



**French Family Science Center**  
**Tuesday, April 21, 2015**  
**11:30 a.m.-2:00 p.m.**

Visible Thinking is a Program of  
The Undergraduate Research Support Office  
Trinity College of Arts and Sciences  
Duke University

Ron Grunwald, Director  
Deborah Wahl, Associate Director  
Laura Jackman, Staff Specialist  
*[undergraduateresearch.duke.edu](http://undergraduateresearch.duke.edu)*

Acknowledgments

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including:

The Duke Undergraduate Research Society  
The Academic Deans of Trinity College of Arts and Sciences  
Coordinators of Undergraduate Research and Fellowship Programs

Funding Provided by Trinity College of Arts & Sciences

# **Undergraduate Research Support at Duke University**

Duke undergraduates have received support from the following College and University programs in 2014-2015:

## **All Disciplines**

ACCIAC Summer Research Fellowship  
Bass Connections  
Career Center Summer Internship Awards  
Dannenberg Summer Fellowships  
Mellon-Mays Undergraduate Fellows  
Global Education Office Summer Fellowships  
Office of University Scholars and Fellows  
Summer Session Fellowships  
Trinity College Deans' Summer Research Fellowships  
Undergraduate Research Support Grants and Assistantships

## **Humanities and Social Sciences**

Asian/Pacific Studies Institute East Asia Projects  
Asian & Middle Eastern Studies Awards  
Benenson Awards in the Arts  
Center for Latin American and Caribbean Studies  
Center for Documentary Studies Awards  
Classical Studies Travel Grants  
Duke Global Health Institute  
Duke Human Rights Center @ FHI Awards  
Duke University Center for International Studies  
History Department Grants  
Vice Provost for the Arts – Creative Arts Grants  
Psychology Vertically Integrated Partners Program  
Research in Practice Program - Engage  
Public Policy Summer Research Fellows Program  
Schiff Family Foundation Summer Research Fellowships  
Service Opportunities in Leadership Program  
Women's Studies Program Awards

# **Undergraduate Research Support at Duke University**

*(cont'd)*

## **Natural & Quantitative Sciences and Engineering**

Biochemistry Department Summer Fellowships  
Chemistry Summer Research Fellows  
Computer Science Undergraduate Research Fellowships  
Duke BioCore Scholars  
Duke Data+ Fellowships  
Duke-TGen Biomedical Futures Program  
Duke Clinical Research Institute NC Collaborative  
Evolutionary Anthropology Molly Glander Awards  
Marine Lab Rachel Carson Research Fellows  
Molecular Genetics and Microbiology Summer Fellowships  
Genome Sciences and Policy Summer Fellowships  
Goldman Sachs Summer Research Fellowships  
Howard Hughes Research Fellows Program  
Howard Hughes Vertically Integrated Partners Program  
Mathematical Biology Summer Research Program  
Neurosciences Program of Research  
NSF-PRUV - Department of Mathematics  
Physics - High Energy Physics Program  
Pratt Fellows Program  
Summer Undergraduate Research in Pharmacology  
Research Internships in Toxicology & Environmental Health  
Trinity College Forums: Biological Sciences & Neuroscience

**For more information about research support,  
visit: [undergraduateresearch.duke.edu](http://undergraduateresearch.duke.edu)**

# Visible Thinking: A Presentation of Undergraduate Research

## Poster Presentations

### *Bass Connections*

<i>Student</i>	<i>Advisor</i>	<i>Title</i>	<i>Time</i>
Emma Achola, Chloe Warnberg	Candice Odgers	Neighborhood to Brain	12:00-1:00
Sophie Alman, Min Tong Cai	Elizabeth Marsh	Heuristics for Judging Truth	12:30-1:30
Rebecca Brenner	Walter Sinnott- Armstrong	Ethical issues of treating children with ADHD Medication: Implication of high rates of misdiagnosis	12:00-1:00
Rebecca Brenner	Ed Levin	Effects of Methylphenidate on Risk-Taking and Sociability in Zebrafish	12:00-1:00
Dylan Brown, Ryder Quigley, Isaac Fraynd, Dylan Brown	Emily Klein	Using Flare Gas to Power Fedex	12:30-1:30
Kristen Buehne, Allison Goldsmith, Burcu Ozler, Sarah Jones	Geraldine Dawson	A Music-based Therapy for Children with Disabilities in Durham Public Schools	12:30-1:30
Katherine Ernst, Danielle Colson, John Gitau, Ryan Buxbaum	Josiah Knight	Energy and the Environment: Design and Innovation--Solar Autoclave	12:00-1:00
James Ferguson, Daniel Ketyer, Jennifer Sekar	Charles Adair	Distributed Solar Generation for Duke Employees: Rooftop Solar to Promote Climate Neutrality	12:00-1:00
Isa Ferrall, Jessica Allen, Robinson Ford, Ryan Bartoszek, Jordan Thomas, Taylor Lane, Victoria Cheng	Josiah Knight	Design and Innovation: Alternative Refrigeration	11:30-12:30
Danalaxshmi Ganapathee, Luxi Wan, Belex Cheng, Sally Al-Khamees, Shanen Ganapathee	Leonard White	Movement, Grace and Embodied Cognition	12:30-1:30
Kunal Goel, Kaylin Tsukayama, Tiffany Kearse	Nina Sherwood	Neuroplicity	11:30-12:30

Dustin Hadfield	Phil Costanzo	Moral Judgments and Attitudes Predicting Legal and Illegal Stimulant Use	12:30-1:30
Lauren Harper, Brandon Ellis	Brian Southwell	Project LITHomes: Homeowners and Energy Efficiency	12:00-1:00
Laurie Hwang, Christine Nunez	Rochelle Schwartz-Bloom	Environmental Effects on Cognitive Development	11:30-12:30
Lauren Kane	Carol Colton	White Matter Alterations and Met Cycle Dysregulations in Mouse Models of Alzheimer's Disease	12:30-1:30
Kristie Kim, Dustin Hadfield, Lauren Miranda, Rebecca Brenner	Walter Sinnott-Armstrong	Stimulating Brains: Individual Levels of Humility and Rebelliousness Influence Moral Judgments in Online Interactions	11:30-12:30
Josh Laveman	Gale Boyd	An Analysis of Global Energy Management at Hanesbrands	11:30-12:30
Grace Li	Subhashini Chandrasekharan	Noninvasive Prenatal Testing in Hong Kong: Ethical, Legal, Social and Practical Challenges	12:00-1:00
Sharrin Manor, Austin Liu, Mindy McTeigue, Zhenzhen Chen	Kyle Bradbury	The University at a Laboratory for Smart Grid Data Analytics	11:30-12:30
Simardeep Nagyal	Francis McClermon	Tobacco Retail Outlets: Density, Storefront Advertising and Smoking Cessation Outcomes	11:30-12:30
Manish Nair, Anya Ranganathan	Jennifer Groh	Dynamic Time Warping: A Novel Metric for Evaluating Piano Performance	12:30-1:30
Max Orenstein, Ilhan Savut	Emily Klein	Animal Feedstock Solution for Flare Gas using Methanotrophic Bacteria	12:00-1:00
Evan Savell	Gale Boyd	Standardization for Energy Use Comparison Across Merck's North American Facilities	12:00-1:00
Tre' Scott	Ken Rogerson	The Impact of North Carolina's Historic Rehabilitation Tax Credit	12:00-1:00
Emmanuel Shiferaw	Regis Kopper	Dig@IT: Virtual Reality in Archaeology	12:30-1:30
Taylor Trentadue, Anna Willoughby, James Yu, Rachel Clark	Charles Nunn	Shining Evolutionary Light on Global Health Challenges	12:00-1:00
Ronnie Wimberley, Emma Zhao, Jemi Galani, McCall Wells	Sara LeGrand	Juntos: A Digital Intervention	11:30-12:30

M. Fikret Yalcinbas, Vinay Nagaraj	Leslie Collins	Self-Guided Parameter Fitting for Cochlear Implant Users	11:30-12:30
Justin Yu, Emily Chen, Indrani Saha	Elizabeth Johnson	Seeing Color: Art, Vision, & the Brain	12:30-1:30

### *Community Engaged Research*

<i>Student</i>	<i>Advisor</i>	<i>Title</i>	<i>Time</i>
Asrael Harewood	Anne-Maria Makhulu	Racial Inequality in Factors Contributing to Recidivism in an Urban Juvenile Probation Agency	12:00-1:00
Kaho Hasegawa	Leo Ching	Japanese Cultural Practices that Japanese Americans in Hawai'i Continue to Practice Today	11:30-12:30
Michael Hu	Sumedha Ariely	Defining Water Access and Safety in Rural Central Uganda	12:30-1:30
Dechen Lama	Subhashini Chandrasekharan	Program Assessment of Direct Benefit Transfers for Janalakshmi in Bangalore, India	12:00-1:00
Clement Lee	Alma Blount	Building a Home for the Brave	11:30-12:30
Erin Leyson	Nicholas Carnes	Moving Communities: The Effects of Zumba Classes on Community in Oaxaca, Mexico	12:30-1:30
Rita Lo	Alma Blount	Ramifications of Hong Kong's statutory minimum wage law on narrowing the gender wage gap	11:30-12:30
Leo Lou	Alma Blount	Reconciling Biases in History Education and Media in Israeli-Palestinian conflict	12:00-1:00
Cecelia Mercer	Suzanne Shanahan	The Role of Mentors for Resettled Refugees: Evaluating the Effectiveness of the REAP's Agricultural Training Model	11:30-12:30
Anna Miyajima	Alma Blount	Generational Gaps in Sustainability Efforts	12:00-1:00
Kevin Nikolaus	Micheal Zavlanos	Can Unmanned Aerial Systems be Integrated into Arctic Environmental Monitoring?	12:30-1:30
Erica Ortiz	Dennis Clements	¡Viva la Partera!: Reproductive Health in Rural Honduras	12:30-1:30
Karishma Popli	Alma Blount	Lighting The Future With Technology: Efficacy of Solar Lamp Use in Rural Villages	12:30-1:30
Houston Rhodes	Charles Piot	Diet/Nutrition and Alzheimer's Disease	12:00-1:00
Anusha Singh	Alma Blount	Access to Essential Reproductive Healthcare in North Carolina: The Influence of Politics	11:30-12:30

Ishan Thakore	Eric Green	A Voice-Based Treatment Module for Treating Perinatal Depression in Rural Kenya	11:30-12:30
Arpita Varghese	Alma Blount	Understanding Victimhood: Human Trafficking in Kerala	12:00-1:00
Archer Wang	Robin Kirk	Lives at the Margin	11:30-12:30
Lun Yin	Lynn Smith-Lovin	High School Model United Nations in China	12:00-1:00
Henry Yuen	David Malone	Innovating Experiential Education in Developing Countries: Nepal	12:30-1:30

### ***Social Sciences***

<i><b>Student</b></i>	<i><b>Advisor</b></i>	<i><b>Title</b></i>	<i><b>Time</b></i>
Ada Aka	Elizabeth Marsh	Improving Reading Comprehension Using Retrieval to Enhance Content Knowledge	12:00-1:00
Logan Beyer	Karen Murphy	Sensory Over-Responsivity in Children with Autism	11:30-12:30
Lexia Chadwick	Zoila Airall	The Yellow: Party Hostels And The New Community Norm	12:30-1:30
Becky Chao	Gareth Price	English as Capital: Language Policy in China and Migration to the U.S. for ESL Study	12:00-1:00
Katharine Cummings	Owen Astrachan	Technical, Legal, and Social Aspects of the Digital World, as Applied to <i>Blown to Bits</i>	11:30-12:30
Jamal Edwards	David Boyd	A Case Study on the Polio Eradication Initiative in Nigeria	11:30-12:30
Nadia-Estelle Fiat	Engseng Ho	Of Trustees and Offsprings: A Diasporic Trail of Parsi "Crisis" from Bombay to Hong Kong	12:00-1:00
Mark Herzog	Eric Green	The Potential Role for High-Risk Obstetric Telemedicine in Southwest Virginia	11:30-12:30
Samantha Huerta	Susan Rodger	Mathematical Integration of Alice in Middle School Curriculum	11:30-12:30
Dalia Kaakour	Krista Perreira	Physicians' End-of-Life Healthcare Decision-Making	12:30-1:30
Charlotte Ke	Raymond Garrett-Peters	Intersecting Identities: The Experiences of Queer Students of Color at an "Elite" Predominantly White Institution	12:30-1:30
Elizabeth Kim	Dan Ariely	Communication and Connection in an Instant Messaging Context	12:30-1:30
Luke Maier	Tony Rivera	Co-evolving Networks of International Conflict and Cooperation	11:30-12:30

Stephanie Ogwo	Raymond Garrett-Peters	Exploring Brain Gain in West Africa: The Experiences of Highly Skilled West African Returnees	12:00-1:00
Oluwatobi Runsewe	Anne-Maria Makhulu	The Rainbow Nation? : A Discursive Analysis of Post-apartheid South Africa	12:30-1:30
Karina Santellano	Raymond Garrett-Peters	The African American and Latino/a Friendship Experience at a Largely White Elite University	12:30-1:30
Élan Yochai	Elizabeth Brannon	The Interaction Between Numeracy and the Unit Effect	12:00-1:00
Ellen Yuan	Susan Rodger	Assessing Computational Thinking Using Alice Programming	11:30-12:30

***Psychology, including candidates for Graduation with Distinction***

<b><i>Student</i></b>	<b><i>Advisor</i></b>	<b><i>Title</i></b>	<b><i>Time</i></b>
Natalie Allen	Mark Leary	The Value of Personal Values: Well-being in College Students	12:00-1:00
Martha Berg	Christina Meade	Depression, sexual trauma and substance-related coping behaviors in drug users	11:30-12:30
Zoe Bulger	Eve Puffer	Resilience Across Internal, Social, & Community-Level Resources	11:30-12:30
Jeremy Clift	Brian Hare	Chimpanzees' Processing of Hierarchies: Social and Nonsocial Stimuli	12:00-1:00
Clara Colombatto	Scott Huettel	The Social Memory Effect: Enhanced Recognition for Objects Designed by Other Minds	11:30-12:30
Kaitlyn Corey	Timothy Strauman	The Perception of Alcoholic Drink Sizes In College Students	12:00-1:00
Erica Figueroa	Makeba Wilbourn	Exploring Ethnic Identity Through Narratives	12:30-1:30
Andrew Hall	Rick Hoyle	Self-Control Forecasting: An Exploratory Analysis	12:00-1:00
Min Kyung Hong	David Rubin	Default Mode Network changes in PTSD Before and After Involuntary Memory Retrieval	12:30-1:30
Hannah Hopkins	Nancy Zucker	Food, Fat Talk, and Females: The relationship between binge eating and rumination	11:30-12:30
Min Su Kang	Ahmad Hariri	Ventral striatum mediates the association between multilocus genetic profile and food addiction	11:30-12:30
Daniel Kort	Laura Richman	#BlackHealthMatters: Current events, African American health, and an identity-based motivation intervention	11:30-12:30



Cayley Larimer	Elizabeth Brannon	Easy as 123: Behavioral implications of training the approximate number sense in preschool aged children	12:00-1:00
Fiona McCrossin	Brian Hare	The effect of pair-housing on the aye-aye	12:00-1:00
Katherine Plevka	Scott Huettel	Athletes Report a Higher Likelihood of Engaging in Risky Activities than Nonathletes	12:00-1:00
Lindsay Rosenthal	Robert Thompson	Parents of Children with Chronic Illness: The Relationship Between Distress and Quality of Life	12:00-1:00
Aditi Sabhlok	Melanie Bonner	Caregiver Functioning and Child Adherence in Sickle Cell Disease	11:30-12:30
Jackson Scharf	David Rubin	Pre-Med Attrition: Personality and Memory Recall Predict Pre-Med Persistence	12:30-1:30
Emily Shroads	Makeba Wilbourn	Listen here!: Parents' use of prosodic highlighting in interactions with young infants	12:30-1:30
Hayley Trainer	Mark Leary	Personality Correlates of the Self-Presentational Use of Clothing in College Women	12:30-1:30

### *Humanities*

<i>Student</i>	<i>Advisor</i>	<i>Title</i>	<i>Time</i>
Andrew Kragie	Gerald Wilson	Moral Vision or Political Opportunism? Lyndon Johnson's Leadership for Civil Rights Legislation	12:30-1:30
Brittany Nanan	David Siegel	The Interaction of Counter-Terrorism with Human Rights	12:00-1:00
Alexis Pearce	Jose Maria Rodriguez-Garcia	An Armed Utopia: Literature, Human Rights, and Justice in 1970s Argentina and Chile	12:00-1:00
Laxmi Rajak	David Malone	Voicing the Unheard: An Examination of the School Experiences of Nepali Dalit Students	12:30-1:30
Nicole Rudden	Mark Antliff	Blood and Money: French Anti-Semitic Imagery in the Golden Age of Caricature	11:30-12:30
Tara Trahey	Sheila Dillon	Visualizing An Iconographic Network Between Athens and Vulci in the 6th Century B.C.E.	12:30-1:30
Sonora Williams	Sheila Dillon	Infant Mortality and the Decision to Care in Classical and Hellenistic Athens	12:00-1:00

## Biological Sciences

<i>Student</i>	<i>Advisor</i>	<i>Title</i>	<i>Time</i>
Umer Ahmed	Christopher Kontos	Regulation of Blood-Brain Barrier Permeability by Caskin2	12:00-1:00
Erik Bao	Richard Auten	Effects of Bronchopulmonary Dysplasia on LAT1 Expression in Neonatal Baboon Lung	12:30-1:30
Ethan Baruch	Emily Bernhardt	Not all pavements lead to a stream: variation in impervious surface connectivity affects urban stream ecosystems	12:30-1:30
Catherine Blebea	David Sherwood	Role of SPARC in Type IV Collagen Removal from the Basement Membrane in <i>C. elegans</i>	12:30-1:30
Hilary Bowman	Ahmad Hariri	From Genes to Behavior: The Role of Dopamine in Sexual Risk Behavior among Emerging Adults	11:30-12:30
Elizabeth Buckley	Mary Foster	Sequence and binding analysis of Goodpasture autoantibodies	11:30-12:30
Caitlin Cristante	Nina Sherwood	Characterizing Degeneration in Organisms Lacking Spastin	12:00-1:00
Aariel Dees	Leslie Digby	Factors Influencing Behavioral Thermoregulation Patterns in Lemurs	12:30-1:30
Patricia DeLacey	Anne Pusey	Mating behaviors and inbreeding avoidance in female chimpanzees	12:30-1:30
Samantha Emmert	Andrew Read	Characterizing bottlenose dolphin breath sounds	12:30-1:30
Stefanie Engert	Nina Sherwood	Induced Glial Protrusions and Synapse Morphology at the Larval Neuromuscular Junction in <i>Drosophila melanogaster</i>	12:00-1:00
Alexa Frink	Charles Nunn	Water preference as a mechanism for disease avoidance in lemurs	11:30-12:30
Anastasia Gazgalis	Christina Meade	Voxel Based Morphology Analysis: Neuroanatomical of Cocaine Usage in Humans	12:00-1:00
Vinay Giri	John Perfect	Transcription factors necessary for survival of <i>Cryptococcus</i> in the central nervous system	12:30-1:30
Ilhan Gokhan	Brenton Hoffman	The Role of the Cell Microenvironment in Mechanosensitive Signaling	11:30-12:30
Aruni Gunaratne	Joanne Kurtzberg	Cell Therapy and Remyelination of the Mouse Cerebellum Following Brain Injury	12:00-1:00

Victoria Haney	Paulo Ferreira	Neuroprotection of photoreceptor neurons by Ran-binding protein 2 upon photo-oxidative stress	11:30-12:30
Troy Huffman-Devey	David Sherwood	Critical Matrix Metalloproteinases Involved in Anchor Cell Invasion in <i>Caenorhabditis elegans</i>	12:00-1:00
Jaclyn Karasik	Ken Poss	Histone H3.3-based identification of active sequences in during regeneration in zebrafish	11:30-12:30
Borna Kassiri	Borna Kassiri	Comparative Responses to Distaste in Lemurs	12:30-1:30
Rebecca Kim	David Hinton	Impact of Endocrine-Disrupting Plasticizers on Medaka Fish Embryogenesis	12:00-1:00
Eric Lakey	Emily Derbyshire	Targeting Chorismate Synthase to Treat Malaria	11:30-12:30
Anastasia Lambrou	David Boyd	Influenza Pandemic Preparedness in Nepal: Simulation Modeling and Surveillance Mapping	12:00-1:00
Hillary Lee	Julie Teichroeb	Group Progressions in Vervet Monkeys: Leadership or Consensus?	12:00-1:00
Hui Yi Grace Lim	Dave Sherwood	Mapping Novel Anchor Cell Invasion Deficient Mutants in <i>C. elegans</i>	12:00-1:00
Mengyun Lu	Fan Yuan	Design of Parallel Carbon Plate Electrodes for Electro-Gene Delivery	11:30-12:30
Jennifer Margono	Blythe Williams	The effects of turnout compensation on foot pressure in classical ballet dancers	11:30-12:30
Emilie Melvin	Daniel Weintraub	Rivastigmine for Mild Cognitive Impairment in Parkinson Disease: A Placebo-Controlled Study	11:30-12:30
Alexander Merriman	Kenneth Poss	Identification of regeneration mutants by a forward genetic screen	11:30-12:30
Briana Mittleman	Mohamed Noor	Evolutionary Genetics of Male Sex Comb Variation and the Sex-Combs Reduced Gene in <i>Drosophila</i>	12:00-1:00
Simardeep Nagyal	Shelton Bradrick	Interferon- $\lambda$ 4 immunoprecipitates identifies nuclear and endomembrane interacting proteins	11:30-12:30
Jasmine Nee	Gerard Blobe	Combination therapy for treating neuroblastoma: effects of retinoic acid, ODSH, and MLN8237 differentiation and proliferation	12:30-1:30

Quang Nguyen	Sallie Permar	Env-specific Monoclonal Antibodies Isolated from Blood and Breast Milk of Chronically Infected African Green Monkeys	11:30-12:30
Hunter Nisonoff	Bruce Donald	A combined inverse rotamer and geometric hashing approach to design of LpxA peptide inhibitors	12:30-1:30
Se Eun Park	Paulo Ferreira	Rod Photoreceptor Degeneration Upon Selective Ablation or Impairment of Ranbp2	11:30-12:30
Bo Peng	Pelin Volkan	The chromatin remodeling protein Alhambra regulates sensory neuron differentiation in <i>Drosophila</i>	12:30-1:30
Samantha Perez	William Reichert	Promoting Elastin Production in Tissue-Engineered Blood Vessels by Inhibiting microRNA-29	11:30-12:30
Cassidy Pomeroy-Carter	Leslie Digby	Differential habitat-use as a thermoregulatory mechanism in lemurs	12:30-1:30
Vikram Ponnusamy	Joe Heitman	The Role of DNA Repair Genes in RNA-Mediated Silencing in <i>Cryptococcus neoformans</i>	12:00-1:00
Murphy Poplyk	Michael Lynch	Heterologous Biosynthesis of Salinosporamide Analogues	11:30-12:30
Sania Rahim	Charles Nunn	Understanding Pathogen Richness: Predicting Pathogen Richness in Squirrels	11:30-12:30
Sandy Ren	Paul Magwene	Multivariate Responses to Direct and Indirect Selection in Yeast	12:30-1:30
Gina Rhee	David Sherwood	Identifying Genes Required for Stem Cell Niche Morphology in <i>C. elegans</i>	12:00-1:00
Callie Roberts	Madan Kwatra	New Therapeutic Targets for Glioblastoma Expressing EGFRvIII	12:00-1:00
Ben Schwartz	Christine Wall	Molecular Analysis of Tooth Enamel Development in Primates	12:30-1:30
Michael Shih	Jennifer Roizen	Catalytically Induced Enantioselective Cyclopropanation Reactions	12:30-1:30
Arielle Shkedi	Christopher Nicchitta	Trafficking of Newly Exported Ribosomes	12:30-1:30
Shilpa Sridhar	Steven Churchill	Geometric methods of body mass estimation in small-bodied hominins	12:00-1:00
Kelly Suchman	Angel Zeininger	Evolutionary Basis for Sex Differences in Locomotor Biomechanics	12:30-1:30

Chandra Swanson	Chandra Swanson	Effects of stress on individual variation in reproductive function of female chacma baboons	11:30-12:30
Sherry (Yunqian) Tang	Eric Spana	Linking the folded phenotype to genetic legions	11:30-12:30
Ha Tran	Marc Caron	Interactions of early life stress with brain serotonin deficiency or adult psychosocial stress:	12:30-1:30
Victoria Treboschi	Gerard Blobe	TGF- $\beta$ signaling in pancreatic stellate cells induces chemoresistance and epithelial-to-mesenchymal transition in pancreatic cancer cells	12:00-1:00
Kevin Vo	Doug Boyer	Functional/Adaptive Implications of the Metacarpophalangeal Joint in Primates and Their Relatives	11:30-12:30
Grace Wang	Emily Derbyshire	Heat shock protein 90 in Plasmodium falciparum as a novel drug target for malaria treatment and prevention	11:30-12:30
Nicole Wayne	Michael Platt	Neural Basis of Decision Making: Rhesus Macaque mSTS, Human TPJ, and the Applications of TMS	12:30-1:30
Sonora Williams	Marc Caron	A Mouse Behavioral Model System of the Adverse Early Life Environment Associated with Suicidality	12:00-1:00
Michelle Wu	Neil Spector	Estrogen receptor and human epidermal growth factor receptors in mediating resistance to Tamoxifen in ER <sup>+</sup> breast cancer	11:30-12:30
Benjamin Xing	Sharyn Endow	A Phylogenetic Analysis of Mklp2 as a Kinesin-6 Motor	12:00-1:00
Sangwon Yun	Anthony Sung	Fibrinogen-Coated Albumin Nanospheres as a Treatment for Thrombocytopenia	12:30-1:30
Roger Zou	Dan Kiehart	Forces from the Amnioserosa are Sufficient to Drive Dorsal Closure in Drosophila	12:30-1:30

### *Physical, Quantitative, and Engineering Sciences*

<i>Student</i>	<i>Advisor</i>	<i>Title</i>	<i>Time</i>
Arielle Brackett	Jennifer Roizen	Selective Palladium-catalyzed Suzuki-Miyaura coupling of 2,6-dihalopyridine	12:00-1:00
David Builes	Richard Hodel	The Large Cardinal Hierarchy and its Consequences	11:30-12:30

Jordan Forte	Amanda Hargrove	Fluorescent Ribonucleoside Phosphoramidite for Identifying Inhibitors of TAR-Tat in HIV	11:30-12:30
Connor Hann	Joshua Socolar	Growth of Icosahedral Quasicrystals	12:30-1:30
Amy Huang	George Dubay	Determining the organic composition of samples through GC-MS, SPE, and HPLC-MS analysis	11:30-12:30
Virginia Isava	Alan Boudreau	Garnet zoning and the metamorphic history of Great Smoky Mountains National Park,	12:30-1:30
Jonathan Litvak Jeger	Steven Malcolmson	Regioselective Functionalization of Alkenes through Molecular Recognition Catalysis	12:30-1:30
Stephanie Jensen	Qiu Wang	Synthesis of Aminoarene Pharmacophores Towards Novel Antipsychotics	12:00-1:00
Anna Knight	Cameron 'Dale' Bass	Detection of Pain-Associated Spinal Injuries <i>in vivo</i> : microCT Imaging and Acoustic Emissions	12:30-1:30
Cathy Li	Daniel Gauthier	Spatial-temporal Chaos in Nonlinear Optical System	12:00-1:00
Abigail Lin	Alexander Hartemink	Integrating biology into a machine-learning framework to predict gene expression from promoter sequences	12:30-1:30
Ching Ying Lin	George Dubay	Analysis of Ancient Sicilian Pottery Shards by HPLC-MS, GC-MS, IRMS, and PCA	11:30-12:30
Kathleen Marsh	Danielle Gorka	Phytotoxicity of Copper Nanowires to <i>L. multiflorum</i>	12:00-1:00
Katrina Miller	Phillip Barbeau	A Recoil Tracking Detector Capable of Infrared Optical Readout	12:30-1:30
Zanele Munyikwa	Zanele Munyikwa	Compositional Approaches to Document Level Sentiment Analysis	11:30-12:30
Cody Parrott	Jennifer Roizen	Novel Thioaryl Cross Coupling Reactions	11:30-12:30
Deepak Sathyanarayan	George Truskey	CFD-Guided Investigation of Corneal Biomechanics in Microgravity	12:30-1:30
Matthew Tyler	David Dunson	Shared Kernel Nonparametric Bayes Bi-Testing	12:00-1:00

## VISIBLE THINKING 2015

### Abstracts in Alphabetical Order

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**Emma Achola, Hannah Morris, Chloe Warnberg**

***Neighborhood to Brain***

Research Advisor: Candice Odgers, Public Policy

Understanding how and why social context and environmental triggers affect health and health behaviors in daily life is important for providing effective interventions. Researchers often must make a choice between collecting data in a highly controlled lab setting or asking respondents to provide subjective reports of their daily lives. With the introduction of new technologies, we now have the opportunity to better integrate real-life into laboratory studies and to better integrate laboratory technologies into real life. Our poster will focus on two studies: one in which we used new technologies to enhance an FMRI laboratory study and a second study using new technologies to collect high quality objective reports of health behaviors outside of the laboratory. The first project involved using GPS to map the activity spaces of study participants. Using that data, we were able to use google-street view to gather pictures of tobacco advertising along the activities spaces. This information gathered from their daily environments were then shown to participants in an FMRI in the lab allowing researchers to measure the response to those familiar images in smoking participants' brains. In the second project, we used technology to better assess health behaviors in daily life. After extensive researching and testing of multiple wireless activity sensors that measured sleep and activity, we selected the Basis Peak watch to embed in an Ecological Momentary Assessment (EMA) study of low-income adolescents. After piloting the watch ourselves, we partnered with the UNC Biobehavioral Lab to test the validity of the Basis Watch against traditional laboratory sleep tests. Through embedding a wireless sensor into an EMA study, we are able to collect objective sleep data instead of relying on self-reports. Our poster will explain how our use of wireless sensors and new technologies are able to better bring the real-world into laboratory studies.

*Bass Connections, 12:00-1:00*

**Umer Ahmed**

***Regulation of Blood-Brain Barrier Permeability by Caskin2***

Research Advisor: Christopher Kontos, Pharmacology & Cancer Biology

The blood-brain barrier (BBB) is formed by capillary endothelial cells (EC) that form tight junctions, which act as a highly selective permeable membrane that limits the entry of blood-borne molecules. Caskin2 is an uncharacterized scaffolding protein that has been identified as an interactor of the endothelial receptor tyrosine kinase, Tie1, which plays a crucial role in the vascular integrity. Data generated by our lab indicate that Caskin2 plays a role in EC quiescence, which is an important aspect of normal EC function. We hypothesize that Caskin2 is involved in maintaining the barrier function of the BBB. To test this hypothesis, we used a transwell permeability assay using a monolayer of bEND.3 cells as a BBB model. We used lipopolysaccharide (LPS), a known permeability-inducing factor, to disrupt the integrity of the cell monolayer. We predicted that overexpression of Caskin2 in cells treated with LPS would inhibit LPS-induced permeability. Understanding the role of Caskin2 in regulating EC function in general and vascular permeability in particular may shed light on BBB permeability, which may assist in developing treatments for diseases that cause disruption of BBB barrier function.

