual classroom is described that affords users enhanced viewing and interaction with 3D objects, while retaining educational supports for drawing, writing, and collaboration with others in the same virtual space. A didactic example of this approach is provided for use in an engineering statics course. To evaluate this concept, two traditional problems were developed that involved the analysis of 3D objects presented with the problems. A pilot study involving 19 student participants, in pairs or individually, solved these problems, one requiring physical measurement of problem variables, entirely within the virtual classroom. Analysis of the qualitative and quantitative data collected during the study suggests that this platform is a viable means to introduce 3D graphics and interaction to the engineering classroom. Despite being unfamiliar with the approach, participants were able to use the technology within minutes. Though student performance was ostensibly worse that when solving ordinary textbook problems on paper, it was well within expectations due to the increased complexity of the approach, both technologically and pedagogically. If the platform and approach were used more comprehensively throughout such a course, particularly one already offered in a distance-education format, performance on these sorts of problems would likely improve. Technology improvements that are on the near horizon will support this evaluation and together may represent a significant inflection point in the cost-effectiveness curve of immersive virtual reality for engineering education leading to widespread adoption.

**Relationship Between Family Stressors and Antibody Response to Influenza Vaccine in Teenagers**

Kamsi Ubezonu, CURO Research Assistant
*Dr. Katherine B. Ehrlich, Psychology, Franklin College of Arts and Sciences*

Adolescence is a critical developmental period, marked by various physiologic changes and social transitions. Given that this can be an inherently stressful time in one's life, additional relationship stressors can have physical and psychological health consequences. Research has evidenced a robust association between relationship stress and immune system functioning in adult populations, but less is known about this link in childhood. This study seeks to examine the relation between family stressors and antibody response to the influenza vaccine, a marker of immunity, in adolescence. We recruited 150 adolescent participants to complete two study visits. At the first visit, adolescents were interviewed about family relationships and stressors; they also received the seasonal influenza vaccine and provided a blood sample. Adolescents returned for the second visit about twenty-eight days later, and another sample of blood was drawn. Adolescent antibody production levels were determined by comparing antibody titers from the first and second visits. A more robust antibody response to the vaccine indicates a greater likelihood of mounting an immune response against the influenza virus. After controlling for demographic characteristics and baseline antibody titers, we hypothesize that adolescents who report poor-quality family relationships and higher family-related stress will produce fewer antibodies compared to those who report high-quality family relationships and lower family-related stress.

**Butting Heads: Competition and Posturing in a Paired Programming Team**

Ross Uhlar
*Dr. Nicola Sochacka, Environmental, Civil, Agricultural, and Mechanical Engineering, College of Engineering*

This Research to Practice Full Paper contributes to the study of undergraduate engineering students' beliefs and educational experiences. Scholars have documented the educational experiences of students including the marginalization of women and underrepresented racial minority groups. Although the experiences of marginalized groups are likely impacted by privileged and majority student groups, comparatively little research has directly focused on the actions and perspectives of dominant students. Additionally, few studies combine the research methods necessary to examine both student beliefs and classroom actions. In this paper we focus on perspectives and actions of dominant groups which may be linked to marginalization. In particular, we focus on the ways students understand and enact the culture of competition in engineering, which has been linked to marginalizing student experiences and reproduced male demographics. Our study uses ethnographic one-on-one interviews and video-recorded interactions to examine the collaboration and perspectives of two White male students in a 10-person laboratory section of an active learning introductory programming course for electrical engineers. Key findings include students' posturing about broad academic status and local assignment expertise that seemed to be triggered by prior experience and shared identities. In addition, views of peers as adversaries rather than partners in their work created a competitive interaction which was counterproductive to their learning and work. These findings suggest that students may be triggered into reproducing a competitive masculine engineering culture. Implications for instructors include the possibility that in some cases talking about and reflecting on competitive approaches in lab can potentially shift student behavior.

**Generation of Sympathoadrenal Progenitor Cells from Human Pluripotent Stem Cells**

Heidi Ulrichs
*Dr. Nadja Zeltner, Cellular Biology, Franklin College of Arts and Sciences*

Our goal is to develop a protocol to differentiate sympathoadrenal progenitor (SAP) cells from human pluripotent stem cells (hPSCs). The hPSCs' ability to self-renew and differentiate into any cell type of the body within the embryo and *in vitro* makes them a powerful tool to study early embryonic development, model diseases affecting specified cell types and conduct drug screening, and drug testing. During development, hPSCs differentiate into ectoderm, which then gives rise to neural crest (NC) cells that further differentiate into SAPs. SAPs can then give rise to sympathetic neurons, chromaffin cells of the adrenal gland, and small intensely fluorescent (SIF) cells. Generating these cells from patients' PSCs is relevant to study diseases that affect them including neuroblastoma, adrenal medulla malignancies, and different disorders affecting sympathetic neurons, like Familial Dysautonomia. In our approach, we initiate hPSC differentiation in a monolayer by TGFβ inhibition and activation of WNT and BMP4, resulting in SOX10-expressing NC cells at day 12. Then, the cells are differentiated towards SAP using WNT, BMP4, neuregulin, SDF1 and retinoic acid. The SAPs are compared to cranial- and vagal-NC as controls. We identified SOX10 and HNK1 expression followed by expression of medium to lower HOX genes and SAP specific gene markers. In conclusion, we developed a protocol to generate SAPs *in vitro* from hPSCs. Overall, the SAP protocol will allow researchers to investigate diseases affecting those cell types.

**Collective Decision Making in the Earth Worm *Eisenia fetida***

Ishan Kumar Vaish, CURO Research Assistant
*Dr. Takao Sasaki, Ecology, Odum School of Ecology*

Collective intelligence is the phenomenon in which organisms use interspecies interactions to make better decisions as a group by sharing information. Some theories suggest that collective intelligence is contingent upon the size of the population while other theories attribute this collective advantage to specific individuals within the group. These contrasting theories reflect the lack of empirical evidence that currently exists to explain the specificities of collective decision making. Furthermore, the manner by which information is passed between individuals still remains largely unknown.

In this study, I aim to address this scarcity by analyzing the collective decision-making abilities of the earthworm, *Eisenia fetida*. Past research indicates that earthworms make decisions as a group. In order to test the mechanics of this ability, groups of varying sizes of *E. fetida* will be exposed to different dirt samples to determine how often the groups pick the ecologically most beneficial habitat. More specifically, the groups will be tested to discern whether a certain number of *E. fetida* are required for a group to make the right decision, or if making the right decision is dependent upon the presence of specific *E. fetida* within the group. If the *E. fetida* make wiser decisions as a group, it will further demonstrate their collective decision-making mechanisms. Studying the specifics of this ability in *E. fetida* will help to shed more light on whether collective decision making is influenced by group size and how social living can evolve to meet the needs of a species.

**Adapting a CRISPR-Cas System into a Novel Gene Expression Knockdown Platform**
Nikita Vantsev, CURO Honors Scholar, CURO Summer Fellow
*Dr. Michael Terns, Biochemistry and Molecular Biology, Franklin College of Arts and Sciences*

CRISPR-Cas adaptive immune systems protect their host prokaryotes from invaders such as viruses or plasmids. CRISPR-Cas systems are diverse in nature but all consist of a CRISPR locus and CRISPR-associated (Cas) proteins. Type III-A CRISPR-Cas system of Lactococcus lactis is able to target and cleave both DNA and RNA invading nucleic acids. In this project, we utilized RNA-targeting capabilities of the effector complex of Type III-A system, called Csm, to develop an efficient gene knockdown tool for *E. coli* proteins. The heterologously expressed Csm complex and synthesized CRISPR array generated crRNPs programmed to target various endogenous *E. coli* mRNAs. The effect on specific mRNA degradation from genes such as *lpp*, *cspE*, and *ompF*, was assayed by Northern blot analysis. The results showed that Csm CRISPR-Cas systems can be engineered to efficiently and selectively inhibit gene expression in a predictable manner.

**Peanut Pod Maturation Assessment Using Image Processing Techniques**
Hima Velaga, CURO Research Assistant
*Dr. Zion Tse, Electrical and Computer Engineering, College of Engineering*

Peanuts are a significant crop in the United States with Georgia growing the largest (over 46 percent) amount. In 2018 approximately 5.47 billion pounds of peanuts were produced in all of U.S. As a valuable crop, maximizing peanut quality and production is very crucial to the agricultural industry. Peanut maturity levels determine the flavor, grade and shelf life. A commonly used technique for assessing peanut pod maturity is the human inspection of the color of the mesocarp of the peanut. Visual inspection alone has been found to give different results in the assessment of peanut maturity. This project proposes an automated method to determine peanut maturity through a smart phone application. Based on digital images of the peanuts, the application implements image processing techniques to segment the peanuts. An image taken from the phone underwent a series of steps that involves isolating the edges of each peanut and then determining the average RGB pixel values to detect the color of the mesocarp of the peanut. The detected color, typically ranging from light yellow to black, will be used to classify the maturation of the peanuts. Additional features of the application include detection of the peanut size and peanut data storage in a remote database for further research and analysis. The goal of this application is to utilize computer vision technology to present an objective and quantitative way to detect peanut pod maturity. This helps farmers choose the optimal harvest dates that result in the greatest yield and quality of peanuts.

