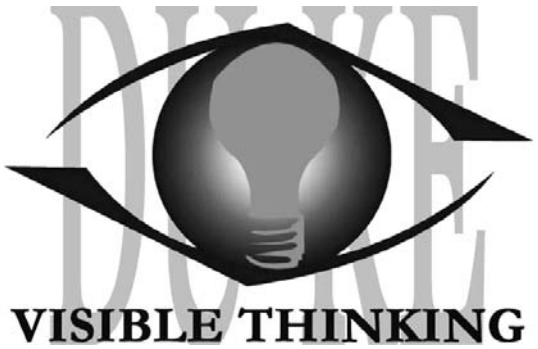

A Presentation of Undergraduate Research

Bryan University Center
Wednesday, April 18, 2012
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

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Undergraduate Research Support at Duke University

Duke undergraduates have received support for their research projects from the following College and University programs in 2011-2012:

All Disciplines

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Trinity College Research Forums in Biological Sciences and Neuroscience
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Howard Hughes Vertically Integrated Partners Program
NSF-Mechanisms of Behavior - Undergraduate Neurosciences Program
NSF-PRUV - Department of Mathematics
Pratt Fellows Program

Bryan University Center
Wednesday, April 18, 2012
A Presentation of Undergraduate Research

11:30 – 12:30 pm
Poster Session I

Name	Advisor	Field of Research	Project Title
Marissa Mumford	Lisa Linnenbrink-Garcia	Behavioral Sciences	A Love Hate Relationship: Exploring the Link Between Class Preference and Motivational Theory
Sicong Zhou	Rebecca Shelby	Behavioral Sciences	How pre-transplant social relationships and support in patients undergoing hematopoietic stem cell transplant is associated with post-transplant physical, functional, and emotional well-being
William Zhang	Anastasia Litvintseva	Biological Sciences	Directed evolution of Cryptococcus neoformans in low-nutrient media generates a stable phenotype that differentially interacts with murine macrophages
Graham Custar	Janine Chalk	Biological Sciences	An Anthropometric Study of Duke's Human Osteological Material
Kemp Knott	Amy Schreier	Biological Sciences	Sibling Effect on Parent-Offspring Relationships in Lemur catta
Tun Jan Young	David Johnston	Biological Sciences	Trends in sea ice cover across the North Atlantic: implications for harp and hooded seals
Megan Welch	Alexander Glass	Biological Sciences	High Resolution Taphonomic Studies of Ophiuroids
Anna Liu	Nicole Calakos	Biological Sciences	Identifying genetic modifiers in DYT1 pathology
Johnny Zhao	Gayathri Devi	Biological Sciences	Evaluation of Carcinoembryonic antigen (CEA) as a Target for Inhibiting Colorectal Cancer Cell Migration: An Immunotherapy Approach
Andie MacDonald	Cynthia Kuhn	Biological Sciences	Role of Sex and Estrus cycle in Ethanol CTA
Brandon Ruderman	Kristin Scott	Biological Sciences	Epigenetic Maintenance and Inheritance of Heterochromatin in Fission Yeast
Emily Chang	David Sherwood	Biological Sciences	Regulation of Basement Membrane Gap Expansion in Anchor Cell Invasion in C. elegans and Related Nematodes
Michael Murphey	Kathleen Donohue	Biological Sciences	The –Delay of Germination 1" Gene: a Dormancy Control Mechanism in Arabidopsis thaliana Mediated by Temperature
Charmaine Mutucumarana	Marilyn Telen	Biological Sciences	Role of Plasma Laminin in SS RBC Adhesion to Vascular Endothelium
Rupen Desai	Philip Benfey	Biological Sciences	Uncovering a Gene Regulatory Network in Arabidopsis Ground Tissue
Kathie Sun	William Copeland	Biological Sciences	Analysis of the subcellular localization of GFP-tagged accessory subunit variants of DNA polymerase γ associated with mitochondrial disease
Allyson Morton	Gerard Blobe	Biological Sciences	Novel interactions between the type III TGF-beta receptor and noncanonical pathways in breast cancer
Annie Chen	Chris Wall	Biological Sciences	Effects of AMELX and AMELY on the Evolution of Dental Sexual Dimorphism in Primate Species
Tian Yuan	Andrea Taylor	Biological Sciences	Scaling of Jaw-Muscle Architecture in New World Monkeys

Joel Bray	Brian Hare	Biological Sciences	Are lemurs sensitive to the visual perception of others?
Alexandra Shams	Christine Drea	Biological Sciences	Cross-species Comparison of Scent Marking Behavior in the genus Eulemur
Molly Grace	Stephen Nowicki	Biological Sciences	Songbird communication in a noisy world: potential benefits of complex notes
Eddie Wu	William Noland	Creative Arts	Pictures of
Mesha Sloss	Sheila Dillon	Humanities	Out of Egypt: Egyptian Influences in Greek Art of the Middle Bronze Age and Early Archaic Period
Tracie Canada	Orin Starn	Humanities	Racial Politics in College Athletics through the Lens of Duke University Football
Julius Jones	Raymond Gavins	Humanities	The African-American Community in post-World War II Portland, Oregon, 1941-1962
Claire Lockerby	Sally	Deutsch	Owning the Intangible: A Historical Study of Euro-American Commodification of Hopi Culture and Theft of Intellectual Property
Emmanuel Lim	Nico Hotz	Physical Science	Comparing Micro- and Nano-scale CuO/ZnO/Al2O3 Catalysts For Methanol Steam Reforming.
Yu-Po Wong	Daniel Gauthier	Physical Sciences	Building a Quantum Key Distribution System
Nada Baalbaki	George Dubay	Physical Sciences	Analytical Methods for the Validation of the Inorganic Complexes of Trace Minerals in Nutritional Supplements
Grace Zhou	Sumi Ariely	Service Opportunities in Leadership	Understanding and Evaluation of the Mental and Physical Well-Being of Orphaned and Vulnerable (OVC) in Naama, Uganda
Jacob Tobia	Robert Korstad	Service Opportunities in Leadership	Somewhere Down the Way: The Marion County Oral History Project
Sharon Pomranky	Alma Blount	Service Opportunities in Leadership	Rejuvenating Geriatrics: Rethinking the American Geriatrics Society's Approach to Advocacy for Geriatric Medicine
Hyejin Sul	Christina Gibson-Davis	Service Opportunities in Leadership	How can DPFC employ social media to inform and motivate early childhood stakeholders to become active advocates of early childhood?
Sanjana Marpadga	Julie Reynolds	Service Opportunities in Leadership	Knowledge of Type 1 Diabetes Mellitus Among Caretakers of Type 1 Diabetic Children at Regional Clinics Within Tanzania
Caitlin Johnson	Alex Harris	Service Opportunities in Leadership	Beyond the Girl Effect: WISER Students' Needs Assessment
Lizzeth Alarcon	Jason Cross	Social Science	Teenage Reproductive Health in a Migrant Community of San Jose, Costa Rica
Alice Zhang	Suzanne Shanahan	Social Sciences	Nutrition of Resettled Bhutanese Refugee Children in North Carolina
Lucy Ma	Rebecca Bach	Social Sciences	True or False? Rape Myth Acceptance at Duke University
Nusaibah Kofar-Naisa	Bruce Hall	Social Sciences	The Demolition of the Kofar Na Isa Gate

Bryan University Center
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12:00 – 1:00 pm
Poster Session II

Name	Advisor	Field of Research	Project Title
Sumana Kommana	Nancy Zucker	Behavioral Science	Investigating Attention Networks Efficiency in Adolescents with Anorexia Nervosa
Andrea Green	David Rabiner	Behavioral Sciences	ADHD in College Students
Emily Bray	Stephen Mitroff	Behavioral Sciences	Factors Affecting Inhibitory Control in Dogs
Hannah Fisher	Frank Keefe	Behavioral Sciences	Mindfulness in Patients who have Persistent Low Back Pain: Relationship to Pain Intensity and Interference, Mood, and Self-Efficacy
Leigh Spivey	Amy Joh	Behavioral Sciences	Wait a Minute! Exploring The Relationship Between Spatial Reasoning and Inhibitory Control in Preschool-Age Children
Hannah Honey	Gavan Fitzsimons	Behavioral Sciences	Partner versus Product: Examining the Use of Consumption versus Support from a Romantic Partner in Emotion Regulation
Amberly Tenney	Elizabeth Marsh	Behavioral Sciences	The Effect of Prior Knowledge on the Acquisition and Retention of Misinformation from Popular History Films
Jenny Wang	Makeba Wilbourn	Behavioral Sciences	Emerging Bilinguals and Executive Function
Lindsay Michalski	Ahmad Hariri	Behavioral Sciences	Genetic Contributions to Bipolar Disorder: Clinical Implications of a CACNA1C Polymorphism
Ania Oddone	Ruth Day	Behavioral Sciences	Reducing Drug-Name Confusions: Auditory Implications of "Tallman" Lettering
Allison Damon	Robert Thompson	Behavioral Sciences	Enhancing Prevention, Intervention, and Treatment for Athletes at Risk for Eating Disorders
Ujjayini Bose	Mark Leary	Behavioral Sciences	The Egoic Mindset: An Exploration into Induction Techniques
Lucy Andrzejewski	Melanie Bonner	Behavioral Sciences	A Novel Test of Facial Expression Recognition for Children with Sickle Cell Disease
Dana Rosen	Kevin LaBar	Behavioral Sciences	Affective Influences On Forgetting
Stevan Budi	Scott Huettel	Behavioral Sciences	An electrophysiological analysis of the stimulus-locked response in a reinforcement learning task
Arianna Uhalde	Gavan Fitzsimons	Behavioral Sciences	Empathy, Sympathy, and Donation Behavior Over Time
Audrey Hu	Amy Joh	Behavioral Sciences	Going through the Motions: Preschool Children's Use of a Motor Strategy on a Spatial Reasoning Task
Ashton Massey	Christina Grimes	Behavioral Sciences	Women and Social Compensation on Facebook
Will Hyung	Grainne Fitzsimons	Behavioral Sciences	Evaluating Self-Control in Social Settings: Actor-observer Biases and their Implications in Relationships
Shalin Sheth	Katie Rosanbalm	Behavioral Sciences	Cohesion and Individuals: The relationship between social cohesion and individual achievement.
Jane Meyerson	Ahmad Hariri	Behavioral Sciences	The Effect of Functional Connectivity Between the Amygdala and the Insula on Anxiety

Fiona Cary	Lisa Linnenbrink-Garcia	Behavioral Sciences	Evaluating the Effect of Gender Stereotype Threat and Women's Intent to Pursue Science-Related Careers
Timothy Fleschner	Gavan Fitzsimons	Behavioral Sciences	Lights, Camera, Product Placement! The Effect of Placement and Audience Characteristics on Brand Recall
Lena Sharma	Amy Schreier	Behavioral Sciences	Can the need to learn sex-specific behavior patterns explain the extended juvenility in Propithecus coquereli and Lemur catta?
Brett Schroeder	Harris Cooper	Behavioral Sciences	The Effects of Grading on Student Achievement and Motivation: A Systematic Review
Jaehyuk Lee	Philip Costanzo	Behavioral Sciences	Racial Differences in Self-Presentation
Aubrey Frazzitta	John Perfect	Biological Sciences	Urea regulates capsule production in Cryptococcus neoformans and Cryptococcus gattii
Shikha Nayar	Elizabeth Godin	Biological Sciences	The use of Pramipexole to reduce motor problems and eventually treat zebrafish induced with a Parkinson's Disease model
Amy Xu	Jonathan Stiber	Biological Sciences	The Role of Drebrin in Skeletal Muscle Regeneration and Repair
Agata Kantorowska	Dana Hunt	Biological Sciences	Seasonal Cycling of Opportunistic Pathogens in the Ocean
Diana Xie	Mohamed Abou-Donia	Biological Sciences	Activation of CAMKII during DFP toxicity mediates cell death in human neuroblastoma SH-SY5Y cells
Adrienne Cohen	Janine Chalk	Biological Sciences	Variation in Mastication Rates between Adult and Juvenile Propithecus coquereli
Evan Schwartz	Rahima Zennadi	Biological Sciences	The Effect of MEK Inhibitors on Sickle Cell Disease
Leah Croll	Nina Sherwood	Biological Sciences	Mi-2: A possible regulator of Kat60-L1, Katanin60, and Spastin
Bowen Niu	Brian Coggins	Biological Sciences	Progress towards NMR Characterization of Oxidized Human Superoxide Dismutase1
Adam Gross	Christine Drea	Biological Sciences	Making Scents: Endocrine Correlates of Olfactory Communication in Hormonally Suppressed Ring-Tailed Lemurs
Alexander Advani	Gregory Wray	Biological Sciences	Fibroblast differences between humans and chimpanzees
Conrad Chou	Meng Chen	Biological Sciences	Characterization of HEMERA through Overexpression in Arabidopsis thaliana
Jonathan Haskel	Meng Chen	Biological Sciences	HEMERA and HFR1 act in parallel pathways to regulate photomorphogenesis in Arabidopsis thaliana
Jennifer An	Chris Wall	Biological Sciences	Search for Positive Selection in AMELX across the Primate Species
Monica Hogan	Tyler Walters	Creative Arts	Heartwork: Triptych Concluded - A Convergence of Dance and Technology
Ibrahim Maali	William Chafe	Humanities	Hands Off District Six: Preserving Community through Militant Nonviolence
Daniella Schocken	Naomi Quinn	Humanities	Sickness and Self-Diagnosis in the Emergency Department
Alejandro Cortese	Mark Kruse	Physical Sciences	Technique for Long-Lived Anomalously Charged Particle Searches at ATLAS
Nicholas Shelburne	Qiu Wang	Physical Sciences	Exploring the Reactivity of Electrophilic Amines and Amides
Aisha Hilliard	Todd Woerner	Physical Sciences	Determining Complexation Constants using Capillary Electrophoresis in Undergraduate Labs

Angela Jiang	Rochelle Schwartz-Bloom	Service Learning	FEMMES: A STEM program for girls that fosters hands-on learning and female-to-female mentorship
Melanie Sperling	Leslie Babinski	Service Opportunities in Leadership	Getting Involved
Alyssa Forman	Alma Blount	Service Opportunities in Leadership	Reaching for College Success
Elisabeth Michel	David Walmer	Service Opportunities in Leadership	A Community Perspective: Haitian Women's Opinions on Health and Health Services in Léogâne, Haiti
Ryan Lipes	David Malone	Social Sciences	Transitioning Students to High School: Freshman Academies in Durham Public Schools
Taylor Cater	Erin Callahan-Price	Social Sciences	Discourse Analysis and Videogame Speech
Uche Anigbogu	Charlie Piot	Social Sciences	Disease Etiology and Cultural Collaboration : The Impact of Foreign Medical Ideas on Igbo Culture

Bryan University Center
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A Presentation of Undergraduate Research

12:30 – 1:30 pm
Poster Session III

Name	Advisor	Field of Research	Project Title
Jocelyn Antonio	Amy Schreier	Behavioral Sciences	The Use of the Prehensile Tail in Alouatta palliata (mantled howler monkey)
Jordan Miller	Anne Pusey	Behavioral Sciences	Aggression and Resource Defense in the Female Chimpanzees of Gombe Stream National Park, Tanzania
Rachna Reddy	Brian Hare	Behavioral Sciences	Do red ruffed lemurs yawn contagiously?
Abhinav Ettyreddy	Mariano Garcia Blanco	Biological Sciences	Prognostic and therapeutic antibodies against the alternatively spliced fibroblast growth factor receptor 2 (FGFR2)
Tony Chen	Daniel Laskowitz	Biological Sciences	Neuroprotection by ApoE-Mimetic Peptides Following Traumatic Brain Injury
Fontasha Powell	Karli Watson	Biological Sciences	Altered Disgust Response to Visual Stimuli in Anorexia Nervosa
Natalie Miller	Ornit Chiba-Falek	Biological Sciences	The Relationship between SNCA SNP Allele Frequencies and the Development of Lewy Bodies
Stephanie Patterson	Nicole Schramm-Sapyta	Biological Sciences	The Role of Adolescent vs. Adult Exposure to Binge Ethanol in Delay Discounting Behavior
Christine Tsai	Michel Bagnat	Biological Sciences	Generating a fluorescently tagged Cd36 protein in zebrafish using BAC recombineering
Mengyou Wu	Cindy Van Dover	Biological Sciences	Genetic Diversity of Branchipolynoe pettiboneae in Manus Basin Hydrothermal Vents
Arun Sharma	Gerard Blobe	Biological Sciences	A Novel Interaction between Endoglin and p38 MAPK Regulates Endothelial Cell Migration during Angiogenesis
Kristie Vu	Gerard Blobe	Biological Sciences	The Role of T-beta-RIII Ectodomain Shedding in Regulating TGF-beta Signaling in Breast Cancer Cells
Nari Sohn	Dan Rittschof	Biological Sciences	Are Oysters and Blue Crabs from North Carolina Safe to Eat?
Kelly Ostrofsky	Steven Churchill	Biological Sciences	Sexual dimorphism in the lumbar vertebrae: Application to Australopithecus sediba
Tawnee Sparling	Steven Churchill	Biological Sciences	The Shoulder of Australopithecus sediba
Ryan Gimple	Nina Sherwood	Biological Sciences	Katanin-p60: How a Microtubule Severing Protein Impacts the Development of the Nervous System in Drosophila melanogaster
Jenny Li	David Cory Adamson	Biological Sciences	Identification of OTX2 as a novel therapeutic target in the malignant childhood tumor retinoblastoma
Mengya Wu	Cindy Van Dover	Biological Sciences	Genetic Diversity of Branchipolynoe pettiboneae in Manus Basin Hydrothermal Vents
Paul Salem	Steven Churchill	Biological Sciences	Penetration, Tissue Damage, and Lethality of Wood- Versus Stone-Tipped Projectiles

Edward Chiou	Rahima Zennadi	Biological Sciences	The effect of p60src and Piceatannol-Sensitive p72syk Tyrosine Kinases on LW and CD44 activation of Sickle Cell Adhesion to the Endothelium
Rong En Tay	Steve Haase	Biological Sciences	Positive Feedback – A Means Of Maintaining The Robustness Of Cell-cycle Oscillations?
Gwendolyn McGinnis	Christine Drea	Biological Sciences	Ring-tailed Lemur Susceptibility to Human Diseases as Reflected by MHC Divergence
David Lung	Matthias Gromeier	Biological Sciences	MAP Kinase Signaling as an Intracellular Determinant for an Oncolytic Virus
Yi Dong	Hiroaki Matsunami	Biological Sciences	In vitro and in vivo approaches for correlating odorant receptor selectivity to axon guidance in mice
Lucy Zhang	Claudia Gunsch	Biological Sciences	Bacteriophage as a Novel Disinfection Technology
Sunny Qiu	Nicole Calakos	Biological Sciences	Characterization of Motor Impairment in Mouse Models of Dystonia
Victoria Arendt	Philip Benfey	Biological Sciences	Automatic detection of crown roots in Zea mays root system models using logistic regression
Margaret Cinderella	H. Nijhout	Biological Sciences	Size and Shape Development in Lepidoptera
Carrie Ho	Sallie Permar	Biological Sciences	Origin and evolution of simian immunodeficiency virus in the breast milk compartment of African green monkeys
Katherine Soltis	John French	Humanities	"Biting the Bullet" and Banning Guns: The Brazilian National Referendum of 2005 and Its Defeat at the Polls
Diana Ruiz	Kimberly Lamm	Humanities	Transgressing the Confines of Victim-Centered Cinematic Narratives: Thomas Allen Harris' Vintage: Families of Value
Laura Dodd	Ayana Arce	Physical Sciences	Can color-connection be observed in top quark events at ATLAS?
Arjun Khanna	Warren Warren	Physical Sciences	Brown Adipose Tissue Detection with MRI: Novel Applications of BOLD and Hyperpolarized Xenon Imaging
Tim Zhang	Benjamin Wiley	Physical Sciences	Silver-Coated Copper Nanowires for Transparent, Flexible Electrodes
Christian James	Jeffrey Forbes	Physical Sciences	Automatic Tuning of PID Controllers for LEGO Mindstorms Robotics
Katelyn Donaldson	David Malone	Service Learning	Partners for Success: A Critical Examination of the Duke Tutoring Program
Max Liu	Susan Wynn	Service Learning	Sustainability in Educational Administration
Sunhay You	Alma Blount	Service Opportunities in Leadership	The Invisibility of Caregiving Work and its Adverse Impacts on Women
Lauren Zalla	Alma Blount	Service Opportunities in Leadership	Embodied History: Breastfeeding Beliefs and Practices in Haiti
Sarah Nolan	Anirudh Krishna	Social Sciences	What Determines Aspirations and University Attendance in Rural India?
Divya Taneja	James Shah	Social Sciences	How do People Exercise Influence over their Own Implicit Motivations?
Lillian Carroll	Diane Nelson	Social Sciences	Enjoy/meant: Couples, Dancers, and Gender, Sex and Power in a Strip Club
Jinyuan Li	Anirudh Krishna	Social Sciences	Impact of Rural-to-Urban Male Migration on Women's Seeking of, Access to, and Financing of Healthcare and of Women's Health among Different Geographies, Caste, and Income Groups and the Perception of Migration by Migrant Men

Bryan University Center
Wednesday, April 18, 2012
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Oral Presentations
Meeting Room A

11:30-11:50	Braxton Shelley	Anthony Kelley	Humanities	A Preacher's Chord: Richard Smallwood's "Hammer" Six-Four
11:50-12:10	Kadeisha Kilgore	Charles Piot	Humanities	Why Do They Have to Pray All-Night?: Ghanaian Charismatic Christianity and Its Influences in the Diaspora
12:10-12:30	Michael Habashi	Rebecca Bach	Social Sciences	Living in Hell in the City of Angels: A Study of Homeless Men on Skid Row
12:30-12:50	Mandy Lowell	Sarah Beckwith	Humanities	To Our Lady We Sing: The History and Style of the N-Town Mary Play
12:50-1:10	Laura Hubbard	Sonke Johnsen	Biological Sciences	Evolutionary dynamics between plant secondary compounds and the reproductive success of a salticid predator
1:10-1:30	Rui Dai	Erich Jarvis	Biological Sciences	Differentiation of stem cells into neurons and cardiomyocytes
1:30-1:50	Christopher Clayton	David Boyd	Social Sciences	Healer shopping and communication among patients of La Clinica Boliviana Americana

Bryan University Center
Wednesday, April 18, 2012
A Presentation of Undergraduate Research

Oral Presentations
Meeting Room B

11:30-11:50	Jianing Xie	John French	Humanities	Two and Two: An Anthropological Study of Protestant Conversion in Guatemala from 1930-1960
11:50-12:30	Allison Denburg	Joseph Grieco	Social Sciences	The Dutch Perspective on the European Union: An Analysis Through Documentary
12:30-12:50	Layla Quran	Robin Kirk	Social Sciences	Division or Development? : Iraq under US Occupation
1:10-1:30	Kathy Chu	Joshua Sosin	Humanities	The Liturgical System in Classical Athens: Contesting Incentive, Reward, and Citizen Rights
1:30-1:50	Nathaniel Hill	Claire Conceison	Creative Arts	Producing Ragtime at Duke University as an Exercise in Collaboration, Adaptation, and Personal Professional Development

Alexander Advani
Fibroblast differences between humans and chimpanzees
Research Advisor: Gregory Wray
Biology

Focal adhesions are large complexes of proteins which are usually found at the periphery of cells. They facilitate cell attachment to the extra-cellular matrix, cell-cell signaling, detection of the extra-cellular matrix and cell movement. A phenotypic change that affects focal adhesions could hinder a cell's ability to perform basic cellular functions even to the point of cell death. Focal adhesions are composed of several proteins and compounds, one of which is vinculin. Vinculin is a focal adhesion-specific protein that is critical to the structure of focal adhesions. The driving question behind this project is: to what extent do human and chimpanzee cells differ in terms of focal adhesions? This study used vinculin as a proxy for focal adhesions and imaged it using fluorescent microscopy to establish the number and size of focal adhesions within a cell. These were then compared between human and chimpanzee skin fibroblasts in order to determine whether or not there is an inter-species difference. The results indicate that chimpanzees have more and larger focal adhesions than humans. In addition this study indicated the existence of a previously unknown, chimpanzee fibroblast shape found by examining the actin structures of the cells. This shape is never observed in humans. These results have the potential to change our understanding of cell movement and cell signaling as well as our understanding of human and chimpanzee cell differences.

Lizzeth Alarcon
Teenage Reproductive Health in a Migrant Community of San Jose, Costa Rica
Research Advisor: Jason Cross
Global Health

Teenage pregnancy is a major public health issue in San José. Existent sexual and reproductive health practices among teenage girls living in Bajo los Anonos, one of the city's most underprivileged communities, were assessed. Given the large presence of Nicaraguan immigrants in the area, the extent to which this background influenced the reproductive health of the population was also studied. In collaboration with Children without Borders, a non-profit organization in the area, door-to-door interviews were conducted. Qualitative data was gathered using structured questionnaires that provided insight into sources of sexual education in the community, the prevalence of sexually transmitted diseases, and access to resources such as contraception. Men, women, and teenagers of both Nicaraguan and Costa Rican nationalities were interviewed. In conducting our research, we found that sex is a very sensitive topic that it is not generally discussed at home. Instead, most of the information girls receive about sex was learned in primary school, where the focus is mostly on anatomy and safe sex practices are only briefly mentioned. Because of the strong presence of religious institutions, premarital sex and contraception are highly controversial subjects. Furthermore, because many uninsured Nicaraguan immigrants are not aware of the health benefits available for their children, medical consultations are seen as an expense only necessary for emergency cases and not for preventive purposes, which poses yet another barrier to reproductive health. Based on the research results, health education workshops were designed and implemented for teenage girls in this community.