*Biological Sciences, 12:00-1:00*



**Ada Aka**

***Improving Reading Comprehension Using Retrieval to Enhance Content Knowledge***

Research Advisor: Elizabeth Marsh, Psychology and Neuroscience

Reading comprehension is a fundamental skill and improving it would be beneficial for students. Prior knowledge (the total knowledge an individual has as of now) is an important factor that influences reading comprehension because having information related to the content of a passage or knowing the definition of the vocabulary words, facilitates understanding of the passage. In our study, we developed an intervention using retrieval as a tool to target prior content knowledge, with the goal of supporting reading. Participants engaged in one of the three activities before reading a passage: retrieving concepts required to comprehend the passage, only studying these concepts, or not engaging in any activity. We hypothesized that participants who retrieve the content knowledge with testing will outperform other participants in a final reading comprehension test. Some individual difference measures such as structure building (creating mental representations and models to understand a narrative) may also influenced these results by helping participants comprehend the passage better or not. In the future, findings of the study may have strong positive influences in classrooms.

*Social Sciences, 12:00-1:00*

**Natalie Allen**

***The Value of Personal Values: Examining Well-being in College Students***

Research Advisor: Mark Leary, Psychology and Neuroscience

The present study investigated the role of value priorities in the transition into college. Schwartz's Theory of Values has identified 10 universal human values that exist across cultures. Research has shown that people's value priorities are related to their well-being. This finding is particularly relevant when people's ranking of values is incongruent with the value hierarchy of their immediate environment. This study assessed how value priorities and value incongruence, related to well-being in college freshman as they transition into the college environment. Results showed a lack of support for the idea that certain values are consistently detrimental to well-being. However, Benevolence was consistently associated with positive outcomes. Furthermore, value incongruence was associated with a greater frequency of interpersonal conflict, positive feelings of fit and value at the university, and patterns of harmful alcohol use. These findings support the notion that some values are more beneficial to well-being than others. Additionally, results suggest the importance of the environment to the impact of values.

*Psychology GwD, 12:00-1:00*

**Sophie Alman, Min Tong Cai**

***Heuristics for Judging Truth***

Research Advisor: Elizabeth Marsh, Psychology and Neuroscience

What makes a statement more believable? We examined young and older adults' use of two different heuristics for judging truth. In one study, we tested age-related differences in the illusory truth effect, where repeated statements are easier to process (i.e., more fluent), and thus appear more truthful, than new statements. We investigated whether knowledge about a statement differentially "protects" older adults from the potentially misleading influence of fluency. Contrary to our hypotheses, both age groups demonstrated a protective effect of knowledge (i.e., smaller illusory truth effect for known than unknown statements). In another study, we attempted to explain the truthiness effect, where pairing an irrelevant picture with a statement increases its apparent truth, in young adults. Fluency has been proposed as the mechanism for this heuristic, but we hypothesize that a picture may increase the subjective sense of the "quantity of evidence" or encourage people to elaborate on the statement. We identified a nominal trend supporting a quantity of evidence account, where young adults' bias to respond "true" increased with more pictures. We plan to replicate this experiment in an older sample and conduct a direct test of the elaboration account by manipulating the relationship among pictures. These data shed light on how two "rules of thumb" differ, as well as suggest ways to protect people from accepting false claims.

*Bass Connections, 12:30-1:30*

**Erik Bao**

***Effects of Bronchopulmonary Dysplasia on LAT1 Expression in Neonatal Baboon Lung***

Research Advisor: Richard Auten, Duke Department of Pediatrics-Neonatology

Bronchopulmonary dysplasia (BPD) is an inflammatory lung disorder common in premature infants. Inhaled nitric oxide (iNO), which induces pulmonary vasodilation and blocks inflammation, is currently being investigated for prevention of bronchopulmonary dysplasia in neonates. iNO reacts with endogenous L-cysteine (L-Cys) in the alveolar lining fluid to form S-nitrosothiol (SNO)-L-cysteine (CSNO), which can then enter cells via the L-type amino acid transporter (LAT). Inhaled NO effects may be opposed by decreased SNO uptake if LAT1 function is impaired. baboons with BPD symptoms and that this impairs CSNO transport. Using the 125d and 140d gestation baboon models of BPD developed by J. Coalson and colleagues, we sought to determine the cellular expression of LAT1 in gestational controls (n = 10) compared to animals with BPD. Paraffin-fixed lung sections obtained from the Southwest National Primate Research Center were labeled using immunohistochemical approaches. LAT1 labeling was identified using a mouse monoclonal anti-human LAT1. Smooth muscle was identified using anti- $\alpha$  smooth muscle actin, and alveolar type 1 epithelium was identified using anti-aquaporin 5. Labeling was detected using both fluorescent secondary antibodies and through signal amplification. Control lung tissue expressed LAT1 in the same places as in healthy rat and mouse lungs: on the surface of type I epithelium, along the endothelial lining of vessels and arteries, and in type II cells. In the 125d gestation animals, baboons treated with 6 days of hyperoxia exhibited increased LAT1 expression, while those treated with 14 days of hyperoxia had decreased LAT1 expression compared to controls. In the 140d model, LAT1 expression was markedly decreased in the BPD animals, particularly in the alveolar epithelial cells lining distal air spaces. Experimental BPD in newborn baboons impairs LAT1 expression in alveolar epithelium. This study on a nonhuman primate model agrees with our previous findings in the rat, suggesting that loss of functional LAT1 could impair SNO uptake in alveolar and vascular cells and therefore impair the potential efficacy of inhaled NO.

*Biological Sciences, 12:30-1:30*

**Ethan Baruch**

***Not all pavements lead to a stream: how variation in impervious surface connectivity affects urban stream ecosystems***

Research Advisor: Emily Bernhardt, Biology

Watershed urbanization leads to chemical and thermal pollution of urban streams and significant declines in aquatic biodiversity. However, most studies have focused on variation in total impervious surface cover (ISC) as the primary variable driving urban stream degradation. I asked instead whether the connectivity of ISC within watersheds alters its impact. I compared seven streams in NC draining watersheds with similar development intensity (ISC 7-14%) but highly variable subsurface (pipe density 1.1-6.9 km/ha) and surface (road density 5.7-10.9 km/ha) connectivity. Across these streams I measured remarkable variability in the duration of increased stream level after a precipitation event (10-45 hours), variance in water temperature (2.21-6.24 °C), and number of macroinvertebrate taxa (11-22). I also found that tissue concentrations of copper, lead, and zinc in several taxa (Cambaridae, Tipulidae, and Hydropsychidae) were correlated strongly with pipe and road densities, but not ISC. Finally, I found that water quality as determined by macroinvertebrate community composition was correlated with watershed connectivity. These results suggest that the connectivity of ISC may drive considerable variation in the magnitude of ecosystem degradation associated with the same level of watershed development.

*Biological Sciences, 12:30-1:30*

**Martha Berg**

***Depression as a mediator of the relationship between sexual trauma and substance-related coping behaviors in drug users***

Research Advisor: Christina Meade, Global Health

Substance use, particularly that of methamphetamine or ‘tik,’ is a growing problem in the Western Cape of South Africa, and has been associated with negative outcomes for individuals, families, and communities. The goal of this study was to identify psychological predictors of drug use, in order to recommend new intervention methods. Individual self-report measures were collected from drug users seeking treatment at rehabilitation centers in two townships in the Western Cape. The data revealed that participants with a history of sexual trauma were significantly more likely to use substances for the purpose of coping. Since the sample included only drug users, this suggested that victims of sexual trauma were likely to have become users primarily for the purpose of coping. Sexual trauma victims who additionally reported symptoms meriting a diagnosis of major depression were at even greater risk of coping with drug use. In the proposed pathway, as shown through univariate and bivariate logarithmic regression models, major depression acted as a mediator in the relationship between sexual trauma and substance-related coping. Although further research is needed in order to establish this causal pathway, the data indicated targeted depression treatment as a possible method of reducing substance-related coping in victims of sexual trauma.

*Psychology GwD, 11:30-12:30*

**Logan Beyer**

***Updated Methodologies and Preliminary Data Analysis of Sensory Over-Responsivity in Children with Autism***

Research Advisor: Karen Murphy, Psychology and Neuroscience

Forty percent of children with autism spectrum disorder (ASD) are also diagnosed with anxiety, a comorbidity that is associated with augmented impairments in social functioning and poorer academic outcomes. However, despite the prevalence of anxiety and its many detrimental effects, little is currently known about early childhood risk factors for the development of anxiety with ASD. The most promising current model postulates a causal relationship between childhood sensory over-responsivity (SOR) and the development of anxiety. Specifically, it is proposed that an overreaction to an individual stimulus may be generalized to the environment over time via context conditioning, leading to the eventual development of anxiety in children with SOR. In order to test this theory, it is necessary to first establish a sound methodology with which to operationalize sensory sensitivity. The purpose of this research was to investigate the suitability of the paired click paradigm task as a measure of auditory SOR in preschool-aged children with ASD, and to determine its relationship to other measures of sensory over-responsivity. In the standard administration of the task, study participants watch a silent movie during the ERP session. In order to make the task more suitable for the study population, an alternative version was piloted, in which participants were allowed to watch a low volume cartoon while the ERP data was collected. It was hypothesized that this additional background noise would not disrupt the quality of the P50 ERP. Preliminary data in 2 adults show that, while there is attenuation of the overall P50 signal when the participant watches the low-volume cartoon, the relative differences in P50 ERP signals between the first and second clicks is unchanged. These findings will be further substantiated with additional data collection next year, but together provide sound evidence for the feasibility and utility of the paired click paradigm in continued studies of SOR in preschool-aged children with ASD.

*Social Sciences, 11:30-12:30*

**Catherine Blebea**

***Investigating the Role of SPARC in Type IV Collagen Removal from the Basement Membrane in *Caenorhabditis elegans****

Research Advisor: David Sherwood, Biology

The extracellular matrix glycoprotein SPARC (secreted protein acidic and rich in cysteine) is a highly conserved protein that has been shown to be involved in many biological processes such as cell proliferation and migration and misregulated in many cancers. Anchor cell invasion during *Caenorhabditis elegans* larval development provides an in vivo model to study SPARC function during cell invasion. During anchor cell invasion, SPARC localizes to the basement membrane (BM), a specialized sheet-like form of extracellular matrix and one of the main barriers for cell invasion. A critical structural component of BM is a highly cross-linked polymeric network of type IV collagen. SPARC has been shown to directly bind to type IV collagen, suggesting SPARC may regulate cell invasion by modulating type IV collagen in the BM. Previous work in the Sherwood lab has shown that overexpression of SPARC in *C. elegans* promotes cell invasion and significantly decreases the amount of type IV collagen in the BM. Collagen and SPARC also colocalize within an unknown class of vesicles within the body wall muscles at the site of SPARC and collagen production. To characterize the mechanism by which SPARC regulates collagen levels, we have constructed strains containing fluorescent markers for SPARC and for multiple different vesicle classes. We observed that SPARC colocalizes with two distinct markers for the recycling endosomes. This suggests that SPARC overexpression leads to an increase in collagen recycling or removal from the BM. To further examine the role of SPARC, we expressed SPARC tagged with a fluorescent reporter under a neuronal promoter. This experiment allowed us to observe the impact of an increase in extracellular SPARC on the BM, as SPARC is primarily produced by the muscle cells in wild type worms. Under these conditions, the amount of type IV collagen in the BM was reduced to comparable levels as seen in SPARC overexpression. This indicates that extracellular SPARC reduces collagen levels and further illustrates that SPARC facilitates the recycling of collagen from the BM.

*Biological Sciences, 12:30-1:30*



**Hilary Bowman**

***From Genes to Behavior: The Role of Dopamine in Sexual Risk Behavior among Emerging Adults***

Research Advisor: Ahmad Hariri, Psychology and Neuroscience

Young adults and adolescents account for half of all new sexually transmitted infections (STIs) as well as a quarter of new HIV infections, representing a significant public health burden. Broadly, the Duke Neurogenetics Study seeks to understand how individual variability in genetic markers and brain function impact how we interact with the world. In our study, we used a multilocus genetic profile of polymorphisms associated with dopamine (DA) transmission to understand how individual variability in dopamine signaling moderates the relationship between brain function and sexual risk behavior. While we hypothesized that greater DA signaling would be associated with greater sexual partners when coupled with high ventral striatum activity and low amygdala reactivity, our results suggest that higher levels of DA signaling are actually more critical when VS activity is low and amygdala activity is high. Furthermore, our results suggest that increased DA signaling and basolateral amygdala activity may represent an increase in sensory input into the corticostriatal circuit, ultimately driving an increase in reward-seeking or motivational behavior. In all, this study adds new insights into the neurobiological mechanisms underlying sexual risk behavior.

*Biological Sciences, 11:30-12:30*

**Arielle Brackett**

***Selective Palladium-catalyzed Suzuki-Miyaura coupling of 2,6-dihalopyridine***

Research Advisor: Jennifer Roizen, Chemistry

The Suzuki-Miyaura cross-coupling reaction is an efficient method of carbon-carbon bond formation that allows access to fine chemicals, pharmaceutical agents, and agrochemical products. Generally defined as a palladium-catalyzed cross-coupling between an organoboron reagent and an organic halide, the Suzuki-Miyaura coupling is particularly useful as it employs mild reaction conditions, tolerates a broad range of functional groups, and has reduced toxicity. Nevertheless, efficient cross-coupling reactions of 2,6-dihalopyridines with alkyl-boranes have not been reported, limiting current access to important pyridyl pharmacophores. Here we report a novel methodology for the Suzuki-Miyaura cross coupling of alkylborane pinacol esters with 2,6-dihalopyridines that exhibits selectivity for 2-halo-6-alkylpyridine or 2,6-dialkylpyridine products. Additional highlights include enhanced stability and easier accessibility of the starting alkylborane pinacol ester and avoidance of alkyl isomerization products. The present methodology may be extended for use with other nitrogen-containing heterocycles, thereby facilitating the synthesis of a variety of both synthetic and naturally occurring compounds of pharmaceutical, agricultural, or commercial interest.

*Physical & Quantitative Sciences, 12:00-1:00*

**Rebecca Brenner**

***Ethical issues of treating children with ADHD Medication: Implication of high rates of misdiagnosis***

Research Advisor: Walter Sinnott-Armstrong, Cognitive Neuroscience

There is significant evidence that Attention Deficit Hyperactive Disorder (ADHD), a disorder characterized by inattention and hyperactivity, is commonly misdiagnosed in children. Since the most prevalent treatment for ADHD is stimulant medications such as Ritalin, misdiagnosis creates a situation where children both with ADHD and without ADHD are given powerful stimulants. Ritalin has not been well characterized in children without ADHD and may be differentially harmful to these children. When weighing the risks and benefits of medication, legal guardians should consider a scenario in which their child was misdiagnosed with ADHD. The poster provides an ethical framework for making medical decisions regarding ADHD medications that takes into account the relevant risks and benefits to the child given the possibility that children may be incorrectly diagnosed. The framework also accounts for other ethical issues such as giving medications at young ages (<4 yrs.) and the potential personality changing aspects of ADHD medications.

*Bass Connections, 12:00-1:00*

**Rebecca Brenner**

***Effects of Acute Methylphenidate on Risk-Taking and Sociability in Adult Zebrafish (Danio Rerio)***

Research Advisor: Ed Levin, Neurotoxicology

Non-prescription use of methylphenidate (Ritalin®), a drug that treats Attention Deficit Hyperactive Disorder (ADHD), is increasing. Methylphenidate is becoming more widely used, especially among college students, because it increases concentration and promotes wakefulness. However, the acute effects on risk-taking and sociability in non-ADHD populations are not well characterized. Zebrafish offer an ideal model system because if behavioral affects are observed, it is easy to study the mechanisms underlying this behavior. Zebrafish have cellular reporter systems, continuous visual access and molecular interventions to help determine critical mechanisms underlying neurobehavioral teratogenicity. Thus, we examined whether the behavior of adult zebrafish changed in response to 30 minutes of exposure to a low, medium or high dose of methylphenidate (2-mg/L, 4-mg/L, 8-mg/L). The zebrafish had impaired behavioral function after being dosed with methylphenidate. In a predator avoidance paradigm, 4 and 8-mg/L of methylphenidate caused less fleeing behavior than control fish in response to a threat stimulus. A social shoaling task revealed that the methylphenidate significantly decreased locomotor response to the social stimulus compared to controls. Importantly, these two results indicate that acute methylphenidate causes an increase in risk taking behavior and a decrease in sociability in adult zebrafish.

*Bass Connections, 12:00-1:00*

**Dylan Brown, Ryder Quigley, Isaac Fraynd, Dylan Brown**  
***Using Flare Gas to Power Fedex***

Research Advisor: Emily Klein, Earth and Ocean Sciences

This project group is developing a case study to analyze the feasibility of using flare gas to power FedEx fleet vehicles in Stark County, North Dakota. The business plan includes using raised capital funds to purchase a warehouse capable of servicing FedEx and renting this facility out to them for a fixed period of time. Tankers would carry the compressed flare gas from the designated well sites to the warehouse distribution center, which also serves as a fueling station hub and FedEx processing warehouse. Profits would accumulate as a result of the set rental premium over the term of the contract, and costs would include the benefits we give FedEx to encourage them to use this facility (e.g. free fuel).

*Bass Connections, 12:30-1:30*

**Elizabeth Buckley**

***Sequence and binding analysis of Goodpasture autoantibodies***

Research Advisor: Mary Foster, Medicine - Nephrology

Goodpasture syndrome is a human autoimmune disease that attacks the alpha3(IV) collagen protein, found in both the lungs and the kidneys. There has been little success in isolating and characterizing the autoantibodies from patients with this disease. I wish to investigate the DNA and deduced amino acid sequences of human antibodies that bind to alpha3(IV)NC1 collagen, and determine whether they bind to similar or different epitopes than do patients' antibodies. Through human hematopoietic stem cell injection into NSG mice, followed by alpha3(IV)NC1 collagen immunizations and subsequent immortalization of B cells, we isolated human B cells that express anti-alpha3(IV)NC1 collagen antibodies. I subsequently subcloned and sequenced the heavy and light chains of seven of these monoclonal human autoantibodies, using RNA extraction, cDNA synthesis, and polymerase chain reactions. I analyzed sequences and gene origins using software to determine if there are common features among these sequences that may predispose to alpha3(IV)NC1 collagen binding. I determined that the seven antibodies were derived from at least six diverse clones, and are essentially unmutated. This indicates that production of antibodies that bind to alpha3(IV)NC1 does not require mutation from the pre-immune repertoire of humans. Additionally, biased use of several gene segments was observed, and each antibody heavy chain had a rare long to extremely long complementarity determining region3 (CDR3), which may imply binding to a common specific structural component of alpha3(IV)NC1 collagen, such as a hydrophobic pocket. Assessment of epitope binding specificities of these antibodies through inhibition enzyme-linked immunosorbent assays (ELISAs) is ongoing.

*Biological Sciences, 11:30-12:30*

**Kristen Buehne, Allison Goldsmith, Burcu Ozler, Sarah Jones**  
***Examining a Music-based Therapy for Children with Disabilities in***  
***Durham Public Schools***

Research Advisor: Geraldine Dawson, Psychology and Neuroscience

This study is designed to assess the efficacy of the Voices Together Music Therapy for improving social and communication skills among elementary school age children diagnosed with an autism spectrum disorder or other developmental/intellectual disabilities. Research in the field of music therapy is limited to small sample sizes or case study reports and often lack in detailed reporting of therapy procedure. Some of the greatest challenges that people with intellectual and developmental disabilities face are in the areas of communication and social/emotional skills; with improvement in these skills, people can become more active participants in their classrooms and families. The Voices Together method combines an engaging music-based structure with evidence-based educational and specialized therapeutic techniques. The study uses a randomized controlled study design, taking place over about 15 weeks. Thirty-three students from four different classrooms within the Durham Public School System are participating. It is predicted that students will show a greater increase in communication, social, and emotion-regulation skills after receiving the Voices Together music therapy, as compared to education as usual. Communication and social/emotional skill is being assessed at three time points using a teacher rating scale and direct observation by Duke undergraduate students and research staff. A coding system was developed to capture participant communication and affect during observation. A mixed ANOVA will be used to determine the results of the study.

*Bass Connections, 12:30-1:30*

**David Builes**

***The Large Cardinal Hierarchy and its Consequences***

Research Advisor: Richard Hodel, Mathematics

Large Cardinals, which are ordinals which are so large that their existence is unprovable from the standard ZFC axioms, play several distinct roles in the mathematical study of set theory. In this project, the main element of study is to the extent to which large cardinals reduce the independence phenomenon in set theory. There are both classic results of this form, for example the proof that the existence of measurable cardinals imply that the set theoretic universe is not constructible, and there are exciting modern results, for example the result that infinitely many Woodin cardinals imply that projective sets of reals are measurable. This project seeks to motivate the existence of large cardinals on the basis of philosophical principles such as reflection and maximization and to prove some of the major classical and modern results while trying to establish just how far large cardinals can reduce independence in ZFC, with an eye towards the famous Continuum Hypothesis.

*Physical & Quantitative Sciences, 11:30-12:30*



**Zoe Bulger**

***Understanding Resilience Across Internal, Social, & Community-Level Resources***

Research Advisor: Eve Puffer, Psychology and Neuroscience

Resilience-based approaches to public health offer a promising means of improving quality of life for individuals and communities facing adversity. Yet, while it is increasingly argued that resources of various levels (e.g. internal, social, and community) can support resilience, few studies have taken a multi-level, empirical approach to understanding resilience. This paper identifies key internal, social, and community-level resilience resources and the pathways across these levels, using a case study of rural and regional Australians (N = 2,389). The rural Australian experience is characterized by frequent demographic, economic, and environmental changes, rendering regional and rural Australians an ideal population within which to study resilience processes. Subjective wellbeing was taken as an outcome of resilience processes and scales for four resilience resources — mastery (internal), optimism (internal), personal belonging (social), and community spirit (community) — were identified and developed using exploratory factor analysis. Hierarchical multiple regression supported the use of path modeling to describe relationships across resilience resources and wellbeing. The final path model reveals that each resilience resource plays a significant, distinct role in determining subjective wellbeing. Specifically, optimism, mastery, and belonging each make direct and indirect contributions to wellbeing while community spirit indirectly contributes via pathways mediated by belonging and optimism. The analysis thus empirically demonstrates that resilience resources act in complex pathways across internal, social, and community levels. Future strategies aiming to promote resilience and wellbeing should consider how resources acting across these levels contribute to an individual's capacity to successfully address adversity and capitalize on opportunities

*Psychology GwD, 11:30-12:30*

**Lexia Chadwick**

***The Yellow: Party Hostels And The New Community Norm***

Research Advisor: Zoila Airall, Education

The purpose of this research was to reveal the attitudes and behaviors that emerged as solo travelers from culturally Western nations (US, Western Europe, Australia, etc.) arrived at a popular party hostel called The Yellow. An ethnographic approach was taken to collect data. This data collection included interviews with hostel guests and staff members, and close observations of the hostel environment as well as the behavior of some guests while in party environments outside of the hostel. This research demonstrates that solo travellers tend to abandon community norms and "group think" instated by their home communities that would otherwise be maintained. This research is limited by the brief length of time spent at the hostel collecting data; more time would allow a more nuanced understanding of the hostel and the behavior of its guests. This research is also limited by a lack of comparison to other party hostels, which promise to provide a similar atmosphere. If other hostels were observed, it would be more clear whether or not The Yellow was unique in how it influenced its guests' behavior or if other party hostels had similar effects. Understanding the community norms and group think behaviors that culturally Western travelers choose to abandon is important in understanding the group mentality of Western nations, and the role societal constraints play in lived experiences. There is little research documenting party hostels and their behavioral effects on guests. Further research is needed to understand the extent to which party hostels affect behavior and its relationship to community norms and group think.

*Social Sciences, 12:30-1:30*

**Becky Chao**

***English as Capital: Language Policy in China and Migration to the U.S. for ESL Study***

Research Advisor: Gareth Price, Linguistics

A significant number of students from China are temporarily migrating to the U.S. to enroll in English as a Second Language (ESL) programs. This study uses data collected through electronic surveys and phone interviews with ESL students from China and ESL instructors and program administrators in the U.S. to examine the motivations for why students are compelled to invest such a substantial amount of resources in time and money to embark on such an endeavor. Using Bourdieu's theory of capital, globalization, and the spread of English, English proficiency acquired through U.S. immersion may be understood as a form of cultural capital highly valued in China for its being taught by a native speaker of English and its role as an asset in gaining access to better schools in the U.S. and in China and better employment opportunities. Through neoliberalism, English may be understood as less of a choice and more of a necessity if Chinese students wish to improve their academic and career prospects. U.S. student visa regulations, however, stand in direct juxtaposition to the "free movement and open borders" advocated by neoliberalism and globalization, and restrict access to this highly valued form of capital. Finally, while the pursuit of English proficiency through enrollment in U.S. ESL programs may be in large part instrumental, filial piety—the idea in Chinese culture that children must do their best to please and respect their elders, especially parents—also factors largely in Chinese students' motivation to pursue ESL study in the U.S.

*Social Sciences, 12:00-1:00*

**Jeremy Clift**

***Chimpanzees' Processing of Hierarchies: A Comparison between Social and Nonsocial Stimuli***

Research Advisor: Brian Hare, Evolutionary Anthropology

The evolutionary pressures that produced intelligence remain debated. Most hypotheses have proposed either social or nonsocial pressures as the driving force of cognitive evolution. Social hypotheses suggest that intelligence arose in response to the challenges presented by group living, while nonsocial hypotheses typically posit that this advancement is rooted in managing complex foraging demands. Previous work has used comparative studies to identify relationships between intelligence levels and factors of social and nonsocial domains. In the present study, we examined within a single species, the chimpanzee, whether this ability is better adapted for processing either social or nonsocial hierarchical information. The ability to reason about hierarchical information is a key cognitive ability in both the social and nonsocial domain. Using touchscreens, chimpanzees participated in studies that assessed their knowledge of hierarchies. In the first study, we assessed subjects' ability to make inferences regarding the rank of a new member to a known hierarchy. In the second study, we assessed how quickly subjects could learn the new individual's relationship to the existing members of the hierarchy. The results support our hypothesis that chimpanzees are better adapted for processing social hierarchical information, lending support to the social intelligence hypothesis.

*Psychology GwD, 12:00-1:00*

**Clara Colombatto**

***The Social Memory Effect: Enhanced Recognition for Objects  
Designed by Other Minds***

Research Advisor: Scott Huettel, Psychology and Neuroscience

Mentalizing is a crucial component of social behavior: considering and perhaps understanding others' thoughts, beliefs, intentions, and other mental states supports most of our interpersonal interactions, including cooperation and understanding. We rapidly infer beliefs and emotions from the appearance and behavior of other people, and we even instinctively attribute human attitudes to inanimate objects such as dots, geometrical shapes, and music. While a robust literature has shown that information about others is particularly salient in perceptual processing, our ability to store in memory and subsequently recall such information is still unclear. In order to compare objects containing social and non-social information, we collected a series of license plates, which contain patterns either randomly created by a computer or intentionally designed by another person. Based on previous evidence that social information is preferentially processed, we hypothesized that participants would show improved recognition memory for patterns believed to be designed by other agents. We demonstrate improved recognition accuracy for plates containing patterns previously judged by the participant as "personalized" and for plates randomly labeled by the experimenter as "personalized". These results provide the first evidence of enhanced recognition for items perceived as containing information about others' intentions and beliefs, and suggest a preferential storage mechanism for social information.

*Psychology, 11:30-12:30*

**Kaitlyn Corey**

***The Perception of Alcoholic Drink Sizes In College Students***

Research Advisor: Timothy Strauman, Psychology and Neuroscience

Background: Small studies have shown that college students are unaware of the amount of alcohol in a standard drink and overpour their drinks, thereby underestimating the amount of alcohol they consume and underreporting their drinking levels. The standard drink size is 12 oz of beer, 5 oz of wine, and 1.5 oz shot of 80-proof spirits ("hard liquor"). Methods: We investigated how college students perceive a standard drink in a social setting and whether there are gender differences in the volume poured. Male and female undergraduates reported their drinking behavior and poured their perceptions of a standard can of beer, glass of wine, and shot of liquor at fraternity and sorority functions. Results: A total of 80 subjects (40 M; 40F) were enrolled. There were highly disparate amounts of alcohol consumed by self-report as well as that poured to estimate standard drink sizes. Males consumed more total drinks in the previous 2 weeks (24.8 vs. 14.6,  $p < 0.05$ ), and a higher nightly maximum number of drinks (9.53 vs. 5.90,  $p < 0.05$ ) than females. Both genders underestimated standard drink sizes for beer, but overestimated standard drink sizes for wine and liquor (beer;  $11.12 \pm 2.01$  oz.; wine  $6.03 \pm 1.46$  oz.; liquor  $1.93 \pm 1.86$  oz.). Males poured more than females for beer (11.55 vs. 10.68 oz) and wine (6.50 vs. 5.57 oz;  $p < 0.05$  for both). Conclusion: These gender differences have implications for targeted education and intervention programs that address alcohol use and abuse in young adults.

*Psychology GwD, 12:00-1:00*

**Caitlin Cristante**

***Characterizing Degeneration in Organisms Lacking Spastin***

Research Advisor: Nina Sherwood, Neuroscience

Spastin, a microtubule-severing protein, is mutated in autosomal dominant spastic paraplegia and is classically considered a neurodegenerative disease. Degeneration, however, can be classified by whether it follows the process of Wallerian degeneration, which is a "program" for degradation of the injured axon. The Wlds mutation in drosophila slows the process of Wallerian degeneration, allowing changes in neuronal appearance to be analyzed as the axon dies, and is therefore useful in genetic crosses. Thus, if the degeneration seen in spastin deletions follows the Wallerian pathway, combining the Wlds and spas5.75 mutations will alter axonal morphology from the spastin phenotype. The spastin pathway remains something of a mystery, which prevents a deeper understanding of HSP. However, through this experiment, we were able to gain insight to the mechanism by which degeneration occurs, thus understanding another component of the complicated interactions of spastin.

*Biological Sciences, 12:00-1:00*

**Katharine Cummings*****Research and Analysis of the Technical, Legal, and Social Aspects of the Digital World, as Applied to Blown to Bits Via Creative Commons***

Research Advisor: Owen Astrachan, Computer Science

The goal of this project is to assess the feasibility of and establish a protocol for creating an online, updatable, and curated version of an open text that is widely used in both academic settings and by those interested in issues related to technology, policy, and the Internet. The new work will ultimately be able to serve as an invaluable online resource that evolves with technological and societal changes. The foundation of this project is the book *Blown to Bits*, which was released under a Creative Commons Attribution–Noncommercial–Share Alike 3.0 license. This, along with the approval of the authors (Hal Abelson, Ken Leeden, and Harry Lewis), has allowed for the adaptation of the original work. *Blown to Bits*, written in 2008, discusses the critical questions at the intersection of technology and society after the digital explosion. The work explores how innovative technologies have encouraged society and its lawmakers to reevaluate definitions and their application in the digital age. However, there have been significant changes in technology, the law, and how society has adapted to both since its publication seven years ago. Three of the original chapters have been updated to reflect recent technological and societal changes, and a plan for implementing the resource online in a wiki-style website to allow for third-party contributions has been developed, in the hope that this project will continue and become an invaluable, community-generated resource that brings awareness to the questions of our ever-changing, digital world.