**Small Satellite Communications: Functionality and Testing**
Claire Ann Venenga, CURO Research Assistant
*Dr. David L. Cotten, Geography, Franklin College of Arts and Sciences*

Communication is crucial for mission success. Within the UGA Small Satellite Research Laboratory's Mission Operations Team, a main focus is to keep the satellite actively operable while in orbit. Through the packaging of data, custom mode management software is needed to be integrated into deployments to read commands tailored to set or receive specific telemetry to be up-linked for scheduled execution by the satellite. In preparation for achieving the goal of successful data sharing, my research is based upon flight software, practicing the building and testing of deployments for various, on-board components. Creation of deployments requires thorough understanding of the Bright Ascension Flight Software Development Kit, a component library that allows for a strong telecommand structure through the assembly of mission-specific communication architecture. Avoidance of errors during code implementation is vital as these can ultimately lead to communication failure; therefore, repeated trials through TMTCLab, a graphical user interface used to interact with the spacecraft database, and testing the deployments on the actual satellite components themselves will ensure functionality. Furthermore, I have moved towards software development for specific components of our COSMO (Center for Orbiting Satellite Mission Operations), the SSRL's ground station, and will be continuing to develop mission-specific platforms for data collection. The functionality of these user interfaces will be easy-to-use, so the telemetry received by the satellite will be straightforward and readable for any given operator.

**Investigation of Labeled Glucose Metabolism in Glioblastoma**
Divya Ventarapragada, CURO Research Assistant
*Dr. Lohitash Karumbaiah, Animal and Dairy Science, College of Agricultural and Environmental Sciences*

Glioblastoma multiforme (GBM) is a highly aggressive central nervous system cancer that has no current effective therapeutics. Clinical advances are continually thwarted by a lack of understanding of key functional signaling pathways, but studying the metabolomics of patient GBM tissues can procvide insight into the biological changes that drive tumor

growth and progression. Metabolomics experiments analzying C13 glucose in $1x10^6$ patient-derived GBM (NO8s) cells and in neural stem cell (hNSCs) control in 60 microliter NMR tubes will be conducted via H-high resolution magic angle spinning-nuclear magnetic resonance spectroscopy (HRMAS) using MestReNova Software. Analysis will be performed directly on spectral data and on relative concentrations of metabolites obtained from spectra. GBm favors glycolysis over oxidative phosphorylation for energy production regardless of oxygen presence. Thus, we hypothesize C13 glucose metabolism will be increased in GBM and resulting metabolomic changes between GBM and NSC cells will provide indication of cancer progression or malignancy markers. An expansion of this initial experiment will investigate key pathways such as glycosylation, cell cycle progression, and invasion under normoxic and hypoxic conditions. Since GBM is resistant to immunotherapeutic treatments, further experimentation will attempt to characterize the metabolome of GBM before and after interaction with T-cells to establish a framework for metabolic changes resulting in immune evasion, T-cell exhaustion, and T-cell senescence or apoptosis. The goal of these metabolite experiments is two-fold: identifying upregulated metabolites common across patient-derived GBM tissues and characterizing GBM interaction with T-cells to establish new immunotherapeutic targets.

**Climate Fiction as a Response to Climate Change: A Genre Analysis**

Teddy Vincent, Ramsey Scholar
*Dr. James Hamilton, Entertainment and Media Studies, Grady College of Journalism and Mass Communication*

This study explores the film genre of climate-fiction, an innovative way of addressing important scientific issues that affect populations worldwide. While movies are well-documented in their ability to capture attention and inspire, films confronting climate change have until recently misfired. They often take the form of documentaries, which rarely engage and rouse their audiences due to their generic footage of the environments, statistics, and muted emotions. However, a new genre of feature film termed climate-fiction, or cli-fi (as a play on the science-fiction genre), depicts the disastrous effects this phenomenon could have on society, or the dystopian futures that could come as a result through expertly crafted, fantasy narratives. This study conducts a modified genre analysis of the quintessential climate change documentary and a popular cli-fi movie. The films to be analyzed are *An Inconvenient Truth* (2006) and *Mad Max: Fury Road* (2015), both being box-office and critically-acclaimed successes. By comparing and contrasting the narrative roles of climate change in each, the study speculates on the possible value of fictional treatments of significant real-world affairs. Through this comparison, I hope to uncover the extent to which climate-fiction might make this notoriously amorphous and ungraspable concept more tangible, and thus more receptive to sincere global response.

**Determining the Validity and Reliability of Two Body Composition Instruments: Bod Pod vs. Dual Energy X-Ray Absorptiometry (DXA)**

Amelia Vu, CURO Research Assistant
*Dr. Jamie A. Cooper, Foods and Nutrition, College of Family and Consumer Sciences*

Dual-energy X-ray absorptiometry (DXA) is the gold standard for body composition measurement; however, the Bod Pod is thought to be similar in accuracy while involving less risk. To compare validity and reliability of Bod Pod against DXA in measuring body composition in adults under different environmental conditions. 30 adults with a BMI≥18.5kg/m2 completed 2 visits within 7 days. At visit 1, Bod Pod measurements were conducted using predicted and measured thoracic gas volume (TGV) with the lab door open and closed (four total readings) to determine body fat percentage (BF%). Room temperature, humidity, body weight and height were recorded before each measurement. At visit 2, BF% was measured using DXA along with the same four Bod Pod measurements. On average, BF% from all Bod Pod conditions had a non-significant 1.8-2% higher BF% vs. DXA. Measured TGV with the door open had the greatest, non-significant, difference (0.5 ±2.2% higher) vs. DXA. Reliability: Overall, there was no significant difference in BF% measurements from visit 1 to visit 2, (1.1±25.4% vs. 1.1±24.8% for visit 1 vs. visit 2, respectively). Compared to predicted TGV, the measured TGV had a larger, yet negligible, variation from visit 1 to visit 2 (0.4±0.4% vs. 0.3±0.1% for measured vs. predicted, respectively). The differences between Bod Pod and DXA measurements, as well as differences in Bod Pod measurements from visit one to visit two, were all statistically insignificant. Therefore, the Bod Pod was both accurate and reliable.

**Influences of Anthropogenic Activities and Meteorological Conditions on the Air Quality of Athens**

Lillian Vu, CURO Research Assistant
*Dr. Amanda Frossard, Chemistry, Franklin College of Arts and Sciences*

Aerosols are solid or liquid particles derived from anthropogenic and natural sources that are suspended in the atmosphere. Some of these particles are classified as air pollutants owing to their adverse effects on human health and thus lowering overall air quality. Urban areas typically exhibit lower air quality compared to rural areas due to an increase in primary and secondary aerosols emitted from vehicles, factories, and industrial facilities. This research focuses on determining the sources of air pollution in Athens, GA by correlating the concentrations and sizes of the aerosol particles to activities and events taking place within the area of sampling. The aerosol particle sizer (APS) and the scanning electrical mobility spectrometer (SEMS) were used to continuously sample aerosols every minute over the course of two months. The daily meteorological conditions also were considered to identify whether pollutants originated from regional or local sources. We believe the weather conditions resulting from Hurricane Michael, in late September and early October of 2018, may have an influence on the concentration of aerosols detected; making

the atmosphere cleaner than usual due to wet deposition and removal of particles. We also predict that the football games held at Sanford Stadium during these months of sampling may significantly contribute to the concentration of pollutants observed locally.

**Packing a Punch: Photoreceptor Packing in the Brown Anole Lizard**
Austin Wahle, CURO Research Assistant
*Dr. James D. Lauderdale, Cellular Biology, Franklin College of Arts and Sciences*

Vital for the finer aspects of sight, the fovea is a pit in the back of the retina with a high concentration of photoreceptor cells. This location in the eye is incredibly important for the level of visual acuity in some vertebrates, including humans. In primates, the development of the fovea is first characterized by the establishment of a pit followed by the packing of photoreceptor cells into the center of the retina. Determining how this process is governed is vital in understanding the development of visual systems. Primates have long been used as a model system for this process; however, due to the lack of genetic tools available in primates, this study aims to explore photoreceptor packing in the bifoveated *Anolis sagrei* (brown anole lizard), a new developmental model system. We aim to determine if the lizard eye exhibits similar photoreceptor packing patterns as primate. Towards this end, our study will explore retinal remodeling and fovea maturation in male and female juvenile brown anoles (2, 4 and 6 months of age) leading up to adulthood. We will do this by tracking changes in photoreceptor cell density in the fovea and assessing whether these packing trends are correlated with overall ocular growth. We predict that overall ocular growth will correlate with fovea development in terms of photoreceptor packing trends and fovea diameter.