Jennifer An
Search for Positive Selection in AMELX across the Primate Species
Research Advisor: Chris Wall
Evolutionary Anthropology

Amelogenin is a major extracellular matrix protein in developing enamel, and it is important for the formation and maturation of enamel. Previous studies indicate that AMELX, a gene that codes for amelogenin, might influence enamel thickness in humans. The central region (exon 6) of amelogenin is highly variable among mammals due to numerous insertions and deletions of polyproline repeats. Jin et al. (2009) found that there is a direct relationship between the length of the polyproline repeat region and the enamel thickness phenotype. This study aims to determine whether there is evidence for positive selection in the exons of AMELX, and whether this is linked to variation in enamel thickness in humans as compared to thin-enameled apes. Microcebus murinus, with thin

enamel and a divergence time of about 85 million years, is a critical phylogenetic outgroup for these comparisons. Complete sequence data are not available for M. murinus. My senior thesis research is to complete the exonic dataset for AMELX in M. murinus and run tests for positive selection on the exons of this gene across all seven primate species. This semester I have worked to download sequence data for AMELX, and to fill in sequence gaps. After all gaps are filled, I will (1) align AMELX and test for positive selection in the exons across hominoids, and (2) provide a fine-grained analysis of variation in the polyproline repeat regions of exon 6 for each species. These analyses will allow an evaluation of an association between positive selection in AMELX and enamel thickness.

Lucy Andrzejewski
A Novel Test of Facial Expression Recognition for Children with Sickle Cell Disease
Research Advisor: Melanie Bonner
Psychology and Neuroscience

Sickle cell disease (SCD) is a chronic illness that affects 1 in every 400-500 African American newborns annually in the United States. The illness is associated with a number of psychological sequelae, including decrements in attention, memory, executive functioning, as well as overall intellectual ability. These cognitive deficits have been linked to other outcomes, including low academic, social, and emotional functioning. In light of this, the present study aims to examine this connection between neurocognitive functioning, social functioning, and facial expression recognition in children with SCD, compared to their typically-developing peers. Children with SCD (ages 8-16; projected n=35) will be recruited from their regularly scheduled clinic appointments and asked to complete a brief neuropsychological battery, an assessment of FER, and questionnaires regarding social, emotional and behavioral functioning. Parents of all youth participants will also be asked to fill out questionnaires regarding their child's social, emotional, behavioral and cognitive functioning. The same measures will be administered to a sample of typically-developing peers (ages 8-16; projected n=35), who will be recruited from advertisements on a clinical trials website. It is expected that children with SCD will have, on average, more difficulty appropriately identifying facial expressions than healthy children, and that these deficits will be correlated with neurocognitive outcomes and questionnaire-based measure of quality of life and social functioning.

Uche Anigbogu
Disease Etiology and Cultural Collaboration : The Impact of Foreign Medical Ideas on Igbo Culture
Research Advisor: Charlie Piot
Cultural Anthropology

This paper is concerned with the relationship between biomedical beliefs and cultural medical knowledge, examining the effect of the latter on the former, as it plays out in Igbo people, an ethnic group native to Nigeria. Igbo people are able to adapt borrowed western knowledge of biomedicine and weave these ideas with independent indigenous medical understandings to create a blend of two mindsets. To understand the effects of Igbo adaptation alongside their insularity above, I examine the following medical conditions and their causes: diabetes-a disease that suggests the prevalence of western understandings, infertility-a disease that implies the pervasiveness of indigenous understandings and high blood pressure-a particularly multifaceted disease that illustrates coexistence between western and indigenous medical beliefs. Each of these three diseases are perceived with a different and distinct level of understanding in regards to causation and treatment with each illness possessing biological, psychological, sociological and cultural dimensions. After colonial intervention and western integration, the definitions and understandings of these diseases, particularly high blood pressure, morphed in interesting ways that suggest the coexistence of diverse ideas in a single space that may also define something distinctive to Igbo. Understanding the etiology of these disease in the Igbo community better enables us to instill effective and culturally competent education and treatment initiatives as well as broaden the scope of bio-medicine to include indigenous ideas.

Jocelyn Antonio
The Use of the Prehensile Tail in Alouatta palliata
Research Advisor: Amy Schreier
Evolutionary Anthropology

In different species of New World Monkeys it has been observed that the prehensile tail serves similar functions to those of the arms and legs. As such, the tail aids monkeys in activities to provide balance and is often referred to as a fifth limb. Prehensile tail use was observed in a group of Alouatta palliata (mantled howler monkey) in the Coffee Forest on Isla de Ometepe, Nicaragua in August 2011. Data were recorded on the monkeys' activity, tail use, and the level of the forest using a scan sampling technique. I hypothesized that A. palliata has a prehensile tail because it is useful during certain activities and in certain layers of the rainforest. A. palliata used the tail 35.6% of the time throughout all activities. The prehensile tail was used the most during sitting (41.5%) followed by resting (36.8%), feeding (10.5%), walking (4.3%), standing (3.2%), climbing (2.5%), jumping (0.7%), and foraging (0.4%). Furthermore, the prehensile tail was used more in the lower level of the rainforest (71.2%) than in the upper level (28.9%). A. palliata use their tail preferentially for stationary activities and in the lower level of the rainforest.

Victoria Arendt
Automatic detection of crown roots in Zea mays root system models using logistic regression
Research Advisor: Philip Benfey
Biology

Root systems of Zea mays (corn) plants contain distinct embryonic and postembryonic types, which differ in their development and relative importance during the life of the plant. Although the embryonic root systems of corn plants are very important in the first few weeks of development, postembryonic shoot-borne roots dominate the adult root system. Because crown roots are the first shoot-borne roots to emerge, their timing, proliferation, and size are very important to the corn plant's growth and development. Quantitative studies of crown root development would allow us to also investigate which genes control its various characteristics. In order to perform these quantitative studies, however, we must be able to computationally isolate crown roots from the others in the Z. mays root system. Previous studies have focused on manually identifying crown roots from root system models, but this technique is inefficient. I developed a program that automatically separates the individual roots from a 3D reconstruction of a corn root system, uses logistic regression to classify roots as crown roots with 87% accuracy, and extracts important information such as volume, cross sectional area, and angle of growth from each of these roots. Future studies will utilize this program to perform a Quantitative Trait Loci (QTL) analysis and identify areas of the corn genome that contribute to the timing and proliferation of crown root development.

Nada Baalbaki
Analytical Methods for the Validation of the Inorganic Complexes of Trace Minerals in Nutritional Supplements
Research Advisor: George Dubay
Chemistry

Trace mineral supplements are marketed to the general public without direct government regulation of the content of the products, despite their limited therapeutic ranges and low safe and effective limits. The USDA Dietary Supplement Ingredient Database (DSID) has begun preliminary studies investigating the appropriate analytical methods for validating the content of nutritional supplements. While they have identified chromium, zinc and magnesium as –priority" ingredients for supplement analysis, analysis of these compounds has not begun ["Dietary Supplement Ingredient Database: Preliminary USDA Studies on the Composition of Adult Multivitamin/mineral Supplements." Journal of Food Composition and Analysis 21 (2008): S69-77.]. Using inductively coupled plasma mass spectrometry (ICP-MS), the inorganic elemental concentration of four different products of chromium picolinate, magnesium citrate, and zinc gluconate was analyzed. Additionally, absorption spectrometry (AAS) was performed on the magnesium citrate products. The ICP-MS instrument and accompanying sample preparation met DSID testing standards for acceptable precision for 90% of the samples, while the AAS method was only adequate for half of the samples tested. The ICP-MS data indicated that tablets from the same product lack uniformity in size and elemental content, and products of the same trace mineral type were consistently higher or lower than their labeled value. Discrepancies between the labeled and found elemental content in the products tested ranged from little or no difference to about 50% error; this variation in product elemental content signifies the value and necessity

of DSID validation of the elemental content of trace mineral supplements to ensure the accuracy of label claims.

Ujjayini Bose
The Egoic Mindset: An Exploration into Induction Techniques
Research Advisor: Mark Leary
Psychology and Neuroscience

The study of egoicism—a construct defined by (1) self-relevant thoughts, (2) introspection, (3) future temporal focus, and (4) abstract construal level—has focused mainly on narrative data. There has been no previous method by which to induce and test the effects of varying levels of egoicism empirically. This methodological study tested a method of inducing levels of egoicism by instructing participants to engage in one of four mental tasks while looking at visual stimuli. The results, while not conclusive, suggest that this methodology may induce particular aspects of egoicism, such as allo-inclusivity and self-focus (demonstrated through a pronoun task), although the effects were moderated by previous meditation experience. Further studies should explore this procedure as basis for future inductions of egoicism, although the specific directions for each condition may be questionable.

Emily Bray
Factors Affecting Inhibitory Control in Dogs
Research Advisor: Stephen Mitroff
Psychology and Neuroscience

Inhibitory control is central to problem solving, making it informative to examine different species' ability to resist impulsive responses in favor of more difficult, adaptive behaviors. I used four tasks to explore whether a dog's inhibitory control is stable or varied across contexts. In a detour task, I asked if dogs could suppress a desire to walk directly toward food behind a transparent barrier in favor of a less direct but more fruitful path. In an A-not-B task, I studied if dogs could inhibit a preference for a place where they had been previously rewarded after watching food moved to a novel location. In a social task, dogs were taught the reputations of a stingy and generous experimenter, and then the stingy experimenter offered (but withheld) more food to see whether dogs could inhibit the desire to approach a larger, unobtainable quantity of food for a smaller, realizable reward. Finally, using a within-subjects design, I compared dogs' abilities to perform a second detour task when addressed in a neutral versus excited voice. Inhibitory control scores were not correlated between tasks, suggesting that context likely plays a large role in effect on performance. Furthermore, between- and within-subject variation in inhibitory control was affected by the dog's arousal level and age. Dogs had more difficulty during arousal trials as compared to baseline trials.

Joel Bray
Are lemurs sensitive to the visual perception of others?
Research Advisor: Brian Hare
Evolutionary Anthropology

The social intelligence hypothesis states that large group size, and the need to compete and cooperate with conspecifics, selected for the evolution of complex cognition in primates. This is supported by research showing a positive relationship between group size and relative brain size in primates; however, there is of yet no experimental evidence showing a direct relationship between group size and cognition in primates. In this project, we used a comparative approach to directly test the relationship between group size and performance on a social cognitive task. Six species of lemurs at the Duke Lemur Center were tested for their ability to exploit basic cues indicating a human competitor's visual perspective in order to steal food from them. Overall, four species were above chance in their ability to use social cues to retrieve food, and there were significant differences between species. Importantly, species-typical group size had a positive relationship with performance on the task, while brain size had no effect on performance. This provides direct support for the social intelligence hypothesis but suggests that brain size may not be a valid proxy variable for general cognition.

Stevan Budi
An electrophysiological analysis of the stimulus-locked response in a reinforcement learning task
Research Advisors: Scott Huettel
Psychology and Neuroscience
Marty Woldorff
Neuroscience department

One critical component of decision making process is the ability to put subjective values on different stimuli and take the appropriate action based on those values. For this process to work in a constantly changing environment, this system also has to be able to update the values of these stimuli based on previous experience. In this experiment, we recorded event-related potentials (ERPs) during a learning-based paradigm task and showed that there is a correlation between brain activity around stimulus presentation and subjective value of stimulus and betting choice. We found two distinct activities related to stimulus-locked response, a parietal and right frontal distributed ERP activities. The parietal distributed ERP activity which occurred ~500ms after stimulus presentation was shown to be primarily modulated by the subjective value of the cues. On the other hand, the right frontal distributed ERP activity which occurred ~900ms after stimulus presentation was shown to be influenced mainly by incoming betting choice. Across trials, ERPs values for parietal distributed activity diverge based on subjective value, further supporting the idea that there is correlation between parietal distributed ERP activity and subjective value. This general trend was not as clear for the right frontal distributed ERP activity. Lastly, we discussed how these findings fit the current valuation process model; how the values of different stimuli are processed in real time in the brain.

Tracie Canada
Racial Politics in College Athletics through the Lens of Duke University Football
Research Advisor: Orin Starn
Cultural Anthropology

It has often been claimed that sports have led the way in promoting integration in American society. According to this view, whites and blacks had to learn to get along in the locker room for the greater good of the team, and in the process, demonstrated that different racial groups could get along. With almost each sport having evidence of close relationships across racial lines, established between both players and coaches, there is evidence for a different, more egalitarian America struggling to emerge from the long shadow of the Jim Crow era. Of course, there was much tension around integration and tolerance in sports. There are plenty incidents that demonstrate the hesitation and sometimes violent opposition to integrating the athletic sphere and at times, change came very late. But what about today? Many declare that race and racism no longer represent major problems in America, but the reality in society in general and sports in particular is not so simple. This study explores the role of race in one particular college football program – that at Duke University. Fortunately, we have moved beyond the old days of outright bigotry and exclusion in college football, but has race really vanished in a society that appears to be postracial? Are football and the athletic community as color-blind as some claim it to be? My research suggests that race does still matter, even in an ostensibly equal program like that of Duke football, in ways both obvious and much more subtle.

Lillian Carroll
Enjoy/meant: Couples, Dancers, and Gender, Sex and Power in a Strip Club
Research Advisor: Diane Nelson
Cultural Anthropology

I explore feminist understandings of empowerment, the gaze, money, and space through a case study of a strip club. I focus on couples to expand on previous studies that concentrate solely on male patrons or female dancers. Ultimately, I argue that male patrons, female patrons, and female dancers adopt mobile identities due to their shifting levels of power.

Fiona Cary
Evaluating the Effect of Gender Stereotype Threat and Women's Intent to Pursue Science-Related Careers
Research Advisor: Lisa Linnenbrink-Garcia
Psychology and Neuroscience

Women discard their pursuit in science, technology, engineering, and mathematics (STEM) at various stages of their education, at a rate much higher than men, thus creating a "leaky pipeline" in these fields. This study examined several psychological factors influencing this "leaky pipeline" in undergraduate women. 641 first-year undergraduate students completed a baseline survey examining levels of perceived gender stereotype threat, intent to pursue a research-related career in science, and three components of task value; cost value, attainment value, and intrinsic value. It was initially necessary to assess validity of stereotype threat measures because

researchers developed the items assessing perceived ethnic stereotype threat. Exploratory and confirmatory factor analyses revealed that adequate measures had been developed. Researchers wished to use mediation analysis to determine if gender stereotype threat was one factor that mediated the relation between cost value and intent to pursue a research related career in science, but analysis was ultimately discontinued. In comparing female participants in a summer research experience with those in a comparison group, it was revealed that those who participated in the summer program reported higher levels of perceived gender stereotype threat. Post-hoc tests revealed that female students within the summer research experience also reported higher attainment value. Perhaps then, gender stereotype threat doesn't prevent women from entering into and staying in the science domain, but rather is a negative side effect of being identified and a minority gender within the domain.

Taylor Cater
Discourse Analysis and Videogame Speech
Research Advisor: Erin Callahan-Price
Linguistics

Mediated discourse analysis (MDA), unlike other approaches to discourse analysis, seeks to unite conversational discourse and social actions because linguistic variables cannot be wholly separated from the social factors surrounding the speech community. This study discusses MDA in the context of videogame speech used among a group of college juniors composed primarily of male gamers during Call of Duty: Black Ops game play. Data was collected by recording the voices of the speakers in the room, who were watching or participating in the videogame, while visually recording the videogame on the television screen in order to correlate speech acts with actions on the screen. The data elicits patterns demonstrating the communicative competence necessary for speakers to effectively participate in the speech situation, certain lexical items found in the videogame speech environment not used in other environments, and the influence of a technological medium on speech. Players' use of cooperative discourse can be classified as one of five discourse strategies: game strategy, self-evaluation, other-evaluation, apology, and response cries. Players also demonstrate 'chronotope switching' in which players transition between talking about the virtual world of the videogame to real world conversation. Videogame mediated discourse also introduces a game-specific lexicon in which players utilize functional shift to adapt game words to specific lexical categories. Conversation within the videogame context functions much the same as non-mediated conversation in that speakers carry similar responsibilities such as having to possess certain knowledge in order to effectively participate in the technologically mediated conversation.

Emily Chang
Regulation of Basement Membrane Gap Expansion in Anchor Cell Invasion in C. elegans and Related Nematodes
Research Advisor: David Sherwood
Biology

Cell invasion through basement membranes (BM) is a complex yet fundamental phenomenon in biological processes occurring during leukocyte migration, trophoblast invasion of the endometrium BM, and notably cancer metastasis. The Sherwood Lab seeks to better understand the mechanisms behind BM invasion by using the transparent nematode Caenorhabditis elegans, whose vulval development involves BM breaching by a specialized somatic gonad cell, anchor cell (AC). Despite the extensive work on vulval development in other nematode species, little is known about how the AC connects the developing uterine and vulval tissues. My research focuses on the extent of evolutionary conservation of AC invasion across nematode species. Thus far, in all the worm species observed, including C. elegans, AC invasion seems tightly regulated, with some differences in the timing of invasion with respect to the divisions of the underlying vulval precursor cells (VPCs). Additionally, the Sherwood lab has shown that following invasion the expanding BM gap stabilizes over the vulD cells on either side of the opening. It has been demonstrated that in all species examined these vulD cells do not divide, unlike the other VPCs. Currently I am attempting to find out whether this mitotic quiescence is responsible for the stabilization of the BM gap. I hypothesize that vulD prevents the BM from overexpanding following AC invasion and that its entry into the cell cycle would cause the BM to slip past its normal boundary positions.

Tony Chen
Neuroprotection by ApoE-Mimetic Peptides Following Traumatic Brain Injury
Research Advisor: Daniel Laskowitz
Neurology

Traumatic brain injury (TBI) is one of the leading causes of death and disability in the United States and has an estimated annual cost of 60 billion dollars. To date, no treatments have been demonstrated to significantly improve long-term cognitive health. Recent studies have identified important genetic influences on head injury, suggesting that patients carrying an apoE4 allele are associated with poorer functional outcomes. However, the exact mechanisms by which the apoE protein affects injury in the central nervous system (CNS) remain unknown. There is accumulating evidence suggesting a role for apoE in downregulating endogenous brain inflammatory responses by interacting with specific cell surface receptors of microglial cells (resident brain immune cells) in an isoform-specific fashion. A previous peptide derived from the receptor-binding region of apoE improved functional outcomes in preclinical models of TBI, and a smaller peptide has been developed to more efficiently cross the blood-brain barrier. This proposal seeks to understand how the peptide affects mouse brains at specific intervals post-TBI in order to evaluate whether its administration is a potential, effective therapeutic strategy. Specifically, our goal will be accomplished by examining neurodegeneration and neuroinflammation, two processes characteristic of TBI. Neuroinflammation will be assessed by counting activated microglial cells stained by F4/80 immunohistochemistry in treated/non-treated mice brains 10 days post-TBI. Neurodegeneration will be assessed by counting degenerating neurons stained by fluoro-jade B in treated/non-treated mice brains 24h post-TBI. This work will contribute to developing the first potentially effective drug for treating closed head injury.

Annie Chen
Effects of AMELX and AMELY on the Evolution of Dental Sexual Dimorphism in Primate Species
Research Advisor: Chris Wall
Evolutionary Anthropology

Phenotypic comparative studies of tooth morphology in primate species have revealed sexual dimorphism of tooth size and enamel thickness (Clutton-Brock, 1978). Human chromosomal abnormality studies also demonstrate a positive correlation between an extra Y chromosome and thicker enamel in males (Schwartz, 2005). An extra X chromosome in males (Alvesalo, 1991) and females (Schwartz, 2005) also correlates with thicker enamel. The genes hypothesized to cause these phenotypic differences are AMELX and AMELY which code for the enamel matrix protein amelogenin. Amelogenin comprises about 90% of the enamel matrix and plays a crucial role in enamel formation, which includes the appositional deposition of crystals by ameloblasts (Simmer, 2010). Hence, the genetic signals of natural selection associated with dental sexual dimorphism may be similar across primate species. The goal of this project is to compare sequence divergence in the exons of the AMELX and AMELY in Homo sapiens, Pan troglodytes, Gorilla gorilla, Pongo pygmaeus, Macaca mulatta and Microcebus murinus. Primer design, polymerase chain reaction, sequencing and sequence alignment are carried out. Tests for positive selection across exons may give insight into the evolution of dental sexual dimorphism in the teeth of primate species.

Edward Chiou
The effect of p60src and Piceatannol-Sensitive p72syk Tyrosine Kinases on LW and CD44 activation of Sickle Cell Adhesion to the Endothelium
Research Advisor: Rahima Zennadi
Hematology

Non-receptor tyrosine kinases are involved in cell-cell interactions. In sickle cell disease, since multiple protein kinases are implicated in the adhesive nature of sickle erythrocytes to the endothelium, we predict that activation of non-receptor tyrosine kinases in sickle erythrocytes mediates adhesion to the endothelium. Therefore, we have investigated both whether p60src and piceatannol-sensitive p72syk tyrosine kinases are active and involved in sickle erythrocyte adhesion to the endothelium, and the molecular mechanisms these two kinases activate. Our results showed that inhibition of tyrosine phosphatases with sodium orthovanadate (Na3VO4) up-regulated adherence of sickle erythrocytes to endothelial cells in

intermittent flow conditions at a shear stress of 2 dynes/cm2 in vitro. The effect of Na3VO4 on sickle erythrocyte adhesion was significantly inhibited with piceatannol, a potent inhibitor of the p72syk Tyrosine Kinase, suggesting that piceatannol-sensitive p72syk is involved in sickle erythrocyte adhesion to the endothelium. Tyrosine kinases p72syk and p60src underwent enhanced phosphorylation with Na3VO4-treatment of sickle erythrocytes, suggesting that increased sickle erythrocyte adhesion to the endothelium involves activation of both p72syk and p60src. These data were confirmed using tyrosine phosphatase inhibitor cocktail, which also showed enhanced phosphorylation of both p72syk and p60src. Furthermore, increased adhesiveness of sickle erythrocytes to the endothelium was mediated via red blood cell adhesion receptors LW/ICAM-4 and CD44. Our data suggests that p72syk and p60src tyrosine kinases may participate in the pathophysiology of sickle cell disease, and could be targeted to prevent sickle erythrocyte adhesion, the hallmark of this debilitating disease.

Conrad Chou
Characterization of HEMERA through Overexpression in Arabidopsis thaliana
Research Advisor: Meng Chen
Biology

Light affects every major developmental transition of plants, from germination through flowering. Upon perceiving light, the seedlings switch from the dark program, skotomorphogenesis, to the light program, photomorphogenesis, where stem growth is inhibited and the leaves expand and become photosynthetic. The Chen lab recently identified HEMERA (HMR), a nuclear and chloroplast gene in Arabidopsis thaliana that is required for light signaling and essential for chloroplast differentiation. hmr mutants define a unique class of Arabidopsis light-signaling mutants that are both albino and tall under continuous red and far-red light, and die at seedling stage. Though it has been proposed that HMR functions in protein degradation, how HMR mediates phytochrome signaling to regulate downstream morphological responses remains unknown. Here, we further characterize HMR by overexpressing the protein via CaMV 35S promoter in hmr null background. In the transgenic lines, a maximum of 30-fold increase in HMR transcript levels is observed, while the HMR protein levels increase only about twofold, indicating that HMR is tightly regulated at post-transcriptional level. In comparison to wildtype seedlings, a moderate increase in HMR protein level in the transgenic lines leads to higher chlorophyll content, larger cotyledon area, and impaired fertility. Conversely, low HMR protein level is associated with smaller cotyledon area and lower chlorophyll content. The results further confirm the importance of HMR in light signaling pathways and regulation of physiological responses.

Kathy Chu
The Liturgical System in Classical Athens: Contesting Incentive, Reward, and Citizen Rights
Research Advisor: Joshua Sosin
Classical Studies

Shortly after the birth of democracy in the late 6th c. BCE, Athens instituted a new system of taxation. Central to the ancient democracy's economy, this system was a means of extracting resources from the wealthy for public benefit. Athens' wealthiest citizens were called upon to make financial contributions, called liturgies, to state military or religious expenses. Prior to the introduction of the liturgical system, the wealthy made voluntary donations in exchange for formal 'gratitude' from the state in the form of publically decreed honors. By instituting mandatory performance, however, Athens restricted the freedom of the wealthy and consequently changed the conceptual framework of public benefaction. While it would appear that formalizing the previously ad hoc system of public benefaction ought to have resulted in a more defined system of rights and obligations, evidence from Athenian forensic oratory suggests the contrary. A century and a half later we still find court cases in which the regulations themselves seem to create conditions that invite the contesting of various aspects of the liturgy process, including incentives for undertaking service, due reward for performance and implications for the rights of the wealthy and the common citizen. To some this debate bespeaks a failure of design or implementation. I suggest that ongoing negotiation of terms and obligations was an intentional feature of the system. The multiplicity of claims brought to Athens' courts should not be seen as a consequence of the failure to legally define benefaction, but as indication of a robust, functioning system.