*Social Sciences, 11:30-12:30*



**Aariel Dees**

***Multivariate Analysis of Factors Influencing Behavioral  
Thermoregulation Patterns in Lemurs***

Research Advisor: Leslie Digby, Evolutionary Anthropology

Mammals are able to internally regulate temperature over a relatively wide range of environmental temperatures, but they do so at great energetic cost. For this reason, mammals use behavioral thermoregulation in order to mitigate the high costs of maintaining body temperature as well as the high costs of extreme temperatures. It has been frequently reported that ambient temperature, age, and sex have effects on thermoregulatory behaviors, but the effects of weight and species have not been frequently tested. In this study, we not only determine how ambient temperatures affect the use of thermoregulatory behaviors, but we also determine which factors (age, sex, weight, and species) best explain variation in the use of these thermoregulatory behaviors. Using semi-free ranging groups of *Lemur catta* and *Propithecus coquereli* at the Duke Lemur Center, we observed thermoregulatory behaviors over a range of temperatures. Using direct comparisons across temperatures categories, we found that ambient temperatures significantly affected all behavioral thermoregulation patterns with the exception of the pattern found for huddling. Conducting a multivariate analysis, we found that other factors such as age, sex, weight, and species also significantly impacted the use of these behaviors with sex explaining the most variation in the use of these behaviors. We conclude that lemurs do in fact use thermoregulatory behaviors to adjust to external temperatures, potentially to reduce thermal stress. The implications are that mammals may be able to adjust to at least minor changes in temperature.

*Biological Sciences, 12:30-1:30*

**Patricia DeLacey**

***Mating behaviors and inbreeding avoidance in female chimpanzees  
(Pan troglodytes)***

Research Advisor: Anne Pusey, Evolutionary Anthropology

Inbreeding, when related individuals breed, causes the resultant offspring to express deleterious homozygous recessive traits. The adverse effects of inbreeding depression are well documented yet inbreeding occurs across the animal kingdom raising questions about the conditions that give rise to this maladaptive behavior. My study used chimpanzees as a model for inbreeding analysis. I analyzed behavioral data from a 34 year period, 1980 to 2013, on the Kasekela chimpanzee community of Gombe National Park, Tanzania. I used recorded pedigree information to ascertain relatedness between adult males and females, assigning Hamilton's R to dyads including fathers, adult sons, maternal and paternal brothers, and maternal and paternal uncles and nephews. Data for each female were divided into mating windows, or periods of fertility between births. We calculated (1) copulation rate over time spent together in a swollen state, (2) copulation rate over total window time, (3) failed copulation rate over time spent together in a swollen state, (4) aggression rate over total time spent together. We found females to mate with all classes of relatives. Among relatives, females mated most frequently with fathers and least frequently with adult sons. Small family groups may drive mating between fathers and daughters. When considering time spent together overall, females mated less frequently with maternal brothers suggesting behavioral avoidance mechanisms. Despite the high frequency of mating between relatives, conceptions were relatively low with only three documented cases. Future studies should include restricted window analysis around ovulation and post-copulatory mechanisms as possible explanations for low conception rates.

*Biological Sciences, 12:30-1:30*

**Jamal Edwards*****A Case Study on the Polio Eradication Initiative in Nigeria***

Research Advisor: David Boyd, Global Health

With only 6 reported cases of polio in Nigeria as of November 2014, the country is close to halting transmission of the virus. The history of polio eradication in Nigeria offers key lessons in the area of trust, monitoring and evaluation, accountability and flexibility that can serve as a model to be extrapolated to different health challenges, context and time. This case study explores the lesson's learned from the country's strategies and displays the many complexities that surface in any multilateral structure and global health initiative.

*Social Sciences, 11:30-12:30*

**Samantha Emmert*****Characterizing bottlenose dolphin (*Tursiops truncatus*) breath sounds***

Research Advisor: Andrew Read, Biology

Respiratory sounds have been studied to better understand the health and energetics of humans, horses, and other organisms. Bottlenose dolphin breath sounds measured at the blowhole have not been described. We describe breath sounds of bottlenose dolphins in the wild and under human care at different activity levels, recorded with a DTAG, a suction-cup attached acoustic recording tag. Results suggest that dolphin inspirations are longer than expirations, and have greater centroid frequencies. Breath sounds recorded from dolphins laying on the padded deck of a veterinary examination boat had longer duration and lower centroid frequencies than those recorded while the dolphins were swimming or floating. The baseline parameters of breath sounds recorded in this study may be useful to future studies of free-swimming dolphin energetics, as a pneumotachometer was simultaneously used to measure the flow rate and gas composition of the breaths recorded while floating and on the deck of the boat. Additionally, these measured parameters could enhance our understanding of dolphin respiratory health.

*Biological Sciences, 12:30-1:30*

**Stefanie Engert**

***Correlation between Induced Glial Protrusions and Synapse Morphology at the Larval Neuromuscular Junction in *Drosophila melanogaster****

Research Advisor: Nina Sherwood, Biology

The role of glia has traditionally been considered restricted to providing structural support and nutrients to the neuron. More recently, however, their importance in the proper development of the nervous system has been recognized and defects in glial function have been implicated in a number of disorders. Glia may also play a role in the neuronal phenotype associated with deletions of spastin, the gene most commonly mutated in patients with autosomal dominant hereditary spastic paraplegia. It has been shown previously that null alleles of spastin cause a heightened number of synaptic boutons and additional branching at the larval neuromuscular junction of *Drosophila melanogaster* compared to the wild type. They also correlate with the increased formation of actin cytoskeleton mediated tubular projections from the glia towards the synapses. Both the neuronal and the glial phenotype can be suppressed by deletions of the genes *draper* or *pak3*, which are normally expressed in the glia. I am exploring whether overexpressing *draper* or *pak3* in glia causes (1) an elevated number of glial protrusions and (2) an increased number of synaptic boutons in the neurons. I found that pan-glial overexpression of *draper* and *pak3* does indeed lead to a significantly increased number of synaptic boutons as compared to the wild type and an elevated incidence of glial protrusions. Furthermore, specific overexpression of *draper* and *pak3* in the glial subtypes present at the neuromuscular junction—perineurial, subperineurial and wrapping glia—suggest an elevated role of *pak3* specifically in the subperineurial glia in the formation of the neuronal phenotype.

*Biological Sciences, 12:00-1:00*

**Katherine Ernst, Zach Weiner, Danielle Colson, John Gitau, Ryan Buxbaum**

***Energy and the Environment: Design and Innovation--Solar Autoclave***

Research Advisor: Josiah Knight, Mechanical Engineering

An autoclave is a pressure vessel used for sterilizing medical equipment, generally with pressurized steam. In areas of the developing world that lack a reliable electrical grid, this technology is unable to function in the same way as in an industrialized country. Our team partnered with a non-profit in Nicaragua, Grupo Fenix, that implements engineering solutions to problems in the developing world. The two major design considerations for our project were how to achieve and hold pressure and how to heat the system. To consistently sterilize instruments the autoclave must stay at 121°C and 15 psi for 30 minutes. We decided to combine a simple and inexpensive pressure cooker with a rudimentary solar reflector. Our prototypes concentrate between one and two square meters of solar energy onto a pressure vessel large enough to hold medium-sized medical tools. Thus far during testing we have achieved 90°C, and are making modifications to reach 121°.

*Bass Connections, 12:00-1:00*

**James Ferguson, Daniel Ketyer, Jennifer Sekar**  
***Distributed Solar Generation for Duke University Employees: Using  
Rooftop Solar to Promote Climate Neutrality***  
Research Advisor: Charles Adair, Energy Initiative

As part of Bass Connections in Energy, our collaborative research team of five students researched the current residential solar landscape in the USA and North Carolina and subsequently conducted a solar marketing campaign. Working closely with the Duke Carbon Offsets Initiative, Sanford School of Public Policy, Nicholas Institute for Environmental Policy Solutions and Duke Law, we set out to determine the potential for residential solar to benefit employees, Duke's environmental leadership and climate neutrality commitment. We researched the technical, policy and economic aspects of residential solar, attending conferences, collaborating with Duke administrators, interviewing community stakeholders and partnering with local solar installers. We discovered historically low prices and a narrowing window of opportunity to take advantage of North Carolina's renewable energy investment tax credit, which prompted us to act on our research. We then created and conducted a solar marketing campaign, Solarize Duke, targeting Duke employees. By providing access to quality information, vetted local installers, a limited-time discounted pricing structure, and attractive financing options, our research team have streamlined employees' ability to take full advantage of residential solar while providing social and economic benefits to the community.

*Bass Connections, 12:00-1:00*

**Isa Ferrall, Jessica Allen, Robinson Ford, Ryan Bartoszek, Jordan Thomas, Taylor Lane, Victoria Cheng**

***Design and Innovation: Alternative Refrigeration***

Research Advisor: Josiah Knight, Mechanical Engineering

Vaccines are often referred to as the “best buy” of public health. Compared to the cost of treating infectious diseases after they are contracted, vaccines cost near to nothing. Therefore, many global health organizations (GHOs) are making vaccination a priority in their effort to relieve the burden that diseases place on developing nations. However, these organizations have encountered a massive obstacle in this effort. Vaccines are thermosensitive. They must be kept between 2°C and 8°C from the time they are manufactured to their administration. This becomes a problem for GHOs in developing countries where the electricity grid is either unreliable or non-existent. If the power goes down, even for just a few hours, the vaccines being stored in that area become useless. On average, 151 million vaccine doses spoil a year due to improper refrigeration, which is equivalent to a loss of \$750 million. Enter: a refrigerator that operates entirely independently of an electrical grid. As a Bass Connections team through the Energy and the Environment: Design and Innovation project, we are working to design and test an intermittent solar adsorption refrigerator that makes ice to keep the vaccines cool. Such refrigerators already exist, but they require specialized maintenance and are often prohibitively expensive. In order to achieve optimal reliability, affordability, lifetime, and performance, we will use an activated carbon and methanol refrigerant pair in valve less system. In addition to building and testing our prototype we are designing our business plan and creating an anticipated environmental impact assessment.

*Bass Connections, 11:30-12:30*

**Nadia-Estelle Fiat**

***Of Trustees and Offsprings: A Diasporic Trail of Parsi “Crisis” from Bombay to Hong Kong***

Research Advisor: Engseng Ho, Cultural Anthropology

This thesis examines the discourse(s) of crisis in the Parsi diaspora. Treating crisis as a common variable, rather than a singular and unique event across various Parsi communities, I investigate the dimensions of crisis that bind separated Parsi communities in anxiety through a shared language, cultural experience, and historical memory. Turning first to India and then Hong Kong as my case studies, I analyze “crisis,” that has often been identified in terms of demographic decay or postcolonial decline, in the context of more subtle debates around racial purity and trust funds. Crisis, for the Parsi diaspora, while indicating a critical moment in the present, also serves to reveal the underlying and pre-existing socio-economic and cultural tensions in the communities. Relying largely on life-story interviews, online blogs and articles, and archival work, I portray the crisis not as a unique and sporadic event, but rather as one of continuity and complexity, albeit manifesting each time in different and unique guises, that continues to disrupt as well as unite the Parsi diaspora today.

*Social Sciences, 12:00-1:00*



**Erica Figueroa**

***Exploring Ethnic Identity Through Narratives***

Research Advisor: Makeba Wilbourn, Psychology and Neuroscience

College campuses are a prime environment for emerging adults to explore and renegotiate aspects of their identity. This is particularly true for the continued development of an emerging adult's ethnic identity, as college is usually the first time in which individuals have to navigate a diverse environment on their own. Narratives are a rich way to inform researchers about individuals' attitudes towards different parts of their identity. The researchers hypothesized that themes detected in personal narratives of Black students would vary depending on different aspects of their racial identity. It was found that female Black students' centrality scores (i.e. how central being Black is to their overall identity) were positively correlated with the amount they discussed emotions and relationships and were negatively correlated with the amount they discussed personal identity in the narratives. It was also found that male Black students' minority ideology scores (i.e. how strongly they believe that minorities should stick together) were positively correlated with the amount they discussed personal identity and that male Black students' centrality scores were negatively correlated with the amount they discussed emotions and relationships. These results indicate that at predominately white universities, male and female Black students navigate their ethnic identities differently.

*Psychology GwD, 12:30-1:30*

**Jordan Forte**

***Synthesis of a Fluorescent Ribonucleoside Phosphoramidite for Identifying Small Molecule Inhibitors of TAR-Tat in HIV-1***

Research Advisor: Amanda Hargrove, Chemistry

The rapid identification of binding events between small molecules and regulatory RNA structures can facilitate the efficient development of highly specific inhibitors. The conserved interaction between the transactivation response element (TAR) and the transactivator of transcription (Tat) in HIV type 1 (HIV-1) was investigated as a model drug target that could benefit from new screening techniques for identifying small molecule inhibitors of TAR. To this end, we synthesized a solvatochromic benzofuran-conjugated uridine (BFU) probe to be incorporated into TAR oligomers using solid-phase phosphoramidite chemistry. Screening experiments between known TAR-binding small molecules and the BFU-TAR resulted in fluorescence quenching to confirm the efficacy and efficiency of our product. Additionally, the probe's high quantum yield, long wavelength of emission, and non-intrusive fluorescent group make it advantageous over other commercially available probes such as 2-aminopurine and fluorescein.

*Physical & Quantitative Sciences, 11:30-12:30*

**Alexa Frink**

***Water preference as a mechanism for disease avoidance in lemurs***

Research Advisor: Charles Nunn, Evolutionary Anthropology

In lemurs' natural habitat of Madagascar, where water sources are not always clean and may pose a health risk, it may be beneficial for lemurs to be able to distinguish between clean and dirty water sources. However, if the region is very dry and finding water is rare, it may be more beneficial not to be picky and drink any water that is available, despite the associated health risks. So, have lemurs evolved an ability to distinguish between clean and dirty, or potentially infectious, water sources; and does that influence their decisions on which water to drink? We studied water preference in lemurs at the Duke Lemur Center in Durham, North Carolina, to determine whether they could differentiate between a clean and a dirty water source, and which they drank from more frequently. In humans, the mechanism of disgust is a relatively well-studied phenomenon and we tend to have disgust responses toward stimuli that have the potential to make us sick. But, whether or not non-human animals have a similar physiological mechanism is a sparsely studied topic. This research has provided the initial steps in the search for such a mechanism, as the lemurs we tested did in fact show significant aversion to the dirty water we presented to them and chose to drink the clean water far more frequently.

*Biological Sciences, 11:30-12:30*

**Danalaxshmi Ganapathee, Luxi Wan, Belex Cheng, Sally Al-Khamees, Shanen Ganapathee**

***Movement, Grace and Embodied Cognition***

Research Advisor: Leonard White, Neuroscience

There is broad cultural agreement about what looks like graceful movement and what does not. But defining grace more precisely is a problem both of body mechanics and of cultural training and consensus. The focus of our Bass Connections group is to attempt at studying grace through an incursion into the biomechanics of movement. But, more broadly, our interest lies in the definition of grace. Grace has a cultural and aesthetic meaning, even a theological one, closely related to social cognition through movement. We explored these connections using a variety of methods, from close readings of key cultural texts to movement measurements producing analyzable data to exploring the neurological bases of body schema and body movement.

*Bass Connections, 12:30-1:30*

**Anastasia Gazgalis**

***Voxel Based Morphology Analysis: Neuroanatomical of Cocaine Usage in Humans***

Research Advisor: Christina Meade, Duke University School of Medicine- Psychiatry & Behavioral Sciences

This project compares and analyzes the MRI images of cocaine users and non cocaine users in order to see the changes in grey matter that occur due to this drug use. High resolution MRI images are used to conduct voxel based morphology analysis, comparing the change in the amount and concentration of grey matter tissue throughout the entire brain and determining significant changes through statistical analysis. These processes are accomplished through the use of the MRI analysis software, FSL. Results of this investigation indicate that there are no significant differences between the brain volumes of cocaine users and non cocaine users.

*Biological Sciences, 12:00-1:00*

**Vinay Giri**

***Identification of transcription factors necessary for the survival of  
Cryptococcus neoformans in the central nervous system***

Research Advisor: John Perfect, Medicine-Infectious Diseases

*Cryptococcus neoformans* is a fungal pathogen that can invade the central nervous system of immunocompromised individuals; the resulting cryptococcal meningitis is responsible for approximately 625,000 deaths worldwide each year. The cerebrospinal fluid of the central nervous system contains unique chemicals and regulatory peptides that make fungal proliferation in this fluid a distinctly different challenge than survival in the blood. Certain gene deletion strains of *C. neoformans* are able to tolerate neutral saline solutions but cannot survive in human CSF, indicating the existence of regulatory pathways activated by the fungus to combat central nervous system stresses. To determine which transcription factors governed these pathways, a library of transcription factor deletion strains was examined. These strains were grown in yeast growth medium, saline solution, and human ex vivo cerebrospinal fluid. Strains with survival defects only in the CSF media were thought to lack transcription factors specific to CSF survival. Twenty-eight candidate transcription factors were identified as necessary for ex vivo CSF survival. Next, one candidate gene was evaluated in a mouse inhalation model. Mice infected with *Cryptococcus* lacking the YAP1 transcription factor had lower fungal burdens and survived longer than mice infected with the wild type pathogen. When another transcription factor in the same regulatory pathway was knocked out in tandem with YAP1, the resulting strain was observed to be fully attenuated. Our results are beginning to elucidate the regulatory controls of CSF survival genes in *C. neoformans*.

*Biological Sciences, 12:30-1:30*

**Kunal Goel, Kaylin Tsukayama, Tiffany Kearse, Tiffany Kearse**  
***Neuroplicity***

Research Advisor: Nina Sherwood, Biology

Scientists are infamously inept at communicating the importance of their research to non-experts. However, most of the questions they study are of fundamental interest and relevance to society, and it is the responsibility of academics (and ultimately, to their benefit) to effectively translate their research to as broad an audience as possible. Our project objective is to leverage new media and digital storytelling to improve the connection between basic neuroscience research and society's understanding of this research – its rationale, significance, consequences and limitations. We aim to achieve this by developing creative and effective means of communicating key issues and developments in memory and disease-related brain research to a broad, non-specialist audience. Our team is guided by the combined interdisciplinary expertise of two primary investigators: one, a neuroscientist specializing in understanding the inner workings of neurons in normal and diseased nervous systems, and the other, an expert in new media technologies, digital storytelling and visual culture. A biology postdoctoral fellow and an MFA student in experimental and documentary arts provide additional mentoring, but the undergraduate students are the major “interpreters” of the team. Through digital video media, the team will continue expanding our website begun last year, neuroplicity.net, furthering our goals of communicating neuroscience fundamentals, the pleasures and challenges of conducting research, and the daily life of “doing science.” Through this medium, we hope to dispel public misunderstandings of neuroscience and connect our audience to resources for additional learning.

*Bass Connections, 11:30-12:30*

**Ilhan Gokhan**

***Understanding the Role of the Cell Microenvironment in  
Mechanosensitive Signaling***

Research Advisor: Brenton Hoffman, Biomedical Engineering

Cell growth and development are intricately regulated by both internal signaling mechanisms and cues from the external microenvironment. In fact, processes such as embryogenesis, cancer metastasis, and stem cell differentiation are affected by changes in the microenvironment. One way this occurs is through a process known as mechanotransduction, in which the cell responds to mechanical cues from the microenvironment. We study this phenomenon using multi-cellular micropatterning to model the microenvironment, and we evaluate the effects of extracellular matrix composition, cell geometric properties, and cell mechanical environment on intracellular signaling pathways. Initial efforts have focused on using Yes-associated protein (YAP), a transcriptional coactivator, as a baseline signal to read out the cell's response to changes in its microenvironment. YAP was chosen because this protein is known to readily respond to mechanical cues; cells exposed to different mechanical conditions have different nuclear YAP localization. We preliminarily demonstrate that by controlling the microenvironment of multi-cellular clusters, changes in cell size, cell geometry, and cell mechanics can be induced, which in turn affect YAP localization. Therefore, our micropatterning model system is able to effectively simulate certain aspects of the cellular microenvironment. The model system can be further developed by testing for different transcription factors, such as those related to differentiation and disease states, to better understand the effect of the microenvironment on these phenomena.

*Biological Sciences, 11:30-12:30*

**Aruni Gunaratne**

***Effect of Cell Therapy on Remyelination of the Mouse Cerebellum  
Following Brain Injury***

Research Advisor: Joanne Kurtzberg, Pediatrics

Demyelination of brain neurons can result from autoimmune reactions, exposure to chemical agents, hypoxic brain injury or enzyme deficiency. Demyelination is detrimental since myelin sheaths facilitate impulse propagation along neuronal axons by providing dielectric insulation. Myelin sheath damage in the cerebellar region of the brain occurs in several diseases such as multiple sclerosis and Krabbe disease. Umbilical cord blood (UCB) cell administration can potentially be used to treat these diseases by inducing remyelination. This project aims to investigate the efficacy of a particular human UCB-derived myeloid cell, the DUOC-01, in inducing effective remyelination in demyelinated cerebellum white matter. It was hypothesized that DUOC-01 cells would be able to augment endogenous mechanisms leading to effective remyelination of damaged myelin sheath cells in the murine cerebellum. In order to test this hypothesis, two distinct methods of demyelination were used. In the first method, four groups of immunosuppressed NSG adult mice were fed .2% cuprizone, a copper-chelating agent, for 3-5 weeks in order to induce cerebellar demyelination through oligodendrocyte degeneration. Groups 1-2 then received intracranial injections of DUOC-01 cells on Day 1 following cuprizone ingestion, while control groups 3-4 received Ringer's saline solution. Luxol Fast Blue (LFB) staining and immunohistochemistry analysis of 300 um sagittal cerebellum slices from these mice failed to show uniform demyelination as a result of cuprizone ingestion. In the second mode of demyelination, BL/6 P4 and P10 mouse pup cerebellum slice cultures were incubated for 16 hours with .5 mg/mL of Lysophosphatidylcholine (LPC), a lipid with detergent-like properties that disrupts the structure of myelin sheath membranes. 48 hours after the end of this LPC treatment period, a portion of these slices were then incubated with DUOC-01 cells (25,000 cells/slice). Immunohistochemistry analysis of these brain slices showed decreased Myelin Basic Protein (MBP) levels in LPC-treated slices, in comparison to control slices. Additionally, DUOC-01-treated slices displayed MBP levels similar to those in the control slices.

*Biological Sciences, 12:00-1:00*



**Dustin Hadfield*****Moral Judgments and Attitudes Predicting Legal and Illegal Stimulant Use***

Research Advisor: Phil Costanzo, Psychology and Neuroscience

This study examined the relationship between binding and individualizing moral domains and psychostimulant usage. Participants completed self-report measures regarding moral relevance in decision making and legal and illegal stimulant use and attitude. Analyses indicate that increased adherence to individualizing moral relevance domains predict increased likelihood of recent caffeine use, while increased scores in two binding moral relevance domains predict decreased likelihood of recent caffeine use. In addition, one binding moral domain was found to reliably predict past cocaine usage. These findings lead to an expanded understanding of sociomoral influences and motivations concerning stimulant use.

*Bass Connections, 12:30-1:30*

**Andrew Hall**

***Self-Control Forecasting: An Exploratory Analysis***

Research Advisor: Rick Hoyle, Psychology and Neuroscience

Self-control is a fundamental skill that can lead to positive life outcomes and successful implementation of goals. These outcomes necessarily depend on the successful execution of predicted self-control actions, yet little is known about the factors that contribute to the accuracy of self-control predictions. This research explores the situational characteristics of events that either precipitate or occur as the result of inaccurate self-control predictions. Similar to the literature on affective forecasting in which people tend to make inaccurate predictions about their future emotional states (Wilson & Gilbert, 2005), an inaccurate prediction effect is hypothesized to be present within self-control predictions, manifesting in relatively poor accuracy in the prediction of self-control success and failure. To explore this claim, narrative accounts were collected of times in which predictions of future self-control exertion were inaccurate. These accounts were coded on a variety of relevant factors as a means of uncovering potentially meaningful explanations of why self-control prediction inaccuracies exist. Based on the richness of the accounts, support is provided for the general applicability of self-control forecasting across temptation contexts. Narratives of forecasting inaccuracies did not suggest a focus on predictions of self-control failure over predictions of success, but did suggest that inaccuracies are made due to mischaracterizations of future situations. Future directions for research in self-control forecasting are discussed.

*Psychology GwD, 12:00-1:00*

**Victoria Haney**

***Neuroprotection of photoreceptor neurons by the cyclophilin-like domain of Ran-binding protein 2 upon photo-oxidative stress***

Research Advisor: Paulo Ferreira, Duke Eye Center

Protein degradation underpins the clearance of mutated, misfolded, and oxidized proteins in normal and disease states. Impairment of proteostasis (protein homeostasis) promotes a variety of age-related neurological disorders. Protein degradation is primarily mediated by the proteasome, a large protein complex in eukaryotes that is comprised of multiple catalytic and regulatory subunits. The pleiotropic and multimodular protein, Ran-binding protein 2 (Ranbp2), was found to suppress protein degradation by the 26S proteasome upon ectopic expression of the cyclophilin-like domain (CLD) in vitro. Further, having only one functional copy of Ranbp2 in an inbred background protects photoreceptor neurons from age-dependent cell-death against light-induced oxidative stress. However, it is not known what physiological and biological activities of Ranbp2 contribute to age-dependent neuroprotection against light damage. I hypothesized that loss of regulation of the 26S proteasome by the CLD of Ranbp2 contributes to the age-dependent neuroprotection of photoreceptors against light-elicited stress. I applied a combination of immunohistochemistry and confocal microscopy approaches to examine and compare multiple outcome measures of cell death between 8 and 24-week old wild-type and transgenic mice in the absence and presence of light-elicited stress. I found that there was a significant difference of the number of TUNEL+ cells between light treated wild-type and transgenic mice of 24 but not 8 weeks of age. Strikingly, I found there were no differences in the number of photoreceptors with activated caspases between wild-type and transgenic mice. Phototoxicity promoted a significant decrease of caspase-like activity of the proteasome in 24-week old transgenic mice when compared to age-matched wild-type mice. Hence, these results support that loss of CLD activity of Ranbp2 confers caspase-independent and age-dependent neuroprotection to photoreceptors upon light-elicited stress. Further, a decrease of the CLD-dependent caspase-like activity of the proteasome may contribute to the neuroprotection of photoreceptors against light damage.

*Biological Sciences, 11:30-12:30*

**Connor Hann**

***Growth of Icosahedral Quasicrystals***

Research Advisor: Joshua Socolar, Physics

The discovery of an icosahedral quasicrystal that formed naturally in a rock sample originating from a meteorite highlights fundamental questions about the processes involved in quasicrystal formation. The growth of a well-ordered quasicrystal through kinetics dominated by local energetic considerations is known to be possible in principle for 2D systems: a Penrose tiling, for example, can be grown from a particular type of small seed by adding tiles only to surface vertex where the tile type and orientation are unambiguously determined by already placed tiles that share that vertex. We consider the generalization of this result to icosahedral quasicrystal tilings comprised of Ammann rhombohedra. Numerical simulations of growth according to vertex rules strongly suggest that infinite, well-ordered, icosahedral quasicrystals can be generated. Unlike the 2D case, defects are created outside the original seed, but the number of such defects appears to grow only linearly with the cluster radius. Analysis of the lift of the tiling to a 6D hypercubic lattice provides key insights into the growth mechanism.

*Physical & Quantitative Sciences, 12:30-1:30*

**Asraiel Harewood**

***Analyzing Racial Inequality in Factors Contributing to Recidivism in an Urban Juvenile Probation Agency***

Research Advisor: Anne-Maria Makhulu, Cultural Anthropology

This project looks at the ways in which racial inequality is manifested through an urban juvenile probation agency. This inequality is analyzed via the rates of recidivism of youth involved. Recidivism is marked by the commitment of a crime after an individual has been charged previously and here it was studied in relation to the neighborhood of the juvenile, age at which the juvenile first received a written allegation, the amount of days spent in a juvenile detention center, and the court mandated services provided to the juvenile after the first offense was committed. As the conclusions of the analysis of the data support the fact that black youth are disproportionately involved in the probation system, this project identifies trends and connections that are common to offenders to further understand components of recidivism.

*Community Engaged Research, 12:00-1:00*

**Lauren Harper, Brandon Ellis**

***Project LITHomes: Homeowners and Energy Efficiency***

Research Advisor: Brian Southwell, Energy Initiative

Project LITHoMES (Leveraging Individual Transitions into Homeownership to Motivate Energy Savings) is a Bass Connections project team under the Energy theme. The team is comprised of faculty, and graduate and undergraduate students interested in understanding how behavioral psychology can be applied to increasing homeowner energy efficiency. The team's main goal was to organize a summit to bring together representatives from government, real estate, construction, finance, and other energy related fields and create a space for innovative, interdisciplinary thinking on household energy efficiency. During the fall semester, the team researched non-traditional conference types and met with experts in scientific education to find best practices for effective summits. The resulting agenda created space for “idea champions” to present their innovative idea and small working groups to combine attendees with different backgrounds to further flesh out the idea. The spring summit was a success and resulted in several viable plans for increasing homeowner energy efficiency. The Bass Connections team will work with the idea champions to publish these ideas as a book through RTI press.

*Bass Connections, 12:00-1:00*

**Kaho Hasegawa**

***The Significance of Japanese Cultural Practices that Japanese Americans in Hawai'i Continue to Practice Today***

Research Advisor: Leo Ching, Asian and Middle Eastern Studies

What is the significance of certain Japanese cultural practices that Japanese Americans in Hawaii still practice today, and how do these practices impact their sense of cultural identity? This project seeks to investigate the unique identity of Japanese Americans in Hawai'i, who form 16.7% of the population, where there are extreme disparities in the extent to which ethnically Japanese people living in Hawaii embrace their Japanese heritage. When the first generation of Japanese immigrated to work on the sugar plantations in Hawaii, they were forced to abandon their culture to prove their allegiance to America. However, the following generations have fought to rediscover their identities. This project seeks to discover the ways such efforts to preserve traditions and the restore cultural roots are made.

*Community Engaged Research, 11:30-12:30*

**Mark Herzog**

***Engaging Community Health Care Providers to Understand the Potential Role for High-Risk Obstetric Telemedicine in Southwest Virginia***

Research Advisor: Eric Green, Global Health

Conservative state estimates that fail to account for drug abuse approximate that a quarter of pregnant women in the Lenowisco and Cumberland Plateau Health Districts of Southwest Virginia are high-risk. With average rates of preterm and low birth-weight deliveries at 16 and 12 percent, these high-risk pregnancies end with poorer health outcomes compared to state and national averages. Local health care providers were engaged in preliminary research to understand the current management of high-risk pregnancies and the potential role for a telemedicine program to improve access to specialty care in these two health districts. Twenty-one interviews were completed with local obstetric-gynecologists (OB/GYN), nurses at OB/GYN practices, obstetric nurse directors at local and referral hospitals, and the maternal-fetal specialist seeing women from Southwest Virginia. The remoteness of these health districts has impacted how local health care providers manage high-risk mothers. Faced with low compliance for referrals in the Lenowisco Health District, providers have relied on managing high-risk factors such as diabetes and hypertension locally. Providers at the only OB/GYN in the Cumberland Plateau Health District continue to care for high-risk mothers, but rely on routine referrals to the closest maternal-fetal specialist located two hours away in Johnson City, Tennessee. This research demonstrates the potential benefit of a telemedicine program, such as the University of Virginia's High Risk Obstetrics Program, to coordinate the use of telemedicine for the region. Use of telemedicine has the potential to improve management of high-risk women by lowering the travel barriers to specialty care and increasing the coordination between local OB/GYN providers and maternal-fetal specialists.