**It Takes a Village: The Effects of Social Support on African Americans Attending Predominantly White Institutions**
Barbara Walcot-Ceesay, CURO Research Assistant
*Dr. Isha W. Metzger, Psychology, Franklin College of Arts and Sciences*

The current study aims to understand the relationship between racial discrimination, self-esteem, and academic performance. Specifically, we seek to explore the extent to which risk (e.g, racial discrimination) and protective (e.g., social support) factors impact the academic and social outcomes (e.g., self-esteem, belonging uncertainty, GPA, depression) of African American students. Currently there are gaps in the literature concerning how PWIs effect the academic and emotional outcomes of black students. There are also gaps in our understanding of how social support influences these outcomes. A study exploring African American college students will provide us with data to improve adjustment problems among these students. Data will come from a larger study concerning the development of African American emerging adults under the mentorship of Dr. Isha Metzger, Director of The EMPOWER Lab in the Department of Psychology at UGA. The study will seek to recruit 150 African American, emerging adults aged 18-25 enrolled at UGA and their caregivers. We will recruit using the UGA Psychology Department Research Participant Pool, via flyers posted around the university, and via email (e.g., listserv). Participants will be asked to complete self-report survey measures of social support, experiences with discrimination, and their academic outcomes. We expect that for students with experiences with discrimination, students who report greater amounts of social support will have better academic outcomes. This study will provide insight into how to improve on campus minority experiences and furthermore improve the academic outcomes of African American students.

**Predicting the Geographical Spread of Emerging Arboviruses**
Joseph Walker
*Dr. John M. Drake, Ecology, Odum School of Ecology*

Future arbovirus emergence trends may be exacerbated by climate change, global trade, and international travel. Public health surveillance and preparedness efforts for arboviral pathogens and associated diseases may be aided by a better understanding of which specific pathogens are most likely to emerge in the future, and which countries may be most suited to arbovirus emergence. In this project, we sought to countries that may be at risk of future arbovirus emergence using a machine learning model trained on biogeographic data, including biological traits of arbovirus species, covariates describing the geographic, economic, and population characteristics of individual nations, and country-level records of virus and mosquito vector occurance. Using this model, we identified individual country-virus pairs that are at the greatest risk of future emergence, as well as broad predictors of country-level arbovirus suitability.

**The Relationship Between Substance Use and Depression Among College Students**
Taylor Walker
*Dr. Thomas L. McNulty, Sociology, Franklin College of Arts and Sciences*

This project examined the relationship between substance use and depression using General Strain Theory as a theoretical foundation. The relationship between strain, depression, and substance use has yet to be rigorously established in the literature. The goal of this project was to determine whether depression serves as a mediator between the sociological concept of strain and substance use. The hypothesis for this project was that strain would have a positive effect upon depression and substance use, and depression will act as a mediator between strain and substance use. To carry out this project, 832 college students between the ages of 18-25 filled out an anonymous online survey containing questions from the Beck Depression Inventory, the Drug Use Screening Inventory Revised, and the Drug Abuse Screening Test. Demographic data was also collected and served as the control variables for the analysis. Data analysis was performed using the Statistical Package for the Social Sciences version 25. Pearson correlation tests and multiple linear regression analyses were carried out on explanatory and control variables. The statistical findings of this project signify that depression acted as a mediator

between strain and substance use. Comparison of findings to past studies and avenues of future research will be discussed.

**Inferring Dietary Composition from Preindustrial Italian Sites Using Stable Isotope Data**
William Walker, Ramsey Scholar, CURO Research Assistant
*Dr. Laurie Reitsema, Anthropology, Franklin College of Arts and Sciences*

Antonio Gramsci's *The Southern Question* details the distinct cultural divide between northern and southern Italy during the nineteenth century. He cites historical and geographical factors that ultimately resulted in these differences. The goal of this study is to use isotope data to compare the dietary composition of several contemporary, preindustrial Italian sites, with Gramsci's work informing expectations in differences between the sites. Carbon and nitrogen isotope analysis allows us to make inferences about broad classes of proteins and carbohydrates consumed by individuals who lived in each of the sites. In this study, we compare carbon ($^{13}C$) and nitrogen ($^{15}N$) isotope data from two rural Tuscan villages and a contemporaneous rural Sicilian village. We expect to find that individuals from Tuscany to reflect terrestrial food sources and cereal grains that form the staples of Tuscan diets. Conversely, we expect to find that individuals from Sicily reflect a diet comprised mainly of aquatic protein sources and carbohydrate sources. Preliminary results show that the diets of the individuals from Tuscany are characterized by lower nitrogen isotope levels ($\delta^{15}N$ = 8.27‰) as compared to the Sicilian diet ($\delta^{15}N$ = 10.42‰). The Tuscan site displays carbon isotope values that reflect a heavier reliance on C3 plants such as barley ($\delta^{13}C$ = -19.61‰), as compared to values from the Sicilian site ($\delta^{13}C$ = -18.61‰). By studying humans directly, this study complements generalizations such as those made by Gramsci about the roots of cultural differences in preindustrial Italy.

**Development of Weigh-In-Motion Algorithms and Procedures**
Matthew Jacob Warren, CURO Research Assistant
*Dr. Mi Geum Chorzepa, Environmental, Civil, Agricultural, and Mechanical Engineering, College of Engineering*

The Georgia Department of Transportation (GDOT) currently has a Weigh-In-Motion (WIM) project in place. GDOT has requested that the University of Georgia improve upon the data analytic tools used in the interpretation of WIM data or develop new software capable of interpreting WIM data. The WIM systems are permanently installed on sites to collect transportation data that can be used in pavement, bridge, and geometric design. With wide-scale implementation, the data can be used to design traffic control systems and regulate vehicle weight. NumPy, a scientific and computational library for the open source programming language "Python", will be used to develop this software that GDOT can use to interpret incoming WIM data and apply it to engineering designs. Small sample sets of data will be used to develop the algorithms and procedures used in the software. Following this, the software will be tested with field data to ensure that full-scale implementation is working as intended. By research completion, GDOT should be able to have software capable of receiving and interpreting WIM data. Additionally, the software should either be able to adjust for drifts in calibration of WIM systems or be able to identify incoming erroneous data.

**The Phenotypic Effects of dsDNTM1 in Spermatogenesis in *Oncopeltus fasciatus***
Joshua T. Washington
*Dr. Trish Moore, Entomology, College of Agricultural and Environmental Sciences*

Double-stranded DNA methyltransferase 1 (DNMT1) is an enzyme responsible for restoring methylation patterns following semiconservative replication. Downregulating *Dnmt1* mRNA by RNAi results in a demethylated genome. Previous experiments in Dr. Moore's laboratory examined RNAi disruption of *Dnmt1* expression in females of the *Oncopeltus fasciatus* species. These experiments demonstrated that downregulation of *Dnmt1* expression resulted in a reduction in egg production both qualitatively and quantitatively. With this in mind, my experiment incorporated this same approach when attempting to manipulate the phenotype of spermatogenesis. It was hypothesized that males who had undergone the same *ds-dnmt1* treatment would show similar results as the females—a reduced amount of sperm production. However, my data suggested that the results of the experiment did not support the hypothesis. An explanation behind this result coupled with ways to test for the aforementioned will be discussed with a higher level of specificity throughout this paper.

**Autonomy in Collaboration: The Role of Task Cards on the Success of Collaborative Interaction**
Lauryn Waters, CURO Honors Scholar
*Dr. Paula J. Mellom, Language and Literacy Education, College of Education*

Research suggests that classrooms with a non-controlling structure and an autonomy-supportive environment engage students more than classrooms with controlling structures and environments that do not support student autonomy. The Instructional Conversation (IC) pedagogy and the small-group, collaborative, conversation-based lessons called Joint-Productive Activities (JPA) at the IC's center, promote students' autonomous interaction with the material they are learning. Students' participation in JPA lessons is facilitated by JPA task cards that provide structure and instructions to guide their completion of the task. This study examines what factors within a JPA task card impact students' autonomous engagement in the JPA lesson. We use the Task Activities Evaluation Rubric developed in a pilot study to rate the Lexile score, sentence structure and collaborative language of JPA task cards designed and implemented by K-12 teachers currently practicing the IC pedagogy. Once the corpus of 50 task cards is rated, student engagement in the JPA lessons will be evaluated using the Video Rating Tool, adapted from Jang, Reeve, and Deci (2010), to rate videos of students who are using the five top and bottom rated task cards to complete a JPA lesson. The task card ratings will then be compared to the levels of student engagement demonstrated in the corresponding classrooms videos to give insight into what factors are most effective in encouraging

student engagement. The results of this study will inform teachers who are using this pedagogy of the most effective ways in which to craft a task card.

**Effect of Social Support on Medication Adherence in Heart Failure Patients at Risk for Hospital Readmission**
Stephanie Christina Watson, CURO Research Assistant
*Dr. Lilian Sattler, Clinical and Administrative Pharmacy, College of Pharmacy*

Heart failure (HF) complications are a highly prevalent, costly, and persistent public health problem. Due to the significance of the problem, there is strong interest in identifying and addressing predictors of HF complications, including hospital (re)admissions. Although evidence strongly supports HF medication treatment as part of standard care to improve quality of life for patients, various patient-related factors may affect medication adherence. Previous research has shown that decreased medication adherence results in more clinical events; however, not much is known about the effect of personal support systems on medication adherence and self-care abilities in patients at risk of readmission. As part of a larger cohort study examining the role of nutritional intake, food insecurity, and medication adherence in heart failure hospital readmissions, the proposed study will evaluate the relationship between social support and medication adherence in HF patients at risk for hospital readmission. Eligible participants with a diagnosis of HF will be recruited at discharge from the Piedmont Athens Regional Medical Center, Athens, GA. Data will then be collected at a one-time visit at the UGA Clinical and Translational Research Unit by self-administered questionnaires. Readmission information will be obtained via telephone as a 6-month follow-up.