Margaret Cinderella
Size and Shape Development in Lepidoptera
Research Advisor: H. Frederik Nijhout
Biology

Currently, very little is known about the mechanisms that drive size and shape change in organs. We use Manduca Sexta as a model organism to investigate this question. We develop a method for quantifying growth across larval imaginal wing discs using thin-plate-spline analysis. Mitoses are recorded across wing discs during larval development and analyzed with respect to both mitotic orientation and density to determine the relationship between mitotic events and future wing growth. We find a strong positive correlation between mitotic orientation and wing growth, proving that directional mitoses are a possible mechanism for driving the shape change of an organ.

Christopher Clayton
Healer shopping and communication among patients of La Clinica Boliviana Americana
Research Advisor: David Boyd
Global Health

Healer shopping, defined as the use of a second medical practitioner without referral from the first, has become extremely prominent in rural-urban migrant communities throughout the world. Patients pull from self-treatment, traditional healers and multiple biomedical clinics, employing aspects of each type of care in an attempt to cure their problems; this is often done without communicating their combined treatment plan to their providers. Patients of La Clínica Boliviana Americana in Cochabamba, Bolivia were targeted to demonstrate the presence of healer shopping among the patient population and the quality of communication between patient and provider. Results from surveys and focus groups demonstrated a high rate of healer shopping among the patients and identified many factors that contribute to the lack of communication with providers surrounding the use of other medical resources. The findings from this preliminary study were presented to clinic staff to promote discussion of the use of outside medical resources with patients.

Adrienne Cohen
Variation in Mastication Rates between Adult and Juvenile Propithecus coquereli
Research Advisor: Janine Chalk
Evolutionary Anthropology

Numerous studies have examined various aspects of the process of mastication in primates, such as differences in mandibular morphology, maximum ingested bite size, bone's response to forces from chewing, or scaling of mastication rates to body size. Unfortunately, the literature is conspicuously scarce concerning primate mastication rates among age classes. The aim of this study was to examine the mastication rates of Propithecus coquereli males (n=2), females (n=2), and juveniles (n=3) housed at the Duke Lemur Center. Between age classes, juveniles were predicted to have similar mastication rates to adults. Mastication rates were calculated as the number of chews per second in a single feeding bout. The subjects were fed carrots, peanuts, and sumac leaves, and the toughness of these foods was collected from literature or calculated using the Darvell mechanical tester. Data was collected through video recording, and mastication rates were calculated from these videos. Kruskal-Wallis tests were used to compare mastication rates among age classes. The mastication rate of juveniles was significantly lower than the rate of females ($p<0.0001$) for all foods, but only significantly different from the mastication rate of males eating sumac leaves. Juveniles followed the same pattern as females, indicating a higher chewing rate for peanuts than sumac leaves. These results failed to support this study's hypothesis and suggest an age difference for sumac leaves and potentially the other foods. The results also suggest a sex difference for peanuts and carrots. These results could stem from subjects' idiosyncracies; further research needs to be conducted with larger sample sizes in order to rule out idiosyncracies and create a stronger view of age and sex differences on mastication rates.

Alejandro Cortese
Technique for Long-Lived Anomalously Charged Particle Searches at ATLAS
Research Advisor: Mark Kruse
Physics

All free particles predicted by the Standard Model are of charge $|q| = 1$, but multiple extensions of the Standard Model, postulate fundamental particles of

anomalous charge. These extensions have motivated multiple group efforts to search for anomalously charged particles (ACPs) that are long-lived enough to be detected within the ATLAS detector at the Large Hadron Collider (LHC). If such long-lived, anomalously charged particles exist, the charge profile of events constructed from measurements of time-over-threshold (TOT) and trailing edge time (TE) from ATLAS's Inner Tracker along with energy loss (dE/dx) from the Pixel Detector and LAr Calorimeters, may offer a powerful discriminating tool. The purpose of Technique for Long-Lived Anomalously Charged Particle Searches at ATLAS is to detail a technique to combine these charge measurements to discriminate for ACPs most effectively and assess initial feasibility of these searches. Using Fisher Linear Discriminant analysis and a maximum likelihood fitting method to extract limits related to the cross sections of ACP events and SM processes, we carry out our complete technique with the Monte Carlo datasets utilized by the HIP group for a Doubly Charged Particle (DCP) search; Drell-Yan heavy fermion pair production of 200 GeV singly charged q-balls serving as background and 200 GeV doubly charged q-balls serving as signal. We set upper limits to 95% confidence of the ratio of DCP to singly charged events out of 10,000 events using a combination of time-over-threshold, trailing edge time, energy loss from the Pixel Detector and energy loss from the LAr calorimeters.

Leah Croll
Mi-2: A possible regulator of Kat60-L1, Katanin60, and Spastin
Research Advisor: Nina Sherwood
Biology

The process of microtubule (MT) severing, whereby MT polymers are cut internally by specific MT severing proteins, can lead to microtubule growth given the presence of nucleating and stabilizing factors. In other cases, MTs may break down very rapidly. The precise regulation of MT dynamics in neurons and dendrites is crucial for proper neuronal development. Kataninp60-Like1 (Kat-like), a putative MT severing protein in Drosophila, regulates the development of multi-dendritic sensory neurons. These sensory neuron dendrites are highly branched and completely cover the larval body wall. Kat-like loss of function mutants have reduced branching and branch complexity relative to wild type controls. Dendritic branching affects the ability of a neuron to receive and process signals and the MT cytoskeleton is thought to play a role in branch outgrowth as well as vesicle and signal trafficking. Mi-2, a subunit of a histone deactylase and chromatin remodeling complex, was picked out of an RNAi screen for potential genetic interactors with Kat-like. Mi-2 mutant larvae have decreased levels of Kat-like transcript. Reduced levels of mi-2 have been shown to suppress the reduced branching Kat-like mutant phenotype. This suggests that Mi-2 contributes to dendrite morphogenesis by regulation of Kat-like. Specifically, this project investigates possible interactions between Mi-2 and Spastin or Katanin60 and characterizes the Mi-2 overexpression allele.

Graham Custar
An Anthropometric Study of Duke's Human Osteological Material
Research Advisor: Janine Chalk
Evolutionary Anthropology

The Evolutionary Anthropology Department at Duke University maintains a collection of osteological material that includes twenty three bone boxes, housing the skeletal remains of an unknown number of individuals. Currently, the material is undocumented, so we have little information about the individuals compromising this collection.
This study aimed to estimate sex and geographic ancestry of the individuals using anthropometric methods found in the literature. These methods included collecting and comparing quantitative measurements and qualitative assessments from the skulls and associated dental remains. Through these methods I attempted to answer questions about these individuals regarding their sex and geographic ancestry.
Without any working knowledge of the history of the individual, the large amount of unknown variables reduced the power of statistical tools such as FORDISC in estimating geographic ancestry. Additionally, the lack of experience of the researcher in this field produced high intraobserver error. However, of the eleven skulls and associated dental remains, the sex of five females and three males were confidently identified while only three remained ambiguous with regard to that character. Two Hispanic, one

European, and two Guatemalan skulls had statistically significant quantitative analyses that supported qualitative assessments of geographic ancestry, while six had metric and nonmetric results that conflicted.
Obtaining information about geographic origin, sex, and stature is the first step to curating human remains. Results from this study provide valuable information on the sex and geographic ancestry of the human osteological material maintained at Duke University, can assist future studies in osteological material of modern humans, and has begun to establish an initial identity for these individuals.

Rui Dai
Differentiation of stem cells into neurons and cardiomyocytes
Research Advisor: Erich Jarvis
Neurobiology

One purpose of stem cell therapy is to introduce pluripotent stem cells to damaged tissues for treating disease or injury. However there are many risks to directly injecting stem cells into patients. The stem cells can differentiate into undesirable tissues, form teratomas or become cancerous. Using partially differentiated stem cells is one possible solution to this problem, and is currently being conducted in mice and a few humans patients. There are however many disorders that cannot be modeled in mice and are not life-threatening enough to be experimented on humans. These disorders, such as vocal learning disabilities and cardiac infarctions, are nevertheless debilitating and should be addressed. The purpose of this project is therefore to explore the neuronal and cardiac differentiation of non-mammalian species stem cells, specifically that of chicken and rat respectively.

Allison Damon
Enhancing Prevention, Intervention, and Treatment for Athletes at Risk for Eating Disorders
Research Advisor: Robert Thompson
Psychology and Neuroscience

Despite the great strides that have been made in the identification of causal risk factors for eating disorders and in their mechanisms of effect, recovery rates remain at less than 50%, and death tolls remain unacceptably high, with estimates that 50,000 women presently suffering from an eating disorder will ultimately die because of it. Elite athletes, in particular, have been shown to live at even greater risk for the development of an eating disorder. Thus, the aim of my thesis is to review the research literature to integrate the findings regarding 1) the factors that predispose and perpetuate eating disorders in female athletes and 2) the effectiveness of current treatment approaches to improve treatment and recovery strategies. One body of research still in its infancy suggests that it might be the mismatch between a patient's state of motivation to recover and the specific treatment approach that is used which leads to poor treatment outcomes and high relapse rates. Motivational Interviewing, a new type of motivational therapy shown to facilitate treatment for other types of addictive disorders, proposes to target something that none of the existing eating disorder treatments do –the patient's motivation to change. I thus conclude my thesis with a proposed study to test the efficacy of Motivational Interviewing as a precursor to any existing form of psychotherapy as a means to enhance eating disorder treatment and recovery success.

Allison Denburg
The Dutch Perspective on the European Union: An Analysis Through Documentary
Research Advisor: Joseph Grieco
Political Science

This study examines the Dutch perspective on the European Union as a political institution. Particularly, it addresses whether the general apathy towards the EU that was observed by Eurobarometer among Dutch citizens in 2001 has persisted in light of the many institutional changes in the EU, and whether and how Dutch opinions on issues such as immigration and the strength of the Euro have changed over the past decade. Data was collected in the form of interviews with Dutch respondents from across the socioeconomic spectrum; the interviews were then compiled into a documentary film. The results reveal that while the Dutch population is supportive of the EU as a theoretical entity, it remains weary of its actual implementation due to a widely perceived lack of transparency in the European Parliament and economic system. However, moving from the lower to the higher end of the Dutch socioeconomic spectrum, responses become more affirmative. Those who are less educated and/or

have lower incomes display a greater distrust for the EU in that institutional policies neglect the "common man." On the other hand, more highly educated and/or higher-earning respondents account for the broader implications of the EU, citing the importance of the international union as an outlet for trade, facilitator of regional peace, and assistor in competition with major world powers.

Rupen Desai
Uncovering a Gene Regulatory Network in Arabidopsis Ground Tissue
Research Advisor: Philip Benfey
Biology

In the model organism Arabidopsis, the development of the root ground tissue, comprised of the endodermis and cortex, is controlled by a series of well-studied interactions between the transcription factors SCARECROW (SCR) and SHORTROOT (SHR). These transcription factors control the asymmetric cell divisions leading to the formation of the root ground tissue through a series of well-studied interactions. However, a Gene Regulatory Network (GRN), or comprehensive pathway of the expression and activity of these transcription factors, has not been established, limiting current understanding of the asymmetric cell division. The purpose of this study was to develop a GRN upstream of several key transcription factors in root ground tissue development (including SHR and SCR) by using yeast one-hybrid (Y1H) assays. Previous microarray data revealed 150 candidate regulatory genes, enriched in the root ground tissue as compared to other Arabidopsis tissues. The regulatory elements upstream of the SCR-SHR interaction of interest are 150 TFs found to be enriched in ground tissue by previous microarray studies. 49 of these TFs were successfully cloned into the yeast DESTINATION vector, pDESTAD-2μ, with a fully verified sequence; 5 promoter regions were cloned into the yeast ENTRY vector, pGEM. Decreased protocol efficiency, caused by intrinsic alternative splicing of RNA by Arabidopsis and tautomeric shifts in nucleotide structure during the cloning procedure, need to be solved before completing the Y1H assay. The yeast assays can later be verified with RT-qPCR of mutant plants. The data from this GRN can then be applied to asymmetric cell divisions of other eukaryotic organisms.

Laura Dodd
Can color-connection be observed in top quark events at ATLAS?
Research Advisor: Ayana Arce
Physics

In this study a recently suggested observable, jet pull, will be used to measure color flow in semileptonic ttbar events at the ATLAS detector at CERN. I will measure the color flow of hadronic W boson decays, using advanced statistical methods to separate the distribution of the relative pull angle, the relative angle between two jet pull vectors.

Katelyn Donaldson
Partners for Success: A Critical Examination of the Duke Tutoring Program
Research Advisor: David Malone
Education

Established in 1998, Partners for Success connects Duke University students enrolled in education service-learning courses to students in the Durham Public School system, engaging in a tutoring program that focuses upon a reciprocal relationship between Duke and the community partners. The intent of this project is to evaluate the strengths and benefits of Partners for Success as well as to examine and to address the weaknesses in order to best serve the needs of the community and the students that tutors work with. The primary research methods employed focus on interviews and feedback from the major parties involved in the program: the Duke tutors, tutor coordinators, education professors, the DPS teachers, afterschool coordinators, and the DPS students tutored. The aim of the project is to utilize this diversity of perspectives on Partners for Success to understand the impact of the program on these parties and shape reform efforts for the future. These research efforts have highlighted the evident disconnect between the groups involved in the program and offers a challenge to address it through a myriad of interactions to enhance communication.

Yi Dong
In vitro and in vivo approaches for correlating odorant receptor selectivity to axon guidance in mice
Research Advisor: Hiroaki Matsunami
Molecular Genetics & Microbiology

Mammalian olfaction is mediated through the binding of odorants to odorant receptors (ORs) located in the olfactory epithelium. These ORs are in olfactory sensory neurons (OSNs), which have axons that project to the olfactory bulb and coalesce into bundles of axon termini called glomeruli, where they synapse with downstream neurons. It is believed that along with the OR, chemical cues can drive the development and positioning of glomeruli, but the role of differential odorant stimulation in this process is unknown. Because all ORs are activated by different sets of odorants, we proposed a new model for glomerular development: that overexposing ORs with specific activating odorants can also influence the formation of the associated glomeruli. We employed both in vitro and in vivo methods to test this hypothesis, using a luciferase assay for ORs expressed in heterologous cells, and fluorescently labeled OSNs in mice, respectively. We first expressed M71, M72, and chimeric ORs in HEK-293T cells, measured their response to different activating odorants at multiple concentrations, and compared them to previously published axon coalescence data that involved the same ORs. We found that certain chimeras had unique odor response profiles that correlated with unique patterns of axon guidance. We then exposed mice with different labeled OSNs to multiple activating odorants and analyzed their glomeruli formation patterns. We were unable to find any significant correlation between odor exposure and mode of glomerular development, thus indicating that differing odorants are not sufficient to drive the expression of unique patterns of axon coalescence.

Abhinav Ettyreddy
Prognostic and therapeutic antibodies against the alternatively spliced fibroblast growth factor receptor 2 (FGFR2)
Research Advisor: Mariano Garcia Blanco
Molecular Genetics & Microbiology

Metastasis, the process through which cancer cells invade secondary organs, is thought to occur through aberrant induction of the epithelial to mesenchymal transition (EMT) cascade. Although the EMT process involves a complex set of cellular changes, the alternative splicing of the fibroblast growth factor receptor 2 (FGFR2) between its FGFR2-IIIb and FGFR2-IIIc isoforms has been shown to play a fundamental role in this dramatic event. In order to elucidate the role of FGFR2 splicing on tumor metastasis, we utilized the following techniques to develop isoform-specific antibodies against the receptor: 1) traditional rabbit immunizations and 2) phage display technology. Through western blotting, immunofluorescence (IF) staining, and ELISA's, we demonstrated that the rabbit anti-FGFR2-IIIb antibodies bind specifically to the IIIb isoform while exhibiting minimal cross-reactivity to FGFR2-IIIc. Furthermore, receptor inhibition assays on mouse explants clearly demonstrated that the antibodies have the ability to down-regulate FGFR2-IIIb signaling and to potently inhibit fibroblast proliferation. Taken together, our data suggests that these antibodies may be sufficient to inhibit the progression of highly malignant cancers that possess aberrant FGFR2-IIIb signaling. Furthermore, through high-throughput IF assays, clinicians can utilize these antibodies to identify both patients who are at risk for developing malignant metastases (prognostic biomarker) and those that will most effectively respond to FGFR2 signaling disruption (predictive biomarker). Based upon this data, we are confident that FGFR2 monoclonal antibody therapies can have a profound impact on the treatment of a wide range of cancers.

Hannah Fisher
Mindfulness in Patients who have Persistent Low Back Pain: Relationship to Pain Intensity and Interference, Mood, and Self-Efficacy
Research Advisor: Frank Keefe
Psychology and Neuroscience

Mindfulness entails qualities such as observing, describing, acting with awareness, non-judging, and non-reacting to inner experience. Acting with awareness, non-judging of inner experience, and non-reacting to inner experience are particularly likely to be salient in coping with persistent low back pain. The purpose of the current study was to examine the relationship of mindfulness, specifically acting with awareness, non-judging, and non-reacting to the report of pain intensity, pain interference, mood, and chronic pain self-efficacy among patients who have persistent low back pain. 28 patients with persistent low back pain completed a battery of self-report questionnaires. Correlational analyses demonstrated that individuals who scored high on acting with awareness were significantly more likely to report higher self-efficacy for pain

management, self-efficacy for physical function, and self-efficacy for coping with symptoms. Individuals who scored high on non-judging of inner experience and total mindfulness were significantly more likely to report higher self-efficacy for pain management, and self-efficacy for coping with symptoms. Those who reported high levels of acting with awareness, non-judging of inner experience, and total mindfulness were also significantly more likely to report higher positive affect, while those with higher levels of non-judging of inner experience and total mindfulness were significantly more likely to report lower negative affect. Lastly, those who reported high levels of non-judging of inner experience were significantly more likely to report lower pain intensity. Non-reacting to inner experience was not observed to be related to any of the outcome variables. The results of this study indicate that clinicians would benefit from attending to patients' levels of mindfulness and that patients might benefit from outpatient pain management programs in which a mindfulness intervention is a component.

Timothy Fleschner
Lights, Camera, Product Placement! The Effect of Placement and Audience Characteristics on Brand Recall
Research Advisor: Gavan Fitzsimons
Fuqua School of Business

Product placement is the inclusion of branded products or identifiers within filmed entertainment. Marketers are increasingly turning to product placement, as media streaming websites and digital video recorders (DVRs) have diminished the effectiveness of broadcast advertising. While product placement has been frequently associated with improved brand awareness, the factors moderating this outcome remain an empirical question. The current study investigates the effects of two levels of product placement: in the foreground (prominent) or in the background (subtle). The stimulus, an original screenplay filmed in two conditions, allowed for the manipulation of different visual placements for Apple and Coca-Cola products. Seventy undergraduate and graduate students (54% female) viewed the film and responded to a questionnaire. We find that participants' attitude toward the sitcom had a significant effect on brand awareness of Apple product placements. There was not a significant effect of self-reported vigilance on brand awareness, which suggests that subjects overestimate their ability to cope with the persuasion tactics of product placement.

Alyssa Forman
Reaching for College Success:
Research Advisor: Alma Blount
Public Policy

Conducted research to determine the best way to develop a curriculum for a four-week summer research initiative at the Urban Assembly School for Criminal Justice, a multi-cultural all-girls school. The students conducted academic research projects related to a community or social issue. Each student selected a topic of interest, researched relevant events and information, and gathered and analyzed data. The program culminated in a paper and presentation of their findings to the school's board.

Aubrey Frazzitta
Urea regulates capsule production in Cryptococcus neoformans and Cryptococcus gattii
Research Advisor: John Perfect
Molecular Genetics & Microbiology
Cryptococcus neoformans causes meningoencephalitis and is an increasing human health threat. C. neoformans is neurotropic and persists in the cerebrospinal fluid (CSF) of the mammalian host during infection. In order to survive, pathogenic fungi must procure nutrients including carbon and nitrogen. To enhance understanding of nutrient acquisition during infection by Cryptococcus sp., we examined utilization of nitrogen sources available in CSF. We screened for growth and capsule production of 817 global environmental and clinical isolates on various nitrogen sources. Capsule production was assessed using ammonium and urea with benomyl to determine the relationship of urea exposure to capsule production. Since urea is metabolized to ammonia and CO2 (a known signal for capsule induction), we examined urea metabolism mutants. Non-preferred nitrogen sources were found to greatly affect capsule production in pathogenic species. Urea induced the greatest magnitude of capsule production and was greater in C. gattii strains than in C. neoformans strains. In addition, both environmental and clinical strains grew robustly on uric acid, casamino acids, creatinine,

and asparagine as sole nitrogen sources. Substantial growth on nitrate was apparent by day 6 for all serotypes. These findings linking cryptococcal pathogenicity through growth and capsule production to nitrogen utilization provide an important advance in our knowledge of nitrogen metabolism in fungi. The abundant amino acids in the CSF may be excellent sources of nitrogen for growth, and the copious amount of urea may be an important capsule induction signal in the host at the site of infection.

Ryan Gimple
Katanin-p60: How a Microtubule Severing Protein Impacts the Development of the Nervous System in Drosophila melanogaster
Research Advisor: Nina Sherwood
Biology

Microtubules are an important element of cytoskeleton and are critical for cellular processes including mitosis, meiosis, cellular transport, and cellular structure. In neurons, microtubules play crucial roles in the development, stability, and function of dendrites as well as in axon guidance and synapse formation. Katanin-p60 (Kat60), the canonical member of the microtubule severing protein family, interacts with and shapes the structure of microtubules. While some work has been done to describe the function of Kat60 in vitro, a complete model of the in vivo effects has yet to be developed. To address this issue, I investigated how Kat60 functions in Drosophila embryonic development, larval nociception, larval synapse morphology at the neuromuscular junction, as well as the neuronal pruning and brain remodeling that occurs during metamorphosis. I found that Kat60 nulls hatched significantly less than wild types, suggesting that Kat60 is important for embryonic development. I used RNAi to selectively knock down Kat60 in certain cell types to investigate its role in nociception response and synapse structure. These results were somewhat inconclusive as the phenotypes were variable. Finally, I found that Kat60 nulls show pruning defects and structural abnormalities in the mushroom bodies and ventral nerve cord during the grand scale nervous system reorganization that accompanies metamorphosis. Together, my studies contribute to a comprehensive model for the in vivo function of Kat60 in the Drosophila nervous system and suggest that this protein is critical for development.

Molly Grace
Songbird communication in a noisy world: potential benefits of complex notes
Research Advisor: Stephen Nowicki
Biology

Loud, low-frequency traffic noise can mask the vocalizations of songbirds, and in response some songbird populations living near roads shift the minimum frequency of their vocalizations upward above the masking range. However, certain songbird note types- complex notes- possess a unique frequency structure which may make them resistant to masking, suggesting that species that use them may be less affected by the problems of traffic noise. Therefore, I predicted that the minimum frequency of complex notes should not increase in response to traffic noise. To test this hypothesis, I recorded wild Carolina chickadee (Poecile carolinensis) calls, which feature complex "D notes," in varying proximity to roads in Durham, North Carolina, USA, and measured the amplitude of ambient noise at the time of each recording. Despite their complex structure, the measured minimum frequency of D notes increased with traffic noise amplitude. Anticipating that the unique structure of complex notes might make it difficult to measure minimum frequency using standard methods, I also conducted a playback and re-recording experiment to determine if accurate measurements could be made in noise. This experiment showed that as noise level increases, the ability to make accurate measurements is greatly reduced, throwing the above result into question. This study highlights the difficulties of measuring complex notes in noise, and I offer suggestions for laboratory experiments that could eliminate the problems faced in my field study. Understanding how complex notes are affected by traffic noise will increase biologists' ability to predict how the ongoing expansion of noisy areas may affect songbird species composition in the future.

Andrea Green
ADHD in College Students
Research Advisor: David Rabiner
Psychology and Neuroscience

Although Attention Deficit Hyperactivity Disorder (ADHD) was once viewed as a disorder of childhood that most individuals 'outgrew' as they moved into adolescence and beyond, research has

indicated that ADHD frequently persists into adulthood. Since this discovery, several studies have emerged on ADHD in adults and in college students more specifically. However, researchers have utilized a variety of techniques—including asking students about their diagnostic status and requiring students to endorse DSM symptoms, among others—to create their ADHD groups. ADHD groups have therefore included inconsistent populations, precluding comparisons across studies, as well as confidence in results. My study of 200 Duke undergraduates compares the utility of three diagnostic methods—the DSM criteria, a new set for developed for adults by Barkley et al. (Proposed DSM-V Criteria for ADHD in Adults), and student-reported diagnostic status. I have found that there is surprisingly little overlap among the students identified as having the disorder based on the three methodologies. I have also found that relative to the DSM criteria, the Barkley et al. criteria identify approximately twice as many students experiencing ADHD-related difficulties in daily functioning. These results have implications both for how researchers select participants with ADHD for studies, as well as for how clinicians should attempt to detect the disorder in young adult college students.