*Social Sciences, 11:30-12:30*

**Min Kyung Hong**

***An Independent Component Analysis of Default Mode Network  
changes in PTSD Before and After Involuntary Memory Retrieval***

Research Advisor: David Rubin, Psychology and Neuroscience

Neuroimaging studies on anxiety disorders have demonstrated abnormal brain activities and connectivity at rest. This paper focuses on the connectivity of the default mode network (DMN), a set of brain regions that show high activity when the mind is at rest, and low activity when the mind is exerting focused attention to conduct task-related activities. Research has shown that patients with anxiety disorders show disrupted DMN activity when the mind is at rest and they also fail to suppress the DMN when they are engaged in a task. However, studies in literature are limited to examining only one resting state either before or after a task. In this study, we are interested in observing DMN connectivity changes before and after involuntary memory retrieval task in order to investigate DMN connectivity changes after involuntary memory flashback between trauma-exposed, non-PTSD individuals and patients with PTSD. We found that compared the control group, PTSD patients show overall lower connectivity within in the posterior cingulate cortex and superior occipital lobe, and higher connectivity in the inferior parietal lobe and medial ventral precuneus. Also, the interaction effect between time and group showed that PTSD group displays lower connectivity in the dorsal anterior precuneus, an area associated with mental imagery and processing self-relevant stimuli, whereas the control group display higher connectivity in the same region after the involuntary memory retrieval. Furthermore, the decrease in connectivity strength in dorsal precuneus after the retrieval was positively correlated with BDI scores in PTSD. Taken together, these findings may suggest useful platform to further investigate the neuroanatomy of the posterior cingulate, precuneus, and other brain regions in the DMN unique to patients who develop PTSD after trauma exposure to elucidate the pathology of PTSD.

*Psychology GwD, 12:30-1:30*



**Hannah Hopkins**

***Food, Fat Talk, and Females: Investigating the relationship between binge eating and rumination***

Research Advisor: Nancy Zucker, Psychology and Neuroscience

Previous research has repeatedly supported the connection between depression and binge eating. Rumination is a specific construct tightly associated with depression and has been related to binge eating. The escape theory-emotional cascade model is a valid explanatory mechanism for the relationship of rumination and bingeing and was used as the basis for the current study. The current study sought to investigate the relationship between binge eating and rumination using a diverse sample of males and females. Two forms of rumination were investigated: solitary rumination and co-rumination, a typically female form of intense mutual self-disclosure. Bivariate correlations, individual regressions, and stepwise regressions were used to test three study hypotheses. Our results support the idea that bingeing and rumination are related in some way. The extent of their relationship as suggested by / the escape theory-emotional cascade model was found to be less significant than predicted. Females showed no significant association between bingeing and co-rumination, implying that co-rumination is not a predictor of future binge episodes. Stepwise regression showed that worry was the only significant predictor of binge eating episodes of the five variables tested. These results call into question the applicability of the escape theory-emotional cascade model and suggest that the positive friendship effects of co-rumination are playing a role in mediating the severity of binge eating.

*Psychology GwD, 11:30-12:30*

**Michael Hu**

***Defining Water Access and Safety in Rural Central Uganda***

Research Advisor: Sumedha Ariely, Global Health

Access to safe water sources and adequate sanitation remain top priorities in international development, and indeed there have been many advances. The United Nations estimates that 1.7 billion people have gained access to safe drinking water since 1990; the Millennium Development Goal 7.C of halving the number of people without access to safe drinking water was reached five years in advance. However, an estimated 748 million people still lack access to safe water, 1.8 billion use faecally-contaminated water sources, and 2.5 billion lack access to basic sanitation services. Additionally, an increasing body of research has shown that access to safe drinking water as a firm metric fails to account for possible contamination between water collection and point of use, so that safe water is not actually safe. This project aimed to establish a baseline state of water access and sanitation practices in a rural parish in the Central Region of Uganda. Within recent years some villages of this parish have received piped water access; however, the vast majority of villages still rely on boreholes and open springs. This project used a combination of bacterial testing and GPS mapping at both the source and household levels, as well as a survey, to collect information from 126 households spread across 14 villages, and four different water source types. Key goals of this project included analyzing household bacterial counts against source counts and establishing possible factors that could correlate with increased household bacterial load. Over 64% of households surveyed had household water bacterial loads greater than their stated water source, including the majority of households with piped water as the primary source. This is despite the fact that nearly all households claim to boil water before use. Only around 7.1% of households had water samples that met or neared World Health Organization standards for water purity. Around 64.3% of households received water from open and unprotected springs, with distances to the nearest water source exceeding 2km for 1.5% of households. Factors that could contribute to increased bacterial load include the frequency of obtaining water, the frequency of cleaning water containers, and the presence of domestic animals.

*Community Engaged Research, 12:30-1:30*

**Amy Huang**

***Determining the organic composition of samples through GC-MS, SPE, and HPLC-MS analysis***

Research Advisor: George Dubay, Chemistry

Historical artworks obtained from excavation sites like paintings, ceramics, and textiles often contain organic constituents. Characterization of the lipid and amino acid composition of these samples can shed light on the diet, trade, and industry of ancient cultures. Although scientific literature offers multiple methods for analyzing lipid and amino acids, difficulties remain in the analysis of small-quantity, impurity-tainted samples. Thus, the goal of this project is to improve these protocols. One clear way to improve these protocols is to use extraction conditions that allow partitioning of the aqueous (proteins and amino acids) and organic (lipid) components of samples. Alteration of the extraction conditions will allow simultaneous analysis of the lipid composition with gas chromatography-mass spectrometry (GC-MS) and amino acid composition with high-performance liquid chromatography-mass spectrometry (HPLC-MS). GC-MS and HPLC-MS methods will also need to be revisited and optimized in order to maximize the sensitivity and minimize the destruction of valuable historical artworks.

*Physical & Quantitative Sciences, 11:30-12:30*

**Samantha Huerta**

***Mathematical Integration of Alice in Middle School Curriculum***

Research Advisor: Susan Rodger, Computer Science

Due to the lack of computer science in K-12 and a predicted shortage of technology workers, it is crucial to develop ways for students to be actively engaged with computing concepts. The most feasible and time sensitive approach considering the overall lack of standards and materials is to integrate these concepts into the existing curriculum. Alice provides teachers an interesting and engaging way to get their students involved with computer programming. Our work focuses on the development of materials that allow teachers and students to explore Alice Programming and also apply it to their core mathematics curriculum for middle school students. We also outline the development of a new Alice resource for students and teachers, assessments, which include multiple choice questions and programming challenges. We also discuss how these materials were used for a student mini-course during the Spring of 2015.

*Social Sciences, 11:30-12:30*

**Troy Huffman-Devey**

***Identifying the Critical Matrix Metalloproteinases Involved in Anchor Cell Invasion in *Caenorhabditis elegans****

Research Advisor: David Sherwood, Biology

Matrix metalloproteinases (MMPs) are zinc-dependent endopeptidases that are overexpressed in tumors that invade extracellular matrices, promoting metastasis. Much research has focused on targeting MMPs in patients with metastatic cancer, but MMP inhibitors have failed to increase patient survival in clinical trials for reasons that remain unclear. One of the key problems in understanding the role and requirement of MMPs during invasion is a lack of in vivo models where the function of these proteases can be visually and genetically examined. To address this, the Sherwood lab utilizes the *Caenorhabditis elegans* model system of anchor cell (AC) invasion through the basement membrane (BM), an extracellular matrix that is one of the major barriers to cancer metastasis in humans. This model system is particularly useful since *C. elegans* have only six MMPs, compared to over 25 in vertebrates. Five of these MMPs are localized within or near the AC prior to and during invasion. Surprisingly however, ACs in animals lacking all five MMPs (mmp-mutant) are still able to invade, indicating that MMPs are not absolutely required for BM invasion. However, these mmp-mutant animals have delayed invasion, as well as a disorganized BM removal at the invasion site. The aim of my project is to identify which MMP or combinations of MMPs are required for efficient AC invasion. To do this, I used three genes identified through a sensitized RNAi screen in mmp-null animals that gives a plate level phenotype, a protruding vulva, which can result from a block in AC invasion. This phenotype is specifically observed in mmp-mutant animals, and not in wild-type worms. To identify the essential mmp genes involved in invasion I examined the proportion of protruding vulva formation after RNAi feeding in animals harboring specific mmp mutations. These experiments identified zmp-1 and zmp-6 as the critical MMPs necessary for efficient BM invasion. Furthermore, zmp-1 and zmp-6 function redundantly, since it is necessary to remove both genes in combination to restore the quintuple null-mmp phenotype. These results identify the minimal repertoire of MMPs necessary to promote efficient invasion through BM, and clarifies the role of these enzymes as playing a modularly role in the invasive process.

*Biological Sciences, 12:00-1:00*

**Laurie Hwang, Christine Nunez**

***Environmental Effects on Cognitive Development***

Research Advisor: Rochelle Schwartz-Bloom, Pharmacology & Cancer Biology

The detrimental health effects of Environmental Tobacco Smoke exposure (ETS) on pregnant women and their offspring are well established. More recent findings indicate that fetal ETS exposure can modify gene expression throughout life through epigenetic mechanisms. Evidence also suggests that fetal ETS exposure may increase the offspring's chances of developing ADHD, and this may be perpetuated across generations, as individuals with ADHD are more likely to smoke. In this study, we have employed social media to inform the public about the effects of ETS on brain development and cognitive dysfunction. Last year we developed an "infographic brochure" that includes a mechanistic explanation of how ETS can lead to an increased risk of ADHD. We evaluated these materials using a randomized-controlled design. We administered a survey targeting pregnant women (and others) in two Durham health clinics to measure their understanding of scientific information on the brochure compared to a control brochure. We have also designed a website and an Instagram contest to engage the community in learning about these health messages. Here we present our preliminary findings: According to our survey results, the participants indicated that they learned significantly more new information from our brochure than from the control brochure. Participants with our brochure scored significantly higher on knowledge-based questions than those with the control brochure. We are conducting data analysis to examine if there is any correlation between demographics and the participants' scores on knowledge-based questions.

*Bass Connections, 11:30-12:30*

**Virginia Isava**

***Garnet zoning and the metamorphic history of Great Smoky Mountains National Park, USA***

Research Advisor: Alan Boudreau, Earth and Ocean Sciences

This project uses the property of mineral zoning in garnets from the Anakeesta Formation to discern changes in temperature and pressure with time, in an attempt to better understand the metamorphic history of Great Smoky Mountains National Park. Electron microprobe analysis shows an increase in garnet endmember almandine and decrease in spessartine from core to rim, indicating a single event of prograde metamorphism. The absence of aluminosilicate minerals in the Anakeesta Formation precluded maximum metamorphism beyond the greenschist facies. The presence of garnets in only a handful of samples from the Anakeesta Formation with seemingly similar compositions was confirmed using major element analysis by direct current plasma (DCP) spectroscopy. A positive correlation between bulk rock manganese content and the presence of garnet is consistent with the lower temperature stability of Mn-rich garnets.

*Physical & Quantitative Sciences, 12:30-1:30*

**Jonathan Litvak Jeger**

***The Regioselective Functionalization of Alkenes through Molecular Recognition Catalysis***

Research Advisor: Steven Malcolmson, Chemistry

Even though alkene functionalization reactions are some of the most elementary reactions in organic chemistry, the majority of these reactions result in products whose regioselectivity is determined solely by the electronic and steric parameters of the substrate and reagent combination used. This causes many valuable regioisomers to be unobtainable through the usual reaction mechanisms, and thus makes synthesizing these compounds a labor-intensive effort, if at all possible. For this reason, we set out to develop a novel class of molecular recognition catalysts (MRCs), which utilize non-covalent interactions to template the substrate's alkene to allow only one regiospecific reaction, resulting in the regioisomer that is not usually obtained. The MRC is built up out of three modules: the reactive, linker and recognition modules. The recognition module functions as a double hydrogen bond donor, which binds onto an acceptor functional group on the substrate, docking the substrate and guiding it into position. The templated alkene is then coordinated by the reactive module, which chelates a rhodium salt. The linker module serves as a rigid structure, locking the other two modules into place and linking them to form the MRC. The structure of the linker module permits unidirectional addition across the templated alkene. Our MRC, however, distinguishes itself from other known catalysts by being highly modifiable at the linker module, since this module is built up out of a peptide chain containing a  $\beta$ -turn. This allows substrate-specific MRCs: amino acids can be added or removed from the module to create a library of catalysts, tailored to the specific geometry of each individual substrate. At this stage, usage of the MRCs will be investigated for hydroboration reactions. Our MRCs could provide a novel method of acquiring high value branched-products from inexpensive starting materials.

*Physical & Quantitative Sciences, 12:30-1:30*

**Stephanie Jensen**

***Synthesis of Aminoarene Pharmacophores Towards Novel Antipsychotics***

Research Advisor: Qiu Wang, Chemistry

A library of novel pharmacophores towards analogs of antipsychotics aripiprazole and cariprazine have been synthesized. Structurally complex amino-arenes were accessed via copper catalyzed electrophilic amination and N-haloamination of arynes. Installation of these novel aminoarenes into the aripiprazole and cariprazine scaffolds has yielded a library of aripiprazole and cariprazine analogs which demonstrate unique biological activity with potential pharmacological utility.

*Physical & Quantitative Sciences, 12:00-1:00*

**Dalia Kaakour**

***Physicians' End-of-Life Healthcare Decision-Making***

Research Advisor: Krista Perreira, Public Policy

Through a qualitative approach, this thesis seeks to gain a better understanding of end-of-life healthcare decision-making among physicians as well as among non-physician elderly individuals. I investigate both attitudes and knowledge regarding advance directives, decision-making concerning end-of-life healthcare, and the patient-doctor relationship in order to understand why physicians make relatively more conservative end-of-life healthcare decisions than the general public does. Ten non-physician individuals living in retirement communities primarily in the Chapel Hill/Durham area and ten physicians of different specialties working in this region were surveyed and interviewed. Using non-physician participants' and physicians' own words, this study explains the different factors important to these two groups in the end-of-life healthcare decision-making process.

*Social Sciences, 12:30-1:30*



**Lauren Kane**

***White Matter Alterations and Methionine Cycle Dysregulations in Mouse Models of Alzheimer's Disease***

Research Advisor: Carol Colton, Neurobiology

Alzheimer's disease (AD) is a chronic, progressive neurodegenerative disease. In order to understand the pathology and progression of AD, the Colton lab has developed a mouse model (APPSwDI/NOS2-/-; CVN-AD) that mimics AD pathology. As human AD patients have white matter atrophy in the brain, we have investigated the role of white matter alterations in our mouse model. We found significant changes in brain volumes and diffusion parameters in the brain of CVN-AD mice, reflecting poor white matter integrity. Moreover, the brain regions afflicted compose a similar circuitry that is implicated in AD patients. Next, we proposed that dysregulations in genes associated with the methionine cycle cause the white matter atrophy. We found that many of the genes involved in the methionine cycle were significantly dysregulated at various time points. These results show that the methionine cycle is affected in CVN-AD mice. We speculate that dysregulated genes code for changes in enzymatic activity in an attempt to restore impaired metabolism of homocysteine, an amino acid that can be recycled to methionine in the cycle. In the process, methionine is diverted, causing hypomethylation and pathology. Overall, our findings support a role of white matter atrophy and methionine cycle abnormalities in CVN-AD mice.

*Bass Connections, 12:30-1:30*

**Min Su Kang**

***Ventral striatum mediates the association between multilocus genetic profile and food addiction***

Research Advisor: Ahmad Hariri, Psychology and Neuroscience

The prevalence rate of obesity rapidly increases in the U.S., yet very few weight loss interventions have shown promise in their long-term efficacy. This failure to intervene after individuals become obese underscores the overwhelming need for prevention prior to the onset of significant weight gain. Food addiction, which has been identified as a precursor to obesity, is a relatively novel construct to describe compulsive eating despite negative consequences and shares symptoms with both eating and substance use disorders (e.g., loss of control, social and occupational impairments, etc.). Research has shown that both food and drug consumption share similar genetic and neural correlates of reward processing (e.g., dopamine genes and ventral striatum). In this study, we aimed to better understand the behavioral and neural correlates of food addiction as well as determine whether this disorder should be classified as an eating vs. substance use disorder in 85 Duke University students aged 18-22. Specifically, we investigated the associations between food addiction, a multilocus dopamine genetic risk score, and ventral striatal (VS) response to reward. Our results revealed that symptoms of food addiction resembled eating psychopathology more closely than a substance use disorder. Using linear regression, we found that higher scores on our dopamine genetic profile was associated with greater VS response to reward, but was unrelated to symptoms of food addiction. We also found that blunted VS response to reward was associated with greater symptoms of food addiction. Finally, we found that VS response to reward mediated the association between the dopamine genetic profile score and the severity of food addiction symptoms. These results suggest that neural or psychopharmacological interventions that upregulate VS response to reward may have promise in improving food addiction symptoms and thus preventing obesity.

*Psychology GwD, 11:30-12:30*

**Jaclyn Karasik**

***Histone H3.3-based identification of active genes and regulatory sequences in cardiomyocytes during regeneration in zebrafish***

Research Advisor: Ken Poss, Cell Biology

There is little evidence to show that human heart muscle cells regenerate significantly after injury. However, zebrafish are able to regenerate injured cardiomyocytes, unlike human hearts which generally heal with scar tissue. One way to understand the mechanism of zebrafish cardiomyocyte regeneration is by looking at gene enhancers that are upregulated or downregulated during regeneration. Activity levels in parts of the genome can be regulated by changes in organization of chromatin. Histone H3 is replaced by variant H3.3 within active genes and within active regulatory sequences. Using a biotinylation method, we were able to analyze expression of H3.3 in cardiomyocytes specifically. Looking at differential expression of H3.3 in conjunction with other histone post-translation modifications, we identified enhancers that direct expression in cardiomyocytes and enhancers that are dynamic during regeneration. To confirm that we had identified true enhancers, we created transgenic fish that express GFP in regions where putative enhancer is active. We also looked at transgenic adult hearts to confirm cell-type specificity of the enhancer and analyze differences in enhancer expression in injured and uninjured hearts. By developing this method for enhancer discovery and understanding gene regulation in zebrafish heart muscle regeneration, we may one day be able to promote therapy for heart disease in humans.

*Biological Sciences, 11:30-12:30*

**Borna Kassiri**

***Comparative Responses to Distaste in Lemurs***

Research Advisor: Borna Kassiri, Evolutionary Anthropology

Distaste is a behavioral response exhibited by animals in order to prevent the ingestion of toxins. Outward distaste responses are thought to underlie a more complicated response called disgust, which is thought to be a disease avoidance behavior. This study tried to determine whether lemur species differ in their distaste responses. I tested whether diet or social system predicted the complexity of lemur distaste response. I studied six lemur species that vary in diet and group size. Each individual was presented with one neutral stimulus, the control, and one sour stimulus, the experimental, and observed for outward distaste responses, such as tongue protrusions, head-shakes, and gapes. When comparing distaste responses between species, I found that dietary preference is a better predictor of distaste response than group size. The implications of these results are that the way in which lemurs reject toxins is closely linked to their diet. Therefore, it may be possible that lemur species with more specialized diets are more tolerant of distasteful stimuli because they are not able to be as picky as lemurs with more generalized diets. It was also observed that distaste responses effectively expelled the distasteful stimulus from the mouths of some lemurs. Further research is needed on determining the functional significance of distaste responses.

*Biological Sciences, 12:30-1:30*

**Charlotte Ke**

***Intersecting Identities: The Experiences of Queer Students of Color at an "Elite" Predominantly White Institution***

Research Advisor: Raymond Garrett-Peters, Sociology

While considerable research has examined the experiences of students of color, queer students, and queer people of color, research concerning the experiences of queer students of color in higher education is scarce. Research has shown that students of color at predominantly white institutions are often marginalized and underserved by college administrations, and queer students at many undergraduate institutions must also navigate social and academic climates that feel hostile. This study utilizes a mixed methods approach to examine and describe the experiences of queer undergraduate students of color at predominantly white institutions. Specifically, I use semi-structured in-depth interviews and surveys to examine these students' thoughts, feelings, and experiences at their respective institutions of higher education, as well as how these students navigate these experiences socially and academically. This study assumes that undergraduate queer students of color at predominantly white institutions share similar experiences and responses to these experiences in common. Preliminary analysis of the data suggests that queer students of color are required to deal with not only the stigmas and microaggressions associated with queerness and their specific racial identity, but also additional shared experiences unique to the intersection of these and other minority statuses. Implications for future research on queer students of color are discussed.

*Social Sciences, 12:30-1:30*

**Kristie Kim, Dustin Hadfield, Lauren Miranda, Rebecca Brenner**  
***Stimulating Brains: Individual Levels of Humility and Rebelliousness***  
***Influence Moral Judgments in Online Interactions***

Research Advisor: Walter Sinnott-Armstrong, Philosophy

Although substantial literature on social conformity emerged following the experiments of Solomon Asch, the effect is far from universal. In this paper, we investigate whether conformity occurs in a virtual environment and concerning moral attitudes. To address these issues, we recruited participants to take an online survey that exposed them to two types of information regarding others' moral opinions: statistics about the frequency of certain responses or descriptive arguments defending the responses. Our results show that personality traits and social information shaped moral judgments in a digital setting. Participants who scored high on humility were more likely to be influenced by arguments and statistical manipulations about others' responses during moral cognition. Participants' levels of rebelliousness or anti-conformity were also measured using a new scale. We subsequently used an eye-tracking system to monitor participants' eye gaze while they read different combinations of a moral vignette and descriptive arguments. We conclude that abstract moral cognition is partly constituted by individual character attributes and is likely supported by gaze-dependent decision processes. Because the future of human social interaction involves communication across virtual screens, understanding how even private moral opinions can be manipulated in this context will be an important topic of future investigation.

*Bass Connections, 11:30-12:30*

**Rebecca Kim**

***Impact of Endocrine-Disrupting Plasticizers on Medaka Fish Embryogenesis***

Research Advisor: David Hinton, Nicholas School of the Environment

It is well known that exposure to Bisphenol-A (BPA) increases risk of health complications such as brain and behavior problems, and in some instances, endocrine disruption. This has resulted in a surge of media attention regarding plastic compounds, and has prompted many companies to advertise their plastic products as “BPA-free.” This marketing phrase has led to the false assumption among the public that there are no toxic risks present in these materials. Storing liquids in BPA-free bottles carries with it the assumption of safety when, in reality, the toxicological implications of “BPA-free” are still unclear. This study examined the effects of plastic leachates on the development of medaka (*Oryzias latipes*), laboratory model fish. In the first phase of this study, medaka embryos were cultured to hatch in embryo rearing medium (ERM) that had been stored in “BPA-free” bottles under controlled conditions for either 1, 4, or 7 weeks. The second phase of this study examined pure plasticizers exposure to medaka embryos. Stage 10 embryos were exposed to a 17 Beta Estradiol (17 $\beta$ -E2) positive control along with common plasticizers: benzyl butyl phthalate (BBP,) dioctyl phthalate (DEHP,) and bisphenol-S (BPS.) Embryos were observed daily until hatch for survival, hatching success, heart rate, and presence/absence of abnormalities including edema, craniofacial deformities, spinal curvatures, and swim bladder inflation. Both samples of fish reared in bottle-stored water and pure chemical compounds displayed similar increases in heart rate, presence of edema, and inability to properly inflate the swim bladder. Furthermore, these developmental abnormalities had an immediate impact on the fishes’ ability to swim and survive.

*Biological Sciences, 12:00-1:00*

**Elizabeth Kim**

***Communication and Connection in an Instant Messaging Context***

Research Advisor: Dan Ariely, Economics

Social isolation in America has doubled since 1985 with the rise of technology and social networking. The number of peoples' confidants has significantly decreased, and now 25% of Americans say they have no one with whom to discuss important matters. To exacerbate matters, many of today's most popular social networking apps proliferate "hook-up" culture and connect people based on superficial incentives such as physical attractiveness. (ex: Tinder) In these apps, the idea of meeting new people automatically carries the connotation of romance. We contend that an developing an app for meaningful conversation will provide a space for people to truly connect for the sake of authentic human connection. The app aims to solve the problem of social disconnectedness by manipulating the cause of that problem: technology. After it connects local members of a university or small community via instant messaging conversations, the app sets up optional in-person meetups. This research will aid the development of such a mobile application by determining the efficacy of its features. It will also provide a deeper understanding of online virtual communication. Can anonymity and the use of social contracts in instant messaging create more meaningful conversations? Participants will be paired for a 20 minute conversation in Gmail chat. In the anonymous condition, participants will not know who they are speaking with. In the identifiable condition, participants will sit in the same room during the conversation, visible to each other. In the social contract condition, participants will sign a statement agreeing to have meaningful conversation. The counter condition will not involve signing a social contract. The pairs will be assigned one of four sets of conditions: -anonymous and social contract -anonymous and no social contract -identifiable and social contract -identifiable and no social contract After the conversation, participants will complete a survey about the quality of the exchange. The results will tell which combination of the two conditions helps create more meaningful conversation.

*Social Sciences, 12:30-1:30*



**Anna Knight**

***Non-Invasive Detection of Pain-Associated Spinal Injuries in vivo  
Using microCT Imaging and Acoustic Emissions***

Research Advisor: Cameron 'Dale' Bass, Biomedical Engineering

Failure response of the lumbar spine is currently not well characterized for minor injuries (e.g. trabeculae failure, localized cortical bone disruption). These injuries are likely associated with acute and chronic pain, and understanding the mechanics of these failures is critical for injury and pain prevention. Previous studies have induced gross bony failures, which have severe long-term effects. / Gross vertebral failures are visible on clinical computed tomography (CT) images, which often have a maximum resolution of 0.625 mm. However, this is inadequate to image trabecular failures and other small injuries. Conversely, microCT produces images up to 10  $\mu\text{m}$  resolution, allowing the identification of small injuries. Soft tissue failures are known to generate acoustic emissions with frequency content between 20-30 kHz and bony failures generate emissions between 80-120 kHz. Nine caprine specimens were placed in a test apparatus that loaded the spine in compression. Seven hydrophones were externally attached to the specimen along the length of the spine from T1 to L6 to measure the acoustic emissions and to allow triangulation of the signal source and fracture location. Load was increased until an acoustic emission indicating bony failure was observed, at which time compression was stopped. Then the spine was imaged at 106 micrometer resolution using microCT to verify the location and type of injury. Acoustic emissions typical of both soft tissue injury and bony failure were generated in all nine specimens. This study shows pain-related injuries induced in an in vivo spinal model. These injuries would not have been detected using clinical resolution CT. Applications of this technique are widespread since noninvasive detection of small injuries allows for the characterization of injury development and eventual treatment of chronic lumbar pain. Further research includes development of an injury criterion based on load and acoustic emission for the full caprine spine and extending this to human spines.

*Physical & Quantitative Sciences, 12:30-1:30*

**Daniel Kort**

***#BlackHealthMatters: Discriminatory current events, African American health, and an identity-based motivation intervention***

Research Advisor: Laura Richman, Psychology and Neuroscience

Perceived discrimination has been repeatedly shown to have a significant negative effect on both mental and physical health for marginalized social groups (Pascoe & Richman, 2009). Past research has pinpointed structural discrimination in the form of salient discriminatory current events as a behavioral cause of health disparities, but an intervention to this phenomenon has not yet been isolated (Richman et al., unpublished). In our studies, we introduce a possible identity-based motivation intervention, in which we hypothesized that evaluating an all-Black health promotion pamphlet, as opposed to an all-White pamphlet, would attenuate the negative effects of discrimination on African American health. We asked African American participants to respond to the current events out of Ferguson, Missouri (Study 1, N = 177) and Staten Island, New York (Study 2, N = 52) that corresponded to the deaths of Michael Brown and Eric Garner. When compared to participants who responded to a race-irrelevant control scenario about their daily routines, participants exposed to discriminatory current events classified themselves and their groups as significantly more confirming of negative racial health stereotypes. We also found that seeing a health pamphlet with only African American individuals trended towards attenuating the negative effects of discrimination on health behavior preferences, while an all-White pamphlet was more effective in the absence of discrimination. Our data hold implications for the impact of salient current events on African American health and how we may use identity-based motivation frameworks to intervene.

*Psychology GwD, 11:30-12:30*

**Andrew Kragie**

***Moral Vision or Political Opportunism? Lyndon Johnson's Leadership for Civil Rights Legislation***

Research Advisor: Gerald Wilson, History

Lyndon Johnson spent twenty years in the U.S. House and Senate voting against every civil rights bill until 1957, when he decided he would run for president in 1960. As president, he pushed through the most significant civil rights legislation since the Civil War. Was his presidential endorsement of civil rights driven by political calculus, was he looking to his legacy, or was he genuinely committed to civil rights and racial equality? Was his pro-equality attitude a sudden conversion, a consistent but quiet belief, or a gradually evolving commitment? As with most questions about the thirty-sixth president, the answers are not straightforward. My project examines LBJ's life story to seek answers. It then tries to place his civil rights leadership in James MacGregor Burns's framework, using MLK as a comparative case study.

*Humanities, 12:30-1:30*

**Eric Lakey**

***Targeting Chorismate Synthase to Treat Malaria***

Research Advisor: Emily Derbyshire, Chemistry

Malaria is a deadly disease caused by unicellular parasites that are spread to humans by infected mosquitos. Over half of the world's population is currently exposed to malaria and it is one of the largest vector-borne causes of morbidity and mortality in the world. To decrease this burden, a biological pathway that is key to parasite survival must be identified and subsequently inhibited with small, bioactive molecules. Specifically, I intend to work on targeting the chorismate pathway in malaria parasites. I propose to I) biochemically characterize a key enzyme in the chorismate pathway: chorismate synthase, II) optimize a high-throughput screen to identify inhibitors of chorismate synthase, and III) test chorismate synthase inhibitors for activity against the parasites. The ultimate goal of this work is to identify parasite chorismate synthase inhibitors to aid in the eradication of malaria.

*Biological Sciences, 11:30-12:30*

**Dechen Lama**

***Program Assessment of Direct Benefit Transfers for Janalakshmi in Bangalore, India***

Research Advisor: Subhashini Chandrasekharan, Global Health

In India, there are two prominent means of distributing welfare benefits, both of which are equally important. The first of which is through the central government. The Government of India is responsible for designing, and in conjunction with the state government, implementing Direct Benefit Transfer (DBT) schemes. The other means of delivering welfare benefits is via the state government. State programs do not necessarily utilize monetary transfers like centrally sponsored DBT schemes. Many state sponsored programs endeavor to provide services rather than conditional monetary transfers. For example, Karnataka state has established day care centers for the elderly and residential schools as well as immunization and employment programs for the disabled. Both types of welfare programs, via the state and central government, are essential for the empowerment and development of India. My research specifically examined the Government of India's centrally implemented DBT schemes. The objective of my research was to contextualize DBT in India after its first year of implementation by examining the evolution of DBT, the advantages, challenges, and the current political environment. Based on these factors, at the conclusion of this report I advocate for expanding branchless banking to accelerate one of DBT's ultimate objectives, widening the financial inclusion of India.

*Community Engaged Research, 12:00-1:00*

**Anastasia Lambrou**

***Analyzing Influenza Pandemic Preparedness in Nepal: Simulation Modeling and Surveillance Mapping***

Research Advisor: David Boyd, Global Health

This study examined the complex issue of pandemic preparedness in developing countries through a case-study lens of Nepal's Kathmandu Valley, comprised of the Kathmandu, Lalitpur and Bhaktapur health districts. A multitude of factors have contributed to Nepal's development into an influenza hotspot, such as its economy, geography and epidemiology. The purpose of this study was to analyze influenza pandemic preparedness of Nepal utilizing two methods: simulation modeling and surveillance mapping. Simulation modeling was based on the use of the Center for Disease Control's Model FluSurge 2.0. This study was the first to utilize FluSurge 2.0 to simulate a future pandemic hospital surge capacity in a developing country—Nepal. The influenza pandemic simulation showed that the Kathmandu Valley's hospitals as a whole are prepared to handle an influenza pandemic. The district of Bhaktapur is severely unprepared for a pandemic as it lacks vital ICU and ventilator capacity. However, the hospitals in the districts of Kathmandu and Lalitpur are prepared. Nepal's disease surveillance system had never been formally mapped. After geographically mapping Nepal's surveillance system, this study suggests that the scope and sustainability of the program are not sufficient to identify new strains and cases in many populations. Only 40 of Nepal's 75 health districts have a functioning influenza surveillance system. Large surveillance gaps were also identified between rural influenza cases and urban reporting sites and subtyping laboratories. Influenza pandemic preparedness must be made a priority now to save future lives in Nepal.

