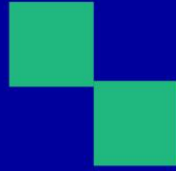


VISIBLE



THINKING

**Undergraduate
Research Symposium**

***Monday,
April 22, 2019***

**Penn Pavilion
10 A.M. - 2 P.M.**

**UNDERGRADUATE RESEARCH SUPPORT OFFICE
TRINITY COLLEGE OF ARTS AND SCIENCES,
DUKE UNIVERSITY**

VISIBLE



THINKING

**PENN PAVILION
Monday, April 22, 2019
10:00 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**

**Sarah Russell, Director
Jen Fry, Program Coordinator
Brittany Kelly, Staff Assistant
undergraduateresearch.duke.edu
Acknowledgments**

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who provided generous assistance including:
The Duke Undergraduate Research Society The
Academic Deans of Trinity College of Arts and
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Research and Fellowship Programs
Funding Provided by Trinity College of Arts &
Sciences**

Undergraduate Research Support at Duke University

Duke undergraduates have received support from the following College and University programs in AY 2018-2019:

All Disciplines:

**ACCIAC Summer Research Fellowship Baldwin Scholars
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Awards Mellon-Mays Undergraduate Fellows Global Education
Office Summer Fellowships Office of University Scholars and
Fellows Office of Summer Session Fellowships
Trinity College Deans' Summer Research Fellowships
Undergraduate Research Support Grants and Assistantships**

Humanities and Social Sciences:

**Asian/Pacific Studies Institute East Asia Projects
Asian & Middle Eastern Studies Awards
Benenson Awards in the Arts Center for Latin American and
Caribbean Studies
Duke Brazil Initiative
Center for Documentary Studies Awards
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DukeEngage Independent Projects
Duke Global Health Institute
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Ethics Summer Fellowships Duke University Center for
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History Department Grants Economics Department Ecoteach
Grants Vice Provost for the Arts – Creative Arts Grants
Psychology Vertically Integrated Partners Program
Research in Practice Program - Engage Public Policy Summer
Research Fellows Program Schiff Family Foundation Summer
Research Fellowships**

Undergraduate Research Support at Duke University

Duke undergraduates have received support from the following College and University programs in AY 2018-2019:

Humanities and Social Sciences (cont):

Service Opportunities in Leadership Program Women's Studies Undergraduate Grants

Natural & Quantitative Sciences and Engineering:

Biochemistry Department Summer Fellowships
Chemistry Summer Research Fellows Computer Science Undergraduate Research Fellowships
Duke BioCore Scholars
Duke Data+ Fellowships Duke Clinical Research Institute NC Collaborative Duke Skin Disease Research Fellowships
Evolutionary Anthropology Molly Glander Awards Marine Lab Rachel Carson Research Fellows Molecular Genetics and Microbiology Summer Fellowships
Genomics & Computational Biology Summer Fellowships Goldman Sachs Summer Research Fellowships Howard Hughes Research Fellows Program Mathematical Biology Summer Research Program
NSF-PRUV - Department of Mathematics Physics - High Energy Physics Program Physics Department Summer Fellows Program Pratt Fellows Program Summer Neuroscience Program Summer Undergraduate Research in Pharmacology Research Internships in Toxicology & Environmental Health

Student	Advisor	Research	Title
Anika Agarwal	Jason Somarelli	Biological Sciences/ 12pm-1pm	Development and Testing of a CRISPR/Cas9-based Lineage Tracing System to Track Metastatic Progression and Therapeutic Resistance
Andrea Ball	Nancie MacIver	Biological Sciences/ 10am-11am	Metabolic mechanisms by which interleukin-6 (IL-6) regulates T cell differentiation and function
Alisa Bedrov	Mark Leary	Social Sciences- Graduation with Distinction/ 11am-12pm	What You Don't Know Might Hurt Me: Keeping Secrets in Interpersonal Relationships
Naime Benitez	Tanya Chartrand	Social Sciences- Graduation with Distinction/ 10am-11am	Working harder not smarter: Arousal's influence on Parkinson's Law
Tatyana Bidopia	Nancy Zucker	Graduation with Distinction/ 11am-12pm	Food for Thought: How Skipping Lunch and Psychiatric Illness Affect Cognition
Katherine Bishara	Nicholas Katsanis	Biological Sciences/ 10am-11am	Evaluation of the centrosomal protein, CEP76 as a candidate cause for Bardet-Biedl Syndrome
Sean Bissell, Zoe King, Sahil Sandhu, Michelle Wong	Jessica Sperling	Social Sciences/ 1pm-2pm	Facilitating Integration of Electronic Patient-Reported Outcomes into Clinician Workflows: A Qualitative Study
Jordyn Blake	Nimmi Ramanujam	Other: Global Health/ 1pm-2pm	Inequitable Risk: Race and Ethnicity as Predictive Factors of High-Grade