Adam Gross
Making Scents: Endocrine Correlates of Olfactory Communication in Hormonally Suppressed Ring-Tailed Lemurs
Research Advisor: Christine Drea
Biology

Female dominance is rare in mammals; however, female dominance is common in strepsirrhine primates and characterizes the social system of ring-tailed lemurs (Lemur catta). In other female dominant species, e.g. spotted hyena (Crocuta crocuta), dominance has been linked to male-like morphological and behavioral traits, and masculinized hormonal profiles. Female ring-tailed lemurs are masculinized physically, and show increased scent marking and aggression. We hypothesized that the typical pattern of scent marking behavior demonstrated by female ring-tailed lemurs is influenced by hormonal state. To test our hypothesis, we treated three female ring-tailed lemurs with Antide, a GnRH antagonist, suppressing the production of sex hormones such as testosterone (T), estradiol (E2), and androstenedione (A4). Data on normative and experimental behavior were collected before, during, and after Antide treatment. The behavioral response of the subjects to the treatment was assessed by a series of behavioral bioassays, testing the response of the subject to conspecific odors. The results were statistically inconclusive due to small sample size (3 subjects), but interesting trends demonstrated variation in overall female response to odors, including genital marking, sniffing odor, and licking odor. Treatment appeared to suppress genital marking, and sniffing, while it increased the frequency of licking. These trends lead us to believe that with an increased sample size, we will be able to demonstrate a significant effect of hormonal suppression on female ring-tailed lemur behavior.

Michael Habashi
Living in Hell in the City of Angels: A Mixed Methods Study of Homeless Men on Skid Row
Research Advisor: Rebecca Bach
Sociology

My research focuses on the nature of homelessness amongst men in Los Angeles' Skid Row, particularly African-Americans, who are overrepresented in the homeless populations of most urban areas, including Los Angeles. I volunteered at and partnered with The Midnight Mission, one of the three largest homeless services organizations in Skid Row, in order to access its population for my research. Relying on both convenience and snowball sampling, I interviewed 20 homeless African-American men, 10 of whom lived on the streets or in temporary shelters and 10 of whom were members of The Midnight Mission's drug and alcohol recovery program. The questions asked included a wide-range of topics including, but not limited to, family background, work experience, education, the origin of their homelessness, substance abuse, trouble with the law, and views of other homeless people. Each semi-structured interview lasted approximately one hour and was recorded and transcribed verbatim. In addition, I distributed a questionnaire to 120 men of various racial/ethnic identities in The Midnight Mission recovery program; it consisted of 22 questions regarding drug and alcohol use, incarceration, family background, and their evaluation of their current situation, among other topics. I have found that homelessness is much more multi-faceted than has previously been accepted. The stories of those interviewed indicate

the strong interconnectedness of drug and alcohol use, mental illness, incarceration, low education level, and single parent families.

Jonathan Haskel
HEMERA and HFR1 act in parallel pathways to regulate photomorphogenesis in Arabidopsis thaliana
Research Advisor: Meng Chen
Biology

Light plays a profound role on plant development and growth, yet the pathway by which photoreceptor activity leads to a plant's phenotype remains elusive. Recent studies suggest that a group of transcription factors known as phytochrome interacting factors (PIFs) are key players in phytochrome-mediated signaling by negatively regulating plant photomorphogenesis, or the cumulative responses that plants have to light. Another transcription factor known as HFR1 is believed to bind to PIFs and regulate their activity. The recent discovery of HEMERA (HMR) as a regulator of PIFs prompted investigation into the signaling pathways by which both proteins, HMR and HFR1, mediate PIF function, and consequently, plant photomorphogenesis. Since each is believed to affect PIF function differently, we asked whether growing a hmr/hfr1 double mutant would result in an additive hypocotyl elongation effect. For this project, we generated a signaling model that depicts the relationships between the two aforementioned proteins and PIFs. We achieved this goal by generating lines of single mutants and a double mutant between HMR and HFR1. We then analyzed the physiological responses of these lines by growing them in dark (D), red (R) and far-red (FR) light and measuring their hypocotyl lengths in each condition as a readout for PIF activity. Through a western blot analysis we also learned that PIF degradation is dependent on HMR. With this data, we were able to conclude that HMR and HFR1 regulate PIF function through different pathways; HMR regulates PIF accumulation, and HFR1 regulates PIF activity.

Nathaniel Hill
Producing Ragtime at Duke University as an Exercise in Collaboration, Adaptation, and Personal Professional Development
Research Advisor: Claire Conceison
Theater Studies

I produced Ragtime at Duke University with the aim of furthering my experience and knowledge in the field of Broadway theater production before entering the industry a professional level. I wanted to continue pushing myself to understand what it is that a producer does and where a producer fits in the collaborative process of bringing a musical to an audience. Another equally important goal was to provide an enriching experience for the students and faculty involved, and challenge the Duke arts community to rise to a new level. My experience and research proved that theater producing is a fusion of effective leadership, decisiveness, and stepping back at just the right time. The role of a producer varies by minute, transitioning between marketing, management, accountant, and an infinite list of other duties the given circumstances of the moment may require. Broadway producer David Stone states that his job is to –provide an environment in which artists can do their best work." The core responsibilities of a professional producer are the raise the capital to produce a show, hire the creative team, and manage the people and money for the run of the show. My work producing Ragtime at Duke centered around gathering support for the project, and overseeing communication between the hundreds of collaborators involved in its production.

Aisha Hilliard
Determining Complexation Constants using Capillary Electrophoresis in Undergraduate Labs
Research Advisor: Todd Woerner
Chemistry

A new experiment was developed for the junior-level physical chemistry laboratory course using Capillary Electrophoresis (CE) to study the stepwise binding of 1,10-phenanthroline to an aqueous cupric ion (Cu2+). CE is already in use in our laboratory curriculum to measure the pka values of acids and bases and our new experiment will build upon that work and give students experience with metal-ligand binding interactions. Quantitative measurement of bound ligand as a function of free ligand concentration using the Hummel-Dreyer method yielded a stepwise binding curve, from which binding constants were determined. Curve fits based on the theory of successive complexation, gave log β1, and log β2. as 7.73±0.03 and 14.53±0.03 ,respectively, where β1 is in agreement with previously reported values. Although β2 does not fall within the range of

literature values, we believe the deviation results from the limited range of the current study. We hope to introduce this experiment in Spring 2013 second-semester physical chemistry laboratory course.

Carrie Ho
Origin and evolution of simian immunodeficiency virus in the breast milk compartment of African green monkeys (Chlorocebus sabaeus)
Research Advisor: Sallie Permar
Pediatrics

Breast milk transmission remains a significant mode of infant HIV acquisition, accounting for nearly half of the 350,000 new infant infections annually. Interestingly, while infants of HIV-infected women and SIV-infected rhesus monkeys acquire the virus via breastfeeding at a measurable rate, infants of natural primate hosts of SIV, such as African green monkeys, largely escape infection, despite high virus load in milk. The mechanisms mediating protection of the infants of natural hosts of SIV are unknown. Studies have shown that breast milk virus populations of postnatal virus-transmitting hosts, humans and rhesus monkeys, are not compartmentalized, indicating that the breast milk compartment is continually seeded by the systemic compartment. However, the breast milk virus population of non-transmitting hosts remains unstudied. As breast milk is the source of virus that is unable to initiate infection in the infant gastrointestinal tract of natural hosts of SIV, this project sought to study the origin and evolution of the breast milk virus population in the non-transmitting African green monkeys. Phylogenetic analysis of SIV variants in plasma and breast milk revealed the presence of clonal amplification and compartmentalization of the breast milk compartment. However, in order to assess whether this compartmentalization represents transient compartmentalization as a result of continual seeding and clonal expansion of viruses to the breast milk from the systemic compartment or whether there is distinct virus evolution in response to humoral immune pressure in the breast milk compartment, virus variants from the breast milk and plasma will need to be compared longitudinally.

Monica Hogan
Heartwork: Triptych Concluded - A Convergence of Dance and Technology
Research Advisor: Tyler Walters
Dance

Technology has significantly broadened the capabilities of dancers and choreographers in performance work today. Video projection, interactive sound and lighting, and other dancer-technology interfaces have all been a part of choreographic experimentation. On April 7th of 2012, I presented a concert of choreographic works that explored numerous approaches to technology integration with dance performance. One of the technologies incorporated in the production was motion tracking, where movement of the dancers controlled interactive lighting in the performance space. Another work utilized online video sharing capabilities to teach choreography and collect videos from dancers around the country; in the performance, an ensemble of both live and virtual, projected dancers performed choreography learned through the same digital platform. Other works involved set design with integrated lighting components, where the dancers themselves interacted with and controlled elements of their stage lighting during performance. One piece integrated Twitter, an infrared sensor bar, and a Wii remote; a dancer interacted with live RSS feed projections that influenced elements of the movement performance. Another piece utilized an iPad and Skype video chat technology to incorporate live-feed video projection. Dancers interacted with each other, the audience, and the camera, changing the perspectives and angles through which individuals were seen via a technological lens. The entire production, titled Heartwork: Triptych Concluded, was a thorough artistic research exploration of the integration of dance choreography with technology.

Hannah Honey
Partner versus Product: Examining the Use of Consumption versus Support from a Romantic Partner in Emotion Regulation
Research Advisor: Gavan Fitzsimons
Fuqua School of Business

In our current study, we compare the role of partner versus product in negative emotion regulation. In two studies, we 1) examine whether individuals choose to turn to their partner versus

their favorite product after a negative affect inducing event and 2) compare the effectiveness of using partner versus product in reducing negative emotions. For Study 1 we distributed a survey to 142 adults on Amazon's Mechanical Turk. Results indicate that 84% of individuals choose to turn to their partner over their product to alleviate negative emotions. However, individuals experiencing irritation (as opposed to sadness or anxiety) are significantly more likely to choose their favorite product. Similarly to Study 1, for Study 2 we distributed a survey to 131 adults on Amazon's Mechanical Turk. Results indicate that consumption of a favorite product is significantly more effective in reducing feelings or irritation than turning to a partner. These results support our hypotheses that individuals seek out non-social forms of emotion regulation to reduce feelings of irritation and that non-social forms of emotion regulation are more effective in reducing feelings of irritation. We are in the process of planning Study 3 to further investigate the role of consumption in regulating feelings of irritation.

Audrey Hu
Going through the Motions: Preschool Children's Use of a Motor Strategy on a Spatial Reasoning Task
Research Advisor: Amy Joh
Psychology and Neuroscience

Spatial reasoning is essential to functioning in everyday life, as all people and objects have a spatial location. Young children who are in the process of developing spatial cognition can benefit from the use of problem solving skills. The current study tested the utility of a motor strategy in 3-year-old children to problem solve through a spatial reasoning task adapted by Hood (1995). Children observed an experimenter hold a ball over three intertwined tubes, and were instructed to trace a tube then place a cup where they thought the ball would emerge from. Since previous research has shown that young children tend to make a perseverative, gravity-driven error on this task, we sought to facilitate learning through a motor representation of the spatial problem. Participants made the same number of correct predictions and gravity bias errors on average, despite using the motor strategy on a majority of trials. These findings suggest that the utility of the motor strategy was limited; it was dependent on which tubes children traced and when they made a choice in relation to the verbal prompt or tracing. While effective for some children, the motor strategy did not appear to be immediately intuitive and teach children a general problem solving strategy for this spatial task.

Laura Hubbard
Evolutionary dynamics between plant secondary compounds and the reproductive success of a salticid predator, Lyssomanes viridis
Research Advisor: Sonke Johnsen
Biology

Unlike other salticids, the eggs of the jumping spider L. viridis are not laid within a silken egg sac, but are instead spread flush against the leaves of their host trees, most notably the southern magnolia M. grandiflora and sweet gum tree L. styracifua. In addition, their eggs will not hatch when laid in a laboratory setting, and instead grow a fungal parasite. We hypothesize that L. viridis relies on
secondary compounds found in both M. grandiflora and L. styracifua as fungicides to protect their eggs. The project will test this hypothesis by having three groups of female L. viridis lay their eggs on leaves of either magnolia, sweet gum or white oak, a control. In addition to seeking to isolate
an antifungal compound within the leaves of both species, which would have practical industrial applications, this research would be the first to study direct interactions between a plant's secondary metabolites and arthropod predators. If such a relationship exists, it would add a new layer of understanding and complexity to the study of natural ecology.

Will Hyung
Evaluating Self-Control in Social Settings: Actor-observer Biases and their Implications in Relationships
Research Advisor: Grainne Fitzsimons
Psychology and Neuroscience

A considerable amount of research has been allocated to the study of self-control: one's ability to regulate behavior, affect, and desire during the process of goal pursuit. The current thesis examines the impact of self-control failures and success in social contexts by analyzing the actor-observer bias between partners of different social relationships. Specifically, how observers and

actors judge a self-control failure differently and its consequences on their evaluation of the actor's commitment to goal pursuit and the observer's willingness to provide social support were examined. In two separate field-studies, romantic partners were compared to friends, using self-report responses on items measuring social support, commitment, and attribution bias. Results indicated that the actor-observer bias occurs more between friends than between romantic partners. Self-control failure or success was shown to have some effect on social support and evaluation of commitment, but within friends only. The significance of the nature and closeness of the relationship in how the actor and observer judge self-control failures is discussed. Finally, future directions in this line of research are outlined.

Christian James
Automatic Tuning of PID Controllers for LEGO Mindstorms Robotics
Research Advisor: Jeffrey Forbes
Computer Science

The Proportional-Integral-Derivative (PID) Controller is the most common form of feedback controller due to its simplicity and ease of implementation and is a popular choice in industrial settings. PID control is also flexible enough to be applied to tasks in the field of robotics. Tuning the gains of the system, though, is a difficult process. Because of this, control theory isn't normally taught in secondary school, even for problems where an apt control-based solution is available. In this case, the problem is that of wall-following: having a differential drive robot maintains a set distance away from a wall while driving parallel to it. This routine has applications in maze-traversal and localization. The PID Informer is developed to tune the gains of a controller used for this process, calibrated to accommodate the build of the robot. This set up lends itself well to experimentation; a means to conduct control systems labs for middle and high school students.

Angela Jiang
FEMMES: A one-day mentorship and after-school STEM program for girls that fosters hands-on learning and female-to-female mentorship
Research Advisor: Rochelle Schwartz-Bloom
Pharmacology & Cancer Biology

Existing gender disparities in science, technology, engineering, and math (STEM) fields underscore the need for outreach programs to engage young women in these subjects. Although many programs exist for high school students, girls may lose interest in STEM subjects at an earlier age. Females Excelling More in Math, Engineering, and Science (FEMMES) hosts an annual, free, one-day event that provides exciting, hands-on workshops for 4th–6th grade girls from Durham, North Carolina, to encourage them to further explore their potential in these fields. FEMMES also provides an after-school outreach curriculum. This study evaluated the effects of the one-day event ("Capstone") and the after-school program on the 4th–6th grade girls' interest in, knowledge of, and confidence in STEM subjects. Assessments (self-reported ratings) were obtained from 319 participants prior to, immediately after, and again three months after the Capstone event. A repeated measure ANOVA (analysis of variance between groups) revealed a significant increase in interest in engineering, and confidence and knowledge of math, science, and engineering three months after the one-day event. A mixed ANOVA revealed a significant increase in the girls' interest in science and engineering, knowledge in science, and confidence in math and science. Results from this study indicate that hands-on workshops and mentorship from female faculty, graduate students, and undergraduate students may be important factors in inspiring young girls to pursue STEM fields.

Caitlin Johnson
Beyond the Girl Effect: WISER Students' Needs Assessment
Research Advisor: Alex Harris
Public Policy

The Women's Institute for Secondary Education and Research (WISER) is a girls' secondary school established by the WISER NGO in partnership with the community in Muhuru Bay, Kenya. Each year a class of thirty students is offered a fully funded education at the WISER school for four years. In a community where few girls ever make it to secondary school and where some girls are forced to engage in transactional sex to pay for school, WISER is hoping to improve the welfare of the students and the community.
When this community-based research project took place, two classes of girls were living at the school

and none had previously lived in a boarding school environment. My project sought to delve into the students' and faculty's thoughts on the struggles and accomplishments that followed the opening of the school. While quantitative data was available in the form of exam scores, there was no qualitative data to reveal what the students thought of WISER and how it impacted them both academically and personally.
This research was designed as a students' needs assessment to help identify where WISER has been successful and what can be improved in order to set the students up for success. A final report, without students names attached, will be used internally by WISER to make changes and help improve the functioning of the school.

Julius Jones
The African-American Community in post-World War II Portland, Oregon, 1941-1962
Research Advisor: Raymond Gavins
History

The proliferation of defense industries caused by the onset of the Second World war led to an in-migration of thousands of African Americans into Portland. African Americans came to Portland because of the economic opportunities afforded by the city's new shipbuilding industry, but once there, new migrants began building more than ships; they built lives. They demonstrated not only the courage to leave their hometowns, but also the tenacity to do hard work and to fight when treated unfairly.
The end of World War II marked a new era of possibilities for African Americans, who emerged from the conflicted determined to use their near universal loyalty and willingness to serve in the Armed Forces as a means to challenge the nation's racial status-quo.
During the war, Portland, Oregon experienced growth in its African American population on parity with other large urban areas on the West Coast. However, the city's racial climate particularly inhospitable.
African Americans who stayed in Portland did not buckle under the pressure of declining employment, limited housing options and discrimination. Rather, they worked diligently to build a community for themselves and better lives for the posterity. Despite their best efforts, African Americans in Portland would soon fall victim to urban renewal and the freeway expansion of the late 1950's and see their small section of the city destroyed.

Agata Kantorowska
Seasonal Cycling of Opportunistic Pathogens in the Ocean
Research Advisor: Dana Hunt
Biology

The marine environment is expected to be significantly affected by climate change– the predicted changes for oceans include an increase in both temperature and sea level (Harvell, Mitchell et al. 2002). This will vastly impact all kinds of marine biota. Although the effects of climate change on plants and animals have been extensively studied, less is known about how they will affect microbial populations (Vezzulli, Brettar et al. 2010). This study used seasonal temperature variation off the coast of Beaufort, NC as a proxy for climate change in the oceans, specifically warming waters. The population dynamics of the bacterial genus Vibrio were examined over three distinct temperature sampling points– spring, summer, and fall. Our data supports the hypothesis that bacterial communities change in response to temperature. Specifically, the data suggests that the greater the temperature difference, the greater the difference in bacterial populations. Warmer ocean waters could lead to an increase in abundance of pathogenic marine species.

Arjun Khanna
Brown Adipose Tissue Detection with MRI: Novel Applications of BOLD and Hyperpolarized Xenon Imaging
Research Advisor: Warren Warren
Chemistry

The recent discovery of active brown adipose tissue (BAT) in adult humans and the correlation between the activity of this tissue and resting metabolic rate suggests that this tissue may play a significant role in human metabolism, as it does in rodents. Despite the possible physiological importance of this tissue, no safe, non-invasive imaging technique to detect BAT activity in humans exists. Here, we demonstrate novel applications of blood oxygen level-dependent (BOLD) contrast and hyperpolarized xenon imaging techniques to detect BAT activity in mice using MRI. The results of our BOLD studies show

that the changes in BAT perfusion that accompany activation result in attenuation of the MR signal in the tissue by approximately 20%, and this contrast can be enhanced by T2*-weighting. Our hyperpolarized xenon studies show dramatic changes in the xenon spectra of BAT during activation. We also find that the spectral lines of dissolved-phase xenon during BAT activity can give information about the cellular composition of the tissue, since separate peaks for xenon localized to fat and xenon localized to aqueous cytoplasm emerge in the spectra during activity. These studies demonstrate novel applications of BOLD and hyperpolarized xenon imaging to detect BAT activity using MRI. We suggest that these safe and non-invasive MR techniques may enable broader future study of BAT activity in humans.

Kadeisha Kilgore
Why Do They Have to Pray All-Night?: Ghanaian Charismatic Christianity and Its Influences in the Diaspora
Research Advisor: Charles Piot
Cultural Anthropology

This is a comparative study of Charismatic Churches in Ghana and Charismatic Churches in the U.S. Prayer topics and rituals serve as the focal point of this investigation. Here I have sought to examine how locale influences the faith and practice of Charismatic Christianity, with the ultimate goal of identifying continuity and change in West Africa and the Diaspora, addressing questions pertaining to how Africa has influenced the practice of religion in the Diaspora and vice-versa. This study involved in-depth participant observation and interviews in Accra, Ghana and an Atlanta-based sister church of one of the churches observed in Ghana.

Kemp Knott
Sibling Effect on Parent-Offspring Relationships in Lemur catta
Research Advisor: Amy Schreier
Evolutionary Anthropology

The juvenile period is a critical phase of development that is especially extended in primates. Despite this extended period, little is known about the actual development process in juvenile non-human primates and how they develop socially. The mother-offspring relationship is crucial to the social development of juveniles. The presence of subsequent offspring can have an effect on this relationship. My goal is to increase the knowledge of juvenile social behavior with specific focus upon the changing juvenile-parent relationship and the impact of additional siblings upon these social bonds and parental investment.

Nusaibah Kofar-Naisa
The Demolition of the Kofar Na Isa Gate
Research Advisor: Bruce Hall
History

On April 19, 2010 the Kofar Na Isa gate, a monument believed to be over 500 years old, was demolished in Kano, Nigeria. Kofar Na Isa was one of 15 gates that provide entrance ways into the old walled city. Together, the walls and gates of Kano are informally referred to as one of the "wonders of Nigeria." Curious about the wider community's feelings regarding the demolition, I traveled to Kano, Nigeria to conduct a series of interviews about responses to the gate's destruction. This research paper attempts to tell the story of Kofar Na Isa by approaching the gate from multiple roads: Part 1 examines the history of class formation in Kano and in so doing, lays the framework for understanding how historical processes of social relations have significant implications on the frustrations that people continue to feel today. This section focuses mostly on the frustration people feel in their limited agency to influence their own environment. Part two examines the ways in which the Kano city walls and gates have been spoken about in both history and contemporary times. The goal of this section is to introduce the reader to the monuments as objects closely linked with the narrative of the city. Part three contains the interview responses given by Kano citizens. These are structured in a narrative form so that insight into the multiple perspectives can easily be pulled. This section is intended to be a space through which the opinions not often heard can be voiced.

Sumana Kommana
Investigating Attention Networks Efficiency in Adolescents with Anorexia Nervosa
Research Advisor: Nancy Zucker
Medical Psychology

Individuals with Anorexia Nervosa (AN) are characterized by a relentless preoccupation with

body shape and weight and are known to exhibit rigid thinking and participate in ritualized behaviors related to their eating habits and food related activities. These behaviors suggest a decrease in cognitive flexibility, or set-shifting, which refers to the ability to shift the focus of attention from one attribute of a stimulus to another based on changing goals and environmental stimuli. Poor set-shifting is an aspect of executive functioning that has been implicated as a risk marker and a potential maintenance factor of AN. Although specific attention deficits have been documented in adults, there has been a general failure to define an objective pattern of attention deficit in younger populations. We focus on adolescents as anorexia nervosa is characterized by its early onset, arising during adolescence in the majority of those who have it. In the present study, we assess the efficiency of the alerting, orienting, and executive control networks with the Child Attention Network Test (ANT-C). We compare the performance of 15 females with a current (AN-M) or prior diagnosis of AN (AN-WT) to 15 age matched healthy controls. Reaction times and accuracy were collected to obtain the alerting, orienting, and conflict scores for each participant. Results showed that reaction rates and error rates did not significantly differ between the two subject groups, suggesting that attentional deficits related to anorexia nervosa develop after its onset and may be influenced by the duration of the disorder. These results can be very useful for the advancement of diagnostic and treatment studies in younger individuals with AN. Specifically, early identification may aid the development of interventions that address and possibly prevent attention deficits from developing in the future.

Jaehyuk Lee
Racial Differences in Self-Presentation
Research Advisor: Philip Costanzo
Psychology and Neuroscience

Self-presentation refers to the manner in which individuals behave and portray themselves in social context. This may differ from situation to situation and also from their self-concept. This deviation is expected to be especially interesting in minority racial groups due to prevailing socio-identity pressures. The purpose of the current study is to examine this deviation and look for consistent differences in self-presentational styles across different races and to examine the adaptive consequences of the differences that exist. Participants completed self-report measures of psychosocial adjustment, well-being, and relevant personality factors. They also rated how they want to be perceived on 19 dimensions by each of nine different social others in their lives (e.g., mother, best friend, romantic partner, coworker). Asians were found to manage a greater number of self-presentational personas than Whites and also perceived themselves as being less behaviorally authentic than Whites and Blacks. In addition, Asians perceived themselves as receiving less social support than both of the other two races. The correlational patterns between these differences and measures of psychosocial adjustment were frequently similar in Whites and Blacks but distinct for Asians. The perceived quality of social support was not associated with depression or any other symptoms of maladjustment in Asians. However, the number of self-presentational personas managed is associated with several measures of psychosocial adjustment for Asians while not for Blacks or Whites. The role of stereotype vulnerability and cultural differences in self-construal in the social behavioral patterns exhibited by individuals of different racial groups is discussed.