*Biological Sciences, 12:00-1:00*

**Cayley Larimer**

***Easy as 123: Behavioral implications of training the approximate number sense in preschool aged children***

Research Advisor: Elizabeth Brannon, Psychology and Neuroscience

Numbers are a critical part of our daily lives, and a stronger grip on mathematics has shown to lead to better wellbeing in adulthood. Despite the necessity of a strong number foundation for future success, large discrepancies exist in ability. These gaps in ability are usually revealed in kindergarten and first grade, as this is when our numerical foundation is typically assessed. Children from lower socioeconomic status families are more susceptible than their middle and higher SES peers. To close this achievement gap, we first must understand what contributes to our mathematical understanding. Research has suggested that the Approximate Number System (ANS) may be linked to our development of mathematical ability. The ANS allows us to estimate amount or quantity without language or symbolic representation. In the current two-part study, we introduce a tablet application that trains approximate arithmetic in low SES preschool classrooms. In the first experiment, we find that compared to a memory matching game, those who played the approximate arithmetic application significantly improved on a math assessment. In the second experiment, we are comparing a commercial number recognition application and a commercial alphabet application to our approximate arithmetic application. The data collection for the second experiment is still ongoing, but we predict that those playing the approximate arithmetic application will improve more overall on a math assessment compared to those in either commercial condition.

*Psychology GwD, 12:00-1:00*

**Josh Laveman, Ashley Brasovan, Josh Laveman, Jordan Hart**  
***An Analysis of Global Energy Management at Hanesbrands***  
Research Advisor: Gale Boyd, Economics

The Bass Connections Team analysis focuses on global energy management at Hanesbrands with the mentorship of Philip Henson, the Senior Manager of Energy and Sustainability, and Kurt Schwalbe, the Director of Facilities Engineering and Energy Demand. Throughout the year, the Duke Bass Connections Team held bi-weekly phone calls with Phil to better gauge the current situation at Hanesbrands and what type of project to pursue. It was determined that although Hanesbrands is a leader in sustainability and a multiple time Energy Star Partner of the Year recipient, the company lacks an automated system for tracking its utility invoices and global energy usage globally. Therefore the main goal of this project was to do a complete analysis on how to streamline and simplify the collection process of utilities invoices and data at Hanesbrands. A more efficient process will allow the Sustainability Team to spend less time collecting and imputing data and more time analyzing the company's actual energy usage and associated costs.

*Bass Connections, 11:30-12:30*

**Clement Lee**

***Building a Home for the Brave***

Research Advisor: Alma Blount, Public Policy

This research studies ways through which i-Suntari, a veteran-owned social enterprise, can provide more expansive services to veterans in Durham and the Triangle Region. This comes at a time when veterans from Operation Enduring Freedom and Operation Iraqi Freedom are returning home and facing reintegration challenges. This study focuses on the following questions. What challenges do veterans face? What services do veterans need? How can i-Suntari reach out to the veteran community, and provide necessary services? Based on focus groups, surveys, interviews and literature review, this study found that veterans in general want services that can provide: community support, financial stability, self-development opportunity, well-being and a sense of purpose. The study concludes with recommendations to i-Suntari, on how it can engage the wider community to build a home for our brave.

*Community Engaged Research, 11:30-12:30*

**Hillary Lee**

***Group Progressions in Vervet Monkeys: Leadership or Consensus?***

Research Advisor: Julie Teichroeb, Evolutionary Anthropology

Group living can be advantageous but necessitates collective movements. Despite long-term research on many non-human primate species, we are just beginning to understand how individuals make consensus decisions. Deeper comprehension of the underlying factors affecting leadership and decision-making in non-human primates is vital to begin to understand our own evolutionary past. Vervet monkeys (*Chlorocebus pygerythrus*) are characterized by matrilineal groups and territoriality. We followed a habituated group of vervets with 17 adult and sub-adult individuals at Lake Nabugabo in Central Uganda over 40 days recording which individuals attempted group movements and ultimately if the initiation was successful or not. We questioned whether successful group progressions were initiated by certain leader(s) and how factors, such as dominance rank, age, or sex, impacted leadership success. We also investigated whether the situation (departing from sleep site, moving to forage, returning to sleep site) influenced whom the group was most likely to follow. We ran Generalized Estimating Equations to determine which of these factors underlie successful progressions. Sex and age were associated with both the number of start attempts and success in leading progressions, but there was no effect of dominance rank. Older females were most successful at leading group progressions, especially towards foraging sites, while adult and sub-adult males almost always led the group out of the sleep site. Our study concluded that group progressions in vervet monkeys are based on distributed leadership and partially shared consensus decision-making. Older females may be repositories of ecological knowledge, resulting in their success of leading the group to forage, and males may be motivated to leave the sleep site in the morning due to energetic needs after long nights of fasting. Young males achieved some success leading group progressions because they were motivated to make many initiations, which may be related to their life-stage. These results give us a better understanding of consensus decision-making in non-human primates.

*Biological Sciences, 12:00-1:00*



**Erin Leyson**

***Moving Communities: A Study of the Effects of Zumba Classes on Sense of Community in Oaxaca, Mexico***

Research Advisor: Nicholas Carnes, Public Policy

This study concludes that group zumba classes are an effective method of developing and strengthening the sense of community among women in settlements surrounding Oaxaca de Juárez. In the settlements of interest, political violence, cultural diversity and religious differences cause distrust among women and prevent them from working together to improve their communities. Community members, organizational leaders and the student collaborated to create an intervention aimed at uniting the women so that they could work more effectively with the community partner organization, AMEXTRA. / There were two experimental settlements and one control settlement. The intervention consisted of five group zumba classes, five health lessons and in-depth interviews with the student occurring over a five-week period. This study used the Sense of Community Index II created by David W. McMillan and David M. Chavis to measure the strength of the sense of community in all three settlements before and after the intervention period. Quantitative data suggest the zumba intervention had positive effects on the sense of community in one of the experimental communities and small negative effects on the sense of community in the other experimental community. These differences in results are most likely due to a lack of time allotted to implement the intervention and a lack of attendance at pre and post survey sessions. However, the qualitative data suggest the zumba intervention enabled women to cross cultural, religious, and political barriers, strengthening their sense of community. This investigation further indicates that movement and exercise-based interventions are promising community-building methods.

*Community Engaged Research, 12:30-1:30*

**Cathy Li**

***Spatial-temporal Chaos in Nonlinear Optical System***

Research Advisor: Daniel Gauthier, Physics

Reservoir computing is an emerging computational model in machine learning. The reservoir is essentially a recurrent neural network, whose computational power is maximized at the border of a stable and an unstable dynamics regime (edge of chaos). In this research, we propose a reconstruction of the reservoir in a nonlinear optical system by taking advantage of the rich dynamics inherent to nonlinear optical materials and that related to the external setup. At this stage, we are comparing different numerical algorithms in terms of their accuracy and speed of convergence in producing a nonlinear dynamical system, which in fact shows the numerical limitation in recreating accurate dynamics or even chaos. In contrast to the million steps and round-off errors created by computer simulation, actual optical system takes advantage of the speed of light and the precision. Meanwhile, numerical algorithms might not win on the long run, the simulations can provide evidence of whether an optical setup can create intended dynamics or not. We have chosen to numerically model a special optical setup where the nonlinear dynamics is created by nonlocal phase shift fed by a laser beam going through a rotated optical bundle. The linear stability analysis including small perturbation has recreated the pattern provided by given rotated angle. We are curious whether this setup will lead to chaotic pattern, which can be utilized in reservoir computing.

*Physical & Quantitative Sciences, 12:00-1:00*

**Grace Li**

***Noninvasive Prenatal Testing in Hong Kong: Ethical, Legal, Social and Practical Challenges***

Research Advisor: Subhashini Chandrasekharan, Global Health

This project aims to examine the ethical, legal, social, and practical issues surrounding the implementation of noninvasive prenatal testing (NIPT) in Hong Kong. NIPT is a relatively new technology, and Hong Kong is a particularly interesting place to study the issues it poses due to the city's unique population and healthcare system. The implementation of NIPT is complicated by the fact that Hong Kong has both a public and private healthcare system, and because of the price, NIPT has been implemented only in the private sector and is not offered as part of the public healthcare system. Because NIPT is a private test, there are also significant concerns about a lack of government oversight and regulation. The use of the information from NIPT is also cause for concern, especially in terms of the sex of the fetus. Revealing the sex is often at the discretion of the company providing NIPT or the practice administering it. The use of this information must also be considered in relation to both Hong Kong's abortion policy and traditional Chinese views on disability and termination. Additional difficulties are posed by the relative lack of genetic counseling in connection to prenatal testing, especially after the results of NIPT are returned. Although NIPT has the potential to significantly alter the landscape of prenatal testing in Hong Kong, it also raises many questions that are in some ways specific to the context it is being implemented in. The relative lack of government oversight, disparities in access and affordability, and the use of information gained from NIPT are all important concerns that require addressing before NIPT is fully implemented into Hong Kong's healthcare system.

*Bass Connections, 12:00-1:00*

**Hui Yi Grace Lim**

***Mapping Novel Anchor Cell Invasion Deficient Mutants in C. elegans***

Research Advisor: Dave Sherwood, Biology

Anchor cell (AC) invasion in *C. elegans* occurs during the mid-L3 larval stage when a uterine cell breaches the basement membrane to establish the uterine-vulval connection. This is a highly precise and conserved process that has been closely studied as a model for understanding the regulatory mechanisms behind similar invasive processes during development and cancer metastasis. Several genes involved in AC invasion have previously been identified, though gaps in the genetic regulatory pathway continue to hinder our complete understanding of this invasion mechanism. To identify novel genes involved in AC invasion, we screened a collection of 76 *C. elegans* mutants bearing the protruding vulva phenotype indicative of altered uterine-vulval connection, and identified 7 with AC invasion defects. Genetic crosses were performed to map each gene to its respective chromosome, and specific markers for AC and basement membrane crossed into each strain for visualization of mutant phenotype. These preliminary findings point towards the possibility of novel regulatory genes that have not previously been identified to act in the AC invasion pathway. Ultimately, understanding cell invasion will not only better inform us on the genetic regulation of specialized developmental processes, but also provide an avenue for targeted cancer therapeutics.

*Biological Sciences, 12:00-1:00*

**Abigail Lin**

***Integrating biological mechanisms into a machine-learning framework to predict gene expression from promoter sequences***

Research Advisor: Alexander Hartemink, Computer Science

It is well-known that promoters play a critical role in determining gene expression levels through transcription, but the mechanism of transcription initiation using promoters remains a huge open question in biology. Recently, an experimental system has been designed to insert various promoter sequences into a reporter gene, the yellow fluorescence protein (YFP) gene, in order to measure the activity level of different promoter sequences independently of the gene sequence being transcribed. Using this data set, my project seeks to incorporate both sequence-based features such as k-mers, as well as chromatin-based features, into a statistical machine learning framework that may tell a more complete biological story behind the mechanism of promoters. Thus far, our model is based on four statistical regressions (ElasticNet, Ridge, SVR, and NuSVR) that we have applied in various ways by using different sets of features, to draw certain preliminary conclusions. A previous model for prediction of transcript levels given a set of DNA promoters had a Pearson correlation of 0.6475: this model used features such as k-mers, promoter length, DNA bendability, and interestingly, nucleosome binding. Our model originally focused on testing biological features, including T- and TA-tract lengths, TF binding probabilities, nucleosomes, and TBP occupancy (as well as k-mer counts and other sequence-based features like meltability): much of our work this summer attempted to shed more light on how nucleosome binding might play into the mechanistic details of transcription initiation using promoters. Literature has shown that nucleosome binding has a negative relationship with gene expression levels (and that nucleosome-disfavoring sequences, which lead to DNA unwinding from nucleosomes, promote gene expression). However, a finding that has been much more useful to our model has been recruitment of the RNAPII holoenzyme, particularly when examining TFIIB occupancy. TFIIB, one of the transcription factors that make up the RNAPII preinitiation complex, has been shown to interact directly with Pol II in determining how far downstream transcription initiation might occur. Results of our predictive model are highly promising when TFIIB is set as a target value.

*Physical & Quantitative Sciences, 12:30-1:30*

**Ching Ying Lin**

***Analysis of Ancient Sicilian Pottery Shards by HPLC-MS, GC-MS, IRMS, and PCA***

Research Advisor: George Dubay, Chemistry

Residues adhered to ancient pottery vessels contain amino acid and fatty acid markers that can be used to determine the original contents within. Quantification of these organic markers offers insight into the culture, trade, and lifestyle of the ancient civilization. Analytical chemistry methods were developed to extract and analyze organic markers from pottery shards using high-performance liquid chromatography/mass spectrometry (HPLC-MS), gas chromatography/mass spectrometry (GC-MS), isotope ratio mass spectrometry (IRMS), and principal component analysis. These methods were used to characterize the contents of organic remnants contained in ancient Sicilian pottery shards.

*Physical & Quantitative Sciences, 11:30-12:30*

**Rita Lo**

***Ramifications of Hong Kong's statutory minimum wage law on narrowing the gender wage gap***

Research Advisor: Alma Blount, Public Policy

This research explores how effective Hong Kong's minimum wage law is in narrowing the city's gender wage gap. Because low-income women are more prone to earning salaries below minimum wage than low-income men, setting a wage floor benefits blue-collar female workers most. However, rampant occupational segregation in Hong Kong means that equal pay is not provided for equal work done between genders. Despite percentage wage increase, women's salaries still lag behind that of men in the same age group. Thus, although minimum wage temporarily narrows the wage gap, it may widen again as males gain easier access to better paying jobs or rise faster up the corporate ladder. By mandating income redistribution – thereby increasing net earnings of low-income workers – minimum wage implementation has an immediate, observable effect on converging gendered wages. However, it treats only superficial symptoms of gender inequality and does not address its root causes ingrained in the discriminatory social culture. Also, it does not expand jobs which offer good future prospects for women: unequal value and occupational segregation continue to put low-wage women workers at a disadvantage. To ensure successful implementation of Hong Kong's minimum wage law, three main steps must be taken: 1. rule creation; 2. institutionalization, and 3. rule enforcement. Parallel non-wage solutions must also be considered. In a short run, the government should practice gender mainstreaming and promote female confidence and empowerment. In a long run, procedures must be observed to ensure that both employers and employees are in compliance with equality legislation.

*Community Engaged Research, 11:30-12:30*

**Leo Lou**

***Reconciling Biases in History Education and Media in Israeli-Palestinian conflict***

Research Advisor: Alma Blount, Public Policy

Most of the civilians in the ongoing Israeli occupation of, and conflict with, Palestine only see the presenting problem of the never-ending war and political turmoil. The war, however, is an end result of the profound political and social disconnects across the border. The adaptive challenge that citizens of both states need to take on is to find common grounds and recreate a shared collective memory with sympathy and forgiveness. To do that, Israelis and Palestinians should reflect critically on their historic narratives and collective memories taught in school and by the media. They shall engage in cross-border dialogues not to argue, but to listen and learn. When conflicts and wars happen, people tend to blame the other side. They blame the civilians' ignorance and biases on the other side as well as the governments' incompetence. These, however, are only the surface issues. Government decisions are made by people. Ignorance and biases, regardless of which side, almost always come from the lack of scrutiny of manipulated narratives. What really needs to change is the tendency of Israelis and Palestinians to buy into the orchestrated collective memory constructed by the governments. Palestinians believe in the history of olive trees being set on fire and residents being kicked out of their homes while Israelis celebrate the history of returning to the land of their destined home. They establish a strong and adamant sense of nationalistic pride, loyalty and belonging with their country and people without ever doubting the subjectivity of what they were told in school and by newspaper on a daily basis. They often blame the separation wall and other institutional barriers for the lack of cross-border conversations and engagements. But they don't see their education, what they think of the others, and how they engage in political conversations, as part of the problem.

*Community Engaged Research, 12:00-1:00*



**Mengyun Lu**

***Design of Parallel Carbon Plate Electrodes for Electro-Gene Delivery***

Research Advisor: Fan Yuan, Biomedical Engineering

Gene delivery is a vital part of gene therapy, which requires delivery of therapeutic genes into a patient's cells to treat disease. In particular, electric field-mediated gene delivery is a widely used non-viral method for the transfer of therapeutic genes into cells. Electric pulses are typically delivered through aluminum parallel-plate electrodes. However, past research has shown that aluminum and other metal materials (gold, stainless steel, silver, etc.) release ions under high voltages. These ions are not only harmful to cells, but also form complexes with negatively charged DNA to cause DNA aggregation and precipitation. The goal of this project was to delve into electrode designs using parallel carbon (graphite) plates that can create a more suitable environment for electrotransfection with higher cell viability and transfection efficiency. The performance of several carbon electroporation chamber designs was compared to that of commercially available aluminum cuvettes. In particular, we examined: 1) the effect of metal ions versus trace amounts of graphite debris on cell viability, and 2) the success rate of gene delivery in both environments. Our findings thus far provide evidence that carbon does not offer significant advantages compared to aluminum in either aspect. However, there is still room for improvement in the carbon electroporation chamber design, and more testing is required before final conclusions can be made.

*Biological Sciences, 11:30-12:30*

**Luke Maier**

***Co-evolving Networks of International Conflict and Cooperation***

Research Advisor: Tony Rivera, Political Science

National security scholars and practitioners have an ongoing need to anticipate future conflict and ways to avert it using non-violent means. The three majors schools of international relations offer alternative predictions about how states behave in the face of uncertainty and insecurity, and political scientists are increasingly applying computational methods to operationalize these bodies of theory. Scholars in the liberal school emphasize that economics, transnational organizations, and diplomacy--all modes of connectivity--can play strong mediating and information-sharing roles in averting (or causing) interstate conflict. Indeed, since 1949, the number and connectivity of international organizations and the world economy have burgeoned, while large-scale interstate wars seem less frequent and less global. Noting this *prima facie* correlation, this project uses measures of the connectivity of the international network to predict the propensity for interstate conflict. The conflict probability is modeled at two levels: at the aggregate network-level and that of individual dyads of states. For the network level, we assess the covariance between trade and institutional connectivity and conflict incidence in the overall system. We also examine the conflict propensity within diplomatic and economic subgroups of the international network. For individual states, we use their relationships with other actors and those dyads' network statistics to model their dyadic conflict propensity. For both levels of analysis, the liberal school would generally predict mutual membership in international institutions and strong trade ties negatively correlate with conflict propensity. Whereas, the realist body of theory would predict patterns of threat balancing and bandwagoning.

*Social Sciences, 11:30-12:30*

**Sharrin Manor, Austin Liu, Mindy McTeigue, Raghav Saboo,  
Zhenzhen Chen, and Abhishek Balakrishnan**  
*The University at a Laboratory for Smart Grid Data Analytics*  
Research Advisor: Kyle Bradbury, Energy Initiative

Energy wasted is money wasted. By tightly monitoring and analyzing energy use one becomes more conscious in their energy decisions and in turn can cut down immensely on this waste. Advancements in smart energy meter technology and the rise of extreme data storage capabilities have resulted in household energy monitoring and disaggregation systems that make this level of scrutiny possible. It is not uncommon for these systems to monitor energy use at a rate as fast as one energy reading per second. With this high frequency data, our Bass Connections group has developed and built upon advanced pattern-recognition algorithms that can identify what energy appliances are active and when, how much power these appliances are consuming, and if there is an anomaly in the energy use. Specifically, our system is based on one-second frequency data gathered from the Duke Smart Home. With this automated live process Duke Facilities, which oversees the Smart Home's energy bill, can save money that otherwise would have been lost to wasted energy use or malfunctioning equipment.

*Bass Connections, 11:30-12:30*

**Jennifer Margono*****The effects of turnout compensation on foot pressure in classical ballet dancers***

Research Advisor: Blythe Williams, Evolutionary Anthropology

In the ballet world, dancers are driven to achieve anatomical extremes in a perpetual pursuit of aesthetic perfection, from hyperextended splits to endless pirouettes. Ballet dancers often resort to turnout compensation techniques in the lower extremities that lead to musculoskeletal pathology. The purpose of this study was to further the understanding the pressure biomechanics behind the various compensation techniques that ballet dancers use to increase their turnout. 13 female ballet dancers and 11 female non-ballet dancers were given a background questionnaire about previous injuries and dance experience. Functional turnout, natural turnout, and compensated turnout were measured with a goniometer and tracing paper. Center of pressure displacement was measured with a PASPORT force plate as the subject stood in first position and performed pliés. 2-sample t-test and linear regression studies indicated that there was no significant difference between the mean center of pressure displacement of ballet dancers and non-ballet dancers. No significant difference was found between the mean natural turnout angle of ballet dancers and of non-ballet dancers. The results of this study demonstrated an association between ballet dance training and higher degrees of functional turnout and turnout compensation. Further research is needed on their relationship to center of pressure displacement.

*Biological Sciences, 11:30-12:30*

**Kathleen Marsh*****Phytotoxicity of Copper Nanowires to *L. multiflorum****

Research Advisor: Danielle Gorka, Chemistry

The goal of this work was to observe the differences in toxicity between copper nanowires (CuNWs) of varying diameters to three model plant species, including *Lolium multiflorum*. Wires with nominal diameters of 60, 100, and 150 nanometers (nm) were synthesized and characterized prior to toxicity testing. *L. Multiflorum* seeds were planted with six different doses of each CuNW solution. After a week of growth, plants were examined to determine if any toxic effects were present. Exposed plants displayed toxicity as decreased root and shoot length with increasing concentration.

*Physical & Quantitative Sciences, 12:00-1:00*

**Fiona McCrossin**

***The effect of pair-housing on the aye-aye (*Daubentonia madagascariensis*)***

Research Advisor: Brian Hare, Evolutionary Anthropology

Aye-ayes (*Daubentonia madagascariensis*) are thought to be solitary animals and are often housed alone in captivity. However, for all primates sociality is known to play a major role in psychological well-being. Captive animals can develop psychological issues related to conditions of housing. To determine whether being housed alone or in pairs is better for aye-ayes, observations on 14 aye-ayes were collected from 2012 to 2014 at the Duke Lemur Center. Each observation period lasted from 30-60 minutes and each individual was observed for an average of 6 periods. Two separate groups of aye-ayes were observed, those housed alone, and those that are pair-housed. Some aye-ayes fell into both categories during the duration of this study and their behavior while pair-housed was compared to their own behavior while solitary, as well as being factored in to the average activity pattern of either group. The activity patterns of pair-housed and solitary aye-ayes were compared using a chi-square test and it was determined that aye-ayes exhibit different behavioral patterns when they are pair-housed than while alone with  $p < 0.001$ . The results of this study show that behavior indicative of psychological issues, pacing, was significantly reduced in pair-housed individuals and that pair-housed individuals were more active than solitary ones. This has important implications for aye-aye husbandry and suggests that aye-ayes may be more social than is often assumed.

*Psychology, 12:00-1:00*

**Emilie Melvin**

***Rivastigmine for Mild Cognitive Impairment in Parkinson Disease: A Placebo-Controlled Study***

Research Advisor: Daniel Weintraub, Parkinson's Disease Research, Education and Clinical Center, Perelman School of Medicine

Mild cognitive impairment (MCI) in Parkinson's disease (PD) may be associated with subtle functional impairment and worse quality of life. The objective of this study was to determine the efficacy and tolerability of rivastigmine for PD-MCI. Patients with PD-MCI (n528) were enrolled in a 24-week, randomized, double-blind, placebo-controlled, crossover, single-site study of the rivastigmine transdermal patch. The primary outcome measure was the Alzheimer's Disease Cooperative Study—Clinical Global Impression of Change (ADCS-CGIC). Secondary outcomes included the Montreal Cognitive Assessment (MoCA), Dementia Rating Scale-2 (DRS-2), Neurotrax computerized cognitive / battery, the Everyday Cognition Battery (ECB), and the Parkinson's Disease Questionnaire (PDQ-8). Twenty-six participants (92.9%) completed both study phase assessments, and 23 (82.1%) completed both phases on study medication. The CGIC response rate demonstrated / a trend effect in favor of rivastigmine (regression coefficient for interaction term in linear mixed-effects model 50.44,  $F[df]53.01 [1, 24]$ ,  $P50.096$ ). For secondary outcomes, a significant rivastigmine effect on / the ECB (regression coefficient5–2.41,  $F[df]55.81 [1, 22.05]$ ,  $P50.03$ ) was seen, but no treatment effect was found on any cognitive measures. Trend effects also occurred in favor of rivastigmine on the PDQ-8 (regression coefficient 54.55,  $F[df]53.93 [1, 14. 79]$ ,  $P50.09$ ) / and the State Anxiety Inventory (regression coefficient5– / 1.24,  $F[df]53.17 [1, 33]$ ,  $P50.08$ ). Rivastigmine in PD-MCI showed a trend effect for improvements on a global rating of cognition, diseaserelated health status, and anxiety severity, and significant improvement on a performance-based measure of cognitive abilities. copyright 2015 International Parkinson and Movement Disorder Society

*Biological Sciences, 11:30-12:30*

**Cecelia Mercer**

***The Role of Mentors for Resettled Refugees: Evaluating the Effectiveness of the REAP's Agricultural Training Model in Cleveland, OH***

Research Advisor: Suzanne Shanahan, Sociology

The Refugee Empowerment Agricultural Program (REAP) operates at the Ohio City Farm, the largest contiguous urban farm in the nation (6 acres, 3 of which are farmed by REAP). This program, which started in 2010, empowers resettled refugee trainees in Northeast Ohio providing them with employment, education, and training. REAP currently employs eight refugee trainees from five different countries (Liberia, Burma, Bhutan, Somalia, and Nigeria). Trainees typically stay in the program no longer than three years. This year there are four new participants. Ultimately, REAP will provide trainees with an employable skill set which will result in economic stimulation and development in Cleveland, OH. Currently, there are both graduates of REAP and senior trainees in REAP. In spring 2014 there was four new participants. This research addresses the new opportunity for veteran REAP participants to mentor and educate new participants of REAP. The research explores: How does mentorship occur between senior trainees and new trainees? What is the process by which this happens among speakers of the same language and among those who do not speak the same language? How beneficial is the mentorship provided by the senior trainees to new participants? Additionally, how does the relationship between senior trainees and new trainees benefit and help foster leadership skills/confidence in senior trainees doing the mentoring? Ultimately through the research conducted, it was determined specific types of leadership were occurring (e.g. between like ethnic groups or genders). This research proposes various methods to improve mentorship such as implementing a big brother/big sister, promoting more volunteers to come on regular basis to practice English with the trainee, and encouraging trainees to push their comfort levels by working with other trainees who do not speak their native language.

*Community Engaged Research, 11:30-12:30*

**Alexander Merriman**

***Identification of regeneration mutants by a forward genetic screen***

Research Advisor: Kenneth Poss, Cell Biology

Regeneration is the process by which organisms replace lost or damaged complex tissue following injury. Zebrafish make an ideal model system for studying regeneration since they are both amenable to genetic approaches and due to their remarkable regenerative capacity, a combination of traits not shared with any other vertebrate system. To identify novel genetic determinants active in fin regeneration, we utilized an unbiased, forward genetics approach screening for regeneration mutants. After ENU-mediated mutagenesis and several generations of out-cross, we identified nine families with phenotypes inherited as a single-locus recessive trait. Interestingly, based on linkage analysis using SNP genotyping, we found that three of our nine mutants were mapped to an overlapping genetic locus (~100 kb) on chromosome 1, containing 4-5 genes. Our future directions are to 1) apply a reverse genetics approach to generate mutants for these candidate genes via either CRISPR/Cas-9 system or TALENs nucleases; 2) determine causative mutations by Sanger sequencing and complementation assays using independently created mutants; and 3) characterize the roles of mutated genes in the context of tissue regeneration. Our studies may shed light on development of novel strategies to enhance regenerative capacity in humans.

*Biological Sciences, 11:30-12:30*



**Katrina Miller**

***Development of a Recoil Tracking Detector Capable of Infrared Optical Readout***

Research Advisor: Phillip Barbeau, Physics

Gas-based recoil tracking detectors are used for a variety of experiments within nuclear and particle physics to identify unknown particles based upon their interaction with the target gas. Recent research has shown that this technology could be potentially useful in detecting dark matter and understanding coherent neutrino scattering. These tracking detectors collect data via charge collection from ionization of the target gas, and via optical readout by detecting scintillation of the gas. This information is used to reproduce a track image of the momentum of the incident particle. Data from the scintillation effects, rather than charge measurements, provides a more efficient means of creating such track images, primarily because radiation signals are not affected by electromagnetic interference in the environment, thereby producing a higher-resolution image. However, modern scintillation tracking detector technology is still limited by the usage of cameras sensitive only to visible wavelengths. This restricts the target gas to carbon tetrafluoride, because it is the only gas that scintillates in the visible region. Other viable candidates for scintillation, particularly gaseous argon, do not necessarily produce visible light. This research presents the initial stages of design and development of a tracking detector able to utilize gases that scintillate in the near-infrared region. A detector capable of this broadens the number of gases that can be used and provides a longer list of alternatives to present-day tracking detectors.

*Physical & Quantitative Sciences, 12:30-1:30*

**Briana Mittleman**

***Evolutionary Genetics of Male Sex Comb Variation and the Sex-Combs Reduced Gene in Drosophila***

Research Advisor: Mohamed Noor, Biology

Traits influenced by strong sexual selection should show little variation within species, yet some adaptive traits retain variation within and among populations. One such sexually selected trait are sex combs: secondary sex characteristics located on the first and second tarsal segments in males of some *Drosophila* species. They are characterized by a set of one or two modulated transverse bristle rows, which point distally, and are oriented along the proximo-distal axis of the prothoracic legs. Dramatic phenotypic variations exist in sex comb morphology between species of *Drosophila* (ranging from complete absence to sex combs with XX teeth), but the genetic underpinnings of this variation, and how variation is maintained, are still poorly understood. Although we know sex combs do not develop when the Sex Combs Reduced (SCR) gene is knocked out, we cannot conclude the gene is responsible for adaptive variation among natural populations. Two studies of the association between SCR and sex comb morphological variation have been pursued. First, directional selection may have acted on SCR in three *obscura* group species exhibiting very different sex comb sizes. However, statistical analyses of SCR sequences failed to detect evidence for directional selection in the first exon of the SCR gene among these species. Second, the investigators have begun to study the genetic basis of difference in distal sex comb size using two strains of *Drosophila subobscura* from different populations, including a potential role for SCR. Preliminary results show a slight contribution of the X chromosome to this within-species variation, and current work focuses on testing whether SCR may also be involved. Overall, this research focuses on understanding the genetic basis of a sexually selected trait in a model system

*Biological Sciences, 12:00-1:00*

**Anna Miyajima**

***Generational Gaps in Sustainability Efforts***

Research Advisor: Alma Blount, Public Policy

Community based research conducted in Kyoto, Japan for Tsukaisute Jidai wo Kangaeru Kai, an environmental sustainability initiative. The organization has been struggling to attract younger members, which is an issue as the average age of members approaches 70. Through interviewing members of Tsukaisute as well as local college students, identified that biases and differences in communication between the younger and older generation were causing the lack of younger members. Made recommendatinos to Tsukaisute regarding social media initiatives and collaboration with local colleges to fix this issue.