			Precancerous Cervical Lesions
Bari Britvan	Michael Tomasello	Psychology-Graduation with Distinction/ 1pm-2pm	"Simon Says": Young children's understandings of norms modeled by peers
Jason Brovich	Sarah Gaither	Psychology Graduation with Distinction/ 10am-11am	Searching for Inclusive Progress: Whites React to Increasing Diversity
Brandon Bui	Steven Malcolmson	Physical Sciences/ 1pm-2pm	Allylic Alkylation of Azadienes
Angela Caldwell	Ruth Day	Social Sciences/ 1pm-2pm	Understanding Medical Devices: Simulating A Real-World Situation
Phoebe Caplin	Rita Svetlova	Psychology Graduation with Distinction/ 1pm-2pm	To Snack or Not to Snack? Children's Delay of Gratification in the Presence of Peers
Andy Chen	Qiu Wang	Physical Sciences/ 11am-12pm	Scoping the Copper-Catalyzed Aminooxygenation of Alkenes and Conjugated Dienes
Vivian Chen	Ornit Chiba-Falek	Biological Sciences/ 10am-11am	Characterizing the neuronal aging phenotypes of the SNCA A53T mutation in hiPSC-derived neural progenitor cells
William Chen	Cagla Eroglu	Biological Sciences/ 10am-11am	What is the Role of Muller Glia on Retinal Synapse Formation and Function?
Natalie Chin Wen Yu	Janet Bettger	Other: Global Health/ 10am-11am	So You Think You Can Accelerate? A Qualitative Study of Accelerator Program Design and Perceived Helpfulness to Scaling Healthcare Innovation

Rachel Cohn	Brian Silliman	Community Engaged Research/ 10am-11am	Small-scale, big impact? The social and ecological effects of small-scale MPAs in Palau
Amanda Conti	Brandon Schickling	Biological Sciences/ 10am-11am	Smooth Muscle Cell MicroRNA-9 is Transcriptionally Regulated by MicroRNA-25 in Vascular Disease
Margaret Darko	Katya Wesolowski	Community Engaged Research/ 10am-11am	Theatre of Health: An Ethnographic Exploration of Female Physician Well-being and the Arts in Accra, Ghana
Elizabeth Delgado	Blanche Capel	Biological Sciences/ 10am-11am	Generation of Gonad Organoids using Embryonic Progenitors
Natasha Derezhinski-Choo	Dominika Baran	Social Sciences/ 10am-11am	Social Networks and Plurilingualism: A study in the Kabiye speech community
Amika Ekanem/Annika Sharma	Christine Drea	Biological Sciences/ 10am-11am	Oxytocin receptor antagonist effects on promiscuous Eulemur
Morgan Ferrans	Makeba Wilbourn	Psychology Graduation with Distinction/ 12pm-1pm	What's in a Face? Facial Cues Facilitate Emotion-word Learning
Gianna Giordano	Kathryn Whetten	Social Sciences/ 10am-11am	Building a Trauma-Informed Foster Care System: Giving Foster Parents the Tools to Help Children Heal
Jeffrey Gu	Ornit Chiba-Falek	Biological Sciences/ 12pm-1pm	SNCA Intron 1 Methylation in Post-Mortem Human Brain Tissues Using Fluorescent Activated Nuclei Sorting (FANS)

Hana Hajda	Makeba Wilbourn	Psychology Graduation with Distinction/ 12pm-1pm	Looking at the Big Picture: How Children's Family Drawings Differ Across Cultures
Haley Hedrick	Timothy Strauman	Behavioral Sciences/ 12pm-1pm	Who You Are, Who You Wish You Were, and Who You Should Be: How Augmented Attained Goal Priming May Be Used Therapeutically
Annabella Helman	Marcella Kelly	Biological Sciences/ 12pm-1pm	Frequency of Scavenging Activity Among Carnivore Species
Katherine Herrmann	Bridgette Hard	Psychology-Graduation with Distinction/ 12pm-1pm	Stressed for Success: An Anxiety Reappraisal Video Intervention for Undergraduates
Bing Ho	Paul Agris	Biological Sciences/ 10am-11am	The Role of Codon Usage Bias in Fine-Tuned Expression of Proteins Integral to Cardiac Physiology
Gvantsa Ivanishvili	Michael Tomasello	Psychology Graduation with Distinction/ 11am-12pm	Children Creating Rules: A Comparison Between Individual and Joint Commitments
Anna Jenkins	Bridgette Hard	Psychology-Graduation with Distinction/ 1pm-2pm	Worried Sick: The Impact of Student's Stress Mindsets on Health and Productivity
Shiyu Jing	Herman Nijhout	Biological Sciences/ 12pm-1pm	Developmental regulation of wing size and shape in Lepidoptera
Trinity Johns	Sarah Gaither	Social Sciences/ 10am-11am	Racial Prejudice and Essentialism in Elite University Traditions
Jill Jones	John Evans	Community Engaged Research/ 10am-11am	Expressive Writing for Resilience: Writing to Heal