Jenny Li
Identification of OTX2 as a novel therapeutic target in the malignant childhood tumor retinoblastoma
Research Advisor: David Cory Adamson
Neurosurgery

The transcription factor orthodenticle homeobox 2 (OTX2) plays a critical role in very early neurogenesis but can become oncogenic when aberrantly expressed later in life. Previous work has identified OTX2 as an oncogene in medulloblastoma, the most common malignant brain tumor in children; however, little is known about the role of OTX2 in retinoblastoma, another childhood malignant tumor. To study the oncogenic role of OTX2 in vitro, OTX2 expression was disrupted in retinoblastoma cell lines via OTX2-specific siRNAs and all-trans retinoic acid (ATRA), and the amount of cell apoptosis and proliferation was assessed after knockdown. To examine the oncogenic effects of OTX2 in vivo, RNA interference experiments were carried out in retinoblastoma mice xenografts, and tumor size

and tumor growth was recorded after OTX2 knockdown. Knockdown of OTX2 expression by siRNA and pharmacologic inhibition by ATRA both significantly increased apoptosis and decreased cell proliferation in vitro. Knockdown of OTX2 also significantly decreased tumor size and growth in vivo. These studies showed that the medulloblastoma oncogene OTX2 plays an important oncogenic role in retinoblastoma. These studies also showed that ATRA, a drug already used in the treatment of other tumors, could repress OTX2 expression, which makes OTX2 a promising target for future therapy in retinoblastoma.

Jinyuan Li
Impact of Rural-to-Urban Male Migration on Women's Seeking of, Access to, and Financing of Healthcare and of Women's Health among Different Geographies, Caste, and Income Groups and the Perception of Migration by Migrant Men
Research Advisor: Anirudh Krishna
Public Policy

Many people use migration as a means to a secondary source of income, while others use it to improve their economic situation and quality of life. In this study, I investigated the impact of rural-to-urban male migration on women's seeking of, access to, and decision making of financial resources and healthcare resource/education management and also on the women's physical and mental wellbeing among different geographies, caste, and income in rural Southern Rajasthan (India). I also looked at the husband's perception of how his actions impact her life. Semi-structured survey questions were carried out for two sets of individuals—single male migrant's wives and rural-to-urban male migrant works—to assess any common themes or patterns present in the following categories of the women's life: Background, Marriage and Living Situation, Assets, Financial Resources Access, Knowledge of Husbands Address and Mobile, Physical and Reproductive Health, and Decision Making & Mobility. It was observed that women in families in which husbands migrate, have to perform household and agricultural work mostly without help. Women in male-migrant labor families may face healthcare seeking delay as it is difficult for them to contact their husbands in emergency situations. In many cases, the wives of migrant-labor families experience more financial stress because they have to seek approval of transactions. Half of the men I talked to expressed that they wished there could be better opportunities in the Udaipur area so that they could return home. The above needs and concerns of the wives of migrant-labor families can be addressed with the correct interventions and support organizations.

Emmanuel Lim
Comparing Micro- and Nano-scale CuO/ZnO/Al2O3 Catalysts For Methanol Steam Reforming.
Research Advisor: Nico Hotz
Mechanical Engineering and Materials Science

Hydrogen could be the fuel of the future. While it has an exceptional energy density by mass, its low energy density by volume makes it a lackluster option as a mobile fuel. A liquid fuel from which hydrogen could be derived when needed would provide a solution. Steam reforming of methanol produces a gas with a high hydrogen composition (typically ~70%). This hydrogen can be used in fuel cells to generate electricity. Methanol steam reforming is endothermic and can be achieved under temperatures of 180-350 °C and atmospheric pressure with a CuO/ZnO catalyst on Al2O3 supports. The current project attempts to determine whether nano-scale catalyst particles (more surface area per volume; higher residence times; higher conversion rates) are advantageous over micro-scale particles for this purpose. The catalyst particles were fixed in a packed-bed tubular reactor, and heat was supplied between 220 °C and 295 °C. An input of water and methanol (steam-methanol ratio of 1.2) was fed to the packed-bed reactor at liquid volumetric flow rates between 1 and 50 microliters/min. The product gases were analyzed via gas chromatography. Conversion rates between micro- and nano- reactors are the basis for comparison. The end goal of the research project is to produce a commercial-ready device that sources solar thermal energy for heat to power this reaction, and that can be used in distributed generation.

Ryan Lipes
Transitioning Students to High School: Freshman Academies in Durham Public Schools
Research Advisor: David Malone
Education

The transition to high school is a critical time in a student's academic development. Students unsuccessful in the ninth grade are much more likely to drop out of high school. Freshman Academies – a type of small learning community – are an innovative solution that can help bridge the transition to high school. The purpose of my research was to determine potential ways Freshman Academies in the Durham Public Schools could be strengthened. Using a framework provided by a review of the literature on the effectiveness of small learning communities, the research presents a case study of the four Freshman Academies in the Durham Public Schools. Freshman Academy teachers completed a survey designed to reveal the strengths and weaknesses of the Freshman Academies along four components: teacher teams, autonomy in decision making, strength of school leadership, and professional development. An examination of the results of the research indicates that Durham's Freshman Academies could improve through better alignment of outcome goals and evaluation metrics, improved use of common planning time, creation of a separate identify within the schools, and improved professional development. The researcher then developed the Freshman Academy Rating Scale, an evaluation rubric which can guide further assessment of Freshman Academies.

Max Liu
Sustainability in Educational Administration
Research Advisor: Susan Wynn
Chemistry

Retaining quality school leaders is a critical aspect in improving the education system. However, high attrition rates coupled with a lowering appeal to enter administration are creating a leadership void within schools such that many schools lack the necessary leadership for quality reform to take place. This study attempts to identify common reasons why administrators decide to leave their positions and pinpoint healthy motivating factors that can enable administrators to have sustainable careers. In-depth interviews of current or past administrators in education were conducted. The motivating factors for staying or leaving administration cited by these interviewees were then compared to the factors frequently cited within the literature to identify which factors are more important than others. It was found that intrinsic goals such as the desire for self actualization are healthy motivators so long as there is an understanding of the inherent limitations of the administrative role. Additionally, although many administrators do not state monetary compensation or work hours as important factors prior to entering administration, these factors, given the harsh demands of the job, are the most likely reasons for leaving administration. These factors need to be addressed if school leadership roles are to become more attractive and sustainable.

Anna Liu
Identifying genetic modifiers in DYT1 pathology
Research Advisor: Nicole Calakos
Neurobiology

Dystonia is a neurological disorder characterized by involuntary and abnormal postures and movements. Although the disease leaves no visible sign of neurodegeneration or identifiable lesions, we can observe and monitor the cellular pathology of dystonia caused by inherited gene mutations. DYT1, the most common of the inherited dystonias, is the result of a three base pair (GAG) deletion in the TOR1A gene, subsequently causing the loss of glutamic acid in the carboxyl terminus of the corresponding protein TorsinA. Overexpression of deltaGAG-TorsinA produces abnormal intracellular inclusions (including proteins and membranous structures) that co-localize with membrane constituents of the nuclear envelope; this phenotype is distinct from the overexpression of wildtype-TorsinA which does not (or rarely) produce such inclusions. I hypothesized that the intracellular inclusions, whose production is associated with the deltaGAG mutation, impair the molecular functions of the TorsinA protein and are the cellular basis for the movement problem that is dystonia. A high-throughput, high-content assay was successfully developed to accurately track and monitor the presence or absence of inclusions through algorithmically defined parameters (i.e. percentage of cells with inclusions, fluorescent intensity of inclusions, etc.) Utilizing this assay, a whole-genome RNAi screen is currently underway to screen and identify potent genetic modifiers of DYT1 pathology that may provide critical insights into the functional roles of TorsinA. RNAi modifiers initially identified from the whole-genome screen will then be analyzed using in

silico pathway analysis to characterize gene clusters and to select candidates for secondary screens.

Claire Lockerby
Owning the Intangible: A Historical Study of Euro-American Commodification of Hopi Culture and Theft of Intellectual Property
Research Advisor: Sally Deutsch
History

Since the late 1980s, as technological innovations have facilitated the circulation of information and exchange of ideas, debates about the ownership of indigenous artistic creations and traditional knowledge have become an important issue on the international stage. The shift from a former lack of regard for the rights of indigenous peoples to a heightened awareness of the ownership of intangible aspects of culture is aptly illustrated in the case of the Hopi Indians, who have inhabited three mesas in Northern Arizona for more than one thousand years. Beginning in the late nineteenth century, interactions with non-Hopis who asserted ownership over various aspects of Hopi culture and used it for their own purposes has shaped the way that the present-day Hopi view and preserve their heritage, as they seek to regain control over their culture. Analyzing the impact that specific historical experiences have had on current Hopi attitudes about cultural preservation allows us to appreciate the value of Hopi heritage to Hopis and non-Hopis alike, while simultaneously demonstrating the difficulty of defining who exactly owns culture. Moving from 1870 to the present, I examine seminal periods of Hopi history that have laid the groundwork for present-day disputes. I first explore the beginnings of American fascination with the Hopi, perceived at that time as a primitive culture, in the late nineteenth century. During this time, researchers studied and documented aspects of Hopi culture that were intended to be held in secret, and corporations enticed tourists to visit the Southwest by turning Hopi culture into a commodity. Next I draw upon memoirs written by Hopi authors, who chronicle their interactions with Americans, including government officials and missionaries, in the late nineteenth and early twentieth centuries. These accounts demonstrate how experiences with forced schooling, land division, and other assimilation efforts designed to stifle Hopi culture have influenced how the Hopi now view and remember their pasts. Lastly, I describe the active role that the Hopi are now taking in preserving and protecting their culture. They seek both to protect their heritage from outside abuse and misappropriation and to preserve their culture internally. Through this study, I ultimately find that appreciating the value of indigenous cultures, and treating members of these groups with dignity and respect, is a more desirable goal than trying to define and assign ownership to each aspect of culture.

Mandy Lowell
To Our Lady We Sing: The History and Style of the N-Town Mary Play
Research Advisor: Sarah Beckwith
Theater Studies

Of the four major existing collections of late medieval religious (mystery) plays, the most mysterious and least studied is the N-Town play cycle. The term –cycle" is used by medievalists to refer to collections of short plays that were probably performed together as part of a religious festival. In the case of the N-Town collection, the term is probably a misnomer; scholars generally believe that it is rather a collection of independent plays that were later compiled into a single extant manuscript. However, within the collection is a set of pageants that scholars do treat as a complete work. These pageants deal with the conception and early life of the Virgin Mary, and are colloquially called the N-Town Mary Play. I will expand upon the already existing scholarship on this fascinating cycle by studying the Mary Play as a piece of theatre. I will examine how and why the play might have been performed at the time of its writing, create my own translation and adaptation of the play designed for performance, and present my research and translation as a senior distinction project.

David Lung
MAP Kinase Signaling as an Intracellular Determinant for an Oncolytic Virus
Research Advisor: Matthias Gromeier
Molecular Genetics & Microbiology

Mitogen activated protein kinase (MAPK) pathways are responsible for fundamental cellular processes, including proliferation. Cancer cells generally have active MAPK signaling. Picornaviruses target cells with active MAPK

signaling, therefore, our lab seeks to use a picornavirus for the treatment of cancer. PVS-RIPO is moving into clinical trial, however, the mechanism(s) by which MAPK signaling stimulates viral proliferation has only recently been studied. The goal of this work is to identify this mechanism. Picornaviruses are positive strand RNA viruses that rely on their ability to usurp host translation machinery to their genomic RNA viral protein synthesis. Their ability to accomplish this relies on an Internal Ribosomal Entry Site (IRES), which recruits the host translation machinery. The key protein involved in this process is eukaryotic initiation factor (eIF) 4G, the ribosome adapter protein, which binds to the viral IRES and directs translation. Both eIF4G and the cap binding protein, eIF4E, are substrates for the MAP Kinase signaling cascade. We employed a model of viral infection in tissue culture to confirm that the kinase for eIF4E and eIF4G, Map Kinase Integrating Kinase (MNK) is responsible for this stimulation. By using a cell line in which endogenous eIF4G was knocked down by shRNA and reconstituted with a phopho-deficient eIF4G at the 1232 site (S1232A), we determined that basal phosphorylation at this site has no effect on viral translation alone. Therefore, future work will focus on what sites downstream of MNK direct the switch from cap-dependent (cellular) translation and viral IRES translation.

Lucy Ma
True or False? Rape Myth Acceptance at Duke University
Research Advisor: Rebecca Bach
Sociology

Rape myth acceptance represents the false beliefs and attitudes on rape, rapists and victims held by individuals that ultimately justify male aggression and behavior towards women. Collaborating with The Line Campaign, a non-profit organization dedicated to the new generation in creating a world sans sexual violence via popular media and critical dialogues, the project, True or False? Rape Myth Acceptance at Duke University, seeks to identify the rape myth acceptance level at Duke University. Surveys were distributed via email through a random sample and convenience sampling on the Bryan Center plaza during peak hours. By identifying and analyzing the rape myth acceptance levels among class year, Greek or non-Greek affiliation and sexual orientation, social action and education initiatives can be undertaken and targeted to certain groups to dispel the myths to provide awareness, a safer campus, and gender equality.

Ibrahim Maali
Hands Off District Six: Preserving Community through Militant Nonviolence
Research Advisor: William Chafe
History

In the mid-1980's the District Six community once again rose up to challenge the apartheid government. In 1966 their neighborhood had been declared a white group area and over the next decade the population was forcibly removed to the distant townships while everything they had known was destroyed by the bulldozer. After numerous attempts to plead with the government and exact a reprieve, a new approach emerged in the 1980s--heavily influenced by the antiapartheid political movements of the time--that would have a far greater effect than any of its predecessors. This organization, Hands off District Six, was marked by a strict unwillingness to cooperate with the government and the development of a platform broad enough that it would be agreeable to the most parties. This generational change in approach allowed Hands off District Six to garner far more respect and community support than any of its predecessors, allowing it to successfully engage the government from a position of self-enfranchisement as opposed to supplication.

Andie MacDonald
Role of Sex and Estrus cycle in Ethanol CTA
Research Advisor: Cynthia Kuhn
Pharmacology & Cancer Biology

Alcoholism has historically been a typically-male problem. However, females alcoholics develop pathological behaviors more rapidly than males, and have a more severe course of disease. One factor contributing to this rapid trajectory into alcohol-use disorders is sensitivity to aversive effects, which is an important determinant of drinking behavior both on group and individual levels. As a group, adolescent rats are less sensitive to aversive effects than adults, and are more susceptible to alcoholism-like drinking behaviors. Individually, the adolescent rats that are least susceptible to alcohol's aversive effects drink the most ethanol voluntarily. Thus, we

sought to explore whether females, as a group, were more or less susceptible to alcohol's aversive effects, and whether estrus cycle has any effect on aversion as measured in the conditioned taste aversion (CTA) task. In this task, rats were trained to associate an aversive experience with something normally enjoyable, saccharin-flavored water. The extent to which rats avoid saccharin-flavored water after its pairing with ethanol is indicative of the strength of ethanol's aversive effects. We compared adult male and female rats and determined the estrus stage of the females. We observed that males were more sensitive to ethanol's aversive effects than females. Additionally, estrous stage of females on the day of ethanol-saccharin pairing affected the strength of aversion, with females in proestrus stage showing less aversion than others. These results suggest that both sex and estrus cycle stage affect the aversion sensitivity, and they shed light on potential mechanisms of sex differences in alcohol use disorders.

Sanjana Marpadga
Knowledge of Type 1 Diabetes Mellitus Among Caretakers of Type 1 Diabetic Children at Regional Clinics Within Tanzania
Research Advisor: Julie Reynolds
Biology

Juvenile-onset diabetes, or Type 1 diabetes (T1D), is one of the most debilitating endocrine and metabolic conditions in children. A recent epidemiological study has revealed a three-fold increase in the global prevalence rate of T1D in the past 30 years, with a high burden of the disease in low- and middle-income countries due to issues of social immobility, access, and limited resources. Therefore, the African Region of the International Diabetes Federation developed a diabetes training manual for Sub-Saharan African aimed at improving diabetes management and quality of care through increased education of patients as well as their families. However, no research has yet been conducted to evaluate new educational strategies. My study was a cross-sectional, correlational study undertaken to assess the impact of this new focus in three government-run hospitals in Tanzania with T1D clinics. Children at each of these clinics are enrolled in the T1D Take Action Children's Program which provides patients with free insulin and glucose monitoring supplies. The goal of the study was to assess the relationship between T1D knowledge among caretakers of T1D children and potential predictors, including socioeconomic status, frequency of visits to the clinic, and the socio-emotional impact of the disease. Data was collected through oral interviews with each of the caretakers, conducted with the assistance of Kiswahili translators. The research has highlighted the importance of improving communication between caretakers and medical personnel, re-education strategies, and synchronizing teaching aids between the different clincis.

Ashton Massey
Women and Social Compensation on Facebook
Research Advisor: Christina Grimes
Psychology and Neuroscience

Over the past decade, social networking sites (SNS) have become a cornerstone of young people's social experiences. A 2011 Pew research survey revealed that online social networking is particularly prevalent among 18-29 year-old women, 89% of whom report using the sites (Madden & Zickhur, 2011). Because of its ubiquity, ability to bridge offline and online communications, and technological breadth, Facebook is a particularly rich and interesting social networking site to study in order to understand how online communication relates to real-life socioemotional development. Studies of differences in Facebook usage indicate potentially different underlying functions of SNS for different populations, perhaps based on social competency or adjustment (Valkenburg et al, 2005). One concept to emerge from this research is the social compensation hypothesis in which less socially skilled people compensate for deficits in their offline social lives with online communication and relationships (Gross, 2002). People with a history of social anxiety are among the populations we might speculate to engage in SNS use for reasons of social compensation. The goals of the present study include investigating how young adult women use Facebook to express themselves, and whether offline social anxiety across the lifespan is related to social compensation in this population. Participants were 55 young adult women who had participated in a comprehensive friendship study as 4th graders. To investigate links between social anxiety, social compensation behaviors, and Facebook content, our study employed direct

coding of Facebook profiles as well as self-report measures of internalizing symptoms and Facebook usage.

Gwendolyn McGinnis
Ring-tailed Lemur Susceptibility to Human Diseases as Reflected by MHC Divergence
Research Advisor: Christine Drea
Evolutionary Anthropology

Zoonotic diseases pose a major threat to human populations and have become increasingly important to study given recent and continuing human encroachment into previously isolated habitats. Intensified contact with other species, especially non-human primates, increases the possibility that these species may serve as reservoirs for deadly human diseases. Increasing deforestation on the island of Madagascar has brought humans and lemurs into closer proximity. This study examines the potential for ring-tailed lemurs (Lemur catta) to serve as a reservoir for infectious human diseases. One hundred L. catta from the Beza Mahafaly Special Reserve in Southwestern Madagascar were tested via PCR assays for four strains of malaria that most commonly infect humans and for Simian Immunodeficiency Virus (SIV). None of the animals tested positive, indicating L. catta are neither susceptible to the human strains of these diseases nor able to act as a potential reservoir for disease transmission. Due to the co-evolutionary relationship between pathogen and host, the evolutionary divergence between humans and lemurs accounts for the differential susceptibility. This evolutionary divergence between pathogens with different hosts mirrors the divergence of the hosts' Major Histocompatibility Complex (MHC) genes. As MHC genes control the immune systems' recognition of these pathogens, this divergence indicates a coevolution and specificity of hominids and certain blood borne pathogens, as compared to generalized gastrointestinal parasites that can be transmitted between ring-tailed lemurs and humans. Though many non-human primates pose a threat to human health through the transmission of deadly infectious diseases, ring-tailed lemurs are not one of them.

Jane Meyerson
The Effect of Functional Connectivity Between the Amygdala and the Insula on Anxiety
Research Advisor: Ahmad Hariri
Psychology and Neuroscience

This study examined the role of functional connectivity between the amygdala and the insula on anxiety, specifically hypothesizing a positive correlation between functional connectivity and anxiety. Previous research suggests that enhanced amygdala and insula activity are independently related to anxiety. However, it remains unclear whether increased functional connectivity between these two brain regions plays a significant role in anxiety within itself. In order to investigate the relationship between amygdala-insula connectivity and anxiety, we measured resting state blood-oxygen-level-dependent (BOLD) signal data, using functional magnetic resonance imaging (fMRI), in 350 nonpatient, young adults, student volunteers. The data were from an ongoing parent protocol, the Duke Neurogenetics Study (DNS). All participants completed the State-Trait Anxiety Inventory (STAI). We found that individuals with higher anxiety exhibited less functional connectivity between the dorsal amygdala and insula. Conversely, we did not find any correlation between ventral amygdala and insula connectivity and anxiety. These findings were therefore in opposition to the initially proposed hypothesis. Future studies should attempt to map the reduced connectivity between the dorsal amygdala and the insula onto a particular gene or genes in order to expand our understanding of these results and aid the effort of creating more effective treatments for anxiety disorders.

Lindsay Michalski
Genetic Contributions to Bipolar Disorder: Clinical Implications of a CACNA1C Polymorphism
Research Advisor: Ahmad Hariri
Psychology and Neuroscience

Recent genome-wide associate studies have shown a correlation between the rs1006737 polymorphism within the CACNA1C gene – which codes for an important voltage-dependent L-type calcium channel subunit protein – and severe psychopathologies, such as bipolar disorder. Given this, it is important that future studies address the underlying biological mechanisms by which this

polymorphism may confer risk for the development of psychopathology. The amygdala, which plays a role in determining the emotional significance of stimuli and responding appropriately to challenges in the environment, may lend insight into this biological basis. Furthermore, the ventral striatum – the hub of corticostriatal reward-related processing – is often abnormally activated in bipolar patients in response to feedback-based tasks. My analyses of fMRI and genome data from 150+ participants in the Duke Neurogenetics Study has shown that the risk allele of this CACNA1C polymorphism is associated with both significantly increased amygdala reactivity to emotionally-salient stimuli and decreased ventral striatum reactivity to positive feedback in an outcome-centered task. These correlations indicate that the risk allele at rs1006737 may, indeed, implicate an increased vulnerability to bipolar disorder.

Elisabeth Michel

A Community Perspective: Haitian Women's Opinions on Health and Health Services in Léogâne, Haiti

Research Advisor: Dr. David Walmer
Reproductive Endocrinology & Fertility

In Léogâne, Haiti, non-profit organization Family Health Ministries (FHM) provides screening and treatment for cervical cancer and is currently building a health center. From June-July of 2011, I conducted community assessments, garnering individuals' perspectives on health services in Léogâne and the care FHM provides through its clinic. The goal of this research was to help FHM develop a better understanding of the community's perspective and develop program objectives that can meet community needs. In addition to a focus group discussion, 55 women ages 18 and over took an oral survey of 31 questions addressing their personal opinions on the health services they encountered in Léogâne. Survey questions implicitly and explicitly concentrated on services that FHM currently provides or will provide in the future. The majority of the respondents failed to recognize the FHM name but proved familiarity with the doctor working in the FHM clinic. Respondents largely stated they preferred public to private health services, however a significant amount of respondents stated dissatisfaction with services received in public healthcare facilities. Respondents also demonstrated a desire for more hospitable environments in health facilities providing free healthcare, and along with the focus group, they identified a need for health education and desire for spiritual support in the hospitals. Final recommendations to FHM included ways for the organization to increase their visibility in Léogâne, address the community's educational and spiritual needs (as they relate to health), and create a positive environment for patients and employees in the new health center.

Natalie Miller

The Relationship between SNCA SNP Allele Frequencies and the Development of Lewy Bodies

Research Advisor: Ornit Chiba-Falek
IGSP

The alpha-synuclein gene (SNCA) was among the first genes to be associated with increased risk for familial Parkinson's disease (PD). A pathological indication of Parkinson's disease, on which we chose to focus, is Lewy bodies (LB), essentially buildup of plaque in the brain. LBs are mostly composed of alpha-synuclein, the protein product of the SNCA gene. The goal of our project was to analyze the association between specific SNCA single nucleotide polymorphisms (SNPs) and LB pathology. We examined seven SNPs along the SNCA gene for four neuropathic patient groups: Normal (N), Dementia with Lewy bodies (DLB), Alzheimer's Disease (AD), and Alzheimer's Disease with Lewy bodies (AD-DLB). SNPs were chosen based on functional data and linkage disequilibrium blocks, See Figure 1. We examined 137 N human brain samples and 589 diseased human brain samples. From these samples, DNA was extracted and Taqman sequencing was used for genotyping. The allele frequencies for each SNP were analyzed in individual bar charts, with SNP frequency on the y-axis and each of the four neuropathic patient groups on the x-axis. With the data, we were able to observe the SNPs that appeared to have an impact on LB formation in DLB and AD-DLB patients. Our results suggested that SNPs in the 3' linkage disequilibrium block had an impact on LB development, especially in DLB patients. The tested SNPs seemed to contribute more to LB formation from N to DLB rather than from AD to AD-DLB. The results can be explained if put into context using data collected from GWAS and known information on LBs. These results may help to further the

understanding of the extent to which genetic variability on the SNCA gene, marked by the chosen seven markers, contribute to development of LBs.