*Community Engaged Research, 12:00-1:00*

**Zanele Munyikwa**

***Compositional Approaches to Document Level Sentiment Analysis***

Research Advisor: Zanele Munyikwa, Computer Science

Much research has been conducted in creating systems for representing text, which are able to learn both syntactic and semantic information for natural language processing tasks such as sentiment analysis. Researchers have built language models based upon the distributional hypothesis, which theorizes that words that appear in similar context in text are likely to have similar semantic and syntactic meaning. In tackling problems within sentiment analysis, we often need to create representations that are more coarsely grained, such as documents and sentences. However, distributional representations of words often do not extend to distributional representations of documents. Constructing effective distributional representations of phrases and sentences requires that we have both a theoretical foundation to direct the development of models of composition and also a means of empirically evaluating those models. Little research has been done in the composition for the vectors created by the popular word2vec model, an unsupervised model for building distributional word vectors. I first discuss the properties and theoretical foundation of semantic composition and then define a set of composition functions that would align with this theory of compositionality. These compositional vector functions are used to create document vector representations, which were tested against a binary sentiment classification task. I found that for the task of sentiment analysis, a simple multiplicative model performs equally to random chance, which differs from previous work, which found that this model operates well on tasks in word co-occurrence. However, we find that the additive model still performed better or equal to each of the compositional functions based upon activation functions.

*Physical & Quantitative Sciences, 11:30-12:30*

**Simardeep Nagyal**

***Tobacco Retail Outlets: Associations between Density, Storefront Advertising and Smoking Cessation Outcomes***

Research Advisor: Francis McClernon, Duke University School of Medicine- Psychiatry & Behavioral Sciences

Tobacco retail outlets (TROs) and related marketing (e.g. storefront ads) are disproportionately concentrated in lower-income, minority neighborhoods. Residential proximity to TROs worsens cessation outcomes during quit attempts. This study analyzed the relationship between TRO density and socioeconomic status (SES) among adult cigarette smokers living in Durham County, NC, and uniquely investigated the relationship between the presence of tobacco ads on TRO storefronts and smoking cessation outcomes. In ARCGIS, we identified the number and location of TROs within a half-mile of each study participant using a database of TRO locations (Dr. Kurt Ribisl, UNC). We then used GoogleStreetView to record the number of tobacco ads visible on each TRO. We found residents who had less than a college degree lived in neighborhoods with a higher mean number of storefront advertisements per TRO ( $r=0.78$ ;  $p<0.0001$ ) than their college graduate counterparts, confirming results of previous studies that SES is correlated with prevalence of cigarette advertising. In an analysis of cessation outcome data, smokers ( $n=23$ ) who lived close to even a single TRO ( $\leq 0.5$  miles) relapsed earlier than those who did not (45 [SD=31.3] vs. 55.4 [SD=22.6] days; Cohen's  $d = 0.4$ ). Furthermore, smokers who resided near a TRO ( $\leq 0.5$  miles) with one or more tobacco ads relapse earlier than those who lived near a retailer with no ads (45.6 [31.2] days vs. 51.8 [26.6] days; Cohen's  $d=0.2$ ). These preliminary results suggest that policies that target the distribution and advertising practices of TROs could be an effective strategy for reducing the burden of smoking among low SES individuals.

*Bass Connections, 11:30-12:30*

**Simardeep Nagyal**

***Proteomic analysis of interferon- $\lambda$  4 immunoprecipitates identifies candidate nuclear and endomembrane interacting proteins***

Research Advisor: Shelton Bradrick, Molecular Genetics & Microbiology

Interferons are a group of secreted proteins that generate antiviral activity by activating interferon-stimulated genes in response to foreign pathogen entry. In particular, Interferon-lambda 4 (IFNL4) induces an antiviral state against Hepatitis C Virus (HCV) in vitro. However, the IFNL4  $\Delta$ G genetic variant responsible for generating the IFNL4 protein has been linked to poor spontaneous or treatment-induced clearance of HCV in vivo. One possible explanation for these paradoxical functions of IFNL4 is that the interferon is secreted weakly, though the modified secretory pathway has not been identified. I hypothesized that IFNL4 associates with specific cellular proteins that alter its secretory activity. Proteins were pulled down in IFNL4-induced and non-induced HeLa cell lysates via immunoprecipitation experiments. They were then identified via mass spectrometry. Proteomic analysis revealed that IFNL4 does not uniquely co-precipitate with a large number of proteins localized in the endoplasmic reticulum or golgi apparatus, both of which are cellular compartments that oversee the packaging or vesicle export of secretory proteins. Instead, IFNL4 uniquely interacts with a high percentage of nuclear proteins. Given that the peptide sequence of IFNL4 contains the nuclear localization signal sequence, this suggests that IFNL4 may be translocated into the nucleus and this may hinder its effective extracellular secretion.

*Biological Sciences, 11:30-12:30*

**Manish Nair, Anya Ranganathan**

***Dynamic Time Warping: A Novel Metric for Evaluating Piano Performance***

Research Advisor: Jennifer Groh, Neurobiology

A current obstacle to evaluating musical performance is the lack of an objective, quantitative framework to measure proficiency. Current metrics used to gauge proficiency in piano performance are subjective, and time-consuming to execute. Additionally, they do not compensate for compounding temporal errors, such as mistakes made in the timing of notes and in musical melody. Dynamic Time Warping (DTW) is an algorithm that can be used to determine the similarity between two temporal sequences, even if they are of different lengths. The output from this algorithm is a single number, which represents the degree of deviation from an ideal execution of a temporal sequence. A score of zero is indicative of a perfect execution, while a large number implies that there were several errors in execution. In the present study, we investigated the utility of DTW in evaluating piano performance. 29 participants were presented with a series of novel piano pieces, and the number of errors per trial was recorded. We found a strong correlation between the total errors and the DTW score. This suggests that DTW is a reliable metric for quantifying proficiency in piano performance. The DTW scoring is also more than 1000 times faster than a manual scoring. Having thus achieved a reasonable assessment of performance and efficiency, DTW scoring could make a major impact in the gamification of music and the development of techniques to expedite music learning.

*Bass Connections, 12:30-1:30*

**Brittany Nanan**

***The Interaction of Counter-Terrorism with Human Rights***

Research Advisor: David Siegel, Political Science

With my research I hope to uncover some of the basic causes of the human rights violations that seem to walk hand in hand with counter-terror methods. I believe that the magnitude and shock of 9/11 caused the USA as well as the UN to make several key mistakes that would open the door to human rights violations as effective response methods. I use an interpretive analytical approach, focusing more on the foundation of these issues than the paths they have taken. My research is founded in secondary source research, with focus on interviews of experts in related fields. Hopefully this research will serve as a guide to future policy makers of the mistakes that should be avoided when dealing with a subject as sensitive as terrorism in order to both avoid potential human rights violations and implement policy that will be effective in both the short term and the long term.

*Humanities, 12:00-1:00*



**Jasmine Nee**

***Creating a combination therapy for treating neuroblastoma: testing the cooperative effects of retinoic acid, ODSH, and MLN8237 on cancer cell differentiation and proliferation***

Research Advisor: Gerard Blobe, Pharmacology & Cancer Biology

Neuroblastoma, the most common cancer in infancy, is a tumor that forms from immature, undifferentiated nerve cells. Tumors composed of fewer adult-like, or differentiated, cells are more likely to be classified as high-risk. Although chemotherapy and surgical removal of the tumor serve as treatment options for neuroblastoma, these therapies have low success in the subset of patients at highest risk. My research project aimed to identify drug combinations that can overcome this lack of efficacy by promoting cell differentiation and inhibiting cell proliferation. There is evidence that three existing compounds—retinoic acid; 2-O, 3-O-desulfated heparin (ODSH); and MLN8237—individually promote differentiation in neuroblastoma. However, it is unknown whether combining these agents can optimally maximize differentiation and minimize proliferation. To investigate this, I co-treated multiple neuroblastoma cell lines with different concentrations of retinoic acid, ODSH, and MLN8237 and analyzed differentiation levels via western blot. I also performed thymidine incorporation assays to measure the extent of cell division in response to treatment. My results suggested that the combination of ODSH and MLN8237, both at low concentrations, yields more differentiation than treatment with either agent alone. Although co-treatment with the same combination did not suppress proliferation, substituting heparin—a structural relative of ODSH—for ODSH led to reduced cell division. The observed cooperative effects between ODSH and MLN8237 lends promise to the clinical success of such a drug cocktail. Furthermore, these findings promote the use of combined differentiating agents as a treatment strategy for neuroblastoma and potentially, other cancers.

*Biological Sciences, 12:30-1:30*

**Quang Nguyen**

***Robust ADCC and Virus Capture Activity of Env-specific Monoclonal Antibodies Isolated from Blood and Breast Milk of Chronically Infected African Green Monkeys***

Research Advisor: Sallie Permar, Molecular Genetics & Microbiology

In contrast to HIV-infected individuals and SIV-infected rhesus macaques (RhMs), African green monkeys (AGMs), the natural primate hosts of simian immunodeficiency virus (SIV), sustain nonpathogenic infection and rarely transmit the virus to their infants despite chronic viremia and high milk virus RNA loads. Additionally, chronically SIV-infected AGMs exhibit more robust milk and plasma envelope (env) gp120-specific antibody responses than non-natural hosts that may be associated with the lack of B cell dysfunction during chronic SIV infection. Therefore, characterizing SIV Env-specific memory B cell repertoire in blood and milk of AGMs could help elucidate the antibody responses that evolved in this natural host species and potentially inform effective vaccine strategies against mother-to-child transmission of HIV-1. Ten mAbs were isolated 1 year postinfection from B cells of 4 SIVsab92018TFiv-infected lactating female AGMs. Assays performed include (1) titration ELISAs against the autologous Env gp120 and gp140 proteins and peptides, (2) SIV neutralization assays using the TZM-bl cell line, (3) ADCC, and (4) virus capture assays, using autologous virus Env proteins or virus. Of the 10 autologous SIVsab Env-specific mAbs, 7 were reactive against gp120 (2 of which were V3-specific mAbs), and 3 were reactive against gp41. Two blood mAbs neutralized the tier 1 SIVmacTCLA. None neutralized the tier 2 autologous challenge virus. Interestingly, all 10 mAbs mediated robust ADCC against autologous Env-coated target cells. Gp120-specific mAbs exhibited robust killing activity against gp120- and gp140-coated target cells with endpoint concentration less than 0.1  $\mu\text{g/mL}$ . Nine mAbs also bound to the surface of SIVsab92018TFiv-infected NKR cells. Of the 10 mAbs, 5 gp120-specific mAbs showed robust capture of autologous SIV virions, yet only in the presence of sCD4.

*Biological Sciences, 11:30-12:30*

**Kevin Nikolaus**

***Can Unmanned Aerial Systems be Integrated into Arctic Environmental Monitoring?***

Research Advisor: Micheal Zavlanos, Mechanical Engineering

Autonomous remote sensing in the Alaskan arctic is a field with much potential. It stands to improve data quality, worker safety, and tedious task automation. However, hurdles exist. This research investigated whether unmanned aerial systems could be effectively integrated in arctic environmental science. The research concluded that there are informational barriers restricting widespread use, information that subsequently motivated me to write an informational brief to concisely fill this informational gap. A subsequent research question developed a detailed case study for the integration of autonomous remote sensing along the Trans-Alaskan Pipeline. This case study is meant as an exemplar that could readily be extrapolated to numerous other arctic contexts.

*Community Engaged Research, 12:30-1:30*

**Hunter Nisonoff**

***A combined inverse rotamer and geometric hashing approach to design of LpxA peptide inhibitors***

Research Advisor: Bruce Donald, Computer Science

The glycolipid lipid A is required for the survival of most Gram-negative organisms. Peptides that target the first enzyme of the Raetz lipid A pathway, LpxA, have shown antimicrobial properties against gram-negative bacteria, but there are still no clinically approved agents targeting this pathway. Thus, it is important to increase the repertoire of LpxA inhibitors through new peptides that are potent, broadly-neutralizing, stable and selective. / / Computational structure-based protein design (CSPD) programs, such as OSPREY, can be used to design peptides and peptidomimetics with these characteristics. By studying the structural information of known inhibitors, we have developed a method to search for peptides that share a small set of key binding sites, but bind uniquely elsewhere. We constructed a database of 1600 known peptides and then used a new geometric-hashing based algorithm to match peptides that bound to key residues of a validated inhibition site. The top results were then designed using OSPREY/K\* for affinity and will be validated experimentally.

*Biological Sciences, 12:30-1:30*

**Stephanie Ogwo**

***Exploring Brain Gain in West Africa: The Experiences of Highly Skilled West African Returnees***

Research Advisor: Raymond Garrett-Peters, Sociology

Through a migration process known figuratively as the "Brain Drain", many talented individuals leave their countries of origin, in this case Nigeria, to pursue advanced education and job opportunities in the United States. While pursuing opportunities in the U.S., many individuals remain tied to their countries and families of origin through various means including, but not limited to, sending remittances home. A subset of these migrants over time choose to return with the intent of using newly acquired skills and resources to improve the lives of those they left behind. In essence, this population represents a reverse process called the "Brain Gain". My study discerns the motivation of those who engage in return migration and what their economic, social, and interpersonal experiences are once they return. To explore these issues, I conducted a semi-structured, qualitative interview study with 10 male and female Nigerians. Preliminary findings suggest that the despite various levels of time spent in-country, immigrants do experience barriers to assimilation including infrastructural, language, and value-based barriers, such as similar attitudes towards work, independence, and authority. Findings also suggest that repatriates often choose to live and work in their countries of origin, despite lowered financial incentives, to explore entrepreneurship, expand their networks in hopes of expanding their opportunities transnationally, and find fulfillment through work that directly or indirectly "advances the country". Limitations to my study include convenience sampling, and limited diversity of occupation of the respondents.

*Social Sciences, 12:00-1:00*

**Max Orenstein, Paul Burgess, Ilhan Savut**

***Animal Feedstock Solution for Flare Gas using Methanotrophic Bacteria***

Research Advisor: Emily Klein, Earth and Ocean Sciences

This projects analyzes economic, environmental, and regulatory perspectives for utilizing flare gas to grow methanotrophic bacteria which can be processed as a feedstock for certain types of mono-gastric livestock. We explore the methods of growing a specific culture of bacterium on natural gas, the harvesting process, and the consequences of replacing protein from soybean meal and fishmeal with bacterial feed in the diets of several animals. We then develop an implementation and marketing plan for a centralized processing plant where flare gas from typical well sites in the Bakken oil fields is consumed to produce the bacterial meal that is to be sold locally.

*Bass Connections, 12:00-1:00*

**Erica Ortiz**

***¡Viva la Partera!: Reproductive Health in Rural Honduras***

Research Advisor: Dennis Clements, Global Health

The use of midwives in the rural communities of Honduras has been significantly reduced as a result of increasing international pressures to reduce neo-natal and maternal mortality. Consequently, most women are encouraged to utilize biomedical resources despite not having economic or transportation capacity to access healthcare resources. It should be recognized that midwives hold a wealth of knowledge and are able to offer intuitive care to economically disadvantaged women in rural areas where hospitals are inaccessible. However, midwives receive no formal training and are sometimes ill prepared for emergency situations. The purpose of this project was to determine how women describe their relation with the midwives while accessing their knowledge on health topics pertaining to the women reproductive system to ultimately draw conclusions on how to best integrate midwives in the community. A total of 30 women were interviewed across the communities of El Pital and Yaruca, Honduras. The results indicate that most women in both communities agreed that midwives are community leaders and fulfill a unique purpose in their respective roles. Women generally understand that midwives should receive more support and training to improve their techniques as they assist women during birth and labor. Furthermore, testimonials from women in the communities reveal that they have knowledge about several topics concerning the reproductive system, yet they abstain from certain behaviors due to their cultural beliefs. The research noted that the midwives in the area are willing to undergo training to provide primary care associated with reproductive health to women in the regions who find it impossible to reach a community health clinic or hospital. As the majority of midwives reaches an older age, it is also necessary to access their knowledge and train a younger generation of midwives with the necessary information to ensure that all women in these rural regions have a safe labor. The midwives are respected members of their communities and it is essential to create regular workshops on topics of the reproductive system, pre- and post-natal care so that they can translate their knowledge to the women in the communities.

*Community Engaged Research, 12:30-1:30*

**Se Eun Park**

***Rod Photoreceptor Degeneration Upon Selective Ablation of Ranbp2 or Selective Impairment of its Ran-GTP-binding Domains***

Research Advisor: Paulo Ferreira, Department of Ophthalmology, Duke University Medical Center

In neurodegenerative diseases, the disintegration of neural networks is thought to occur by intrinsic and extrinsic stressors causing the autonomous and non-autonomous death of neurons. The etiology and pathogenesis of various neurodegenerative diseases have yet to provide the cellular and molecular bases of the autonomous and non-autonomous death of neurons and this limitation has hindered the development of therapeutic interventions. The neuroretinal network is a great model system to study neural death processes due to its diverse and unique structures, distributions and functions of closely related photoreceptor neurons, the cones and rods. This study employed the Ran-binding protein 2 (Ranbp2), a multifunctional protein linked to the modulation of cell death by intrinsic and extrinsic stressors, to dissect the downstream effects of gene ablation and interactions between photoreceptor types in cell death processes. Previous studies have found that 1) cone-specific ablation of Ranbp2 causes non-apoptotic death of cones and cone-dependent non-autonomous apoptosis of healthy rods and 2) expression of Ranbp2 with impairment of selective Ran-GTP-binding domains (RBDs) in cones without Ranbp2 rescued the degeneration of mature cone photoreceptors. In this study, a combination of immunohistochemistry, confocal microscopy and morphometric analysis was used to investigate the degree of conservation of cell death mechanisms between rod and cone photoreceptors upon 1) rod-specific ablation of Ranbp2 or 2) expression of Ranbp2 with impairment of selective Ran-GTP-binding domains (RBDs) in rods without Ranbp2. Results showed that rod-specific ablation of Ranbp2 causes rapid rod death with surviving yet dysfunctional cone photoreceptors, while selective impairments of RBDs of Ranbp2 provide delayed but failed to rescue rod photoreceptor degeneration. This study sheds light on distinct roles of Ranbp2 and Ran GTPase regulation in autonomous and non-autonomous cell death between rod and cones photoreceptors, thus providing insights to the molecular bases of the onset and progression of neurodegenerative diseases affecting photoreceptors and likely other neural cell types.

*Biological Sciences, 11:30-12:30*

**Cody Parrott**

***Investigations into Novel Thioaryl Cross Coupling Reactions***

Research Advisor: Jennifer Roizen, Chemistry

Cross coupling reactions are an important class of transformations in organic chemistry, traditionally allowing for the creation of carbon-carbon bonds between electrophilic aryl halides and nucleophilic organometallic reagents. Thioaryl electrophiles represent a particularly challenging class of substrates, due in part to the relatively strong carbon-sulfur bond. Nevertheless, our lab has begun investigations into nickel-catalyzed Suzuki and palladium-catalyzed Heck reactions of these compounds. In preliminary Suzuki reaction studies, poor conversion of the thioaryl substrates and large amounts of boronic acid dimerization were observed. Focus has shifted to the creation of a library of aryl sulfides for use in subsequent methodology development. Thioaryl substrates have been prepared via the alkylation, arylation, and esterification of thiophenol and related compounds.

*Physical & Quantitative Sciences, 11:30-12:30*



**Alexis Pearce**

***An Armed Utopia: Literature, Human Rights, and Justice in 1970s Argentina and Chile***

Research Advisor: Jose Maria Rodriguez-Garcia, Romance Studies

Argentina and Chile experienced violent oppression throughout the 1970s and 1980s when the quest to exterminate communism and the desire for neoliberal economics culminated into military regimes that acted with impunity. The strength, however, of human rights organizations and their political pressure led to popular social mobilizations which urged the transitional governments of both countries to begin judicial processes against the juntas. The truth commissions, el Informe Sábato (Argentina, 1984) and el Informe Rettig (Chile, 1991), delineated the transgressions undertaken by the Armed Forces and attempted to calculate the number of disappeared and/or tortured. That Ernesto Sábato, an Argentine literary voice, presided over the National Commission for Disappeared Persons speaks to the overlapping of literature, human rights, and justice that occurred during and right after the military dictatorships. This study seeks to explore these intersections further by examining various approaches to Argentine and Chilean literary production and human rights discourse across a timespan of twenty-five years. *Libro de Manuel* by Julio Cortázar (*Manual for Manuel*, 1973), *Abaddón el exterminador* by Ernesto Sábato (*Abaddón the Exterminator*, 1974), and *Nocturno de Chile* by Roberto Bolaño (*By Night in Chile*, 2000) serve as the primary literary texts analyzed in this study. This study ends by questioning the transition from the future-oriented texts of Cortázar and Sábato to fiction anchored in turbulent historical moments, as represented by Bolaño's fiction. As time, dominant historical narratives, and amnesia continue to distance us from the thousands of human rights transgressions whose justice still has not been exhausted, it is of the utmost importance to reproblematicize the past and its representations. In this way, we are able to serve our duty to the past and there relocate a utopia in which justice is given to those whose basic rights were ignored in the conquest of progress.

*Humanities, 12:00-1:00*

**Bo Peng**

***The conserved chromatin remodeling protein Alhambra regulates olfactory sensory neuron differentiation in Drosophila***

Research Advisor: Pelin Volkan, Neurobiology

Understanding how neurons acquire distinct identities is a central question in developmental biology. The olfactory system of *Drosophila melanogaster* is an excellent model to answer questions about neuronal identity due to its small yet highly diverse system of olfactory receptor neurons (ORNs). Although the specific expression patterns of ORNs are well characterized, little is known regarding how diverse ORN identities originate from a small number of neuronal precursors. Here we show that the highly conserved chromatin remodeling protein Alhambra in *Drosophila* is required for correct expression of a subset of ORN identities in adult and pupal flies. Alhambra appears to be expressed in affected ORNs during pupal development; specifically during the time period of odorant receptor expression, the key marker of ORN identity. To confirm these results and expand our understanding of the endogenous Alhambra protein, we present a plan to tag Alhambra with GFP using the CRISPR/Cas 9 system. With this new technology, not only can we directly visualize the presence or absence of endogenous Alhambra, but we can also perform future biochemical analysis. This work implicates chromatin modification in identity specification in ORNs, and may contribute to sensory plasticity in fly courtship behavior.

*Biological Sciences, 12:30-1:30*

**Samantha Perez**

***Promoting Elastin Production in Tissue-Engineered Blood Vessels by  
Inhibiting microRNA-29 in Human Neonatal Dermal Fibroblasts***

Research Advisor: William Reichert, Biomedical Engineering

Tissue-engineered blood vessels (TEBVs) lack the compliance of the native vasculature due to minimal elastin production. Inhibition of microRNA-29a (miR-29a) increases elastin production in smooth muscle cells by preventing the binding of a RNA-induced silencing complex to tropoelastin mRNA, thus allowing the translation and secretion of tropoelastin into the ECM. Past attempts to integrate elastin into TEBVs by use of mechanical stimuli or growth factors have shown limited success; however, miR-29a inhibitors offer a possible solution towards achieving physiologically compliant TEBVs. In the current study, human neonatal dermal fibroblasts (hNDFs) cultured in 2D and 3D in a dense collagen gel construct were transfected with a miR-29a hairpin inhibitor to promote elastin production. This study is the first to focus on integrating elastin into rapidly producing robust cellularized TEBVs from a biological scaffold. Results demonstrate that miR-29a upregulates ELN gene expression and protein production in hNDFs in 2D and in 3D.

*Biological Sciences, 11:30-12:30*

**Katherine Plevka**

***Athletes Report a Higher Likelihood of Engaging in Risky Activities than Nonathletes***

Research Advisor: Scott Huettel, Psychology and Neuroscience

Unintentional injuries, resulting from taking unnecessary risks, are the most common cause of death among adolescents and young adults. Specifically, Division I Varsity collegiate athletes are the most likely group of young adults to participate in risky behaviors. Current work on differences in risk-taking between athletes and nonathletes focuses on risk acceptance in sporting environments, and does not address differences in risk-taking between athletes and nonathletes in daily life. The current study sought to fill this gap by investigating differences between athletes and nonathletes in risk-taking in a laboratory setting, likelihood of taking risks, and risk perception. Highly active, Division I collegiate athletes (N=29), highly active nonathletes (N=18), and moderately active nonathletes (N=19) completed a battery of tasks that included a demographic questionnaire, the IPAQ, the BART, and the mini-DOSPert. There were no significant differences between athletes and nonathletes on the BART, our behavioral laboratory task, on the likelihood of risk-taking and perception of risk in the social domain of the DOSPert, or on the perception of risk on the health/safety, recreational, social and daily college life domains of the DOSPert. However, significant differences between athletes and nonathletes were found on the likelihood of risk-taking scale of the DOSPert in the health/safety, recreational, and daily college life domains. These results indicate that athletes and nonathletes perceive risks in the same way. Athletes, however, report a higher likelihood of taking risks on the health/safety, recreational, and daily college life domains of the DOSPert. The lack of significant findings on the laboratory behavioral risk-taking task, the BART, support previous work that there are social and emotional factors at play in daily risk-taking that are not captured in a laboratory setting. The DOSPert results show that athletes understand the potential consequences of risk-taking as well as nonathletes, however they still report a higher likelihood of engaging in risky activities in daily life. This indicates that athletes are more willing to take risks in daily life than nonathletes. It is our hope that these findings can be used to improve current educational programs aimed at reducing risky behaviors in collegiate athletes.

*Psychology GwD, 12:00-1:00*

**Cassidy Pomeroy-Carter**

***Differential habitat-use as a thermoregulatory mechanism in lemurs:  
the relationship between vertical and horizontal microhabitat selection  
and climatic variables***

Research Advisor: Leslie Digby, Evolutionary Anthropology

Behavioral thermoregulation is a critical means of mitigating the costs of physiological temperature regulation in endotherms. Despite its biological relevance, behavioral thermoregulation remains poorly characterized in primates. Strepsirrhine primates, including lemurs, have relatively low basal metabolic rates, potentially limiting their capacity for autonomic maintenance of temperature homeostasis. As such, behavioral strategies may be particularly important thermoregulatory mechanisms in these species. Some forms of behavioral thermoregulation, such as huddling and sunning, are well-established hallmarks of lemur behavior, but differential habitat-use has not been explored as a potential thermoregulatory strategy in this family. This study aims to address that gap by examining correlations between climatic variables and vertical and horizontal microhabitat selection in semi-free ranging *Lemur catta* (ring-tailed lemurs) and *Propithecus coquereli* (Coquerel's sifakas) housed at the Duke Lemur Center. I found a significant positive correlation between temperature and time spent higher than four meters in linear mixed model analysis ( $p < 0.0001$ ). There was not a significant correlation between horizontal habitat-use and temperature, but a significant positive correlation between time spent at the interior of the forest and humidity did emerge ( $p = 0.0084$ ). Because lemurs do employ differential habitat-use as a thermoregulatory mechanism, these results have implications for lemur biogeography and the ability of these species to cope with large-scale habitat disturbances such as climate change and deforestation.

*Biological Sciences, 12:30-1:30*

**Vikram Ponnusamy**

***The Role of DNA Repair Genes in RNA-Mediated Silencing in  
Cryptococcus neoformans***

Research Advisor: Joe Heitman, Molecular Genetics & Microbiology

*Cryptococcus neoformans* is a fungal pathogen that primarily affects immunocompromised people and causes life-threatening meningitis. AIDS patients and organ transplant recipients undergoing immunosuppressive therapy are the most vulnerable to this disease. Greater understanding of regulatory mechanisms such as RNA interference (RNAi) can improve the knowledge of the molecular biology of this pathogen. RNAi uses small noncoding RNAs to induce transcriptional and post-transcriptional silencing of gene products, and it has roles in drug resistance and genomic defense. In *Neurospora crassa*, it has been observed that the homologous recombination gene RAD52 plays a role in RNAi. To determine whether RAD52 is also involved in RNA based gene silencing in *C. neoformans*, we deleted RAD52 in both mating type a and  $\alpha$  strains of *C. neoformans*. By analyzing the RNAi silencing efficiencies during vegetative growth, as well as during sexual reproduction, the role of RAD52 in mitotic silencing and sex induced silencing was assessed.

*Biological Sciences, 12:00-1:00*

**Karishma Popli**

***Lighting The Future With Technology: An Evaluation on the Efficacy of Solar Lamp Use in Rural Villages***

Research Advisor: Alma Blount, Public Policy

The purpose of this program evaluation was to determine whether solar lamps are an effective and feasible technology that can easily be introduced in rural villages to help students study productively at night when they have no access to electricity. Students are unable to study and complete homework productively at night when they do not have adequate lighting. Three years after initially distributing solar lamps to students at a rural village school in Rajasthan, India, an evaluation was conducted to determine whether students had incorporated use of this sustainable technology, how students utilized the solar lamps, and whether the introduction of this technology helped them study more effectively. The findings of this evaluation suggest that both students and their parents found the solar lamps useful to study, perform household chores, and work outside in the field after dusk. After the introduction of solar lamps, families no longer used kerosene, which is dangerous to their health and the environment. An interactive lesson plan on the importance of solar technology was prepared and presented at the village school for grades 6-12. The average self-rated response on students' knowledge of solar technology after the lesson was 9.8 out of 10 compared to 3.4 prior to the lesson. Responses indicate students understood the beneficial impact of utilizing solar energy, and welcomed the introduction of this new technology in their community.

*Community Engaged Research, 12:30-1:30*

**Murphy Poplyk*****Heterologous Biosynthesis of Salinosporamide Analogues***

Research Advisor: Michael Lynch, Biomedical Engineering

Salinosporamides are a group of beta-lactone natural products made by marine bacteria. These beta-lactones are protease inhibitors active against both the human proteasome and pathogenic microbes. Salinosporamide A is currently in clinical trials as a treatment for multiple myeloma, and this class of molecules also shows promise to treat microbial diseases such as chlamydia. Our project is to biosynthetically make salinosporamide analogues in genetically engineered bacteria. We hope that our heterologous pathway will enable the production of structurally diverse analogues providing a scalable, cost effective alternative to total synthesis.

*Biological Sciences, 11:30-12:30*



**Sania Rahim**

***Understanding Pathogen Richness: Predicting Pathogen Richness in North American Squirrels (Sciuridae)***

Research Advisor: Charles Nunn, Evolutionary Anthropology

Zoonotic pathogens that are shared with wild or domesticated animals are the cause of more than 60% of human infectious diseases. These pathogens are responsible for millions of deaths annually and have cost over a hundred billion US dollars in the past two decades. Investigating different aspects of zoonotic pathogens can help inform policy decisions on public health, agriculture, and conservation of biodiversity. Pathogens play essential roles in natural communities; studying the variables that influence pathogen richness is important in determining the biological principles governing biodiversity. Squirrels, a rodent family which is commensal with humans and known to carry zoonotic pathogens, provides an ideal model system for asking basic questions about the distribution of pathogens in a group of mammals. This study looked at how well sampling effort, body mass, sociality, home range area, minimum temperature, precipitation, terrestriality, and urbanization explained variation in pathogen species richness in North American squirrel species. According to a measure of sampling effort that used number of individuals sampled for each host species, it was found that sampling effort, home range area, and urbanization were positively correlated with pathogen richness while terrestriality was negatively correlated. In another measure of sampling effort that used the number of unique studies done on each host species, sampling effort was positively correlated with pathogen richness and mean precipitation was negatively correlated. In both cases sampling effort explained over 70% of the variation present in the dataset. Moving forward, we hope that future studies will assess these variables in other host species, in an attempt to identify patterns of zoonotic pathogen transmission that affect humans.