**Building a Better Box: Design and Analysis of 3U to 6U CubeSat Frames**
Alexander Watson-Jones, CURO Research Assistant
*Dr. David L. Cotten, Geography, Franklin College of Arts and Sciences*

My research at the UGA Small Satellite Research Laboratory is in designing and testing the mechanical structure of 3U (3 unit) and 6U (6 unit) cube satellites, and its relationship with the electronics necessary for the satellites function. Before now, the UGA SSRL has only designed and built 3U satellites, and so the shift into the development of the 6U represents the SSRL branching out and adding functionality to our satellites and the willingness of the Air Force to accept a larger form-factor in exchange for drastic additions to our satellites. Moving forward I will be utilizing our on-site 3D-printer to generate tangible models of our 6U MOCI satellite to allow the electronics team and all willing to engage with the program to better understand the form factor of the satellite. The ANSYS structural simulations will output results from Modal, Inertial, Random Vibration, Static Structural, etc which will allow me to express extensive data to back up each structural design change in the satellite's frame to determine the most effective benefit to weight ratio. The overarching question is how to increase the structural rigidity of a 6U frame while allowing for payload and electronics (limited internal structure). I will be using Autodesk Inventor, ANSYS, MATLAB, Thermal Desktop, Blender, and 3D Printing to complete my research. This will set the path for bigger, more capable satellites coming out of the UGA SSRL through the coming years.

**Randomization in the Classroom: Understanding Instructor Thinking Related to Random Call**
Alex Waugh
*Dr. Tessa Andrews, Genetics, Franklin College of Arts and Sciences*

Active learning relies heavily on student participation during class discussions. In these discussions, it is the instructor's responsibility to select students to participate. An instructor has a range of strategies at their disposal when it comes time to make this selection. Volunteer-based methods have been demonstrated to be problematic in addressing inequities that exist within STEM. Randomizing the selection process allows voices to be heard that are representative of the diversity of experiences students bring to the classroom. Random call also provides benefits for student accountability. However, recent studies suggest that random call can cause anxiety for students which is a concern because anxiety can have adverse effects on persistence in STEM. Other evidence suggests anxiety is reduced over the course of a semester. We sought understand the differences in rationale and classroom practices that allow some instructors to use random call with success and other instructors avoid the strategy. We used two sets of semi-structured interviews with users and non-users to qualitatively analyze the rationales that differentiate instructors who utilize random call and instructors who avoid such strategies. We found that random call users recognize the anxiety risk but employ strategies to mitigate anxiety. Random call users demonstrated an awareness of their own inherent biases and often expressed a desire to create a more equitable discussion environment. Here, we provide education researchers with a more comprehensive understanding of instructor rationale underlying random call and offer prospective random call users a list of strategies currently being implemented with success.

**Reclassifying Rape as Discrimination: The Risks of Applying Title IX and Post-Secondary College of Education Policies to the Military's Response to Sexual Assault**
Ashlyn Webb, CURO Summer Fellow
*Dr. Maryann Gallagher, International Affairs, School of Public and International Affairs*

Sexual assault in the United States military and the country's universities have received public and political scrutiny for the way in which the institutions address the prevalence of sexual assault. Though both institutions struggle with a similar issue, the American government has pushed the military and universities in opposite directions in how they respond to rape. Recent research suggests American universities are addressing cases effectively through Title IX and other post-secondary policies and that a model of these policies should be applied to the military's response because the insufficiency of the military's criminal justice system and the comparability of the institutions' insular environments. So, should a model of Title IX

and other post-secondary education policies be applied to the military's response to sexual assault? And, what societal norms could form if these policies are adopted? This paper argues that Title IX and other post-secondary education policies should not be applied to the military's response to sexual assault because the formation of negative societal norms including the delegitimization of punishment and institutional authority. I assess the argument by analyzing the military's and universities' responses to sexual assault through the institutional reporting rate and conviction rate within administrative proceedings, or court-martial in the case of the military. The results suggest that applying a model like Title IX and other university policies could risk the reliance on administrative proceedings and the delegitimization of punishment issued through the institution.

**The Effects of Intergenerational Transmission on the Gender Gap in STEM**
Zach Weingarten, CURO Summer Fellow, CURO Research Assistant
*Dr. Christopher Cornwell, Economics, Terry College of Business*

Despite a vast literature surrounding the topic, little is known about the cause of the gender gap in STEM. Moreover, seemingly less is known when looking at the household as a source of variation in labor market preferences. Using data cohorts from the General Social Survey spanning over thirty years, I show that there exists a pattern in the level of influence each parent has on their child's occupational outcome over time. Further, I contextualize this in both STEM occupations and STEM education in an attempt to explain the gender gap in each. I compare within-STEM analyses through the exploitation of varying definitions for STEM. I also focus on the intergenerational transmission of skills in the medical field, a sector highly similar to STEM but not considered to be a part of it. I find that the gender gap in STEM is largely due to the fact that mothers, who are growing increasingly influential, do not occupy STEM spaces. I also find that the gap may exist because careers are deemed STEM, rather than STEM careers being additionally difficult for women, or women having a weaker skill set than men.

**Effects of Long-Term High-Fat Feeding in a Rodent Model**
Noah Weinstein
*Dr. Krzysztof Czaja, Veterinary Biosciences and Diagnostic Imaging, College of Veterinary Medicine*

Obesity has become one of the most common and devastating diseases throughout the world. The deadly comorbidities often associated with the disease, such as cardiovascular disease, cancer, and type-II diabetes make it a major health problem that must be tackled as soon as possible. One of the many factors in the etiology of the current obesity epidemic is the modern high-fat Western diet. The purpose of this experiment was to investigate the effect of long-term consumption of a high-fat diet on food intake, body weight, and body composition in a rat-model. Nine male Sprague Dawley rats were fed an ad libitum high-fat diet (45% fat) for 26 weeks. Body weight and 24-hour food intake measurements were taken twice a week over this period. Body composition data was collected over the same period with the same frequency using nuclear magnetic resonance. Caloric intake showed a significant increase in the first week of the experimental treatment, but by the end of the third week caloric intake leveled off and remained stable for the duration of the experiment. The data showed that average body weight increased 41.36%, while percent fat mass increased 146.89%. This increase in body weight and percent fat, with stable food intake measurements, supports the significance of a high-fat diet as a cofactor in the etiology of obesity and lays the foundation for further research on the physiological effects of a long-term high-fat diet.

**Performing a Deletion of the QseC Gene in *B. bronchiseptica***
Hannah Weiss
*Dr. Eric T. Harvill, Infectious Diseases, College of Veterinary Medicine*

*Bordetella pertussis*, a gram-negative bacterium, is the causative agent for whooping cough, a sometimes-deadly respiratory disease in humans. *B. pertussis* infects humans by attaching to the respiratory tract, releasing toxins that cause damage and induce inflammation in the airways. Bacteria utilize quorum sensing systems to sense and respond to changing stimuli in the surrounding environment, which in turn regulate virulence gene expression. In this study, *B. bronchiseptica*, the ancestor strain of *B. pertussis*, is used to study the role of quorum sensing system in the pathogenesis of *Bordetella* species. We identified homologs of the quorum sensing system of *E. coli*, *QseC/QseB*, in *B. bronchiseptica* as BB3183/BB3182. Based on the role of *QseC* in *E. coli*, we hypothesize that a deletion of the BB3183 gene will comprise the virulence expression of *B. bronchiseptica*, leading to an earlier clearance in mice. In the experiment, we will use PIPE cloning to generate the allelic exchange vector for the gene deletion. Once the mutant is generated, we will check the growth curve of the mutant to see whether there is a growth defect. Complement killing assay will be performed on the mutant *in vitro*. The colonization and pathology caused by infection will be tested in mice. A transmission assay will be conducted in mice to measure the transmission of the mutant bacteria compared to the wild type. This study will give us clues on the role of the quorum sensing system in the infection and circulation of *B. pertussis*.

**Women's Rights Activism in the Indonesian Music Industry**
Madison Caroline Werner, CURO Research Assistant
*Dr. J. Peter Brosius, Anthropology, Franklin College of Arts and Sciences*

After the 1998 collapse of the Suharto dictatorship, Indonesian women have been actively challenging gender expectations through women's rights activism that developed within the framework of Islam. While the #MeToo movement spread throughout the global north to challenge the established sexual assault culture within elite Hollywood circles, the #MulaiBicara (Start Taking/Talk About It) hashtag simultaneously began to raise awareness about instances of rape, sexual assault, and street harassment throughout Indonesia. Indonesian activists have continued to utilize digital, audio, and visual media to produce content that is centered

around women's stories of assault and violence. It is through this creative technological context that I will examine how Islamic activist ideals inform the music culture of Indonesia through newer musical genres and women's rights collectives, both of which work to promote political messages through cultural mediums. I plan on exploring literature that includes journal articles and academic publications, as well as more informal means of information such as websites, blogs, social media, poems, and music videos. As an American studying the intersection between women's activism and the music industry, I plan on collaborating with Indonesian feminists, women's rights activists, and both male and female musicians to theorize how activism is being developed and articulated through music.