Jordan Miller
Aggression and Resource Defense in the Female Chimpanzees of Gombe Stream National Park, Tanzania
Research Advisor: Anne Pusey
Evolutionary Anthropology

There is striking variation in the reproductive success of individual female chimpanzees, Pan troglodytes. In primates, this variation is often tied to dominance rank in which dominant females out-compete subordinates. However, female chimpanzees lack a linear dominance hierarchy and agonistic interactions are rare. Female reproductive success is thought to be largely determined by access to resources, implying that those individuals with the highest fitness have secured food resources more successfully than their competitors. Defending core areas, spaces in which female chimps forage alone within larger male defended territories, is one potential mechanism through which females can maintain long-term access to food resources. The purpose of this thesis is to examine the nature of female competition in the chimpanzees (Pan troglodytes schweinfurthii) of Gombe, and to determine whether females actively defend their personal core areas through overt aggressive interactions. Specifically, is core area competition the predominant precipitator of female-female aggression and therefore an example of contest competition?

Allyson Morton
Novel interactions between the type III TGF-beta receptor and noncanonical pathways in breast cancer
Research Advisor: Gerard Blobe
Pharmacology & Cancer Biology

The transforming growth factor-beta (TGF-beta) signaling family regulates a multitude of biological processes including cell proliferation, migration, differentiation, and apoptosis, and is commonly altered in breast cancer. TbetaRIII, a TGF-beta co-receptor, is expressed in essentially all cell types and the loss of TbetaRIII expression correlates with breast cancer progression and poor prognosis. Recent work on TbetaRIII has uncovered non-redundant roles for this protein independent of other TGF-beta receptors, suggesting that TbetaRIII can regulate cell processes and cancer progression via Smad-independent pathways. This project aimed to investigate the mechanism of TbetaRIII's well-established role in breast cancer progression, specifically to see if non-canonical signaling through TbetaRIII contributes to its role as a tumor suppressor. Based on an initial analysis of pathway signatures which identified significant correlations between TbetaRIII expression and signaling pathway activity, several pathways commonly mutated in breast cancer were chosen for validation in vitro. Expression of TbetaRIII appeared to down-regulate the ERK pathway in a primary breast cancer cell line. Additionally, TbetaRIII appeared to have roles in the regulation of other pathways, including Akt. To investigate possible mechanisms of action, we utilized TbetaRIII cytoplasmic domain mutants which are unable to bind to beta-arrestin2 or GIPC, both of which have been shown to mediate noncanonical signaling. Our data suggest that TbetaRIII is able to regulate the activity of noncanonical signaling pathways, identifying TbetaRIII as a possible therapeutic tool for the treatment of breast cancer.

Marissa Mumford
A Love Hate Relationship: Exploring the Link Between Class Preference and Motivational Theory
Research Advisor: Lisa Linnenbrink-Garcia
Psychology and Neuroscience

Employing the advantages of a qualitative approach, the current study examines whether certain motivational elements of the classroom bear greater or lesser weight in liking or disliking of a class in high school versus college students. This study has three aims: (1) to examine the prevalence of elements of motivational theory in favorite versus least favorite classes, (2) to identify common individual motivational profiles, and (3) to compare the reasons high school versus college students identify for favorite and least favorite classes. Instead of pre-designing the coding scheme before viewing the data, the current study enabled patterns to naturally arise that best described the data. These patterns reflected the constructs of achievement goal theory, interest development, and expectancy-value theory. Findings from this study will help determine

salient factors in the high school and college classroom environment that are liked or disliked by students and how to potentially manipulate external and internal factors of students in the classroom environment to optimize adaptive goal-directed behavior.

Michael Murphey
The "Delay of Germination 1" Gene: a Dormancy Control Mechanism in Arabidopsis thaliana Mediated by Temperature
Research Advisor: Kathleen Donohue
Biology

Germination is a plant's first major life history event. The environment in which a seed germinates is very important, so plants have specific mechanisms to delay germination until conditions are favorable. A cold maternal temperature has been shown to induce dormancy, while seeds have been shown to lose initial (primary) dormancy as they age, in a process called after-ripening. The Delay of Germination 1 (DOG1) gene induces dormancy in Arabidopsis thaliana, though how external factors such as temperature and after-ripening affect its expression is unknown. I conducted germination assays with seven different alleles of the DOG1 gene with varying expression levels to test how DOG1 affects germination in different pre-dispersal and post-dispersal temperatures. Fresh and after-ripened seeds were used in order to test how age affects DOG1's response to these conditions. I showed that DOG1 is necessary for dormancy induced by cold maternal temperatures in fresh seeds. A cold post-dispersal temperature broke this dormancy in genotypes with a semi-functional DOG1 gene. DOG1 was also necessary for secondary dormancy (restoration of dormancy in after-ripened seeds) induction by a prolonged cold post-dispersal treatment, and influenced the optimum germination temperature. DOG1's affect on germination after this cold post-dispersal treatment reversed directions following a hot stratification. These results illustrate the complexity of genome-environment interactions, and solidify DOG1's importance as a dormancy regulator in A thaliana.

Charmaine Mutucumarana
Role of Plasma Laminin in SS RBC Adhesion to Vascular Endothelium
Research Advisor: Marilyn Telen

Clinical severity of sickle cell disease (SCD), measured by vaso-occlusion frequency, strongly correlates with the degree of sickle red blood cell (SSRBC) adhesion to vascular endothelium (Hebbel et al., 1980). SSRBC's intercellular adhesion molecule – 4 (ICAM-4) mediates adhesion to the vascular endothelium integrin alphaVbeta3 (Zennadi et al., 2007). In addition, BCAM/LU is a high affinity receptor found on RBCs that binds laminin isoforms 10 and 11 (Udani et al., 1998) and can mediate SSRBC adhesion to immobilized laminin. Since plasma factors have been shown to affect sickle erythrocyte adhesion to vascular endothelium (Mohandas et al., 1985) and soluble plasma laminin levels in SCD patients are elevated compared to non-sickle cell patients (Bolarin et al., 1998), the role of plasma laminin in SSRBC adhesion warrants investigation. In this project, we used the static flow chamber assay to investigate the ability of soluble purified laminin and plasma laminin to enhance SSRBC adhesion to endothelial cells. Our data suggests that the incubation of SS patient plasma with washed SSRBCs enhances adhesion of the SSRBCs to endothelial cells. A dose-response investigation of human soluble purified laminin's ability to enhance SSRBC adhesion to endothelial cells is currently being undertaken, and preliminary results are presented. Subsequent work investigating the degree to which laminin levels in plasma correlate with the degree of SSRBC adhesion enhancement produced by different plasmas will illustrate the role of plasma laminin in influencing vaso-occlusion frequency in SCD patients.

Shikha Nayar
The use of Pramipexole to reduce motor problems and eventually treat zebrafish induced with a Parkinson's Disease model
Research Advisor: Elizabeth Godin
Pharmacology & Cancer Biology

The use of adult zebrafish to study neurodegeneration and behavior has developed extensively in recent years. Locomotion, in particular, has been a common method to test the effects of toxins such as 6-hydroxydopamine (6OHDA) used to induce a model of Parkinson's Disease (PD). To delve further into the neurodegenerative studies already conducted, the induction of a PD model in zebrafish provides a good window to test other possible treatments that

act as dopamine-enhancing drugs. In this study, different doses of Pramipexole were used to treat PD induced zebrafish, through which the change of their locomotion was monitored. The general relationship observed was that higher Pramipexole doses reduced locomotor activity, which implies reduced motor function. This is inconsistent with the literature in that dopaminergic drugs have shown an increase locomotor activity; possible reasons for this inconsistency and consequences from this study are discussed.

Bowen Niu
Progress towards NMR Characterization of Oxidized Human Superoxide Dismutase1
Research Advisor: Brian Coggins
Biochemistry

Superoxide Dismutases are a class of enzymes responsible for converting highly toxic superoxide anions to hydrogen peroxide and oxygen. Human superoxide dismutase 1 (SOD1) is a dimeric enzyme with 153 amino acids that binds one atom of copper and zinc per subunit. SOD1 misfolding and aggregation has been implicated in causing Amyotrophic Lateral Sclerosis (ALS) more commonly known as Lou Gehrig's disease. Recent evidence suggest that SOD1 mutations could be the only mutations that cause ALS exclusively (with no other pathology).Much is still unknown regarding the mechanism of misfolding and aggregtion but a recent study showed that toxic SOD1 aggregates share a structural epitope with oxidized SOD1 and other research indicates that the four cysteines on each subunit play a key role in aggregation. The goal of our experiment is to study native and oxidized SOD1 at atomic resolution using NMR.

Sarah Nolan
What Determines Aspirations and University Attendance in Rural India?
Research Advisor: Anirudh Krishna
Public Policy

Children born to rich parents often attain similar levels of wealth, while children from poorer backgrounds tend to remain that way. While a universal theme, this trend is particularly striking in India's rural areas. India's IT sector isn't exactly drawing employees from its city slums or rural villages. The world's largest democracy is not a meritocracy. So why are bright and talented young people growing up in India's villages unable to attain high paying jobs matching their potential? Kids who top their classes become teachers or low-level government employees, or work the same day labor jobs as primary school dropouts. What is holding these youth back? With the advent of greater technology and communication, bridging the divide between rural and urban, could some intervention correct the imbalance between ability and opportunity in rural India? By comparing the experiences of young people a variety of distances from the city of Udaipur in southern Rajasthan, my study seeks to unearth the tangled roots of the new generation's difficulties sharing in India's much lauded economic success. All of the variables I hope to measure proved meaningful in understanding how youth make plans and their ensuing success fulfilling their ambitions. Unsurprisingly, the factors that influence university outcomes are manifold. Students who live closer to the city did have a simpler journey to university, with easier commutes, more role models, and more information sources. Perhaps most significant, it seems students with clear aspirations, no matter their background, were more likely to be on track for college than their classmates with unarticulated hopes for the future. Aspirations are born of role models and clear information on careers, schools, scholarships etc. both of which are lacking in village communities.

Kelly Ostrofsky
Sexual dimorphism in the lumbar vertebrae: Application to Australopithecus sediba
Research Advisor: Steven Churchill
Evolutionary Anthropology

Lumbar lordosis is a hominin adaptation that helps maintain the body's center of mass above the hips during bipedal locomotion. Previous studies have shown that females have an increased curvature and greater reinforcement of the lumbar vertebrae, thought to have evolved to compensate for heavy fetal loads during pregnancy. Since natural selection likely began operating on the lumbar region with the earliest hominin bipeds, the australopiths, sexual dimorphism in the lumbar vertebrae can be expected in Australopithecus. The remarkably complete fossil skeletons of A. sediba, MH1 and MH2, preserve several lumbar vertebrae; thus the potential exists to examine sexual dimorphism based on lumbar vertebral morphology. The ultimate goal is to confirm the

sex diagnoses of these fossil individuals. Univariate and multivariate analyses indicate that lumbar wedging angle, relative zygapophyseal surface area, relative robusticity of the pedicles, and relative spinous process thickness are important discriminators between modern human males and females. However, due to a large degree of overlap in these features, discriminant functions produced relatively low cross-validation classification rates, ranging between 65-75%. Comparative analyses plot specimens of A. sediba and A. africanus in relation to the modern human sample. Due to the fragmentary nature of the fossils and lack of separation between modern human males and females, these comparisons were unsuccessful in evaluating the degree of sexual dimorphism in the fossil species. Nonetheless, this research did raise several important questions regarding the degree to which the female skeleton may be adapted to gravid body weight, which will require further study.

Stephanie Patterson
The Role of Adolescent vs. Adult Exposure to Binge Ethanol in Delay Discounting Behavior
Research Advisor: Nicole Schramm-Sapyta
Psychiatry

Delay discounting is one aspect of impulsivity that has been shown to contribute to vulnerability to drug addiction. It has also been shown that adolescents have immature brain development, particularly in regions related to impulsivity and decision-making. Furthermore, exposure to many drugs of abuse, including ethanol, has been shown to increase impulsivity. This study was designed to test the hypothesis that ethanol exposure during adolescence, when impulsivity is naturally high, would have a lasting effect of increasing impulsivity in adulthood. We used a recently characterized, semi-rapid delay discounting task to assess the effect of ethanol exposure at two developmental time points, adolescence and adulthood, on delay discounting behavior in adulthood. We observed that the timing of the exposure has no effect on choice behavior. However, exposure to ethanol at either time point resulted in the animals choosing the delayed lever more often than control animals, particularly at longer delay durations. A trend toward higher omissions in the ethanol-exposed animals suggests that this perceived decreased impulsivity may be related to decreased motivation.

Sharon Pomranky
Rejuvenating Geriatrics: Rethinking the American Geriatrics Society's Approach to Advocacy for Geriatric Medicine
Research Advisor: Alma Blount
Public Policy

By 2030, the number of people age 65 and older will increase from 13% to 19% – 40 to 72 million. However, as of March 2011 there were only 7162 board certified geriatricians, one for every 5500 people. Only 3% of students in medical schools take geriatrics electives; only 10% of medical schools require geriatric medicine rotations. There is a clear disconnect between population distribution and specialized medical professionals serving them. The lack of trained physicians alone would not be an issue if it were not inflated by a lack of nurses, direct care workers, pharmacists, psychologists, psychiatrists and social workers with geriatric training.
Though medicine is one sliver of society, the lack of qualified geriatric-trained medical professionals perpetuates stigmas against the elderly and relegates them to inferior levels of care. "Rejuvenating Geriatrics" is an exploratory venture into the current state of geriatric medicine. I apply the adaptive leadership framework to reframe how the American Geriatrics Society should approach advocacy for geriatrics. Adaptive Leadership points toward value conflicts – in this case, life prolongation versus quality of life – to approach innovative solutions to the issues underlying the shortage of qualified geriatric care providers.

Fontasha Powell
Altered Disgust Response to Visual Stimuli in Anorexia Nervosa
Research Advisor: Karli Watson
Neurobiology

Individuals with anorexia nervosa typically consume fewer than 500 calories a day and exhibit an obsessive fear of weight gain. These symptoms may arise due to a conditioned disgust response to food. In the current study, we use electromyography (EMG) to measure the disgust response in participants with and without a history of anorexia nervosa. Activity in the levator labii muscle, located under the nose, is the evolutionary adaptation of distaste exhibited by many mammals as a means to reject or expel potentially harmful

stimuli. Disgust, a higher order manifestation of distaste, is a universal emotion amongst humans, and previous imaging studies have mapped the experience of disgust onto the insular cortex. Moreover, previous studies have shown the insula to be disordered in subjects who have experienced anorexia nervosa. In the present study, participants attend an experimental session during which EMG electrodes are placed on the levator labii while anorexic subjects and control subjects are exposed to various categories of visual stimuli, including social images and images of contamination. Additionally, each participant explicitly reports subjective ratings of disgust, valence, and attractiveness in response to each image. We hypothesize that participants with a history of anorexia nervosa will have significantly different disgust response to food stimuli and body stimuli than control subjects. With this behavioral study, we expect to further implicate the insular cortex as a source of neural dysfunction in anorexia nervosa.

Sunny Qiu
Characterization of Motor Impairment in Mouse Models of Dystonia
Research Advisor: Nicole Calakos
Neurobiology

Dystonia is a neurological movement disorder characterized by abnormal postures and repetitive movements. The most common genetic cause is the ΔGAG mutation in the TOR1A gene. ΔGAG mouse models have been created, but do not demonstrate clear motor phenotypes. This lack of a clear motor phenotype in mice impedes the study of TOR1A functions and potential treatments. I therefore took two approaches to identify motor phenotypes in mouse models of dystonia. First, I studied ΔGAG mice, which have abnormal responses in tonically active neurons. As these neurons are involved in reward prediction, the abnormal responses would be predicted to cause deficits in reward prediction, but this behavior has not yet been studied in ΔGAG mice. Therefore, I tested ΔGAG mice on a reward prediction test. Contrary to the hypothesis, no deficits in reward prediction were detected in ΔGAG mice. Second, I studied a novel mutation, called F205I, which was reported in a human dystonia patient. In cell culture, F205I showed similar pathology as ΔGAG. However, the F205I mutation appears to be hypomorphic to the ΔGAG mutation due to less severe clinical and cellular phenotypes. Similarly, whereas all ΔGAG homozygous mice die, F205I homozygous mice survive. I therefore tested F205I heterozygous and homozygous mice on motor learning and coordination tasks. Interestingly, F205I mice performed similarly to wildtypes on motor learning tasks, but F205I homozygotes had performance deficits on motor coordination tests. The presence of this motor phenotype in F205I homozygotes indicates that this mouse model may be a useful tool to study dystonia pathology and treatments.

Layla Quran
Division or Development? : Iraq under US Occupation
Research Advisor: Robin Kirk
ICS

On March 13, 2003, the U.S. commenced Operation Iraqi Freedom with the announcement by former President George W. Bush that the US would begin stages of military intervention in Iraq to reveal and remove weapons of mass destruction. Former President Bush highlighted in a January 2007 address that 80% of the sectarian violence within Iraq occurred within 30 miles of the capital, which has consequently divided Baghdad into sectarian enclaves. My research seeks to understand how Iraq was altered politically, socially, and economically after the fall of Saddam Hussein, in order to further comprehend how this affected sectarianism in Iraq. In order to answer this question, I will create a website divided into political, social, and economic tabs which further include smaller projects on the impact of US invasion on Iraqi women, the economy of Iraq, and the organization of the Iraqi government structure pre/post-US invasion. I share this information and include input on how this affected sectarianism within Iraq.
My audience is the general public of the United States, whether an expert or student interested in US foreign policy and unaware of the impact of U.S. invasion of Iraq. The goal of the website is to present the impacts of a U.S.-controlled Iraq, in particular the political, social, and economic effects of the U.S. invasion on the sectarian divide. I began this project to present the facts on a war commonly misunderstood, and allow the general public to decide for themselves what happened in Iraq.

Rachna Reddy
Do red ruffed lemurs yawn contagiously?
Research Advisor: Brian Hare
Evolutionary Anthropology

Animals use many mechanisms to form social bonds. Humans, for example, mimic aspects of others' behavior nonconsciously to create affiliation. One behavior susceptible to such mimicry is yawning. Contagious yawning is influenced by social closeness and linked to empathy in humans. Several nonhuman haplorhine primates also display contagious yawning. To understand the evolution of this behavior in primates, we investigated whether a strepsirrhine species, the red ruffed lemur (Varecia variegata rubra) yawned contagiously. In the first experiment, subjects (n=10) housed at the Duke Lemur Center were shown footage of a yawning conspecific. To investigate the link between contagious yawning, social bonds and empathy, we showed each subject footage of a yawning stranger and a yawning groupmate, as well as control footage of these individuals at rest. Subjects did not yawn in response to video stimuli. We conducted a second experiment to determine whether red ruffed lemurs were capable of understanding video stimuli. We showed subjects from the same social groups as study I (n=11) footage of a fox walking, and footage of their technician providing grapes, stimuli to which they produced differential responses. Lemurs produced more alarm vocalizations in the fox condition than in the technician condition. Our study provides the first evidence that strepsirrhine primates respond to video playbacks and suggests that red ruffed lemurs, and perhaps strepsirrhines, do not yawn contagiously, implying that contagious yawning behavior evolved later in primate evolution.

Dana Rosen
Affective Influences On Forgetting
Research Advisor: Kevin LaBar
Public Policy

Inhibition allows people to suppress competing memories so that the most relevant memories can be remembered successfully. In order to study inhibition or related items, the Retrieval-Induced Forgetting (RIF) paradigm was used in the present study. While previous research has investigated the role emotion by altering the affective state or changing the emotional content of stimuli, no study has yet examined the effect of the interaction of mood and affective stimuli on forgetting behaviors using this paradigm. Participants began by studying word lists in which neutral cues were paired with either negative or neutral associates. Later, participants experienced either a neutral or negative mood induction and subsequently retrieved a portion of the study list. Following a distracter task, participants completed a voice recall test of the original study list. There was a significant difference in stimuli valence for the negative mood induction condition, in which negative items were remembered more than neutral items. This may be an indication for the mood-congruency theory, which would predict that items of similar valence to mood would be remembered more. Furthermore, our data revealed that participants who had higher ruminative tendencies had less inhibition of negative items compared to neutral items. The findings have clinical implications, as deficits in inhibition are associated with mood and affective disorders.

Brandon Ruderman
Epigenetic Maintenance and Inheritance of Heterochromatin in Fission Yeast
Research Advisor: Kristin Scott
IGSP

Molecular regulatory mechanisms allow eukaryotic cells with identical genomic sequences to display a wide variety of phenotypes. One of the ways this occurs is through the structural and functional differentiation of chromatin into distinct domains throughout development, guiding adaptation to environmental changes and cell specialization in vivo. Broadly, chromatin can adopt either a transcriptionally active state known as euchromatin or a transcriptionally silent state known as heterochromatin.
Our goal is to understand the contrasting roles of genetic and epigenetic signals that maintain chromatin states through multiple cell generations and the molecular mechanisms behind this inheritance. Our lab has developed an assay in the fission yeast Schizosaccharomyces pombe to separate genetic and epigenetic signals involved in regulating chromatin. My research has focused on using this assay to study the mechanisms of trans-acting chromatin proteins and also improving it to study inheritance patterns in individual cells.
First, I investigated the role of chromatin assembly factor 1 (CAF1), a conserved histone chaperone, in

the epigenetic maintenance of heterochromatin. My results suggest that, in addition to its known role in histone deposition during DNA replication, CAF1 has a direct function in heterochromatin maintenance. Second, I have worked to allow for single-cell observation of heterochromatin maintenance by using the green fluorescent protein gene, gfp, as a reporter gene. Cell sorting and live cell imaging can be used to observe the inheritance of alternative chromatin states between cells.

Diana Ruiz
Transgressing the Confines of Victim-Centered Cinematic Narratives: Thomas Allen Harris' Vintage: Families of Value
Research Advisor: Kimberly Lamm
Women's Studies

In recent years, film and television documentaries have received attention for both depicting issues of sexual violence and for portraying liberating, therapeutic roles for the victims in the films. There remains a question of the extent to which such documentaries can have an emancipatory effect for sexual violence survivors if their experience is ultimately being narrated and represented by someone else (such as an actor, editor, or filmmaker). To this end, emerging filmmakers have engaged in productive exercises that open the possibility for alternatives. I find that among the many alternatives, perhaps the most important involves the possibility of restoring the agency to victims of sexual violence, since all acts of sexual violence strip the victim of his or her sense of power, or agency. I focus on Thomas Allen Harris' Vintage: Families of Value (1995) because I find that the film's mode of production works to undo established continuity editing and narrative approaches of treating sexual violence survivors on screen.

Paul Salem
Penetration, Tissue Damage, and Lethality of Wood- Versus Stone-Tipped Projectiles
Research Advisor: Steven Churchill
Evolutionary Anthropology

Lithic projectile points are a universal component of the hunting tool kits of archeologically- and historically-known foragers. Recent experimental work with ballistic gelatin targets has shown that lithic-tipped projectiles do not have a marked penetration advantage over those with simple sharpened wooden points, leading to the suggestion that investment in the production of lithic points may serve social rather than economic motives. Here we report on experimental work with wood- and stone-tipped arrows fired into calibrated ballistic gel. While the stone-tipped arrows underperformed with respect to penetration, they far exceeded the wood-tipped arrows in the volume of gelatin destroyed. These results suggest that the total volume of tissue destroyed by a projectile is as or more important than its penetration depth, that adding a lithic point increases the lethality of a projectile, and that decisions about projectile armatures were motivated by economic rather than social concerns.

Daniella Schocken
Sickness and Self-Diagnosis in the Emergency Department
Research Advisor: Naomi Quinn
Cultural Anthropology

As information formerly accessible only to individuals with advanced training and degrees is disseminated widely through the Internet, laypersons today have unprecedented access to literature and knowledge on a broad range of topics, including health. Before entering a doctor's office, a patient may now look online in search of self-diagnosis, testing, and treatment options. This research aimed to investigate the extent to which patients engage with Internet-based health resources in order to self-diagnose during episodes of acute illness. / By interviewing patients in the Emergency Department of a large, urban hospital, I was able to examine a demographic cross-section of that city's population, determining what broad trends exist with respect to patterns of self-diagnosis and sources of information about health. This research offered the opportunity to refine my data collection process for future studies, but it also yielded a range of qualitative data suggesting the diversity of illness behaviors and experiences among Emergency Department patients. After collecting interviews from twenty-five patients, I found that contrary to my hypothesis, relatively few patients consulted the Internet or endorsed it as a reliable source of information about sickness and health. Additionally, only five participants in my study indicated that they had self-diagnosed their malady prior to coming to see a doctor, many fewer than I had initially anticipated. Rather,

families and extended social networks were of primary importance in my interviewees' illness experiences, helping them to contextualize their problems, carry out research, and make the decision to seek further care from a physician.

Brett Schroeder
The Effects of Grading on Student Achievement and Motivation: A Systematic Review
Research Advisor: Harris Cooper
Psychology and Neuroscience

In the United States education system, the practice of grading is almost universal in its reach and prevalence. Yet, despite the widespread use of grades as the primary means for evaluating student work and progress, there is still much to learn about whether this practice is harmful or beneficial, or whether a better method might be available to educators both in the United States and abroad. The present systematic review thus sought to identify past research to better understand grading and its impact on student achievement and motivation. By examining previous studies that investigate the relationship between grades that teachers give and student future achievement and motivation, suggestions could be made for future assessment practices. Following a meta-analytic combination of effect sizes, grades were found to be more beneficial for student performance outcomes than no feedback at all, but any type of feedback, whether it be comments or praise, was found to be more beneficial than simply grading a student. The effects of traditional grading practices on student motivational outcomes (e.g. interest in subject matter) also highlighted the negative effects of grading. Students in constructive or elaborative feedback conditions were more likely to give higher ratings of interest and more positive attitudes toward school than students in the grades only conditions. Finally, suggestions for future research with an eye towards investigating possible moderator effects—grade level, cross-cultural factors, and type of feedback—are discussed.