*Biological Sciences, 11:30-12:30*

**Laxmi Rajak**

***Voicing the Unheard: An Examination of the School Experiences of Nepali Dalit Students***

Research Advisor: David Malone, Education

In Nepal, caste is at the center of people's conversations about themselves and their experiences at school. Regrettably, Dalit students' position at the bottom of the caste hierarchy continues to frame their educational experience. There is an emerging literature focused on this issue. However, only a handful of investigations observe the school experiences of Dalit students from their own perspectives. In addition, focused on a narrow geographical context, the scholarly work fails to adequately emphasize and analyze the heterogeneity of Dalit students' school experiences. My thesis, thus attempts to address these gaps in the existing research in order to articulate a more nuanced understanding of Dalit students' school experiences. In the summer of 2014, I conducted interviews with 61 Dalit children from various geographical regions (Sindhupalchok in Mountain region, Lalitpur in Hilly region, and Nawalparasi in Terai region) with different socio-economic status. Informed by the educational theories and studies from Nepal, my analysis showed that, particularly three social context factors including Family Educational Background, Economic Status, and Neighborhood Effects, as well as five school-related factors including Caste of Teachers, Teachers' Expectations, School Curriculum, Dalit Scholarship Programs, and Relationship with Peers, when studied together, have significant impacts on Dalit students' school experiences. In other words, these factors do not operate in isolation but, rather, they interact in powerful ways to shape and influence the school experiences of Dalit students. Further research on an even larger scale is necessary in order to better understand and enhance the quality of Dalit education. Ultimately, my research shows that policies designed to improve (and increase) the educational opportunities for Dalits must, in order to be effective, form part of a broader initiative to identify and address the ways in which multiple factors come together to shape their school experiences.

*Humanities, 12:30-1:30*

**Sandy Ren**

***Multivariate Responses to Direct and Indirect Selection in Yeast***

Research Advisor: Paul Magwene, Biology

Phenotypes are often controlled by complex genetic networks, where multiple genes can influence a single trait and a given gene can also influence the outcome of multiple traits. Complex genetic networks and pleiotropy can induce correlations between phenotypes and such correlations influence responses to selection. Thus, it is important to study selection in a multivariate context. In this project, the budding yeast, *Saccharomyces cerevisiae*, was used to assess multivariate responses to selection. The phenotypes of invasive growth, colony morphology, and sporulation were jointly examined since they have overlapping signal transduction pathways and regulatory networks with genes of known pleiotropic effect. Based on the current understanding of the shared genetic networks underlying these traits, I hypothesized that invasive growth would exhibit a positive correlation with colony morphology and a negative correlation with sporulation. To test this hypothesis, I characterized changes in the joint distributions of these phenotypes under two selection regimes: (1) direct selection for invasive growth and (2) indirect selection during multiple generations of ostensibly neutral, random mating. While there were complex distributional changes in both selection regimes, I consistently observed a positive association between invasive growth and colony morphology. However, contrary to expectation, there were no consistent statistically significant associations between sporulation and either invasive growth or colony morphology. The results of this experiment highlight the challenges of predicting multivariate responses to selection which are influenced not only by the interactions of networks controlling phenotypes but also by the allelic variation present in populations.

*Biological Sciences, 12:30-1:30*

**Gina Rhee**

***Identifying Genes Required for Stem Cell Niche Morphology in C. elegans***

Research Advisor: David Sherwood, Biology

The stem cell niche is a microenvironment that maintains a self-renewing progenitor cell population, but when it is disrupted, inappropriate differentiation can often occur. In *Caenorhabditis elegans*, the germ stem cell niche consists of a single cell, the distal tip cell (DTC), which enwraps adjacent germ stem cells to maintain a proliferative stem cell state. I am hypothesizing that germ cells induce enwrapping in their niche through interactions between the germ line and its somatic partners. The DTC in *C. elegans* serves as an excellent model to further study the stem cell niche and its role in enwrapment by muscle. The mechanism underlying how germ cells induce enwrapment in niche formation is unknown. Thus, the objective of my work is to identify mutant genes with defect of enwrapment of the germ line by the distal tip cell. Screens in the lab have identified two mutants with a defect of enwrapment and with this information, I hope to map the chromosomes that these mutant genes are located on. Such findings will elucidate how DTC morphology plays a role in normal stem cell biology and provide insights on the mechanism of the interaction between the germ cell niche and its somatic partners. This will further our knowledge of which genes induce DTC enwrapment in the normal niche and the functional consequences of this enwrapping behavior.

*Biological Sciences, 12:00-1:00*

## **Houston Rhodes**

### ***Diet/Nutrition and Alzheimer's Disease***

Research Advisor: Charles Piot, Cultural Anthropology

Studying beliefs about coconut oil's association with Alzheimer's disease (AD) in Lomé, Togo allowed for thorough investigation of whether or not people trusted their connection and participated in using the oil to treat AD or Alzheimer's-like diseases. Although minimally discussed and researched in the Western hemisphere, coconut oil and AD's relationship has been noted historically throughout Togolese traditional medicine. What is inferred from studying this relationship for over five years is that the lack of research and discussion on such relationship is primarily due to big corporations and pharmaceutical companies' interest in monetary gains rather than health equity. During my research in Lomé, I found that coconut products, specifically the oil and outer shell, have been used for decades to regress and aid memory loss in the elderly. This mode of treatment is far less expensive and more accessible compared to treatment offered at hospitals. For my fieldwork I traveled throughout southern Togolese villages and towns' hospitals, businesses, and street vendors to gain more knowledge about coconut use and AD. Fieldwork focused on how Togolese view coconuts' medical and/or treatment capabilities, as well as, how Togolese understand its impact on mental illness and memory disorders. Fieldwork concluded that Togolese believe coconut products have treatment measures that can be used to positively impact Alzheimer's-like diseases.

*Community Engaged Research, 12:00-1:00*

**Callie Roberts**

***Discovery of New Therapeutic Targets for Glioblastoma Expressing EGFRvIII***

Research Advisor: Madan Kwatra, Cell Biology

Glioblastoma (GBM) is among the most aggressive and common primary brain tumors in adults. GBM patients have an extremely poor prognosis, and current treatments (including surgery, radiation therapy, and chemotherapy) have failed to extend median survival beyond 15 months. Therefore, the need for an effective GBM therapy is urgent. To achieve this goal, researchers are seeking to understand glioblastoma biology more fully in order to identify novel molecular targets to block tumor growth. One such target is the epidermal growth factor receptor (EGFR). Amplification of the EGFR gene and subsequent overexpression of EGFR are seen in about 40% of glioblastomas; over 50% of these glioblastomas with overexpressed EGFR also contain a variant of EGFR, known as EGFRvIII, which lacks amino acids 30-297 in its extracellular domain. Key features of EGFRvIII include a lack of binding to EGF and constitutive tyrosine kinase activity. The GBM cell line U87 MG with recombinant expressed EGFRvIII showed a significant growth advantage (in tumor xenografts and cell culture models) compared to parental U87 MG cells expressing only wild-type EGFR. EGFRvIII enhances tumorigenicity through multiple mechanisms. It increases proliferation, reduces apoptosis, and activates PI-3-kinase pathways. EGFRvIII has also been implicated in tumor invasion and angiogenesis. To better define signaling differences between GBM with wild-type EGFR with gene amplification and EGFRvIII, we recently characterized a panel of twenty patient-derived glioblastoma xenografts (PDGX) using reverse phase protein arrays, and this panel included six PDGX with elevated EGFR. Among these six, three expressed EGFRvIII. A comparison of the proteomic profiles of PDGX with wild-type EGFR and EGFRvIII revealed that PDGX with EGFRvIII have an overexpression of several protein including beta-catenin. Along with beta-catenin, the following proteins were identified to have significantly increased expression in EGFRvIII-expressing xenografts tumors relative to wild-type EGFR xenograft tumors: BCL XL, Beta Catenin, S6-pS235-s236, S6-pS240-s244, TAZ-pS89, TRFC, and YB1. These seven proteins can now be used for targeted therapies to treat the subset of GBM patients with EGFRvIII.

*Biological Sciences, 12:00-1:00*

**Lindsay Rosenthal**

***Parents of Children with Chronic Illness: The Relationship Between Distress and Quality of Life***

Research Advisor: Robert Thompson, Psychology and Neuroscience

Parents of children with chronic illness often experience great amounts of distress. The aims of this investigation were to compare the quality of life (QoL) of parents of children with chronic illness to parents of healthy children, and to investigate the relationships between parental distress, intentional self-regulation (ISR), and parental QoL in parents of chronically ill children. The sample consisted of 147 parents of children with chronic illness and 149 parents of children without chronic illness. Parental distress was measured using the Parent Experience of Childhood Illness (PECI) survey. ISR, a proxy for coping, was assessed with the ISR scale. Parental QoL was surveyed by the use of the Short Form 12-Question (SF-12) questionnaire, which measures physical and mental health-related QoL. Results revealed that there were no significant differences between parents of children with chronic illness and parents of healthy children in regards to parental physical or mental health-related QoL. Within the group of parents of children with chronic illness, parental distress was significantly related to parental mental health-related QoL ( $p < .001$ ) and approached significance for physical health-related QoL ( $p = .059$ ), after controlling for all other factors. Finally, low ISR approached significance as a moderator of the relationship between parental distress and mental health-related QoL ( $p = 0.07$ ), holding all other factors constant. In order to determine how to best promote the well-being of parents of chronically ill children, further investigation into the relationships between parental distress, ISR, and QoL is warranted.

*Psychology GwD, 12:00-1:00*

**Nicole Rudden**

***Blood and Money: French Anti-Semitic Imagery in the Golden Age of Caricature***

Research Advisor: Mark Antliff, Art, Art History, Visual Studies

Fin de siècle Paris was at the heart of a recently industrialized country confronting the pressures of modern life. From 1890 to when France entered World War I in 1914, tensions were building between the traditional social order and new systems— such tensions included the conflict between big and small scale businesses, a fledgling government seeking to assert its power, and the rapid exchange of news and ideas through mass printing. Movements across the political spectrum advocated for different methods of stabilizing France in the Modern Age. The authoritarian Right sought the reestablishment of the monarchy and a return to traditional French values in agriculture (versus industry) and called for the realignment of Church and State, which the Socialist Party had torn asunder in 1905. The libertarian Left proposed abolishing government in favor of an anarchist organization of workers syndicates that would protect the urban proletariat and rural peasantry from state-sponsored capitalism. Despite their opposing politics, the reactionary Right and the anarchist Left both used derogatory Jewish stereotypes to represent their grievances with modern France. My research engages in a comparative analysis of two primary source documents exemplifying such representations: the Left-wing illustrated journal *L'Assiette au beurre* (First Series, 1901-1912) and the Right-wing newspaper *La libre parole* (1892-1924). Both of these publications were circulating in the critical time before the First World War, and are now held in Duke University's Rubenstein Library. This study analyzes French Right-wing and Left-wing anti-Semitic caricatures within their historical context in an attempt to understand how the Jewish people became the symbol of societal ills across a wide political spectrum.

*Humanities, 11:30-12:30*



**Oluwatobi Runsewe**

***The Rainbow Nation? : A Discursive Analysis of Post-apartheid South Africa***

Research Advisor: Anne-Maria Makhulu, Cultural Anthropology

In 1994, the apartheid regime fell and South Africa became a democratic nation. Immediately after the political transition, South Africa came to be characterized by discursive notions such as democracy, truth, reconciliation, freedom, human rights, and racial reconciliation. It also came to be known, locally and globally, as the “Rainbow Nation” due to its claims to racial reconciliation and equality. This thesis goes beneath these grand-narratives of post-colonial triumph and explores the complexities, contradictions and shifts within these discursive questions. In particular, I am interested in how “Born Frees”, young South Africans born just before or after the political transition who became eligible to vote for the first time in 2014, have caused a shift in the dominant post-apartheid discourse. I analyze their formation as political subjects and the socioeconomic realities that they face in order to understand their political incentives and motivations. Ultimately, I argue that, in response to the socioeconomic inequalities that have become too glaring to ignore, and a shifting, younger electorate that is both aware of these inequalities and disengaged from history, South Africa is moving away from the triumphalist discursive questions that dominated its early post-apartheid era and moving towards a discursive space that challenges the allusions of post-apartheid racial and class equality. I use political adverts to show that political discourse is also shifting from history-based or race-based campaigning to issue-based campaigning focused on economic inequality and its enablers.

*Social Sciences, 12:30-1:30*

**Aditi Sabhlok*****The Relationship between Caregiver Functioning and Child Adherence in Sickle Cell Disease***

Research Advisor: Melanie Bonner, Psychology and Neuroscience

Sickle cell disease (SCD) is a chronic illness that affects approximately 1 in 2500 newborns in the United States every year. To manage the multitude of symptoms and medical risks associated with the disease, children with SCD are required to follow extensive and complex treatment regimens. Caregivers of these children, play a daily, critical role in the management of health outcomes of these children, however, there is still a large gap in the understanding of the relationship between caregiver functioning, and adherence to treatment. In light of this, the current study investigated the relationship between caregiver functioning and child adherence. In addition, in order to more fully understand the relationship between child adherence and quality of life (QOL), caregiver functioning, burden and emotional resources were investigated as potential moderating factors. Good adherence levels were associated with higher emotional resources, and lower levels of emotional distance, medical care burden and overall frequency of stressful events. Almost all caregiver functioning subscales were strongly correlated with parent-reported child QOL. In child-reports significant correlations were only noted between emotional resources and the social domains of QOL. Hierarchical regression analyses identified significant interactions between adherence and the long-term uncertainty, sorrow and anger and communication burden, suggesting that these indices of caregiver burden factors are potential moderators of the relationship between adherence and child QOL. Identifying caregiver functioning as a moderator variable is significant for clinical application as it implicates both child and caregiver variables as having an important impact on adherence and QOL. Addressing these specific domains of caregiver functioning during treatment planning or adherence interventions could lead to better health-related quality of life for children living with sickle cell disease.

*Psychology GwD, 11:30-12:30*

**Karina Santellano**

***The African American and Latino/a Friendship Experience at a Largely White Elite University***

Research Advisor: Raymond Garrett-Peters, Sociology

Friendships are a natural part of the landscape of college life. While considerable research has examined friendship relations among white students, few studies have considered the nature of these relationships among college students of color. In this study, I explore the nature of friendships among students at a predominately white institution (PWI), with a focus on mixed race friendships. Specifically, I explore friendships among African-Americans and Latinos and the impact that race has on the nature of their friendship bonds. My work is guided by the assumption that racial/ethnic minorities in PWIs share common experiences such as racism and isolation, which draw them to develop social bonds. Using survey methods and qualitative interviews, I gather data on African-American and Latino friendship pairs to explore how their friendships are initiated, the characteristics of their bonds, as well as the sustainability of their relationships. Preliminary analysis of the data suggests that the relationships provide systems of support for students involved and represent a sense of solidarity than those with whites, but require constant vigilance in understanding racial differences within the friendship pair. Implications for future research on college students' friendships are discussed.

*Social Sciences, 12:30-1:30*

**Deepak Sathyanarayan**

***CFD-Guided Experimental Investigation of Corneal Biomechanics in Microgravity***

Research Advisor: George Truskey, Biomedical Engineering

After periods of five or more months in microgravity, astronauts have returned home with numerous detrimental physiological changes, including deterioration of vision. Post-mission studies have attempted to understand the influence of microgravity in the eye, but the cornea was yet to be analyzed for potential contributions to vision loss during spaceflight. Through this study, the group generated a finite element model of the eye's anterior chamber in ANSYS Fluent. Computational Fluid Dynamics and Fluid-Structure Interaction analyses [with boundary conditions] on the inflow-outflow problem revealed formation of one swirl observed in microgravity simulation, compared to two swirls found in literature 1G models. The resulting higher velocity aqueous humor flow toward the iris surface induced a lower pressure gradient across a majority of corneal surface. Reduction in outward pressure against the cornea may potentially lead to a transient relaxation and instability of the cornea, thereby influencing the progression of vision changes in microgravity. Guided by these theoretical results, the applanation-based biomechanical testing of the cornea in microgravity was conducted with the support of NASA's Reduced Gravity Education Flight Program (RGEFP). Corneal applanation velocities and corneal thickness (pachymetry) were found to be influenced by the gravity conditions tested. Future analysis with sufficiently large sample sizes is required for definitive conclusions to be made.

*Physical & Quantitative Sciences, 12:30-1:30*

**Evan Savell**

***Standardization for Energy Use Comparison Across Merck's North American Facilities***

Research Advisor: Gale Boyd, Economics

Merck Pharmaceuticals is a global producer of pharmaceuticals, vaccines, biological therapies, and consumer and animal healthcare products. Motivated by rising energy prices, the volatile nature of energy supply, and a responsibility to protect the environment, Merck is dedicated to improving its energy management activities. Merck facilities service all aspects of pharmaceutical production, from research and development laboratories to active ingredient production, finish and fill products to final packaging and distribution centers. As such, comparing the energy use between its different sites has proven challenging for the company. Through the use of site specific data from thirteen facilities across North America, our Bass Connections team employed multivariate regression models to standardize energy consumption. Using these results, we developed a tool to compare energy use at Merck sites spanning different facility types, sizes, and geographic locations. This tool estimates predicted energy consumption based on specific site characteristics, including space type and climate. By comparing this estimate to actual energy consumption, Merck can estimate site efficiency and prioritize its corporate energy reduction strategy. Our normalization model can be used continuously by Merck in the future to develop new plant scores and can be expanded to include more of their facilities worldwide.

*Bass Connections, 12:00-1:00*

**Jackson Scharf**

***Pre-Med Attrition: Personality and Memory Recall Predict Pre-Med Persistence***

Research Advisor: David Rubin, Psychology and Neuroscience

A large number of students enter Duke with a pre-med track in mind, but almost half of them transition out. What factors are important in determining whether a student remains pre-med or transitions out? First year pre-med students completed personality and self-esteem questionnaires, and recalled pre-med related memories. After determining which of these participants ended up transitioning out of pre-med, we looked at individual differences between those who stayed pre-med and those who transitioned out. At this time, we asked students why they left pre-med or why they were still pre-med, tested their emotional intelligence, and determined their GPA in pre-med classes. We found that participants that were less conscientious were more likely to leave pre-med later on. Further, we found that participants that had a stronger physical reaction to recalling pre-med related memories were more likely to stay pre-med. The most applicable reason why students transitioned out was because they found something else they were more interested in. The most applicable reason students stayed pre-med was because they had strong initial investment in the medical track. No difference in emotional intelligence, self-esteem, or GPA was found between students that stayed pre-med and those that left.

*Psychology GwD, 12:30-1:30*

**Ben Schwartz**

***Molecular Analysis of Tooth Enamel Development in Primates***

Research Advisor: Christine Wall, Evolutionary Anthropology

Primate dental morphology – specifically tooth enamel – is strongly correlated with dietary function and is key to understanding the evolutionary changes related to diet within the primate lineage. There currently are no data on primates that reflect the genetic, developmental and phenotypic patterns of variation in enamel thickness. *P. troglodytes* (chimpanzee) has thin enamel and *M. mulatta* (rhesus macaque) has intermediately thick enamel relative to tooth size, yet they have similar absolute enamel thickness. Inter-specific variation in regulatory regions of enamel development genes (MMP20, ENAM, KLK4, AMELX and AMBN) could affect developmental parameters that have an effect on relative and absolute enamel thickness. There is evidence for strong positive selection in the regulatory region of MMP20 in humans and *P. troglodytes* in comparison to other extant hominoids and *M. mulatta*. I utilized reverse-transcription quantitative polymerase chain reaction (RT-qPCR) to compare the mRNA expression levels of enamel matrix proteins in the developing teeth of neonatal *P. troglodytes* and *M. mulatta*. I found that within deciduous teeth, the *M. mulatta* expresses higher mRNA levels of these genes compared to the *P. troglodytes*. This could correlate to relatively thicker enamel and/or to increased developmental rates in *M. mulatta*. However, both species express similar mRNA levels of these genes within the adult teeth, which could indicate that expression levels are correlated with absolute enamel thickness as opposed to relative enamel thickness. Here I begin to unravel how the developmental process of enamel formation in relation to enamel thickness may differ across primate species.

*Biological Sciences, 12:30-1:30*

**Tre' Scott*****The Impact of North Carolina's Historic Rehabilitation Tax Credit***

Research Advisor: Ken Rogerson, Public Policy

The North Carolina Historic Rehabilitation Tax Credit program, enacted in 1997, has served as a catalyst for millions of dollars of investment in historic properties across the state. The NC Historic Tax Credit (HTC) was set to end January 1, 2015 after political disagreements regarding the credit's generous tax break. While the tax credit came at a cost to the state, the HTC program increased local property values, provided jobs and embraced the historical heritage of North Carolina. The state legislatures' decision not to renew the tax credit is misaligned with the economic development strategies of municipalities throughout the state. Over the course of the semester, this project aimed to conduct an analysis of the impact, both monetary and non monetary, North Carolina's HTC had on its 100 counties.

*Bass Connections, 12:00-1:00*

**Emmanuel Shiferaw*****Dig@IT: Virtual Reality in Archaeology***

Research Advisor: Regis Kopper, DiVE

With advances in image-based modeling, laser scanning, and other 3D capture technologies, the amount of graphical data archaeologists are able to collect on their sites has grown greatly. Using 3D models of landscapes, buildings, and artifacts generated by digital archaeologists on-site, we have created Dig@IT, an immersive VR application that allows users to interact with and understand dig sites. Dig@IT contains a full-scale recreation of the Catalhoyuk dig site in Anatolia, Turkey, as well as a user interface to interact with it. This application, being built for the Oculus Rift head-mounted-display, DiVE, and PC, allows users to fly around the landscape, measure objects, virtually 'dig' to see buried artifacts, and see information from the existing archaeological database for the site. Using this application, archaeologists will be able to explore a dig-site deeply, with information displayed in spatial context, after digging has been completed, thus preserving the original state of the site.

*Bass Connections, 12:30-1:30*



**Michael Shih**

***Catalytically Induced Enantioselective Cyclopropanation Reactions***

Research Advisor: Jennifer Roizen, Chemistry

Methods of site-selective asymmetric cyclopropanation of polyolefin substrates are unprecedented in current literature, though access to these processes will unlock late-stage functionalization of many biologically active small molecules. A few chiral porphyrin complexes of cobalt (II) induce high enantiomeric excess in intermolecular cyclopropanation reactions, but are unable to facilitate chelate-directed, site-selective cyclopropanation reactions. It is hypothesized that the novel tridentate carbazole bisoxazoline cobalt complex may perform cyclopropanation reactions with enantioselectivity comparable to its chiral porphyrin analogs, while also being able to induce site-selectivity by coordinating both a carbene and a polyolefin substrate at two adjacent points to facilitate cyclopropanation reactions. This tridentate carbazole bisoxazoline cobalt complex will be synthesized, isolated, and tested as a catalyst for cyclopropanation reactions. By investigating the effects of the ligand/metal complex, methods to induce enantioselectivity and site-selectivity in these cyclopropanation reactions will be identified, thus providing a new way to access desired biologically active small molecules. Preliminary results in forming the tridentate carbazole bisoxazoline cobalt complex have been successful, and testing of the complex in intramolecular cyclopropanation reactions has already begun.

*Biological Sciences, 12:30-1:30*

**Arielle Shkedi**

***Trafficking of Newly Exported Ribosomes***

Research Advisor: Christopher Nicchitta, Cell Biology

Ribosomes are components of the cell that function in mRNA translation/protein synthesis in the two primary protein synthesis compartments of the cell, the cytosol and the endoplasmic reticulum (ER). Ribosomes are assembled in the nucleolus and then exported into the cytoplasm, where they engage in mRNA translation. In current models all newly exported ribosomes reside in the cytosol, with trafficking to the ER only occurring upon translation of a secretory protein mRNA. To date, this model has not been experimentally verified. To test this model, a biosynthetic labeling approach is used to identify newly synthesized HeLa cell ribosomal RNAs as a proxy for newly synthesized ribosomal subunits. Using a pulse labeling/chase protocol, the subcellular location of the tagged ribosomal subunits were then monitored by cell fractionation, RNA gels, and polysome analysis. Using this protocol, investigations of ribosome trafficking were conducted to determine how ribosomes were partitioned between the cytosol and ER.

*Biological Sciences, 12:30-1:30*

**Emily Shroads*****Listen here!: Parents' use of prosodic highlighting in interactions with young infants***

Research Advisor: Makeba Wilbourn, Psychology and Neuroscience

Prosodic highlighting, the use of pitch changes to emphasize particular words, has been shown to aid infants in word learning. However, questions remain as to how parents use prosodic highlighting in speech to their infants, as well as whether parents' use of this cue confers any vocabulary advantages for their infants. Parents and infants were recorded interacting in a book-reading task when infants were 10 and 14 months in age, and vocabulary was assessed at 10, 14, and 18 months. Parents' speech was examined for use of prosodic highlighting through speech analysis software. Results showed that parents were most likely to use prosodic highlighting when labeling objects, actions, or attributes for their infants, and that within these contexts, most highlighted words were label words. Parents whose infants were producing fewer words at 10 months prosodically highlighted more words, suggesting parents' prosodic highlighting may be compensatory in nature. Further, using highlighting frequently and more consistently highlighting in information-providing contexts were associated with later gains in receptive vocabulary for their infants. These results suggest that parents' prosodic highlighting can be a useful cue for infants in learning new words, especially for infants with smaller productive vocabularies.

*Psychology GwD, 12:30-1:30*

**Anusha Singh**

***Access to Essential Reproductive Healthcare in North Carolina: The Influence of Politics***

Research Advisor: Alma Blount, Public Policy

The research portfolio frames the social issue of reproductive healthcare for uninsured women, women who rely on Medicaid, and women living in rural areas in North Carolina. Through the analysis of multiple sources, reproductive healthcare is addressed in the context of poor women in North Carolina, the role of government and policy, the cost of healthcare disparities to society, and finally the challenges of eliminating disparities. The purpose of this analysis is to outline the multiple facets that impact uninsured women's access to reproductive healthcare in the United States, and to highlight how North Carolina is affected specifically. This analysis will therefore provide perspective on how local organizing groups can affect policy change for the benefit of uninsured and underinsured women in North Carolina. Specifically, this research portfolio will address gaps in North Carolina's Contraceptive Equity law. These gaps in the law result in reduced coverage for poor women and increased economic burden of unintended pregnancy on the state of North Carolina.

*Community Engaged Research, 11:30-12:30*

**Shilpa Sridhar**

***Geometric methods of body mass estimation in small-bodied hominins***

Research Advisor: Steven Churchill, Evolutionary Anthropology

Body mass is an ecologically- and biomechanically-important variable in the study of early hominin biology. Regressions derived from recent human samples allow for the reasonable estimation of body mass of later hominins (genus *Homo*) from hip joint dimensions, but potential differences in hip abductor biomechanics across hominin taxa render questionable their use with early hominins (such as *Australopithecus*). Geometric methods of mass estimation using stature and bi-iliac breadth avoid this problem, but their applicability to early hominins that differed in body size and proportions from adult recent humans has not been demonstrated. Here we use mean stature, bi-iliac breadth, and body mass on global samples of human children ranging in age from 6-12 years (N = 530 age and sex specific samples, from the literature) to evaluate the accuracy of this method when applied to small-bodied samples (who also differ in proportions from adult human reference samples). The method systematically underestimated mass in the younger (6-9 year old) age groups (median prediction errors ranging from -0.2 to -5 kg, representing median errors of 1.0-32.7%), who are smaller on average (grand mean body masses of 19.7-26.3 kg) than most australopiths (ca. 29-45 kg). The method moderately overestimated mass in the older (10-12 year old) groups (1.2 to 3.2 kg [3.9-7.9%]), whose body masses (grand means of 29.2-36.2 kg) fall in the range of adult *Australopithecus*. While further testing with additional samples is warranted, these results suggest that stature and bi-iliac breadth may reasonably be used to estimate mass in small-bodied hominins.

*Biological Sciences, 12:00-1:00*

**Kelly Suchman**

***Evolutionary Basis for Sex Differences in Locomotor Biomechanics***

Research Advisor: Angel Zeininger, Evolutionary Anthropology

Women exhibit a higher prevalence of lower limb injuries than men, including ACL tears and metatarsal stress fractures, but the cause of this disparity is difficult to identify. Size or sex-related anatomical or biomechanical differences between men and women could account for this pattern of injury. One way to study this is a comparative evolutionary approach to sex-related patterns in lower limb mechanics. Like humans, our closest living relatives, apes, exhibit moderate to extreme sexual dimorphism (e.g., males three times as large as females). Yet, at present it remains unknown if these body size differences are related to biomechanical differences, as has been proposed for adult humans. Additionally, it is unknown if human biomechanical differences are present throughout early walking development. To answer these questions, this study uses an experimental and developmental approach. My hypotheses were that (1) sexual dimorphism in apes is associated with differences in lower limb mechanics between males and females and (2) these differences emerge during development in both humans and apes, with discrepancies between males and females increasing with age.

*Biological Sciences, 12:30-1:30*

**Chandra Swanson**

***Effects of energetic and general stress on individual variation in reproductive function of female chacma baboons (*Papio ursinus*) on the Cape Peninsula, South Africa***

Evolutionary Anthropology

Individual variation in reproductive health is an important correlate of fitness. Advances in observational and hormonal measures of reproductive health have aided in our understanding of how primate behavior and social structure have evolved under pressure from natural selection. This project explores female primate reproductive health with two aims: to characterize individual variation in reproductive function, and to investigate the role of energetic and general stress as potential predictors of this variation. Observational and hormonal data collection took place at the Tokai Forest Reserve from August 2008 through December 2014, and included 33 adult females from 2 social groups. Variation in reproductive function was tested by comparing the lengths, estrogen levels and progesterone levels of conceptive and non-conceptive cycles, as well as postpartum amenorrhea. Next, individual variation was correlated to changing levels of c-peptides and glucocorticoids, measures of energetic and general stress. We found that irregularity in cycling correlated to decreased reproductive function, that increases in estrogen in the follicular phase correlates to non-conceptive cycles, and that increases in energetic stress could prolong PPA, impeding successful reproduction. However, high GCs did not correlate to prolonged PPA periods. This difference between the two measures of stress raises questions about the potential effects of kind of stress on reproductive function. Thus, further investigation into stress-related measures and their correlations with reproductive function are warranted. Parasite load is one potential stressor that could be correlated to reproductive function.

*Biological Sciences, 11:30-12:30*

**Sherry (Yunqian) Tang**

***Linking the folded phenotype to genetic legions***

Research Advisor: Eric Spana, Biology

Many phenotypic mutations in *Drosophila melanogaster* were identified in the early 20th century and despite their age, have not been linked to specific genes. Wing development in *D. melanogaster* provides a powerful system to study basic cell biological processes—some of which these mutations may effect. folded is a mutation altering wing development of *D. melanogaster* and is characterized by uninflated wings; however, the underlying molecular lesion for the folded mutation has yet to be found. Preliminary complementation experiments have established folded as a defect in the BarH1 locus. However, analyses of the sequence isolated from mutated flies reveal no obvious genetic legion in the BarH1 locus that could be responsible for the phenotype displayed by the flies. We verified the location of the gene responsible for the folded phenotype to regions containing the BarH1 gene. In order to eliminate the possibility that the gene responsible for the folded phenotype is within the BarH1 locus, further complementation tests were done. In addition, using RNAi knockdown methods, we attempted to identify any genomic enhancers within the BarH1 locus that could phenocopy the folded phenotype.