**Measuring Pyrantel Resistance in the Canine Hookworm, *Ancylostoma caninum*, Using the Larval Arrested Morphology Assay (LAMA)**

Patricia Wetherly, CURO Research Assistant
*Dr. Ray M. Kaplan, Infectious Diseases, College of Veterinary Medicine*

*Ancylostoma caninum*, the canine hookworm, is the most common and important intestinal nematode of dogs, causing both enteritis and anemia. Anthelmintic drugs are used for treatment; however, *A. caninum* has become resistant to all approved anthelmintics, presenting an emerging canine health crisis. The objective of this study is to measure drug resistance to pyrantel in *A. caninum*. Pyrantel is the most common drug for treating intestinal nematodes in dogs and acts by causing paralysis; this phenotype can be used to measure the dose response in an *in vitro* assay: the larval arrested morphology assay (LAMA). Feces are collected from hookworm-infected dogs, egg counts performed, and eggs are then isolated from the feces by passing through a series of sieves. Recovered eggs are placed onto NGM plates, and cultured at 25°C for one week to develop to third-stage larvae (L3). L3 are then added to the 96-well LAMA plate, which contains a gradient of increasing concentrations of pyrantel pamoate (1.603x10-4uM-168.76uM) and negative control wells. In the absence of drugs, larvae maintain a straight posture, however, exposure to pyrantel causes larvae to take on an arrested morphology (dormant state). characterized by a coiled/kinked posture. Numbers of larvae with arrested morphology will be counted in each well, and the dose response will be measured by performing a logistic regression analysis. The resulting IC50 values (drug concentration causing 50% of larvae to have arrested morphology) from clinical samples are then compared to a drug-susceptible control strain of *A. caninum* to determine level of resistance.

**To Eat or Not to Eat: the Athens Community's Willingness to Try Edible Insects Based on Prior Knowledge, Preferences, and Biases**

Anne Whatley, CURO Research Assistant
*Dr. Marianne Shockley, Entomology, College of Agricultural and Environmental Sciences*

While eating insects may seem revolting to many Westerners, over two billion people eat them regularly. As an important source of protein, vitamins and minerals, over 1,900 species are eaten world-wide. It is hypothesized that adults given information about insects as a sustainable protein source will be more willing to try insects than those who did not receive any. To examine peoples' perceptions about edible insects, two groups will be tested. The first group will take a survey about the importance of insects without any prior introduction about the topic from me. The second group will be given information/facts about insect farming and nutrition before the same survey is administered. For both groups, those who express willingness to try edible insects will be offered two cookie recipes: one with cricket powder, the other with whole, roasted crickets. Testers will take another survey determining their preference and opinions about the cookies. The number of individuals who tried the cookies will be recorded, which option they chose, and their opinions about the cookies. It is expected that the people given information on edible insects beforehand will be more willing to try insects than those who were not. Further, it is expected that the cookies with insect powder will more popular than cookies with whole insects. Crickets contain as much protein as beef, gram for gram, while reducing greenhouse gasses and water use. With growing populations, insect farming could provide a sustainable alternative to livestock farming to meet future global food demands.

**Design and Implementation for Power Verification Engine for Small Satellites**

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

Power allocation is an essential aspect of maintaining spacecraft operations in orbit. Very few satellite components can operate without power and allowing the stored power to dip too low could result in mission failure. The different modes of the satellite have different power draws that are not necessarily scalar and depend on other factors such as solar intensity, temperature, position in orbit, and attitude. As such, the design of the satellite's operational timeline must be meticulously simulated. At the UGA Small Satellite Research Lab we are building a robust power verification engine which takes in a tentative operational timeline in addition to predicted power generation and temperature from STK to accurately model the power consumption and power state shifting of each component in the satellite on a per second basis. The engine outputs data on each component's power consumption as well as the composite power draw of the entire satellite. Furthermore, the engine is built to be as modular as possible, so component elements can be modified, removed, and added as necessary. The combination of modularity and exhaustive data generation allows us to use the same engine for several different missions as well as allowing us to test potential operations while the satellite is in development to guide hardware changes and software design. Being able to test a potential timeline with a program accurately and quickly on the ground before commanding the satellite will help ensure satellite safety and mission success.

**Site-Specific Theatre vs. Traditional Theatre**

Michaela Danielle Wilkins, CURO Research Assistant
*Dr. John Patrick Bray, Theatre and Film Studies, Franklin College of Arts and Sciences*

How is site specific theatre different from traditional theatre? What can be accomplished with site-specific theatre that might not be able to be accomplished by traditional theatre? Site-specific theatre has been occurring for years, but it has recently become more and more popular with shows like *Sleep No More*. I was interested to look at the different things that can be accomplished by theatre that is performed in the correct space it was written for. For this project, I created a script for what is referred to as a "living room play". The script calls for three actors, and an audience that will be in close proximity to the actors throughout. This, coupled with a working script, makes this play unlike any other I have worked on. There are a limited number of light transitions and special effects that you can include when the play is not being produced in a theatre and is being performed in such an intimate space. This style of theatre does however allow for simplistic acting style, and for the audience to really be privy to the inner thoughts and personal lives of the characters. The play will go up in April, and my research will continue throughout the process of editing and producing.

**The Roles of Induced Genes in *Fusarium verticillioides* Resistance to *Streptomyces* Bacteria**

Felicia Williams, CURO Research Assistant
*Dr. Scott Gold, Plant Pathology, College of Agricultural and Environmental Sciences*

The soil microbiome includes myriad species in competition for limited resources. Among its many inhabitants are bacteria of the genus *Streptomyces*, which are known for the wide range of antibiotic compounds they produce. One of the species affected by exposure to Streptomyces bacteria is the soil-borne fungus *Fusarium verticillioides* (*Fv*), on which these bacteria have demonstrated inhibition of growth. As a mycotoxigenic pathogen of maize, *Fv* has significance both as a yield-reducing plant pathogen of corn and as a threat in the resultant contaminated feed to animal and human health. In our current research, we have conducted an RNAseq experiment to examine patterns of differential expression by *Fv* in response to exposure to *Streptomyces* bacteria. Among the most strongly induced genes are those encoding proteins with implications in a resistance response to encountered xenobiotic compounds, including lactamases and transport proteins. Operating on the hypothesis that genes are highly and specifically induced by encountered xenobiotics, we expect that *Fv* strains mutant in highly induced genes to exhibit increased sensitivity to *Streptomyces*. Based on this paradigm, we are investigating the roles of induced genes in fungal resistance through mutagenesis and survival assays.

**Ubiquitin and Species' ISG15 Specificity of the vOTU from the Kupe Virus**

Isabelle Lynn Williams, CURO Research Assistant
*Dr. Scott Pegan, Pharmaceutical and Biomedical Sciences, College of Pharmacy*

The Nairoviridae family is comprised of approximately 40 members that have been shown to productively cause disease in numerous animals. Of these nairoviruses, several have been shown to cause severe infections in humans as well as other agriculturally important animals. Specifically, Crimean-Congo hemorrhagic fever virus (CCHFV) causes fatal disease outcomes in humans with others such as Nairobi Sheep Disease virus (NSDV) causing moderate to mild human illness. In addition, NSDV has been shown to cause fatal disease outcomes in sheep. Other nairoviruses identifying closely with animals include Kupe virus (KUPEV) and Erve virus. A distinguishing feature of nairoviruses from others in the *Bunyavirales* order is the expression of a viral ovarian tumor protease (vOTU). This protease has been implicated in its down-regulation of the innate immune response by the reversal of post-translational modification of proteins by Ubiquitin (Ub) and Ub-like protein interferon stimulated gene product (ISG15). Intriguingly, a vOTU's ability to productively engage ISG15 is suggested to be influenced by species-species variances in ISG15 and thus is a potential player in zoonotic viral transmission. This research utilizes recombinant DNA technology, X-ray crystallography, and enzymology to understand the Ub/ISG15 substrate preference of vOTUs from KUPEV and the NSDV variant Ganjam virus. The molecular details of structures of these and others vOTUs in complex with their preferred ISG15 substrates illuminates the mechanism of species preference among these vOTUs. This allows deeper insights into the molecular drivers of ISG15 processes and how this may contribute to nairovirus host tropism.

**The Effect of Gut Microbiota on Appetitive Motivation via the Mesolimbic Dopamine System**

Kevin Charles Williams III, CURO Honors Scholar, CURO Summer Fellow
*Dr. Claire de La Serre, Foods and Nutrition, College of Family and Consumer Sciences*

Obesity has become the fifth leading cause of death in the world, accounting for 3.4 million deaths annually. It is known obesity occurs from excessive high-fat food intake; however, the reason behind this excessive caloric intake is not well understood. Evidence suggests the motivation toward high-fat (HF) food intake is mediated by dopaminergic activity in the mesolimbic system. Recent evidence also points to gut microbiota as being highly associated with obesity via effects in the central nervous system (CNS) via vagal afferent neurons (VAN) that innervate the gut. This study seeks to establish a connection between gut microbiota and dopaminergic activity in the mesolimbic system as it relates to appetitive behavior. To explore this connection, germ-free (GF) Fischer rats were divided into two groups based on microbiota conventionalization with HF microbiota (Conv HF) or low-fat (LF) microbiota (Conv LF) (N=16; n=8). For controls, regular

Fischer rats were utilized and divided between HF and LF microbiota (N=16; n=8). For a direct measure of appetitive behavior, progressive ratio testing was implemented. To assess dopaminergic activity, microdialysis, ELISA, and in-situ hybridization were used to quantify extracellular dopamine, tyrosine hydroxylase, and dopamine 1 and 2 receptors respectively. It was found that Conv HF and Conv LF rats exhibited significantly higher lever presses for a food reward than HF and LF rats, and we expect dopaminergic activity in Conv LF and Conv HF rats will be significantly different than HF and LF rats.