Evan Schwartz
The Effect of MEK Inhibitors on Sickle Cell Disease
Research Advisor: Rahima Zennadi
Hematology

In sickle cell disease, end-organ damage is likely caused by acute vaso-occlusive "crises". Vaso-occlusion is largely promoted by abnormal sickle red blood cell adhesion to enflamed-vascular endothelium. Our recent studies have shown that mitogen-activated protein kinase MEK1/2 and its downstream effector ERK1/2 are expressed in red blood cells. Importantly, ERK1/2 is hyperactive in sickle cells but not in normal cells, and is involved in sickle red cell adhesion to the endothelium. We therefore hypothesize that inhibition of MEK1/2-induced ERK1/2 activation in sickle red cell prevents adhesion to the endothelium and vaso-occlusion in vivo. Here, our data show that treatment of sickle red cells with MEK inhibitors inhibits their adhesion to activated-endothelial cells using in vitro adhesion assays. MEK inhibitor treatment of sickle red cells ex vivo also reduces adhesion to enflamed venules and prevents vaso-occlusion in nude mice implanted with dorsal skin-fold window chamber in vivo. Beta-arrestin1 and GRK2, two kinases known to regulate ERK signaling, were both increasingly recruited to the plasma membrane and phosphorylated in sickle red cells as a result of receptor-stimulation, suggesting that these two kinases up-regulate ERK1/2 activation. In normal red cells, membrane–recruitment and phosphorylation of GRK2 did not change. However, membrane-recruitment of beta-arrestin1 increased while phosphorylation decreased as a result of receptor-stimulation, suggesting that beta-arrestin1 activation in normal cells is involved in receptor desensitization. Based on our data, targeting ERK signaling will likely prove to be a novel effective therapeutic strategy to prevent painful vaso-occlusive crises in patients with sickle cell disease.

Alexandra Shams
Cross-species Comparison of Scent Marking Behavior in the genus Eulemur
Research Advisor: Christine Drea
Evolutionary Anthropology

The functional role of scent marking is poorly understood because many believe that its significance is diminished in primates. Nonetheless, olfactory communication is important to many primate groups, particularly strepsirrhine species. Scent marking has been shown to convey a variety of information in strepsirrhines, including dominance status, reproductive state, and relatedness. It may also communicate territorial

defense, maintain dominance hierarchies, influence competition, and aid in sexual advertisement. Scent marking's specific function in individual species may differ based on social, ecological, and physical properties. In this study, I examined the scent marking behavior of five species of prosimian primates from the genus Eulemur that vary in social and mating structure. I observed male and female pairs during the breeding and nonbreeding seasons. Four of the species are female dominant and were grouped based on their classifications as pairbonded or multimale/multifemale (MM/MF). The final species was grouped separately because it has a codominant social structure. The study's results show that the patterns of seasonal change and gender disparity in scent marking vary by social structure. Female dominant species scent marked more than codominant species and the males of the MM/MF groups increased scent marking in the breeding season .This supports the idea that olfactory communication is used for different purposes in each group.. This study provides a novel look at the effects of social systems on scent marking behavior and suggests functional differences for olfaction within the genus, a concept that should be further investigated in a larger primate sample.

Arun Sharma
A Novel Interaction between Endoglin and p38 MAPK Regulates Endothelial Cell Migration during Angiogenesis
Research Advisor: Gerard Blobe
Pharmacology & Cancer Biology

The molecular mechanisms behind angiogenesis in cancer, or the development of blood vessels providing nourishment for tumors, must be better understood in order to develop effective therapies for this disease. In this study, I investigated the role of the transforming growth factor beta (TGF-B) signaling pathway in regulating the migration of endothelial cells, which line the interior of blood vessels. Proper endothelial cell migration is a critical aspect of angiogenesis during development and tumor formation. I utilized molecular techniques such as western blotting and immunofluorescence in cultured endothelial cells in order to study the protein endoglin, a transmembrane TGF-B co-receptor mutated in cancer and cardiovascular diseases such as hereditary hemorrhagic telangiectasia type 1 (HHT-1). The role of endoglin in regulating endothelial cell migration during angiogenesis via its interaction with other signaling pathways is not well understood. However, I found that protein signaling crosstalk is occurring between endoglin and the p38 mitogen-activated protein kinase (p38 MAPK) signaling pathway, which is known to positively regulate endothelial cell migration. Through the previously mentioned biochemical assays, I discovered that elimination of endoglin causes a significant increase in the activation of p38 MAPK and a subsequent upregulation in endothelial cell migration. Additional assays have indicated that this interaction between p38 MAPK and endoglin at the cell surface of endothelial cells may be mediated by the scaffolding protein B-arrestin2. Given the role of endoglin in cardiovascular development, this study offers insight into endothelial cell biology and the protein-protein interactions driving the process of angiogenesis.

Lena Sharma
Can the need to learn sex-specific behavior patterns explain the extended juvenility in Propithecus coquereli and Lemur catta?
Research Advisor: Amy Schreier
Evolutionary Anthropology

Among mammals, primates have the longest juvenile period. During this extended juvenility, young primates face many challenges, in addition to a greater risk of death and delayed reproduction. Thus, there must be a great fitness advantage that results from this extended juvenility. A clear explanation for this extended juvenile period has yet to be found, but it is thought that the large amount of social skills that need to be learned and developed before adulthood may be the most likely one. This reason is what has been suggested by the sex-typing and behavioral role model hypotheses. Although studies have been conducted on the juvenile period in apes and monkeys, this has yet to be done in great detail in lemurs. It is for this reason that I focused on the relationship between extended juvenility and social development in lemurs. Using a scan sampling technique, I observed three Propithecus coquereli groups and one Lemur catta group at the Duke Lemur Center to test both hypotheses. I predicted that juveniles will spend more time with same sex adults than opposite sex adults. I also predicted that there will be a greater degree of sex-typing among female

juveniles compared to male juveniles because of the female dominance in these species. Overall, the results supported these predictions. Juveniles associated more with same sex adults than opposite sex adults and adults associated more with same sex juvenile than opposite sex juveniles. Additionally, sex-typing was more prevalent in P. coquereli than L. catta.

Nicholas Shelburne
Exploring the Reactivity of Electrophilic Amines and Amides
Research Advisor: Qiu Wang
Chemistry

Nitrogen plays an important role in the structure and function of many biologically important molecules. As such, being able to manipulate the reactivity of nitrogen-containing compounds is of particular importance to organic chemists. One such strategy to do this has been to add electronegative heteroatoms to the nitrogen, which can lead to a change in polarity and reactivity of amines and amides. Our lab has been seeking to utilize these electrophilic amines to develop new transformations that could be used to synthesize a wide variety of small molecules with potential biological activity. In particular, we sought to use transition metal catalysts and an electrophilic nitrogen source to generate C-N bonds in the place of specific, previously unreactive C-H bonds on heterocyclic building blocks. Unfortunately, these experiments were hampered by difficulties in directing the catalyst to activate the appropriate bond and frequent breakdown of starting materials at the reaction conditions used. We also explored the ability of N-chloroamines to selectively oxidize alkylbenzenes to the corresponding aldehydes. We were able to consistently generate the desired product using this transformation, but its utility is diminished by our inability to increase the typical yield above 20 percent due to frequent side reactions and breakdown of the nitrogen source. These transformations, while still in need of more development, offer interesting potential because they could eventually be important tools in the ongoing discovery and development of new drugs by allowing for the efficient synthesis of relevant small molecules.

Braxton Shelley
A Preacher's Chord: Richard Smallwood's "Hammer" Six-Four
Research Advisor: Anthony Kelley
Music

Richard Smallwood's gospel compositional style is influenced by at least three central aspects of his biography: Smallwood has decades of experience as a church musician, he is a classically trained pianist, and he is a seminary-trained preacher. The compositional influence of his experience and training in the African-American homiletical tradition is especially clear in his 1999 composition, "Healing." This paper, which is inspired by Robert Hatten's semiotic reading of the "arrival" six-four chord, uses scholarship about narrative paradigms in country music, the structure of many African American sermons, the analytical history of the six-four chord in tonal music, and the characteristics of Pentecostal "church" songs to relate Smallwood's harmonic practice in “Healing” to the African-American preaching tradition. Analysis reveals that Smallwood’s use of the “cadential” six-four chord in "Healing" is not merely syntactical. For Smallwood, the six-four is a rhetorical hammer. He uses the harmony-- and the lyrics associated with it--to reiterate the central message of his piece. This reiterative strategy is very similar to the ways in which themes are repeated in many African-American sermons. This characteristic of Smallwood's music is especially significant, because it emphasizes the close relationship that exists between African-American Gospel music and the African-American preaching tradition.

Shalin Sheth
Cohesion and Individuals: The relationship between social cohesion and individual achievement.
Research Advisor: Katie Rosanbalm
Public Policy

Our communities serve as our friends, our support networks and our burdens. Community cohesion has typically been defined in five separate ways: collective efficacy (community self-belief), interpersonal relationships (friendship), trust (trust between members), task-oriented relationships (cohesion developed around working together) and social support (support/aid between members). The relationship between community cohesion and

individuals living in those neighborhoods has previously been primarily been tested in terms of scholastic achievement. This study explores the effect that different forms of cohesion have on individual development factors – specifically parenting, emotional state, and household state – in order to better understand community structure.

The study used data from the 2004 Cross-Sites survey on various neighborhoods in North Carolina. The survey included 600 participants. The sample population was 70% African-American and the majority of the participants had an income of $20,000-$70,000. The survey itself was extensive and comprehensive and required trained researchers to conduct one-on-one interviews. The researchers were also asked to give their own impressions of the household states. The survey was split into sections (typically about 10 questions) that represented the community cohesion types and the individual development factors.

Preliminary analysis reveals a strong and significant relationship between the collective efficacy and trust cohesions and positive parenting and emotional states. Task-oriented cohesion had a weaker significant relationship. The forms of cohesion had only a small relationship with household state. In effect, certain forms of cohesion had a strong relationship with emotion and behavior, but less with factors that depend more directly on income levels.

Rachel Simon

Reevaluating Civil Religion in America:

Research Advisor: David Morgan

Religion

Robert Bellah proposed a theory of American civil religion as such: the "public religious dimension [that] is expressed in a set of beliefs, symbols, and rituals." He goes about defining it through textual evidence, such as the Declaration of Independce. But religion is more that its dogma, and comes from a very real human need. Following this idea, I apply Emile Durkhiem's articulation of the Elementary Forms of Religious Life as a framework to go about looking for civil religion in the most basic units of material culture.

Mesha Sloss

Out of Egypt: Egyptian Influences in Greek Art of the Middle Bronze Age and Early Archaic Period

Research Advisor: Sheila Dillon

Art, Art History, Visual Studies

I conducted my research, as part of the Mellon Mays Undergraduate Fellowship, on Egyptian influences on Greek art of the Middle Bronze Age and Early Archaic Period. From the Middle Bronze Age, I focused on the Shaft Graves of Mycenae circa 1650 BCE and the fragments of Palace wall paintings from Avaris circa 1500 BCE. From the Early Archaic Period, I analyzed selected Greek kouroi and the finds from the Royal Tombs on Salamis, all of which were from around the early eighth to the early sixth centuries BCE. I structured my argument around the claims of Martin Bernal in his 1987 volume Black Athena: The Afroasiatic Roots of Classical Civilization and the countless literary responses to this work. The seemingly strong connection between many of the finds at the Shaft graves and Royal Tombs and ancient Egyptian religious practice, in addition to the superficial resemblance of Greek kouroi to the Egyptian sculpting style and the inter-cultural exchange suggested by the subject matter of the wall paintings of Avaris led me to conclude that the art of the ancient Greeks was influenced by their neighbors to the south. The extent of said influence, however, is debatable.

Nari Sohn

Are Oysters and Blue Crabs from North Carolina Safe to Eat?

Research Advisor: Dan Rittschof

Biology

Polychlorinated biphenyls (PCBs) are manmade industrial compounds that pose a great health risks to humans and animals. Humans get PCB exposure primarily through seafood. In response to concerned consumers, Environmental Defense Fund (EDF) created guides that provide seafood safety recommendations. However, the recommendations on whether or not to eat seafood are based on a national average for contaminants. The objective of my study was to determine levels of PCBs in two popular seafood varieties, oysters and blue crabs, from North Carolina, so that I can reevaluate EDF's non-regionally specific seafood assessments. Samples were collected from fishery

regions (northern, central and southern) in North Carolina coast. To extract and measure PCBs from blue crabs and oysters, enzyme-linked immunosorbent assay (ELISA) was performed. Although flagged for high toxin levels by EDF, North Carolina softshell and hardshell blue crabs had low enough concentration of PCB that anyone could consume them without restriction. Oysters had equally low level of PCBs; this aligned with EDF recommendation. Overall, about 98% of all samples were below the EDF health-risk levels for adults. A regionally-specific study should be replicated in other locations to further evaluate the relevancy of EDF recommendations. The next step would be to update EDF and demand for regionally specific seafood guides so that consumers can make better informed decisions.

Katherine Soltis
"Biting the Bullet" and Banning Guns: The Brazilian National Referendum of 2005 and Its Defeat at the Polls
Research Advisor: John French
History

After the United Nations named Brazil the country with the highest number of gun deaths in the world in 1996, the Brazilian government set the date for the world's first and only national referendum to vote on gun prohibition in 2005. Although public opinion polls showed popular support levels over 80% just three months before the vote, the ban was surprisingly defeated with 64% of those who voted, or 59 million people, voting against it. To date, the existing studies on the disarmament issue have argued that the outcome reflected the success of the "No" Front's advertising messages that played off of widespread insecurity and violence, yet literature on other aspects of the disarmament movement remains limited. This study examines regional and state variation in voting results, showing the importance of overlooked cultural factors and finding that higher homicide rates and lower public security provision were associated with support for the ban. These results show that disarmament was not out of touch with civilian preferences as previous studies have concluded but was in fact an appealing public security response for Brazilians faced with crime and insecurity.

Tawnee Sparling
The Shoulder of Australopithecus sediba
Research Advisor: Steven Churchill
Evolutionary Anthropology

Australopithecus sediba is a recently discovered 1.977 million year old fossil from South Africa. MH2 in particular retains a relatively complete scapula, or shoulder blade, and may provide insight into whether these hominins engaged in arboreal behaviors. The shoulder joint is functionally divergent among primates, and has been used to infer locomotor behaviors through comparative studies. In this thesis, I applied principal component analyses to study the scapular morphology of MH2 in comparison to that of Homo sapiens, Gorilla gorilla, Pan troglodytes, Pongo pygmaeus, and Hylobates lar, as well as DIK-1-1 and KSD-VP-1/1 (the only other nearly complete hominin fossil scapulae to date). Overall, MH2 is characterized by a cranially oriented glenoid fossa, an oblique spinous process, and a large supraspinatus fossa. The presence of such primitive traits indicates an arboreally competent hominin and supports previous descriptions of the Malapa hominins as a mosaic, transitional species in the evolutionary lineage towards modern humans.

Melanie Sperling
Getting Involved
Research Advisor: Leslie Babinski
Child and Family Policy

Parent engagement in their child's schooling improves child achievement, academic performance, and the parent child relationship. The objectives of my research were to find out what barriers keep parents from being involved in their child's academic life, and how the BELL Foundation can engage parents when it comes to: home to school communication, and learning at home. Over ten weeks I conducted email surveys, phone interviews, and parent forums. I found that parents are eager to improve their communication with the school, and believed that using email could reinforce school to home communications. Parents are enthusiastic to find new ways to help their children at home, but have barriers such as: having other demands (children and work), having a lack of understanding the subject matter, and being unfamiliar with the –technical language" (current nomenclature) in what their child is

learning. I recommended that BELL use email and Facebook to improve communication, that teachers reach out to parents at drop off and pick up, that teachers give specific times for parent drop-ins, and that teachers give parents their contact information. Handouts should be sent home that give directions to parents for difficult homework assignments, and have a simple checklist where parents can check off that the homework had been completed, and where they can write any questions or concerns for the teacher. Lastly, BELL should have engaged parent leaders run meetings to talk about individual's struggles as parents, and ways parents can become more positively involved in their child's education.

Leigh Spivey
Wait a Minute! Exploring The Relationship Between Spatial Reasoning and Inhibitory Control in Preschool-Age Children
Research Advisor: Amy Joh
Psychology and Neuroscience

Spatial reasoning emerges early in the first year of life and continues to develop through childhood. Researchers have suggested that the development of spatial reasoning is reliant on a functioning inhibitory control system (Freeman, Hood, & Meehan, 2004), which is one component of a broader executive functioning mechanism. Here, this theory was tested directly by asking 3.5- to 4-year-old preschoolers to complete one measure of spatial reasoning (modified from Hood, 1995) and three separate measures of inhibitory control (Day-Night, Dimensional Change Card Sort, and Frog-Monkey tasks) within a single laboratory session. Participants were grouped based on their inhibitory control abilities as indexed by the number of practice trials required to learn the rules of the Frog-Monkey task. For the group of children requiring less practice—presumably, those with more developed inhibitory control skills—performance on the spatial reasoning task was correlated positively with performance on the inhibitory control tasks. No such relationships were found for the group of children with less developed inhibitory control skills. These results support and refine the proposed theory on the role of inhibitory control on spatial reasoning by elucidating the developmental relationship between the two cognitive skills.

Hyejin Sul
How can DPFC employ social media to inform and motivate early childhood stakeholders to become active advocates of early childhood?
Research Advisor: Christina Gibson-Davis
Public Policy

Organizations, including non-profits like Durham's Partnership for Children, are shifting their media strategies to keep up with evolving technologies. But are these new methods actually worth the time and investment? The purpose of my community-based research project is to investigate the effectiveness of social media as a communication tool. My research question is: How can DPFC employ social media to inform and motivate early childhood stakeholders to become active advocates of early childhood? To answer this question, I surveyed and interviewed individuals that were already involved with the Partnership in order to determine how we might best communicate with them and to identify characteristics of potential supporters. Based on the findings of my research, I was able to design a social media strategy that recognizes the strengths and constraints of social media, and targets pre-motivated supporters and likely supporters with focused messages on early childhood efforts. The results of my study unearthed some trends about the way the Partnership could be using social media as a way to communicate and the impact it is having on early childhood stakeholders. For example, among Partnership supporters and stakeholders, Facebook is used primarily used for personal reasons—catching up with friends, looking for pictures, etc. Based on the data and on background research, I was able to make recommendations about how to focus the Partnership's social media strategy by targeting likely supporters by tapping into existing adjacent networks—immediate friends, neighbors, and colleagues who already have a vested interested in early childhood.

Kathie Sun
Analysis of the subcellular localization of GFP-tagged accessory subunit variants of DNA polymerase γ associated with mitochondrial disease
Research Advisor: William Copeland
Medical Psychology

Human mitochondrial DNA (mtDNA) is replicated by polymerase γ, a heterotrimer composed of a 140 kDa catalytic subunit (p140) and a 55 kDa dimeric accessory protein (p55). The nuclear genes POLG and POLG2 code the p140 and p55 subunits, respectively. The p55 accessory protein enhances DNA binding and promotes processive DNA synthesis, and thus plays an important role in the replication of genes located on the mtDNA that encode components of the electron transport chain and are required for oxidative phosphorylation and ATP generation. Mutations of the POLG2 gene that typically result in amino acid substitutions throughout the protein, including at the p55 dimer interface region and the C-terminal domain that interacts with the catalytic subunit, have been implicated in the pathogenesis of mitochondrial diseases. This project demonstrates that an engineered p55 tagged with green fluorescent protein (nGFP) is expressed and targeted to mtDNA when transfected into HEK293 cells and visualized in vivo using confocal microscopy. Using this tool we analyzed the subcellular localization of select disease-associated variant p55 subunits by comparing their nGFP fluorescent emissions to those of other mitochondrial stains and the wild-type protein. Overall, this study has enhanced our understanding of the pathophysiology of clinical mutations located in the p55 coding region. In particular, we demonstrate for the first time the requirement of the p55 mitochondrial targeting sequence for correct localization to the mitochondrial matrix and, specifically, the mtDNA. Additionally, two variants, L475DfsX2 and P205R, fail to localize to discrete regions containing mtDNA.

Divya Taneja

How do People Exercise Influence over their Own Implicit Motivations?

Research Advisor: James Shah
Psychology and Neuroscience

Goals are the foundation of human self-regulation. At any given time, there is a limit to how many of our goals are the level of conscious awareness. Therefore, the unconscious plays a huge role in how our goals are organized and prioritized in order to regulate our behavior. This project focuses on unconscious goals, and how regulating our exposure to cues in our environment can bring particular goals to the conscious level. We call this psychological process self-priming. In our study, we seek to find out to what degree people might be regulating their exposure to primes, even unconsciously. Also, we hope to find out what the potential consequences of self-priming are for individuals' ongoing self-regulation. To study this, we have designed a study with a 2x2 factorial design. The first manipulation is a health prime. To see whether participants self-prime, the second factor is foreknowledge of an eating task. We expect that those primed with a health goal and with the foreknowledge that there will be an eating task will self-prime. To measure this, we will have participants choose 6 posters from a set of 12 to place on the wall in front of them. 3 of these posters show unhealthy logos, 3 show healthy logos, and 6 show neutral logos. Depending on which posters are selected, we can see if participants self-prime. We will measure the effectiveness of the initial prime and the self-prime in the eating task, where we will record how much each participant eats.

Rong En Tay

Positive Feedback – A Means Of Maintaining The Robustness Of Cell-cycle Oscillations?

Research Advisor: Steve Haase
Biology

Cyclin/CDKs are commonly thought to be a core regulatory component of the eukaryotic cell division cycle; however, our lab has proposed an alternative model in which the cell-cycle transcriptional programme is regulated by a network of serially-activating transcription factors functioning as a cyclin/CDK-independent oscillator. In the absence of cyclin/CDKs, transcriptional oscillations are dampened, suggesting that cyclin/CDKs promote oscillation robustness. As cyclin/CDKs positively feed back into several transcription factors in the oscillator network, I hypothesise that positive feedback maintains the robustness of cell-cycle transcriptional oscillations.

To test this hypothesis, I replaced cyclin/CDK-mediated positive feedback with transcriptional positive feedback in Saccharomyces cerevisiae strains lacking B-cyclin/CDK activity. This was done by placing two distinct transcription factors (SWI5 and HCM1) within our network oscillator under the control of promoters of their respective target genes, SIC1 and NDD1. Thus, cyclin/CDK-independent positive feedback loops were engineered into the transcription factor network.

Changes in oscillation period and amplitude were then examined in synchronised yeast populations over time.
My data show that oscillations in S. cerevisiae strains with engineered transcriptional positive feedback exhibit decreased periods and increased amplitudes relative to oscillations in strains without transcriptional positive feedback. The partial restoration of oscillation robustness by transcriptional positive feedback is consistent with my hypothesis that positive feedback contributes to the maintenance of robust cell-cycle oscillations. Furthermore, my data also support the idea that a transcriptional network serves as the fundamental oscillator of the S. cerevisiae cell cycle, and may be relevant to the study of cell-cycle oscillations in other organisms.

Amberly Tenney
The Effect of Prior Knowledge on the Acquisition and Retention of Misinformation from Popular History Films
Research Advisor: Elizabeth Marsh
Psychology and Neuroscience

History educators often show popular films in the classroom, but these films can contain major historical inaccuracies. In two experiments, we investigated how the amount of prior knowledge students have before viewing these films effects their acquisition and retention of misinformation in the films. Participants read texts about historical topics, took a test, and watched corresponding film clips. Each text contained a target piece of information that contradicted the misinformation in the film clips. The initial test was used to manipulate how well participants knew the material presented in the texts before they were exposed to the misinformation. After a week delay, participants took a final test on the texts. When participants had prior knowledge about the target fact that was inaccurately represented in the film, they retained more of the correct information and did not acquire the misinformation. When participants had prior knowledge that supported the target fact, they also retained more of the correct information and acquired less of the misinformation; however, supportive prior knowledge was not as protective as target prior knowledge. Overall, these findings indicate that students would benefit from a strong background about a topic before they view a popular history film.

Jacob Tobia
Somewhere Down the Way: The Marion County Oral History Project
Research Advisor: Robert Korstad
Public Policy

This past summer, I was given the opportunity to conduct an oral history project in Marion County, SC. Marion County, SC is somewhere that most people only pass through on the way to Myrtle Beach. Located about an hour west of the beach, the county typifies the South Carolina low-country. The county is mostly poor, mostly rural, and dotted with small towns throughout. While it is rich in a conflicted, sometimes painful, and oftentimes joyful history, it is an area that has rarely been studied and a place where history is rarely reflected on. My goal in conducting life history research in Marion County is to bring this history to light through the lens of personal experience and to help facilitate dialogue in a community where dialogue is oftentimes rare.