*Biological Sciences, 11:30-12:30*



**Ishan Thakore**

***Designing a Voice-Based Treatment Module for Treating Perinatal Depression in Rural Kenya***

Research Advisor: Eric Green, Global Health

Depression is the largest contributor to the worldwide disease burden of mental, neurological and substance use disorders. Addressing perinatal depression is a particular challenge in low- and middle-income countries where screening and treatment is not readily available. A potential solution to this treatment gap is shifting treatment from more skilled to less skilled providers. A treatment model using lay counselors in Pakistan demonstrated large reductions in depression rates but is challenging to implement at scale. This study investigated how mobile phones could be used to deliver treatment sessions remotely through an automated voice-based service, thus potentially easing the burden of implementing the program at scale in rural and remote regions. Working in Bungoma County, Kenya, we followed a Human Centered Design approach to adapting and testing a session of an efficacious treatment program developed in Pakistan called the Thinking Healthy Program. We conducted two rounds of testing with community health workers. Participants were randomly assigned to complete the session in person with a single facilitator or as part of a group, or remotely via a mobile phone with or without live operator support. Comprehension of session content was high and not significantly different across in person and phone conditions. Phone implementation was feasible and acceptable to participants, though refinement is needed. Results suggest that automated phone administration could be a viable method to deliver session content. Further testing should assess therapeutic benefits of such as system compared to standard, in person delivery.

*Community Engaged Research, 11:30-12:30*

**Tara Trahey**

***Visualizing An Iconographic Network Between Athens and Vulci in the 6th Century B.C.E.***

Research Advisor: Sheila Dillon, Art, Art History, Visual Studies

The figured vase trade between ancient Athens and the Etruscan city of Vulci during the 6th century BCE involved a complex arrangement of local and external networks that transmitted both physical material and cultural ideologies. This paper aims to visualize these relationships through a case study stemming from provenance research on twin Attic black-figure vases showing a “woman riding a bull.” In the paper, I use iconography, rather than traditional economic data, to construct our understanding of the ancient historical economic network between Athens and Vulci. Iconographic decision-making within Attic workshops depended upon influences from both Athens and Vulci. I explore why ancient Athenian vase painters made particular choices in subject matter and how particular ideologies might have disseminated throughout production and export. I use the web-based visualization platforms, Palladio and RAW, and an expanded data set of 100 vases with like iconography to create a set of network visualizations that explore how and why particular choices in subject matter were made. Connectivity is visualized between attributed hand, destination, shape and trademarks. From the visualizations, I argue that the identity of the woman on the bull is purposefully ambiguous and I demonstrate the cultural and economic reasons why such ambiguity was advantageous for the ancient pottery industry. Ultimately, the case study of the “woman riding a bull” presents an organization and visualization of a complex set of interactions, local and external. Through the use of network visualizations, the traditional established considerations for discussing iconography may be re-evaluated in the context of visualizing the dynamic trade network of the 6th century BCE.

*Humanities, 12:30-1:30*

**Hayley Trainer*****Personality Correlates of the Self-Presentational Use of Clothing in College Women***

Research Advisor: Mark Leary, Psychology and Neuroscience

In a study of the relationship between personality and the impressions that people try to convey through clothing, 120 female undergraduate students completed measures of five personality variables – authenticity, self-esteem, fear of negative evaluation, need to belong, and self-monitoring – and rated their own attractiveness. They then submitted photos of the outfits they wore in public over the course of four days and answered questions about the impressions they believed their clothing made on other people, the extent to which their clothing choice was based on personal preference or social norms, and the degree to which the clothing was physically and socially comfortable. Correlational analyses showed that participants high in authenticity showed more variability in the impressions they thought their various outfits would make on others, rated their clothing as more physically comfortable, and indicated that their clothing choices were affected more strongly by their personal preferences. Participants high in fear of negative evaluation and self-monitoring showed less variability in the impression they thought they would make across the outfits they wore and expressed that their clothing choices were more strongly based on social norms; additionally, participants high in self-monitoring rated their clothing as less physically comfortable. Ratings of body attractiveness correlated positively with six of the seven impression dimensions, indicating that body satisfaction may play an important role in the evaluation of one's impressions on others.

*Psychology GwD, 12:30-1:30*

## Ha Tran

### ***Neurobiological interactions of early life stress with brain serotonin (5-HT) deficiency or adult psychosocial stress: potential implications for psychiatric disease***

Research Advisor: Marc Caron, Cell Biology

Depression is a major contributor to the global burden of disease and disability, and yet it is still poorly understood. Early life stress (ELS) is known to contribute to depression and anxiety disorders. However, not all who experience ELS develop depression. Thus, it appears likely that while ELS may not be sufficient to directly cause depression, it is potentially a contributing factor when combined with other genetic and environmental factors. Here, we examined the neurobiological interactions of ELS with brain serotonin (5-HT) deficiency or adult psychosocial stress. First, we aimed to study the effects of 5-HT deficiency on hippocampal and hypothalamic neurogenesis in ELS-exposed WT and Tph2KI mice. Tph2KI mice exhibit 60-80% reduced 5-HT levels. There was a significant reduction in hippocampal neurogenesis of adult mice following ELS, but it did not differentially affect WT and Tph2KI mice, suggesting stress susceptibility of WT and Tph2KI mice is caused by neurogenesis-independent mechanisms. Second, we aimed to study the effects of ELS on expression and phosphorylation status of proteins within the nucleus accumbens (NAc) induced by adult psychosocial stress. Exposure to psychosocial stress led to upregulation in the cytoplasmic levels of  $\beta$ -catenin, a protein responsible for the regulation of gene transcription. However, our data showed no significant difference in  $\beta$ -catenin levels in the ELS-exposed mice and the standard reared mice, suggesting that cytoplasmic  $\beta$ -catenin expression underlie the increased stress susceptibility exhibited by ELS-exposed mice. Our findings may have important implications for our understanding of the negative effects of ELS, which may provide insight into the interactions between genetic and environmental factors that contribute to the development of neuropsychiatric diseases.

*Biological Sciences, 12:30-1:30*

**Victoria Treboschi**

***TGF- $\beta$  signaling in pancreatic stellate cells induces chemoresistance and epithelial-to-mesenchymal transition in neighboring pancreatic cancer cells***

Research Advisor: Gerard Blobel, Pharmacology & Cancer Biology

Pancreatic cancer chemotherapy treatments are largely ineffective, and this is thought to be partly due to the complex effects of the tumor stroma in the cancer microenvironment. Pancreatic stellate cells (PSCs) are a main cell type responsible for secreting the stroma in pancreatic cancer. Transforming growth factor  $\beta$  (TGF- $\beta$ ) is a growth factor known to be involved in pancreatic cancer and serves to activate stromal cells such as PSCs. This study examined how activating TGF- $\beta$  signaling in PSCs affects the behavior of neighboring cancer cells by using an indirect co-culture model in which conditioned media is collected from PSCs (+/- TGF- $\beta$  activation) and used to treat cancer cells. My data shows that the TGF $\beta$ -induced PSC secretome increases chemoresistance and epithelial-to-mesenchymal transition and reduces proliferation in cancer cells. I then identified cysteine-rich angiogenic inducer 1 (CYR61) as a specific TGF $\beta$ -regulated secreted soluble protein from PSCs. Ongoing studies seek to characterize the effects of CYR61 on pancreatic cancer. Understanding the TGF $\beta$ -induced factors in the PSC secretome has the potential to reveal targetable factors to increase the effectiveness of pancreatic cancer treatments.

*Biological Sciences, 12:00-1:00*

**Taylor Trentadue, Anna Willoughby, James Yu, Rachel Clark**  
***Shining Evolutionary Light on Global Health Challenges***  
Research Advisor: Charles Nunn, Evolutionary Anthropology

The goal of this project is to take an evolutionary perspective on changes in health status that are associated with changes in people's environment. Madagascar is ideal for the research because it has communities that maintain traditional behavioral and technological patterns, as well as those that are gradually adding modern technologies and behavioral patterns due to increased outside contact. One thing that makes Madagascar especially interesting is that, like many developing countries, the health burden in Madagascar is complicated by the growing presence of non-communicable conditions, or chronic conditions that are not transmitted from person to person. One explanation for the rise of conditions such as obesity, diabetes, and musculoskeletal disease stems from evolutionary mismatch, or the idea that humans are currently living in environments that are vastly different than the ones in which we evolved. Thus, the exposure to novel environmental and lifestyle factors has implications for our health. Factors that contribute to this phenomenon include environmental exposures, changes in diet, and varying occupational risks. The price that we pay for this environmental dissimilarity is often reflected in health outcomes. As such, we plan to quantify these dissimilarities by assessing dental health, respiratory health, musculoskeletal health, sleep patterns, cardiovascular health, and the influence of the environment on altering the skin microbiome, with implications for mosquito susceptibility.

*Bass Connections, 12:00-1:00*

**Matthew Tyler**

***Shared Kernel Nonparametric Bayes Bi-Testing***

Research Advisor: David Dunson, Statistical Science

Bi-clustering focuses on simultaneously clustering data based on two different attributes. Previous work has used a Dirichlet process for the row and column clustering and then applied parametric models for within-cell data distributions. We develop a fundamentally different approach that borrows information across the post-clustering cells, while modeling the cell-specific data distributions as nonparametric mixtures of shared kernels. This leads to (1) clusters that are much less dependent upon the choice of the parameterization and hence are more scientifically interpretable and (2) more testing power due to sharing data between clusters through the use of shared kernels.

*Physical & Quantitative Sciences, 12:00-1:00*

**Arpita Varghese**

***Understanding Victimhood: Human Trafficking in Kerala, Kerala***

Research Advisor: Alma Blount, Public Policy

Human trafficking is acknowledged as one of the largest organized crimes in the world today. While human trafficking in Indian cities such as Mumbai, Delhi and Kolkata is studied, there is hardly any data available on human trafficking in Kochi, a city in the South Indian state of Kerala. This project, based in Kochi, originated from the recognition that although there were victims of human trafficking in my community-partner's shelter home for women, law enforcement officers refused to acknowledge the presence of human trafficking in the state. Using my interviews with law enforcement officers at the District Crime Records Bureau and from the Anti-Human Trafficking Unit, I argue that instances of human trafficking are not recognized as such because of the law enforcement officers' narrow conceptions of victimhood. I examine these conceptions of victimhood to identity the expectation of "pure innocence" that is at play. I conclude that the absence of data on human trafficking in Kochi is not because human trafficking is not an issue in Kerala. Instead, it is a result of the narrow understanding of victimhood held by law enforcement officers which prevent them from recognizing instances of human trafficking as such.

*Community Engaged Research, 12:00-1:00*

**Kevin Vo**

***Functional/Adaptive Implications of the Metacarpophalangeal Joint in Primates and Their Relatives***

Research Advisor: Doug Boyer, Evolutionary Anthropology

Previous research has shown that the angle of the proximal surface of the proximal phalanx can be used to distinguish locomotive behavior in cercopithecoids and hominoids. This study expands upon this research by applying a similar methodology to examine whether this relationship holds among other extant primates and their extant euarchontan relatives. The primary data for this study is the angle of orientation of the proximal surface relative to the shaft of the proximal phalanx. Landmarks used to calculate our measurements were placed on microCT scan-generated, 3D models of phalanges. When applied to the fossil record, these data may help to characterize in more detail the evolutionary shift away from claw-clinging and towards prehensile grasping during euprimate origins. We predict that species utilizing claw-clinging have a lower angle of orientation than those that utilize prehensile grasping, because the former group typically have more hyper-extended metacarpophalangeal joints. Our results indicate that extant claw-clinging euarchontans (*Cynocephalus* and *Tupaia*) exhibit the lowest angles of orientation while our arboreal grasping strepsirrhine samples had on average a much higher angle of orientation. With regards to our fossil samples, though plesiadapiforms have claws, they appear to have higher angles than extant claw-clingers, while *Notharctus* and *Adapis* exhibit values close to extant strepsirrhines. This may suggest that despite the presence of claws, plesiadapiforms relied on prehensile grasping more frequently than living non-primate euarchontans.

*Biological Sciences, 11:30-12:30*



**Archer Wang**  
***Lives at the Margin***

Research Advisor: Robin Kirk, ICS

I intend to present how labor movements in China have evolved and changed the lives of the marginalized populations. Labor unrest is a serious threat to social stability and equality in China today. Recent years have seen an upsurge in the numbers of labor rights violations and protests in southern China. A couple of factors contributed to this socio-economic issue that has political implications. As labor costs in China soar, China is moving away from the profitable end of the cost-benefit country spectrum, so the outsourcing western companies are relocating their factories or changing their partners. As a result, factories fire their workers without proper explanations or compensation. While this practice is effectively unlawful, employers more often than not avail themselves of the weak law enforcement and lack of effectual regulations in China. On the other hand, chronic problems such as low wages and hazardous working conditions constantly put psychological and economic pressures on the workers. Sometime when the pressure becomes too overwhelming, it crushes their minds. Between 2010 and 2013, 25 Foxconn employees chose suicide as a way out; everyone except two died. Pneumoconiosis and other deadly lung diseases have also long plagued the worker population in mining, jewelry, metal production and processing, construction, etc. The standard processes for workers who feel their rights are being taken away are to follow a company's internal appeal process; appeal for labor arbitration with local government-run unions or committees, usually a branch of All-China Federation of Trade Unions (ACFTU); file a complaint to a low court, or start a strike. Due to the lack of resources, social connections, legal knowledge, and financial means, the costs for workers to do so are much higher than those for middle-class college-educated white-collar people. Especially filing lawsuits almost seems beyond their reach.

*Community Engaged Research, 11:30-12:30*

**Grace Wang**

***Heat shock protein 90 in Plasmodium falciparum as a novel drug target for malaria treatment and prevention***

Research Advisor: Emily Derbyshire, Chemistry

Malaria is an infectious disease that affects millions of people worldwide, mostly pregnant women and children under the age of five. Many infections are caused by *Plasmodium falciparum*, a malaria parasite, and are characterized by severe symptoms and even death if left without proper treatment. The rate of drug resistance developed by the parasites has become a challenge to currently available malaria pharmaceuticals. To address this global concern, the present proposal focuses on the heat shock protein 90 in the deadliest species of malaria parasite, *P. falciparum*, as a novel drug target to develop effective antimalarials. This work will employ protein expression, purification and activity assays to characterize the heat shock protein activity, followed by inhibitory studies with small molecules. The ultimate goal is to discover potent and selective inhibitors of PfHsp90 to be further advanced into pharmaceutical products.

*Biological Sciences, 11:30-12:30*

**Nicole Wayne**

***Neural Basis of Decision Making: Rhesus Macaque mSTS, Human TPJ, and the Applications of TMS***

Research Advisor: Michael Platt, Neuroscience

Social decision-making plays a vital role in the daily lives and interactions of people. Social decision-making utilizes social contexts, interactions, and cues in the decision-making process. These decisions often involve analyzing outcomes and weighing costs and benefits for the decision maker and/or others. Failures of social decision-making have effects on human's socializing abilities and the ways in which people navigate their daily surroundings and interactions. Such failures manifest themselves in several psychopathological disorders, including autism. Understanding more about the neural mechanisms underlying social decisions may help to uncover new ways of treating disorders characterized by deficits in social decision-making. Additionally, advancing our understanding of this aspect of the brain's functioning may shape public health policy and laws. This project focuses on the rhesus macaque middle superior temporal sulcus (mSTS), as it relates to the human temporoparietal junction (TPJ), and how this brain region plays a role in social decision-making and the integration of costs and benefits to others in these decisions.

*Biological Sciences, 12:30-1:30*

**Sonora Williams**

***Infant Mortality and the Decision to Care in Classical and Hellenistic Athens***

Research Advisor: Sheila Dillon, Classical Studies

Scholars have only recently begun to take a closer look at children in Greek Antiquity. Many classicists believe that exposure and infanticide practices completely defined the archetypal style of child rearing in Classical Greece. However, to best understand what children, and specifically infants, meant to society in this very different time, a more holistic approach is needed. I traveled to Greece to look at the skeletal remains of infants to see if the common perceptions still hold true despite this novel source of evidence. I found skeletons both confirming and contradicting these perceptions, thus demanding further research. In Athenian texts, I found a surprising amount of concern for the proper treatment of children of all ages. When examining the practices of exposure and infanticide, I found more evidence of compassion where I half expected to find callous disregard for life. Following the changes in geographical burial practices of children, I found great attention to detail and well thought out burial plans that molded the city layout. Deciphering Classical Attic funerary dedications, I found an immense fascination with children and the importance they add to a relative's life. Finally, the osteological records further supported my hypothesis. Regardless of the era and the circumstances, there was, as there is now, a natural instinct to cherish our children as best as one can.

*Humanities, 12:00-1:00*

**Sonora Williams**

***A Mouse Behavioral Model System of the Adverse Early Life  
Environment Associated with Suicidality***

Research Advisor: Marc Caron, Cell Biology

Suicide is the 10th leading cause of death in Americans according to the CDC. There is etiological evidence suggesting that early life stress during childhood predisposes the adult to suicidality. The human suicidal phenotype is characterized by the impaired ability to form and sustain social bonds due to diminished sociability and increased aggression. In this study I modeled an early life adverse environment by incorporating specific elements associated with suicidality in humans. I used mice genetically deficient of serotonin as low serotonin levels in humans have been associated with suicidality. Both the pups and their mother were exposed during post-natal development. The mother was injected with an alcohol solution. The bedding was changed and the nesting material was neglected. The pups were separated from the mother, and an adult male was introduced into the home cage environment. I found that these traumas further diminished sociability and increased aggression in the experimental mouse group. My findings on mice are consistent with the human correlative studies that show similar impact of early life stressors on adult suicidality.

*Biological Sciences, 12:00-1:00*

**Ronnie Wimberley, Emma Zhao, Jemi Galani, McCall Wells,  
McCall Wells**

***Juntos: A Digital Intervention***

Research Advisor: Sara LeGrand, Global Health

To describe research findings from a one-year, qualitative, community based research project with Latino men who have sex with men (MSM) and transgender women to inform the development of a digital health program, Juntos (“together”). METHODS: 35 total interviews. 20 in-person interviews and brief surveys with HIV+ and HIV- Latino MSM and transgender women in North Carolina exploring mental and physical health, social support, stigma towards race and sexual behavior, and services available to meet their health needs; 11 interviews with the same population reviewing screen shots of a preliminary website intervention; and 4 phone interviews with local health services providers regarding their perspectives on the health concerns of Latino MSM and transgender women. Acceptability of a confidential, digital program to improve social support and healthy behaviors is also explored. RESULTS: Findings indicate Latino MSM and transgender women in North Carolina experience stigma and discrimination in the community, have limited social support, and describe a lack of mental and physical health resources in the community. The Internet is used to search for health information, and there is interest in finding social support through a tailored, digital program. Literacy may be a barrier to engagement in an online program; digital access is not perceived as a barrier. DISCUSSION: Latino MSM (and other MSM of color) in the United States experience worse behavioral, social, mental and physical health outcomes (e.g. sexually transmitted infection rates, violence, drug use) than white MSM, despite more frequent condom use and fewer sexual partners.

*Bass Connections, 11:30-12:30*

**Michelle Wu**

***Mechanisms of co-regulation of estrogen receptor and human epidermal growth factor receptors in mediating resistance to Tamoxifen in ER+ breast cancer***

Research Advisor: Neil Spector, Pharmacology & Cancer Biology

Breast cancer is a heterogeneous disease characterized by multiple molecular subtypes, the most common of which is presented in 75% of diagnoses and is characterized by overexpression of estrogen receptor. Current treatment options aim to block the effects of the estrogen-ER signaling axis and include fulvestrant, aromatase inhibitors, and Tamoxifen. Despite the availability of these targeted therapies, ER+ tumor cells still develop resistance. In the present study, I aimed to elucidate the mechanisms mediating tumor cell resistance to Tamoxifen by characterizing response to inhibition of ER transcriptional activity. Focusing specifically on the role of HER receptors as potential mediators of Tamoxifen resistance, I investigated how disruption of ER signaling regulates expression of HER receptors in parental and matched Tamoxifen resistant ER+ human breast cancer cell lines. Expressions of HER2 and HER3 were up-regulated as a result of ER inhibition in treatment naïve, but not Tamoxifen resistant, cells. The results of my study provide insight into potential alternative endocrine therapies to pursue, in the hopes of improving clinical outcomes for patients with ER+ breast cancer.

*Biological Sciences, 11:30-12:30*

**Benjamin Xing**

***A Phylogenetic Analysis of Mklp2 as a Kinesin-6 Motor***

Research Advisor: Sharyn Endow, Cell Biology

Mklp2 (Kif20A) is a Kinesin-6 protein in humans that plays an important role in the cell cycle during mitosis. It localizes to the mitotic spindle and recruits key regulatory proteins, including Aurora B and the ESCRT machinery. Mklp2 is unique in that it has an exceptionally long loop L6 in the motor domain (aa's 197-298), which is believed to have a role in targeting Mklp2 to the spindle midbody. This suggests that, although Mklp2 has a motor domain, its motor activity may not be critical to its function in the spindle. Another human kinesin-6 protein, Mklp1, is closely related to Mklp2. Unlike Mklp2, Mklp1 has been shown by others to have microtubule motor motility. Because of this basic difference between the proteins, we built phylogenetic trees to evaluate Mklp2 in the context of the other kinesin-6 proteins. The impact of L6 on tree branching was specifically studied by deleting L6 from the sequences in the alignment and performing another tree search. Our findings indicate that although Mklp2 contains conserved kinesin motifs, it is unique from other kinesins including Mklp1, and that these differences extend beyond L6. We show that the presence of L6 strengthens the confidence of branching within protein orthologs, but not between different proteins. The trees also reveal that the *Drosophila* Mklp2 ortholog, DmSubito, deviates and branches independently from the rest of the kinesin-6 family.

*Biological Sciences, 12:00-1:00*



**M. Fikret Yalcinbas, Vinay Nagaraj**

***Self-Guided Parameter Fitting for Cochlear Implant Users***

Research Advisor: Leslie Collins, Electrical Engineering

A cochlear implant is a surgically-implanted electronic device that converts sound into an electrical signal in the brain of a person who is hard-of-hearing. The complexity of the system as well as confounding factors such as brain plasticity and changing physiology require that the parameters associated with the cochlear implant be continually updated to maximize listening performance and user satisfaction. Updating the parameters of these devices currently requires visits to a clinician which limits the number and scope of updates possible within a fixed time frame. As a solution, design and development of a take-home fitting software system would enable implant users to interact with and control their personal device's parameters. CI users support the development of such a product and are comfortable adjusting their own device parameters; however, the ideal method by which to guide CI users to optimize their device parameters without clinician interaction is unknown. Our project aims to develop a graphical user interface (GUI) that will guide CI users to adjust their device parameters so that their speech recognition and listening satisfaction are improved. In the current iteration of the project, the parameter that was measured was the minimum hearing threshold, which was tested using three different approaches. A GUI was programmed for each method, and each of these GUIs were subsequently tested on a group of ten normal hearing subjects in order to validate for one of the three proposed methods.

*Bass Connections, 11:30-12:30*

**Lun Yin**

***High School Model United Nations in China***

Research Advisor: Lynn Smith-Lovin, Sociology

Since it was first introduced in 2006, Model United Nations (MUN), in which students debate pressing issues like terrorism through role-playing in committees in or out of the UN system, has been extremely popular in high schools all around China, thus creating an ever-growing community known as “MUNers”. Astoundingly, every day there is at least one conference being held somewhere in China, and new MUN clubs and organizations are emerging everywhere. As the activity expands rapidly, some MUNers, including me, expressed concerns about commercialization and lack of innovation in some conferences and clubs. These concerns lead to a pursuit of a more “pure” MUN, one that truly aimed at educating high school students to become creative and responsible global citizens. I have been involved in MUN as both a delegate and an organizer. When I reflected on my MUN experience, I realized that we had a rather limited perception of the status quo of high school MUN’s development in China, not to mention participants’ rationale for joining clubs or attending conferences. During the summer of 2014, I interviewed several active or previous MUNers about their MUN stories as well as their thoughts on MUN’s future. A few of the interviews ended up as deep conversations or exchange of personal anecdotes. Based on the interview notes, I have concluded a comprehensive picture of the purposes of MUN as well as its pros and cons. In addition, I also offered some suggestions for high school MUN reform in China.

*Community Engaged Research, 12:00-1:00*

**Élan Yochai**

***The Interaction Between Numeracy and the Unit Effect***

Research Advisor: Elizabeth Brannon, Psychology and Neuroscience

Numeracy and the unit effect have been studied independently, and research suggests a relationship between each principle and decision-making. The current study seeks to identify whether there is an interaction between numeracy and the unit effect, such that people who are higher in numeracy are less susceptible to the unit effect, particularly in economic contexts. A temporal discounting task and an economic risky decision-making (gambling) task were used to test for this interaction. In the gambling task, an interaction was identified between numeracy and the unit effect, whereby decisions about whether or not to gamble were more susceptible to changes based on unit of money for people with low numeracy than for people with high numeracy. These findings suggest that not all people are equally susceptible to the unit effect, and those that test higher in numeracy may be less vulnerable, and thus better equipped to make sound and logical decisions in economic and other contexts.

*Social Sciences, 12:00-1:00*

**Justin Yu, Emily Chen, Indrani Saha**

***Seeing Color: Art, Vision, & the Brain***

Research Advisor: Elizabeth Johnson, Neurobiology

Artists and scientists have been fascinated and perplexed by the visual and neural mechanisms associated with the experience of color. Although color is often thought to be a physical property of an object, it is actually a perception created by the eye and brain. This project focused on the complex concepts involved in color perception and the use of color in art. Our team organized *Seeing Color: Art, Vision & the Brain*, an art exhibition and symposium with a specific focus on color and luminance perception. The exhibition and the accompanying catalog that our team constructed, is on display in the Academic Focus Gallery at the Nasher Museum through July 5, 2015. The exhibition features works from the Nasher Museum of Art's collection that illustrate how art can inform our understanding of the human visual system. The symposium, held on April 13, 2015, brought together prominent artists and leading vision scientists. Seven speakers discussed topics including the use of color in their artwork, the neural mechanism of the visual system, and the application of scientific techniques to art history. The art exhibition, catalog, and symposium present the current consensus on human color perception, the underpinning neurobiology, and contemporary research questions, theories, and artistic approaches that address how we see color.

*Bass Connections, 12:30-1:30*

**Ellen Yuan**

***Assessing Computational Thinking Using Alice Programming***

Research Advisor: Susan Rodger, Computer Science

With the growing use of technology in the classrooms, the mediums through which students absorb information is also changing, as schools start transitioning from paper textbooks to online materials. Further, while there is an increased use of technology in the classrooms, there is also minimal exposure to computer science among students in K-12. In the past six years, The Adventures in Alice Program at Duke University has been creating curriculum materials for students and teachers to use with Alice, a 3D virtual world environment. This program uses a drag-and-drop interface, which makes it appealing to beginner programmers. In the summer of 2014, we developed more curriculum materials and tutorials based on teachers' needs and interests, and used them with teachers at the Alice workshops held at Duke. Many of these tutorials are written and take the user step-by-step until they complete the Alice program or Alice world. However, this year, based on teacher feedback, we created several video versions of existing tutorials. We also created assessments corresponding to many of our curriculum materials. These assessments are in the form of multiple-choice quizzes and programming challenges. In spring 2015, a mini-course was held for middle school students, in which they learned the materials from either the video or written tutorials at home, and completed assessments and challenge worlds during the workshops. Results from the workshops show that the tutorials seem to be effective in teaching students Alice since their pre- and post-test scores improved. However, there did not seem to be a difference between students who used the video-version tutorials and those who used the written-version. To help expose more students and teachers to computer science our curriculum materials are available for free on the Adventures in Alice Programming website.

*Social Sciences, 11:30-12:30*

**Henry Yuen*****Innovating Experiential Education in Developing Countries: Nepal***

Research Advisor: David Malone, Education

If a native education system fails to empower our youth and nurture a sense of purpose, how do we innovate an initiative to break the cycle for students who have no access to quality tertiary education? Karsh Mentorship Initiative (KMI) was founded by two Karsh International Scholars – Laxmi Rajak and Henry Yuen - in January 2014 after discovering that a huge lack of exposure and access to experiential education opportunities in developing countries such as Nepal. Our mission is to increase the number of international high school students from Nepal gaining scholarships to American colleges through leadership, personal development and service opportunities. Students participate in a week-long camp that focuses on critical reflection and civic engagement, followed by a year-long distance mentoring relationship with a student at Duke University. We piloted our camp in Kathmandu, Nepal for the first time this past summer in July and August, taking 25 students through two camps of eye-opening experiences and team-building activities. Almost one year on, we have been impressed by our results. Two girls gained admission to a very prestigious law school in Nepal, one of whom also gained a full scholarship, awarded only to 2% of all applicants. Another student gained entrance into four American universities, including Boston College and University of Massachusetts Amherst. This summer, 10 Duke students will be travelling to Nepal to expand KMI to Pokhara, as well as to 80 high school students throughout June, July and August. This presentation will discuss the process from idea to action and evaluation metrics as well as future plans of scalability and sustainability.

*Community Engaged Research, 12:30-1:30*

**Sangwon Yun**

***Investigating the Therapeutic Efficacy of Fibrinogen-Coated Albumin Nanospheres as a Treatment for Thrombocytopenia***

Research Advisor: Anthony Sung, Dept. of Medicine - Div. of Hematological Malignancies

Thrombocytopenia is a hematological condition involving low platelet counts. It is a common medical problem of patients with various blood diseases or cancers receiving radiation or chemotherapy and may lead to fatal bleeding. Currently, this is mitigated by administering platelet transfusions. However, platelets carry serious risks of transfusion reactions, as well as viral and bacterial infections. These are especially problematic as thrombocytopenic patients are often also immunocompromised from radiation and chemotherapy. Furthermore, recruiting platelet donors can be difficult, causing supply problems, and platelet transfusions are often cost prohibitive. As such, exploring synthetic alternatives is imperative. Here, we investigate the therapeutic efficacy of an alternative treatment, fibrinogen-coated nanospheres (FCN). Prior research on synthetic platelet substitutes has shown improvements in bleeding times in animal models; however, no previous product has demonstrated the ability to prevent fatal hemorrhage. Fibrinogen is a protein that is involved in clot formation and also binds to platelets. As such, in the setting of thrombocytopenia, FCN may augment limited numbers of platelets, binding to them, contributing to clot formation and reducing bleeding. We use a C57BL/6 murine model in which we induce thrombocytopenia by administering radiation and multiple injections of platelet-depleting antibody. Preliminary studies found that mice receiving FCN had significantly higher survival relative to various control groups. Autopsies revealed that untreated mice likely died as a result of significant intracranial and gastrointestinal bleeding. We hope to elucidate the mechanism through which FCN prevents bleeding. We hypothesize that FCN aggregates platelets and thus induces hemostasis.

*Biological Sciences, 12:30-1:30*

**Roger Zou**

***Complete Canthi Removal Reveals that Forces from the Amnioserosa are alone Sufficient to Drive Dorsal Closure in Drosophila***

Research Advisor: Dan Kiehart, Biology

*Drosophila's* dorsal closure provides an excellent model system to analyze biomechanical processes during morphogenesis. During native closure, the amnioserosa, flanked by two lateral epidermal sheets, forms an eye-shaped opening with canthi at each corner. The dynamics of amnioserosa cells and actomyosin purse strings in the leading edges of epidermal cells promote closure while the bulk of the lateral epidermis opposes closure. Canthi maintain purse string curvature (necessary for their dorsal-ward forces) and zipping at the canthi shortens leading edges, ensuring a continuous epithelium at closure completion. We investigated the requirement for intact canthi during closure with laser dissection approaches. Dissection of one or both canthi resulted in tissue recoil and flattening of each purse string. Following recoil and a temporary pause, closure resumed at approximately native rates until slowing near the completion of closure. Thus, the amnioserosa alone can drive closure following dissection of one or both canthi, requiring neither substantial purse string curvature nor zipping during the bulk of closure. How the embryo coordinates multiple, large forces (each of which is orders of magnitude greater than the net force) during native closure, and is also resilient to multiple perturbations are key, extant questions.

*Biological Sciences, 12:30-1:30*