**Using Camera Traps to Estimate Proportional Territory Overlap of Jaguars**

Tyus D. Williams, CURO Research Assistant
*Dr. Nate Nibbelink, Forestry, Warnell School of Forestry and Natural Resources*

Jaguars (*Panthera onca*) are a threatened species due largely to the effects of widespread habitat loss and fragmentation. They can use a variety of different habitat types but there is relatively little information related to their ecology within naturally-occurring and neotropical pine forests. The objective of this research was to assess space use and overlap by jaguars in the ~500 km2 Mountain Pine Ridge Forest Reserve (MPR) in Belize, Central America using camera traps. In 2018, we identified jaguars by their individual rosette patterns via remote cameras. This information contributed to a 15-year dataset we used to average the number of photographs taken per individual, the frequency of photographs taken per year, and generate territory (i.e., minimum convex polygon) estimates. Currently, we summarized the average number of photographs taken per individual for both males and females along with the number of stations they were photographed at during each year. We further plan on using detections among camera stations to create minimum convex polygons and quantify territory overlap of jaguars. We expect that as the number of camera stations increased from 24-50 between 2004 and 2017 we will see a concurrent increase in the detection rates of male and female jaguars. The data we generate within this study should help generate novel information about jaguar ecology and can be used to inform conservation and management plans.

**The Influence of Muscle Length on Gastrocnemius and Vastus Lateralis Muscle Oxygen Saturation and Endurance**

Sarah Williamson, CURO Research Assistant
*Dr. Kevin McCully, Kinesiology, College of Education*

Increasing muscle length (passive stretch) has been shown to reduce muscle oxygen levels by increasing intramuscular pressure. Purpose: To measure the effect of passive stretch on muscle-specific endurance and oxygen saturation in the vastus lateralis and medial gastrocnemius muscle groups. Methods: The vastus lateralis and medial gastrocnemius muscles were studied in stretched (lengthened) and relaxed (shortened) positions in 10 healthy individuals (21+1 yrs.). A triaxial accelerometer was used to measure endurance as declines in twitch acceleration during stimulation at 2, 4, and 6 Hz for 3 minutes at each level. A continuous wavelength Near Infrared Spectroscopy (NIRS) was used to measure muscle oxygen levels. Results: The stretched position exhibited a lower endurance index in the gastrocnemius (51+9.6% vs. 77+9.1%, p=0.008) and vastus lateralis (54+ 8.9% vs. 75+9.6%, p< 0.001). The time to half recovery of oxygen levels during reactive hyperemia was slower in the stretched positions for the gastrocnemius (11.4+1.0s vs. 8.2+1.1s, p<0.001) and the vastus lateralis (9.8+1.9s vs. 6.3+0.7s, p<0.001). However, oxygen saturation during the endurance tests were not different between stretched and relaxed conditions for the gastrocnemius or the vastus lateralis (p>0.05 for all comparisons). Conclusions: The stretched positions resulted in reduced muscle endurance compared to the relaxed position in both muscle groups. This was consistent with reduced blood flow measured by the time to half recovery of oxygen levels. Studies of muscle endurance need to control for muscle length as changes in muscle length can influence muscle endurance.

**Copepod Survival in Water Dishes Exposed to Average Ambient Temperatures of Chad, Africa**

Jessica Wilson
*Dr. Michael Yabsley, Forestry, Warnell School of Forestry and Natural Resources*

Guinea worm disease, or dracunculiasis, is a zoonotic parasitic disease caused by infection with the nematode *Dracunculus medinensis*. Infection most commonly occurs following ingestion of drinking water contaminated with freshwater crustaceans called copepods, which serve an intermediate host for the worm. Incidence of infection is most common in impoverished areas of Asia, South America, and Africa where clean drinking water is not readily available. In the last three decades, much work has been done on the part of local governments and the Carter Center's Guinea Worm Eradication Program in an effort to thwart the spread of the disease and decrease the number of infections in endemic areas. Though the number of confirmed cases per year has decreased by more than 98%, Chad and a number of other African countries have seen an increase in infection of domestic dogs, likely following water consumption. In order to determine how long copepods are able to survive in a water dish, copepods were placed in dishes made of four different materials (metal, glass, plastic, and gourds) and subject to a simulated Chadian environment. Current data suggests that metal containers allowed the smallest chance of survival, with almost 100% mortality after 2 hours of exposure. Plastic, however, exhibited the lowest mortality at all time intervals. Furthermore, current gourd trial data indicates that mortality is high at long exposure times. Overall, preliminary results indicate that the type of dish used to provide dogs with drinking water is an important factor in interrupting D. med transmission.

**The Computational Investigation of the Novel Anticancer Drug GH501, and its Potential Protein Target: AKR1C3**

Lauren Marie Wilson, CURO Research Assistant
*Dr. Paul Xie, Electrical and Computer Engineering, College of Engineering*

GH501 is a novel anticancer drug that was designed to treat prostate cancer; however, the target protein(s) of this drug remain unknown. To investigate the possible protein target(s) it is necessary to research further into existing prostate cancer targets, and their mechanistic pathways. This study uses computational methods such as protein-ligand docking to perform virtual-screening on several potential targets. Aldo-Keto Reductase Family 1 Member C3 (AKR1C3) has been found to play a key role in the development and progression of various types of cancers. Through preliminary research, it is thought that GH501 is an inhibitor of AKR1C3. Nonsteroidal Anti-Inflammatory Drugs are designed to selectively and non-selectively inhibit AKR1C3. Based on this, the binding sites of these drugs were used as templates to predict potential drug binding sites for GH501. By using Schrödinger's Maestro, a chemical simulation software, it was revealed that the hypothesis of this study was supported with protein-ligand docking: GH501 is a potential inhibitor of AKR1C3. However, basic protein-ligand docking scores are not enough evidence to support the hypothesis of this study. Thus, another computational tool, molecular dynamics (MD) simulation will be used to aid in the understanding of the dynamic movement of the protein-drug complex. By analyzing factors such as the root-mean-square deviation (RMSD) of the system over a short period of time, it will be possible to determine whether the GH501-AKR1C3 system is stable. If the system is stable, the hypothesis that GH501 is an inhibitor of AKR1C3 will be further supported.

**The Intersection of Disability and Poverty: Social Security Administration Appeals in the Federal Trial Courts**

Taylor Withrow, CURO Honors Scholar
*Dr. Christina Boyd, Political Science, School of Public and International Affairs*

The Social Security Administration (SSA) adjudication process is of increasing concern to government officials, the media, and U.S. citizens with a growing case backlog and average hearing wait time of over one year. Further, as many as 50 percent of SSA's disability determinations reviewed by the federal district courts are reversed or remanded to the SSA for additional proceedings and frequently, a disability benefits award. This project aims to provide insight onto how the characteristics of the SSA case, litigant, and judge can affect judicial decisionmaking and case outcome. Specifically, this project will examine how low-income or impoverished status, as measured by filing in forma pauperis, correlates to the likelihood of obtaining disability benefits while also examining the effect of other variables including political affiliation, rate/ethnicity, and gender of judges. The project draws on a literature review focusing on the difficulties that poorer populations face in the court system ranging from access to lawyers, success in their claims, and ability to negotiate. Using data collected as part of an original dataset on SSA disability adjudications, this project will use a sample based on five federal district courts studying variables of status and income levels while also exploring variables on the characteristics of judges and the potential effect on judicial decisionmaking. We will control for other confounding variables that will affect the likelihood of success. The broader impact of this project is profound as it addresses the intersection of disabled and indigent citizens, bureaucratic policymaking, and judicial review.