Christine Tsai
Generating a fluorescently tagged Cd36 protein in zebrafish using BAC recombineering
Research Advisor: Michel Bagnat
Cell Biology

During development most internal organs are formed by the assembly of tubular structures made across polarized epithelial surfaces depending on the asymmetric localization of membrane proteins between apical and basolateral surfaces. Cellular processes such as protein sorting and trafficking are critical in the formation of tubular organs such as the gut. Cd36 is a polarized cell surface protein that may play a role in fatty acid and glucose metabolism and has been shown to localize to the apical surface of the gut epithelium in mice. To better understand the cellular mechanisms regulating this protein during tube formation we use the zebrafish gut as a model system due to its optically clear nature, genomic plasticity and rapidly developing embryos. To visualize the zebrafish protein Cd36, I created a modified bacterial artificial chromosome (BAC) tagged with a red florescent protein (RFP) marker to the C-terminal end of the cd36 gene. The recombinant construct was injected into single cell wildtype zebrafish embryos and screened for florescent expression during gut development (3-5 dpf). Transiently expressing zebrafish were then

screened for transgenesis and embryos carrying the transgene cd36::RFP were used for fluorescent confocal microscopy imaging. This transgenic line will allow us to trace the sorting and trafficking pathway of Cd36 throughout gut development in zebrafish embryos.

Arianna Uhalde
Empathy, Sympathy, and Donation Behavior Over Time
Research Advisor: Gavan Fitzsimons
Psychology and Neuroscience

In a two-part online study, we explore the effects of empathy and sympathy on donation behavior over time. We further the argument that empathy and sympathy are two distinct but related emotional responses: empathetic donors feel with victims, whereas sympathetic donors feel for victims (Escalas & Stern, 2003). We predict that individuals who self-report high empathy (vs. low empathy) will donate more at time 1, time 2, and overall. Similarly, we predict that individuals who self-report high sympathy (vs. low sympathy) will donate more at time 1, time 2, and overall. Lastly, we hypothesize that individuals who self-report high empathy and high sympathy (vs. high empathy/low sympathy; low empathy/high sympathy; and low empathy/low sympathy) donate more at time 1, time 2, and overall.

Kristie Vu
The Role of T-beta-RIII Ectodomain Shedding in Regulating TGF-beta Signaling in Breast Cancer Cells
Research Advisor: Gerard Blobe
Pharmacology & Cancer Biology

The transforming growth factor beta (TGF-beta) signal transduction pathway has both tumor-suppressing and tumor-promoting roles in different cellular contexts. The most commonly expressed TGF-beta receptor is the type III receptor (T-beta-RIII), which undergoes a process called ectodomain shedding. Ectodomain shedding is the cleavage of T-beta-RIII's extracellular domain from the cell membrane; this cleaved extracellular domain then resides in the extracellular space as soluble T-beta-RIII. Soluble T-beta-RIII binds and sequesters TGF-beta ligands and thus inhibits cancer progression in cancerous epithelial cells by hindering TGF-beta signaling. This reduced TGF-beta signaling leads to decreased cell migration, invasiveness, angiogenesis, and metastasis in several types of cancers, including breast cancer. However, the exact role of T-beta-RIII ectodomain shedding in regulating TGF-beta signaling is not well understood. My research thus investigated whether T-beta-RIII ectodomain shedding regulates TGF-beta signaling in breast cancer epithelial cells in vitro. In order to determine this, I expressed T-beta-RIII cleavage mutants that undergo reduced ectodomain shedding and a T-beta-RIII super-shedding mutant that undergoes increased ectodomain shedding in MDA-MB-231 (invasive human breast cancer) and HEK 293 (human embryonic kidney) cells. The level of TGF-beta signal transduction resulting from each mutant strain was then measured using Western blotting analysis. Although my preliminary results were not conclusive, they suggested that T-beta-RIII ectodomain shedding may in fact have a role in regulating TGF-beta signaling. Further elucidation of this regulatory role of T-beta-RIII ectodomain shedding will be significant in the development of a breast cancer treatment that modulates TGF-beta signaling via generation of soluble T-beta-RIII.

Jenny Wang
Emerging Bilinguals and Executive Function
Research Advisor: Makeba Wilbourn
Psychology and Neuroscience

Executive function, an umbrella term for goal-oriented behavior, encompasses inhibition, shifting, and updating. In the executive function research, bilinguals are a particular group of interest due to their cognitive management of two languages. This research has repeatedly found a bilingual advantage. However, most research focuses on crib bilinguals, leaving open the question of how bilingual input affects executive function. The current study explores emerging bilinguals, who are in the process of becoming bilingual, and .the bilingual input they receive. To address this question, we conducted a series of experiments with children enrolled in a Two-Way Language Immersion Program (TWLIP) and children enrolled in a traditional English-only program (TRAD). All children were given two executive function tasks. The findings revealed that children with more years of bilingual instruction (<1. 1, 2 years) performed significantly better on the cognitive inhibition and attentional control task. The TWLIP children did not show

any significant improvements in working memory or lexical access. However, children enrolled in the traditional, English-only program (TRAD) did not demonstrate a similar pattern of results. The results of the analyses confirmed that children who had one or more years of bilingual language experience in the TWLIP program performed significantly better on the cognitive inhibition and attentional control task compared to children who had less than a year's worth of exposure in the TWLIP program. Thus, these results provide insight into bilingual cognitive development with strong theoretical and practical applications.

Megan Welch
High Resolution Taphonomic Studies of Ophiuroids
Research Advisor: Alexander Glass
Earth and Ocean Sciences

Fossilization of organisms with a low preservational potential requires unusual environmental conditions. Taphonomic studies seek to delineate the chemical, physical, and biological factors that influence necrolysis, decay, biostratinomy, and diagenesis, ultimately contributing to fossilization.
Brittlestars (Phylum Echinodermata, Class Ophiuroidea) are ubiquitous in today's marine environments and they have been a key component of marine ecosystems since the early Paleozoic. This project presents high-resolution, ossicle-scale observations of decay rates and chronology for the extant suspension-feeding ophiuroid Ophiothrix angulata. The decay of specimens was carefully monitored hourly for several weeks under varying temperatures, levels of agitation, and dissolved oxygen contents.
Depending on lab conditions, initial signs of deterioration began between 12 and 36 hours. Soft tissues deteriorated first with the tube feet, then arm tissue, stomach gland tissue, spine ligaments, and finally intervertebral muscles. Skeletal disarticulation is generally in the following order: spines, lateral arm ossicles, dorsal and ventral arm ossicles, and central disk skeleton. Tube feet, and overall timing of deterioration, began fastest under water-agitated conditions and was slowest under anoxic conditions. Paramecia were most prevalent on specimens that developed heavy microbial mats, which occurred most on the ophiuroids under oxygenated water conditions. Significant disruption of the entire skeleton occurred when decay gases built up in the organic rich stomach folds and caused the overturning or floatation of the carcass. Furthermore, anoxic conditions retarded the decay rate by a few hours, but ultimately neither initial nor developing anoxia appears to slow decay significantly compared to well-oxygenated conditions.

Yu-Po Wong
Building a Quantum Key Distribution System
Research Advisor: Daniel Gauthier
Physics

One early and important application of the emerging field of quantum information is quantum key distribution (QKD). The primary difference between quantum and classical key distribution is that QKD uses a fundamental property of quantum mechanics, known as wavefunction collapse, to increase its performance over existing classical communication systems. Quantum key distribution has been proven to be fundamentally secure against eavesdropping, and may have important uses in securing information communicated between parties, such as in the smart power grid or in the financial industry. The main goal of this project is to build a QKD system for use in an advanced physics laboratory course. In this project, I use the polarization of photons to entangle information. The polarization-entangled photons are created from a nonlinear optical process known as spontaneous parametric down-conversion (SPDC). Experimentally, I send a strong laser beam (pump) into a nonlinear crystal where there is a small probability that the pump photon is annihilated and two lower-energy photons with correlated polarizations are created. I characterize the quality of quantum entanglement from SPDC and implement methods to improve the quality of the entanglement, which is important for generating a key with the highest fidelity and rate. I will describe the experimental system, how it is used to distribute a cryptographic key, and the performance of the QKD system.

Mengyou Wu
Genetic Diversity of Branchipolynoe pettiboneae in Manus Basin Hydrothermal Vents
Research Advisor: Cindy Van Dover
Nicholas School of the Environment

Hydrothermal vents are ephemeral and in this dynamic environment, vent organisms with high

dispersal have higher success. Dispersal is a key factor for population recovery after catastrophic disturbance such as a volcanic eruption or mineral extraction. One area planned for mineral extraction is Manus Basin. The dispersal potential of one Manus Basin vent polychaete species, Branchipolynoe pettiboneae , was inferred from genetic statistics. Portions of the CO1 and 16S genes from B. pettiboneae were used to determine haplotype frequencies at two sites separated by ~ 40 km [Solwara 8 (n = 28 individuals) and South Su (n = 27 individuals)]. We found no genetic differentiation between the two site and infer high levels of gene flow in Manus Basin on this spatial scale. The population of B. pettiboneae in Manus Basin is likely undergoing demographic expansion, suggesting that repopulation following a disturbance is possible .

Eddie Wu
Pictures of
Research Advisor: William Noland
Art, Art History, Visual Studies

This semester, I collected many photographs in the Triangle Area based on visual interest. That is, there is no unifying metaphor or conceptual point that my photographs illustrate; rather, the subject matter and colors in these photographs generate interest. In this presentation, I show several photographs from my project.

Mengya Wu
Genetic Diversity of Branchipolynoe pettiboneae in Manus Basin Hydrothermal Vents
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Hydrothermal vents are ephemeral and in this dynamic environment, vent organisms with high dispersal have higher success. Dispersal is a key factor for population recovery after catastrophic disturbance such as a volcanic eruption or mineral extraction. One area planned for mineral extraction is Manus Basin. The dispersal potential of one Manus Basin vent polychaete species, Branchipolynoe pettiboneae, was inferred from genetic statistics. Portions of the CO1 and 16S genes from B. pettiboneae were used to determine haplotype frequencies at two sites separated by roughly 40 km [Solwara 8 (n = 55 individuals) and South Su (n = 54 individuals)].

Diana Xie
Activation of CAMKII during DFP toxicity mediates cell death in human neuroblastoma SH-SY5Y cells
Research Advisor: Mohamed Abou-Donia
Pharmacology & Cancer Biology

Organophosphate pesticides have been classically described as inhibitors of acetylcholinesterase (AChE) activity. However, there is now more evidence supporting the hypothesis that these compounds also act through non-cholinergic pathways, particularly those related to inducing cell death. This experiment investigates the effect of organophosphate diisopropyl phosphorofluoridate (DFP) dependent-activation of CAMKII in human neuroblastoma SH-SY5Y cells. Effects on differentiation will be assessed through monitoring morphological changes. It is hypothesized that DFP will increase CAMKII expression in SH-SY5Y. Furthermore, induced-differentiation of SH-SY5Y by retinoic acid (RA) will decrease the number of neurite-bearing cells compared to control treated with RA that will show increased number of neurite-bearing cells. Cell death will be measured using MTT cell assay, and rates of apoptosis will be compared between the control and experimental groups. If preliminary data supports this hypothesis, it will suggest that CAMKII may play a crucial role in cell death/survival during DFP treatment.

Jianing Xie
Two and Two: An Anthropological Study of Protestant Conversion in Guatemala from 1930-1960
Research Advisor: John French
History

David Stoll refers to Protestantism in Latin America as an –inevitable reformation growing out of Catholicism itself." The implications of this statement are complex, but it is clear that Protestantism in Guatemala in the 1950s rose as an alternative due to the lack of hegemonic Roman Catholicism. The Catholic Church's ability to maintain a vertical power structure was in peril due to decentralization of diocese power and political polarization at the national level. Especially after the coup of leftist president Jacobo Árbenz in 1954, the Catholic hierarchy began to divide into camps characterized by varying degrees of nationalism, religious orthodoxy, and social action.

Additionally, new proselytization methods focused on education and poverty reduction rarely reached villages in the rural highlands. What existed in the stead of orthodox Catholicism was a diverse mix of indigenous religion and natural belief systems which found stability in Catholicism as a venue for communal organization. Protestantism, which first came to the country in the 1880s, found potential for conversion within this background. This research paper studies ethnographies in Guatemala that have done their fieldwork between 1932-1962, in order to explore the status of Protestantism preceding the boom in evangelization during the 1960s and 1970s. It proposes three community models that center on religious, racial-political, and rural-urban differences, and how each of these displayed the absence of hegemonic Catholicism. Thus, although Guatemalan Protestants initially faced alienation due to their abandonment of the dominant religious system, their response is also natural as people seeking individual stability and opportunity.

Amy Xu
The Role of Drebrin in Skeletal Muscle Regeneration and Repair
Research Advisor: Jonathan Stiber
Cardiology

Muscle fiber formation during development and post-injury repair involves the proliferation, migration, and fusion of muscle stem cells known as myoblasts. These events necessitate the calcium (Ca2+)-dependent reorganization of the myoblast actin cytoskeleton, a process that is modulated by diverse proteins including the Transient Receptor Potential (TRP) channels, Homer scaffold proteins, and various actin-binding proteins. However, the detailed mechanisms linking TRP channel activation (and subsequent Ca2+ influx) with cytoskeletal remodeling remain unclear. Our recent findings indicate that the actin-binding protein drebrin is localized in the subsarcolemma of skeletal muscle tissue and is dramatically upregulated after cardiotoxin injury. Mice deficient in drebrin were viable, but showed significant lethality immediately after birth. As drebrin was also found to impact expression levels of multiple proteins involved in Ca2+ signaling and cytoskeletal rearrangement, we postulate that drebrin is a critical component of channel regulation and actin remodeling processes. Understanding drebrin's various functions may provide deeper insight into muscle fiber development and repair, and improve current therapies for a range of degenerative myopathies.

Sunhay You
The Invisibility of Caregiving Work and its Adverse Impacts on Women
Research Advisor: Alma Blount
Public Policy

My research and understanding of domesticity raises the questions: How do we shift away from the ideology of domesticity that renders caregiving work invisible and work toward de-gendering and legitimizing care-giving work? Who should take on this challenge so we can move towards a more integrated and inclusive understanding of the value of caregiving work, particularly in divorce courts? What are possible structural/policy changes that can address gender inequity in the home and the workplace, the affects of which culminate in gender-inequity in divorce courts where more and more women and children are ending up in poverty?

Tun Jan Young
Trends in sea ice cover across the North Atlantic: implications for harp and hooded seals
Research Advisor: David Johnston
Nicholas School of the Environment

Ongoing changes in ice conditions pose significant challenges for harp and hooded seals, which use sea ice as a platform on which to give birth and nurse their pups. It is known that sea ice dynamics in harp and hooded seal breeding locations are governed largely by the phase and amplitude of the North Atlantic Oscillation (NAO). In this study, we examined the coupled relationship between the NAO and satellite-derived measures of sea ice cover during February and March 1979 – 2011 in areas where harp and/or hooded seals traditionally reproduce. We confirmed a consistent positive correlation between the NAO Index and annual sea ice in the regions located in the Northwest Atlantic off eastern Canada. However, sea ice cover in the White Sea harp seal region between Norway and Russia was negatively correlated with the NAO, and the West Ice region off eastern Greenland showed a consistent decline across the entire time series that is indicative of longer-term climate change. A mixed effects linear regression analysis of sea ice cover in the same breeding regions

revealed a significant annual decline in sea ice cover across the entire North Atlantic, regardless of regional NAO effects. These results indicate that both short-term and longer-term climate variability are affecting the breeding regions of harp and hooded seals. Management strategies for these and other ice-breeding seals should account for local climate effects and larger-scale climate trends. This is especially important for the West Ice stock of hooded seals, which has decreased in number by up to 90% over the last 50 years and was listed as "vulnerable" by the IUCN in 2008.

Tian Yuan
Scaling of Jaw-Muscle Architecture in New World Monkeys
Research Advisor: Andrea Taylor
Evolutionary Anthropology
New World Monkeys (infraorder: Platyrrhini), differ dramatically in adult body size, feeding behavior and diet. Variation in jaw muscle morphology has been functionally linked to feeding behavior and diet but is not fully understood in regards to size. Looking at variables related to ingestion and mastication, I further extend the work of Anapol et al. (2009) by evaluating scaling relationships of PCSA and fiber length on load-arm (jaw and condyle-M1 length) measurements. Superficial masseter and temporalis muscles of eighteen platyrrhine species (n=102) were weighed and measured for fiber length and calculation of PCSA, indicators of muscle excursion and force, respectively. Using Systat, mean data was plotted to illustrate variation in fiber lengths and PCSA, signifying a correlation between architecture variables and size. Jaw length was highly correlated to condyle-M1 length and body mass, indicating its use as a proxy for either variable. Ordinary least squares regression (OLS) slopes largely demonstrated negative allometry (< 1.0), and correlations were significant ($p < 0.01$), indicating that as platyrrhine body size increases, muscles have less excursion and produce relatively less force. Reduced major axis (RMA) slopes additionally included cases of isometry and positive allometry, and results should be taken with caution. Functional variations found after allometric analyses support previous studies of feeding behavior and diet (e.g. C. apella's large PCSA correlate to its consumption of hard nuts) and encourages further research on platyrrhine functional morphology (e.g. Alouatta). Data could be improved with more samples and control for phylogenetic non-independence.

Lauren Zalla
Embodied History: Breastfeeding Beliefs and Practices in Haiti
Research Advisor: Alma Blount
Public Policy

This project works at the intersections of anthropology, history and public health to explore breastfeeding beliefs and practices in Haiti. It draws on survey and ethnographic research conducted from May-July 2011 in Leogane, the epicenter of the January 12, 2010 earthquake. An analysis of this data offers a novel summary and description of breastfeeding rates and beliefs in Haiti.
Taking into account the history of wet nursing on colonial plantations, as well as interviews with midwives, vodou practitioners, and foreign aid workers, I argue that breastfeeding promotion campaigns too often ignore the role of structural violence in determining breastfeeding practices. I investigate how the United States and Europe have performed and exacerbated structural violence in Haiti, from colonization to contemporary foreign policy. My project concludes with practical implications of this analysis for foreign aid organizations seeking to promote breastfeeding in Haiti.

William Zhang
Directed evolution of Cryptococcus neoformans in low-nutrient media generates a stable phenotype that differentially interacts with murine macrophages
Research Advisor: Anastasia Litvintseva
Molecular Genetics & Microbiology

Cryptococcus neoformans var. grubii is an opportunistic human pathogen that causes significant morbidity and mortality among immuno-compromised patients, particularly those with HIV/AIDS. Infection is acquired by inhalation, and if not contained by the local immune response, spreads from the lungs to other parts of the body, preferentially to the central nervous system, where it causes meningitis. Other researchers utilized methods of reverse genetics and identified several factors that are required for virulence, but have not uncovered the fundamental mechanisms that enable C. neoformans to infect

and colonize mammals. Here, we employ a forward genetic approach and apply experimental evolution to study virulence of C. neoformans. To test our hypothesis that ability to adapt to a nutrient-limiting environment can enhance virulence, we selected several avirulent strains and propagated them for approximately 250 generations in microbiological media containing limiting amounts of the essential nutrients, such as glucose, nitrogen, iron and copper. We then tested the stability of the acquired phenotypes by growing these evolved strains on rich media for one week (five passages), and assayed their ability to grow in the nutrient-limiting conditions to which they were originally adapted. Our results indicate that these strains retain their superior ability to proliferate in nutrient-poor media even after propagation on rich media. Further, results from in vitro murine macrophage assays suggest that our evolved strains may be preferentially phagocytized and/or have an enhanced ability to proliferate within macrophages. Our ongoing work focuses on separating these two potential effects and studying each in isolation.

Alice Zhang
Nutrition of Resettled Bhutanese Refugee Children in North Carolina
Research Advisor: Suzanne Shanahan
Sociology

For 18 years, approximately 107,000 Bhutanese refugees lived in refugee camps in Nepal. In 2008, the Bhutanese refugees began the process of resettlement. As of 2011, 43,000 Bhutanese refugees have resettled in the United States, with at least 1,800 Bhutanese refugees in North Carolina. Faced with an environment of greater food options, different means of obtaining food, and a new food culture, the Bhutanese refugees may alter their food consumption patterns. Their new food consumption patterns can impact their nutritional intake and body mass index (BMI), resulting in a change in their nutritional status.
Given that resettled Bhutanese refugee children are consuming new food items through the school lunches, I examined their nutritional status. I focused on the Bhutanese population in North Carolina, particularly in Durham and Raleigh. Data collection began in the summer of 2011, through an initial measurement of their BMI and an administration of a food frequency questionnaire. During a six-month follow-up in January, a second BMI measurement was taken and a 24-hour dietary recall was conducted. Further interviews will be conducted with resettled Bhutanese families to gain an understanding of their food culture, attitudes toward food, and household food security. As more Bhutanese refugees continue to resettle, the findings will provide insights on the dietary acculturation process, particularly in the resettled refuge children. Practically, the information could identify which interventions are beneficial and what improvements are needed.

Tim Zhang
Silver-Coated Copper Nanowires for Transparent, Flexible Electrodes
Research Advisor: Benjamin Wiley
Chemistry

Transparent electrodes made with indium tin oxide films are found in many electronics, but they are expensive, inefficiently deposited and brittle. Electrodes made with a film of copper nanowires are an alternative that maintain comparable levels of sheet resistance and light transmittance. Copper is much less costly, and the film's synthetic and deposition methods allow for high throughput. Another advantage is that the nanowires retain conductivity after being flexed over 1000 times. However, the synthesis of copper nanowire electrodes requires a rate-limiting annealing step, which is a significant input of energy. Additionally, the film exhibits a reddish tint, rather than the gray color optimal for electronic displays. We believe that coating the copper nanowires with silver will resolve both of these problems. Silver was deposited onto the copper nanowires using a variety of methods. A thin film was then produced on a glass slide using a Meyer rod. The silver reduces the level of red color and greatly lowers the average sheet resistance of the film compared to copper nanowires without annealing. After finalizing the coating procedure and the optimal amount of silver to use, the next part of the study will focus on the retention of conductivity when the coated nanowires are exposed to air and heat, and when bent upon flexible substrates.

Lucy Zhang
Bacteriophage as a Novel Disinfection Technology
Research Advisor: Claudia Gunsch
Civil and Environmental Engineering

Many bacteria have developed resistance to antibiotics and traditional physicochemical disinfectants. Therefore, a better method for controlling such pathogenic species, especially in engineering systems and health settings, is needed. Lytic bacteriophages, viruses that specifically destroy bacteria, have long been overlooked since the advent of antibiotics, and may be a solution. We isolated three unique phages from the environment for each of the model species Bacillus cereus, Escherichia coli, and Pseudomonas aeruginosa, and evaluated their ability to control bacterial culture growth in comparison to that of bleach, ampicillin, and kanamycin. The bacteriophages proved to be as or more effective in maintaining a low OD620 value as the traditional disinfectants for up to 24 hours, over a range of multiplicities of infection. These results suggest that phages are a promising novel disinfection technology that is furthermore environmentally and economically sustainable. Future studies should examine their characteristics through electron microscopy and molecular studies and explore their potential in genetic engineering and other applications.

Johnny Zhao
Evaluation of Carcinoembryonic antigen (CEA) as a Target for Inhibiting Colorectal Cancer Cell Migration: An Immunotherapy Approach
Research Advisor: Gayathri Devi
Surgical Sciences

Immunotherapy has become an attractive treatment for various types of cancers due to its specific targeting of cancer antigens. One particular antigen of interest in colorectal cancer is Carcinoembryonic antigen (CEA), a glycoprotein involved in cell adhesion and which has been found in the serum of individuals with colorectal carcinoma. The PANVAC phase I clinical trial is being conducted on patients with both CEA+ and CEA- colorectal cancer. A pox viral vector containing the CEA gene construct is being administered to the subjects to induce cell-mediated immunity against CEA. The mechanism of CEA immunotherapy is unknown and we hypothesize that sera containing antibodies against CEA work in part by inhibiting cancer cell motility and migration.

Grace Zhou
Understanding and Evaluation of the Mental and Physical Well-Being of Orphaned and Vulnerable (OVC) in Naama, Uganda
Research Advisor: Sumi Ariely
Global Health

This study assesses the mental, emotional, and physical well-being of institution-based orphaned and vulnerable children (OVC), community-based OVC, and non-OVC who attend Naama Millennium Preparatory School. In addition, it compares the standards of care such as healthcare, child labor, and nutrition of these 3 groups in order to create a comprehensive picture of the challenges OVC in the community face. The results showed that although the physical and cognitive well-being between the 3 groups did not differ significantly, community-based OVC had higher levels of emotional trauma, received less adequate healthcare, and spent more time on household chores than the others.

Sicong Zhou
How pre-transplant social relationships and support in patients undergoing hematopoietic stem cell transplant is associated with post-transplant physical, functional, and emotional well-being
Research Advisor: Rebecca Shelby
Psychiatry

Hematopoietic stem cell transplantation (HSCT) is a prevalent treatment for serious diseases, but often has severe physical and emotional side effects and consequences. HSCT also impairs the quality of life (QOL) in patients. Past research indicates an important role for social support in patient outcome and quality of life. This study examines how pre-transplant social relationships and support in patients undergoing hematopoietic stem cell transplant is associated with post-transplant physical and emotional well-being. The study uses data from 52 patients, collected at pre-transplant, discharge to home, and 3 months post-transplant. The results indicate that greater pre-transplant social support is significantly correlated with greater physical, emotional, and functional well-being. The results from this study have important clinical implications and will help health professionals improve patient care and outcomes.