**Glioma-on-Chip Microfluidic Platform to Observe T-Cell Targeting and Evasion**

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

Glioblastoma multiforme (GBM) is a primary central nervous system tumor with poor clinical outcomes. GBM patients have a prognosis of 12-15 months, and standard-of-care treatment consists of surgery, chemotherapy and radiotherapy with little success. Immunotherapy approaches have emerged as promising strategies in cancer treatment, but there has been minimal success with immunotherapeutic targeting of GBM. We developed a glioma-on-chip microfluidic device incorporating perfusive flow similar to cerebral blood flow conditions, in which we believe we will observe real-time interactions between immune cells and patient-derived glioblastoma stem cells (GSCs) housed in 3D hydrogel reservoirs. Our device includes a 1mm-wide channel with a 1mm outlet and 1 mm inlet and six 4mm reservoirs along the channel. To observe realistic T cell extravasation dynamics, we will endothelialize the channel through the seeding of 10x106 Human Umbilical Vein Endothelial Cells (HUVECs) after fibronectin coating the PDMS device and observing endothelial cell growth over 96h. After 72-96 hours in culture, devices are imaged to validate adherence and barrier formation, and barrier formation will be validated by flowing fluorescently-tagged bovine serum albumin (BSA) to observe any leaking through barrier junctions. Extent of endothelialization and barrier formation will be quantified through immunocytochemistry and high-magnification epifluorescence imaging. We will flow either non-targeted T-cells or CAR-T cells through these endothelial-lined channels to observe T-cell targeting of GSCs within reservoirs observe how GBM evade T-cell detection and targeting. The microfluidic platform represents a novel opportunity to study GBM-immune cell relationships, which can inform future immunotherapeutic approaches against GBM.

**Impact of Early Growth Hormone Induction on Growth and Metabolism in Breast Muscle and Liver of Meat-Type Chickens**

Justin Wolozin, CURO Research Assistant
*Dr. Laura Ellestad, Poultry Science, College of Agricultural and Environmental Sciences*

Corticosterone is a naturally occurring hormone that is used in mid-embryonic development to initiate pituitary growth hormone (GH) production. Pituitary growth hormone is a key component of the somatotropic axis that plays a crucial role in regulating proper growth and development in all

vertebrates. Previous research has shown improved feed efficiency, increased meat yields, and reduction of abdominal fat in chickens hatched from eggs injected with corticosterone; however, it is unknown which genes are responsible and the mechanistic pathways they follow that contribute to this improved growth performance. Exploring this growth-related pathway is important for finding novel strategies during rearing in order to increase production yields. The objective of this present study is to investigate whether early stimulation of growth hormone by mid-embryonic in ovo injection of corticosterone during chicken development can cause long-term changes in gene expression in breast muscle and liver tissue. RNA was extracted from these tissues at hatch and 14, 28, and 42 days of age before being reverse transcribed into cDNA. Fourteen different genes associated with hormone signaling, growth, and metabolic processes are being analyzed using a technique called reverse transcription quantitative polymerase chain reaction (RT-qPCR). By identifying differences in gene expression patterns, we hope to be able to better discern how an earlier induction of the somatotropic axis may regulate growth and potentially aide in improving poultry production yields.

**CBR and LWD as Predictive Measures of Resilient Modulus of Subgrade Soils**

Hampton Worthey, CURO Research Assistant
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The use of Resilient Modulus (MR) testing as a measure of stiffness of subgrade soil is becoming increasingly more useful as the Georgia Department of Transportation (GDOT) begins implementing the Mechanistic-Empirical Pavement Design Guide (MEPDG). Due to the complexity of the resilient modulus testing procedure, determining MR stiffness values for in-situ soil is often difficult. Research suggests using soil strength parameters determined from California Bearing Ratio (CBR) or Lightweight Deflectometer (LWD) tests as predictive measure of soil stiffness. By conducting CBR or LWD testing procedures on varying soil types within the state of Georgia, the soil-strength data can be compared to the stiffness values as determined by MR testing. Over the course of this study, CBR and LWD data of soils from Coweta, Hall, and Gordon counties has been measured and cataloged. With completion of resilient modulus testing, the CBR and LWD values from these counties will be cross examined with the respective MR values. The results of this study may confirm or deny the notion of CBR or LWD testing as a predictive measure for the resilient modulus of in-situ soil. A proportional correlation between strength and stiffness is to be expected. The conclusion of this study will seek to provide the GDOT engineers with an efficient method by which to determine subgrade soil stiffness for use in the MEPDG. This method will effectively reduce the time and associated cost of a GDOT pavement design.

**Nitric Oxide (NO) Releasing Coatings for Reduction of Infections Associated with Medical Devices**

Olivia Anne Wright, CURO Research Assistant
*Dr. Hitesh Handa, Chemical, Materials, and Biomedical Engineering, College of Engineering*

One of the major problems hospitals encounter is high rate of infection, specifically with catheters. Our goal is to develop a coating that prevents not only infection but other problems such as foreign body response and thrombosis. Nitric oxide (NO) has shown promise because of its antimicrobial and antithrombotic properties, but more research on the best material to release the NO still needs to be conducted. Our lab is incorporating the S-nitroso-penicillamine (SNAP) NO donor molecule with a polymer to test the efficiency and rate of NO release into the body. We test this via a nitric oxide analyzer that measures the release of NO over time. Some key characteristics that we are looking for are biocompatibility, release kinetics, storage stability, sterilization effects, among others. We also perform cell culture plating to see the growth of bacteria with and without NO and SNAP. Continuing off of this research we are testing different ways the NO can be incorporated into a film and how to simultaneously fight off infection, prevent clotting, and prevent buildup of bacteria on medical devices without causing a cytotoxic response. Other applications of NO include an antibacterial paint for use in hospitals, schools, and other areas of high concentration of people.

**Determining the Effects of Chronic Exposure to Low Dose Ionizing Radiation on Medaka Fish at a Proteomic Level**

William M. Wright
Tova Asher
*Dr. Carl Bergmann, Biochemistry and Molecular Biology, Franklin College of Arts and Sciences*

Humans are exposed to radiation every day, from natural sources such as the sun or rock, or human sources such as diagnostic exams. Examples of low dose ionizing radiation (LoIDR) exposure can include being exposed to cosmic radiation on an airplane, working in a nuclear power plant, or living in a building made with high levels of naturally radioactive materials. While we are exposed to varying levels of radiation daily, most research to date has focused on the effects of acute, high-dosage exposure to ionizing radiation. Very little research has been done on the effects on humans of chronic LoDIR over an extended period of time. The goal of our research is to analyze the proteomic effects of chronic exposure to varying levels of LoDIR using medaka fish (*Oryzias latipes*). The fish were exposed over six months at the Savannah River Ecology Laboratory (SREL), after which the fish were dissected and subjected to proteomic and bioinformatic analysis. This allowed us to identify changes in expression levels of proteins and predict possible affected pathways that could lead to physiological consequences. A total of 265 proteins were detected in carcasses, of which 78 demonstrated overall overexpression that is statistically significant ($p < 0.05$). In organs, 752 proteins were detected, of which 183 demonstrated overall repression (especially after exposure to medium

and high levels of LoIDR). Certain pathways, such as drug metabolism, necroptosis, oxidative phosphorylation, and cardiac muscle contraction were predicted to be affected by chronic exposure to radiation, but further analysis is required.

**Evasion of T-Cell Targeting by Glioblastoma Multiforme**
Kallie Elise Wynens
*Dr. Lohitash Karumbaiah, Animal and Dairy Science, College of Agricultural and Environmental Sciences*

Glioblastoma multiforme (GBM) accounts for the majority of primary malignant brain tumors among adults in the United States, and patient prognosis remains extremely poor. Immunotherapy approaches have shown promise in clinical outcomes for other cancer types, but minimal success has been observed in the treatment of solid tumors. The accumulation of immunosuppressive immune cells within GBM is associated with worse prognosis and is a significant barrier to immunotherapeutic approaches, but the recruitment of these cells to the tumor microenvironment is poorly understood. We hypothesize that GBM selectively recruits suppressive T-cells to the microenvironment, as well as contributes to effector T-cell senescence and death to avoid T-cell targeting. To investigate this phenomenon, characterization experiments be performed using 1x106 human T-cells (Promab). T-cells will be activated with ImmunoCult Human CD3/CD28/CD2 T Cell Activator serum and evaluated using imaging cytometry for T-cell subtype markers to delineate populations of effector T-cells (CD4), regulatory T-cells (CD4/CD25/Foxp3), and cytotoxic lymphocytes (CD8) compared to lyophilized peripheral blood mononuclear cell (PBMC) controls (Veri-Cell). Activated T-cells will be exposed to patient-derived glioblastoma stem cells (GSCs) in a 10:1 ratio over 72-96h and then examined for apoptosis marker Annexin V and proliferation marker Ki67 using imaging cytometry. Subsequent exposure experiments will evaluate if GSC exposure induces phenotypic changes in T-cell subtype towards an increase in immunosuppressive regulatory T-cells, and if GSC exposure increases markers of T-cell senescence or death. Understanding the mechanisms behind GBM evasion of T-cell targeting could lead to more successful treatment of these tumors by immunotherapies.

**Who Am I?: The Intersection Between Racial and Emotional Socialization in the Development of Black Ethnic Identity**
Kaela Yamini
Dominique Harry
*Dr. Anne Shaffer, Psychology, Franklin College of Arts and Sciences*

Parent socialization is a strong contributor to the development of identity in adolescence and young adulthood. Across families, the ways that race and emotions are socialized can vary. The conceptualization of race is important for helping a child understand who they are in society, and the ways in which parents respond to their children's emotions can predict many aspects of well-being. However, these types of parental socialization are not often considered together in research. This research examines if there are relations between how African American parents socialize race and how they socialize emotions for their children, and how these types of socialization predict racial identity. Participants for this study were 141 African American undergraduates (N = 102 women), who completed measures of their experiences of parental racial and emotion socialization when growing up, and their current racial identity. Results indicate that higher levels of supportive emotion socialization were correlated with greater racial socialization from parents. Supportive emotion socialization was related to higher messages of egalitarianism ($r$ = .28), racial barriers ($r$ = .22), racial pride ($r$ = .36), and cultural socialization ($r$ = .39). In multiple regressions, egalitarian messages positively predicted Humanist racial identity (β = .31), whereas Nationalist racial identity was predicted by more unsupportive emotion socialization (β = .40) and fewer messages of egalitarianism (β = -.32) or racial pride (β = -.32). Future research could be conducted on a campus with a higher percentage of African American students such as an HBCU (historically black college and university).

**Developing Proximity-Based Biotin Ligation Methods for Protein Interaction Studies in *Neurospora crassa***
Tiffany Yee
*Dr. Zachary A. Lewis, Microbiology, Franklin College of Arts and Sciences*

Polycomb Repressive Complex 2 (PRC2) is a chromatin modifying enzyme that is important for development and cell differentiation. PRC2 can promote gene silencing through the methylation of lysine 27 on histone H3 and has been implicated in some diseases, such as cancer. The mechanisms that control PRC2 activity are poorly understood. We are using *Neurospora crassa* as a model to understand regulation of PRC2 and its role in epigenetic gene silencing. Preliminary RNA-seq analysis shows that histone deacetylase-1 (hda-1) influences expression of PRC2 target genes. We hypothesize that HDA-1 deacetylates histone or non-histone substrates to influence expression of PRC-2 target genes. To test this hypothesis, we are using a proximity biotinylation scheme to identify proteins that interact with HDA-1. I developed novel plasmids that allowed construction of HDA-1 fusion proteins joined to the biotin ligase BirA. I transformed Neurospora crassa to introduce an HDA-1-BirA fusion and confirmed this fusion protein is expressed by Western blotting. I am currently testing BirA enzyme activity *in vivo*. Future work will include using streptavidin to pull down proteins that are biotinylated by the HDA-1 fusion construct and identifying them through mass spectrometry. This work will help further our understanding of the control and function of PRC2 and identify novel targets of HDA-1.

**Changes in Gene Expression in Equine DSLD as Determined by Next Generation Sequencing**
Madeline Grace Young, CURO Summer Fellow, CURO Research Assistant
*Dr. Jaroslava Halper, Pathology, College of Veterinary Medicine*

Equine Degenerative Suspensory Ligament Desmitis (DSLD) occurs in many horse breeds and often results in pain and lameness. Our lab has shown that the key histopathological sign of DSLD is a buildup of an abnormal form of decorin, a

tendon proteoglycan, within connective tissue throughout the body. Decorin in DSLD horses has a chondroitin sulfate in place of a dermatan sulfate on its GAG chain. Additionally, we have found that DSLD tissues have increased levels of the chondrogenic growth factor BMP-2. The tendency of equine DSLD to run in families suggests a potential genetic component to the disorder. Thus, we chose to use next generation sequencing technology to determine the differential expression levels of RNA between control and DSLD horses. Using Cufflinks analysis, 1,500 genes were identified as being up or down regulated in DSLD horses when compared to the control horses. While the significance of all 1,500 genes in the pathogenesis of DSLD is still unclear, we have identified several genes of interest including: ADAMTS4, Keratins, Collagen and fibrillin, chemokines, cytokines, and interleukins, BMP2, FGF5, and Wnt/cathenin and MAPK signaling molecules. Gaining a greater understanding of the genetics behind equine DSLD will allow for proactive treatment and management of the disease as well as the ability to advise breeders on responsible breeding practices. Our research will now look towards understanding the interconnected pathways that include genes from the next generation sequencing data to gain a better understanding of the pathogenesis of the disease.

**Investigating Cognitive Impairments with Inhibition and Impulsivity**

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

Cognitive control is essential to healthy functioning. Daily functioning requires inhibition to override stimulus-driven behavior. Paradigms involving volitional rapid eye movements, or saccade tasks, are used to measure behavioral inhibition. The Minimally Delayed Oculomotor Response (MDOR) task isolates the extent of subjects' inhibition. Trials start with the subject fixating at the center of a screen. They are instructed to maintain fixation as a peripheral cue appears and to move their gaze to the periphery when it disappears. Success in maintaining fixation is evidence of inhibition. Inhibition failure is seen when an error is made by a saccade to cue onset. While saccade tasks capture short term inhibition, the Barratt Impulsiveness Scale measures long-term impulsivity. The BIS is a self-report questionnaire that is answered on a scale of 1-4. Ranging from Rarely/Never, Occasionally, Often to Almost Always, respectively. Three factors of this scale will be examined: Attentional, Motor, and Nonplanning. This study will investigate the relationship between behavioral inhibition and general character-like impulsivity by using correlational analysis of MDOR error rates and BIS factors. MDOR error rates and all BIS factors are expected to correlate positively, indicating subjects with higher error rates will have higher second order factor scores. Data will be taken from 213 undergraduate students at UGA. Studying inhibition is important because poor inhibitory control is associated with disorders involving cognitive deficits. Finding a relationship between impulsivity and inhibition could contribute to greater understanding of disorders with cognitive impairment.

**The Link Between Parental Control and Youth Maladjustment: Is Parental Affection Expression a Protective Factor?**

Jenny Zhang, CURO Research Assistant
*Dr. Assaf Oshri, Human Development and Family Science, College of Family and Consumer Sciences*

Parenting is multifaceted in behavioral dimensions that bear significant implications on youth development. The proposed study will focus on two critical and opposing dimensions. The first style is psychological control where parents control children's behaviors by controlling their emotional states or beliefs. This parenting induces negative emotional states in children including depression, low self-esteem, and loneliness. In contrast, parental affection expression is a parenting style empirically linked to long-lasting positive effects on youth's mental health. Thus, the aim of the present study is to examine the effect of parental affection expression as a protective force against socioemotional consequences of psychological control. I hypothesize that when affection expression is high, the implications of psychological control on children's emotional outcomes will be mitigated. The proposed study is based on longitudinal data from a racially diverse sample of pre-adolescence youth and their primary caregivers (N= 101) assessed at two waves differing in one year. Participant families were of low-socioeconomic status from non-metropolitan neighborhoods. Data will be analyzed with PROCESS SPSS Macro, and path analysis will be conducted to examine the moderating effect of affection expression on parental psychological control and youth's callousness and unemotional traits, hopelessness, and future orientation. Parental psychological control was measured by Parent's Report of Parental Behavior Inventory, and children's socioemotional characteristics were measured by various self-reports. Results from the study will provide insight into how affection expression can be a protective factor in parent-child relationships and can facilitate youth's positive socioemotional development and mental health under parents' psychological control.

**An Evaluation of the Functional Properties of Repetitive Vocalizations**

Rachael Zimmerman
Keri Barrientos, Miranda Capomaccio, Emily P. Culpepper, Natalie Mathis, Logan Norris, Ashley Patrick
*Dr. Sandie Bass-Ringdahl, Communication Sciences and Special Education, College of Education*

Non-socially mediated behavior includes behavior that occurs for no apparent social purpose. That is, the behavior is maintained by the internal reinforcers it directly produces. Some individuals with autism spectrum disorder engage in repetitive vocalizations, phrases, and sounds assumed to be non-socially mediated, because the behavior does not appear to serve a social function (i.e., the behavior does not appear to be maintained by reinforcers delivered by someone else in the environment). However, the conclusion of behavioral function, non-social or social, may be reached based on structural qualities of the vocalizations, such as their repetitiveness. Reaching this conclusion in the absence of systematic data

related to the function of vocalizations may result in clinicians overlooking vocalizations that, in fact, have a social function, and that can be further emphasized during interventions, such as functional communication training. Thus, strategies to determine the functional properties of vocalizations could be helpful. This study provides an example of analysis of assessment data designed to identify the social (or non-social) functions of behavior.

**The Effect of Maternal Intake of Lutein on the Antioxidative Status in the Offspring**

Jillien Zukaitis, CURO Research Assistant
*Dr. Hea Jin Park, Foods and Nutrition, College of Family and Consumer Sciences*

Lutein is a dietary carotenoid that protects against the development of chronic diseases via its antioxidant traits. Lutein accumulates in the infant brain and is prevalent in breast milk, indicating its role in the development of infants' brains. We investigated whether lutein supplementation in sows during gestation and lactation affect the oxidative stress and antioxidant defenses of the offspring. Pregnant sows were assigned to either a control diet (n=3) or lutein supplemented diet (2.2 mg lutein/kg body weight/day, n=5) from day 74 of gestation through lactation (21 days post farrowing). Piglets from the sows with average body weight of each litter were selected for the further analysis. At weaning, blood was collected from the piglets and activities of plasma catalase and plasma concentration of malondialdehyde (MDA) were measured using colorimetric methods. Piglets from lutein-supplemented sows (291.82±25.78 nmol/min/ml) had a weak trend for the elevated catalase activity (p=0.0997) compared to the controls (231.3±35.84 nmol/min/ml), while no significant difference in MDA concentration was observed between the two groups. Taken together, maternal supplementation of lutein during gestation and lactation may strengthen the enzymatic antioxidant system in the offspring.

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