Jill Jones	Eric Thompson	Biological Sciences/ 10am-11am	Inhibiting Abelson (ABL) family kinase activity as a potential treatment for leptomeningeally disseminated medulloblastoma
Kushal Kadakia	David Kirsch	Biological Sciences/ 1pm-2pm	Metabolic Modulators of Soft Tissue Sarcomas
Celia Kohler	Rita Svetlova	Psychology-Graduation with Distinction/ 10am-11am	Linking Parenting Style to Parenting Behaviors & Child Helping Behavior
Shourya Kumar	Ashutosh Chilkoti	Other: Biomedical Engineering/ 10am-11am	Development and validation of a point-of-care test for liver cancer
Eliana Lauder	Karen Murphy	Psychology-Graduation with Distinction/ 1pm-2pm	Seeing through the enemy's eyes: Using virtual reality to increase empathy in the Palestinian-Israeli conflict
Nathan Liang	Bridgette Hard	Behavioral Sciences/ 1pm-2pm	Mapping the Structure of Metaphorical Lay Theories in Education
Angela Liu	Amanda Hargrove	Biological Sciences/ 11am-12pm	The Development of a High-Throughput Differential Scanning Fluorimetry Method to Identify Small Molecule Probes for the MALAT1 Triple Helix
Kiera Lunn	Megan Holmes	Biological Sciences/ 12pm-1pm	Muscle Fiber Phenotype Distribution and Size Across Papionins
Siera Lunn	Christine Drea	Biological Sciences/ 12pm-1pm	Exploring variability in the skin microbiome by examining hormonal effects in Coquerel's sifakas (<i>Propithecus coquereli</i>) and ring-tailed lemurs (<i>Lemur catta</i>)

Kara Madey	James Davis	Other: Smoking Cessation/ 11am-12pm	Predictors of Smoking Behavior and Medication Adherence
Jesse Mangold	Sallie Permar	Biological Sciences/ 1pm-2pm	Characterization of viral evolution and rebound in a preclinical model of pediatric HIV therapy
Julia Marshall	Gustavo Silva		
Emily Marun	James Davis	Other: Clinical Research/ 1pm-2pm	An Evaluation of Patient Distress and Assertiveness during Lung Cancer Screening Process
Madison Mastrangelo	Jennifer Lansford	Social Sciences/ 12pm-1pm	A Policy Analysis of No Hit Zones: What are barriers to No Hit Zone implementation?
Hannah McDaniel	Francis Keefe	Psychology- Graduation with Distinction/ 12pm-1pm	Parenting concerns, psychological distress, and relationship satisfaction in parents coping with cancer
Jonathan Michala	Alex Watson	Physical Sciences/ 10am-11am	Edge states in disordered media and the Clifford index of three almost- commuting matrices
Jaewon Moon	Katherine Franz	Physical Sciences/ 10am-11am	Understanding how specific histidine residues and their modifications modulate chemical properties of Cu-binding peptides
Ernesto Morfin Montes de Oca	Anne West	Biological Sciences/ 11am-12pm	Using dCas9 for Functional Epigenomic Editing of Arc
Arjun Nanda	Emily Derbyshire	Biological Sciences/ 1pm-2pm	A potential anti-malarial weapon: understanding microbial dynamics in a 1:1 ratio
Mahnoor Nazeer	Rita Svetlova	Behavioral Sciences/ 10am-11am	Friend or Foe? Building Empathy Across Demographics

Stephanie Ng	Nancy Zucker	Psychology-Graduation with Distinction/ 10am-11am	The Clash of Culture and Cuisine: Conflicting Expectations and Disordered Eating in Chinese Adolescent Women
Julia Nicholas	Nancy Zucker	Psychology-Graduation with Distinction/ 1pm-2pm	The Weight of Stigma: The Effects of Internalized Weight Bias on Eating Behaviors in Young Adults Across the Weight Spectrum
Moreen Njorge	Megan Huchko	Community Engaged Research/ 12pm-1pm	Using GIS Spatial Mapping to Enumerate the Risk of Loss-to-Follow up for Cervical Cancer Treatment in Western Kenya
Melina Nolas	Susan Alberts	Biological Sciences/ 12pm-1pm	Strategies for inbreeding avoidance in the absence of dispersal: do fathers and daughters avoid breeding in baboons (<i>Papio cynocephalus</i>)?
Damilola Oke	Nancy Zucker	Behavioral Sciences/ 11am-12pm	The Company You Keep: The Relationship between Friendship Qualities and Mental Health among College Students
Margo Orlen	Marc Caron	Biological Sciences/ 10am-11am	Characterization of the dopamine D2 receptor internalization and signaling using BRET
Christiana Oshotse	Cheryl Lin	Behavioral Sciences/ 12pm-1pm	Self-Efficacy and Adherence Behaviors in Rheumatoid Arthritis Patients
Ajile Owens	Randall Kramer	Social Sciences/ 11am-12pm	Understanding Social Networks for Disease Transmission and Information Interventions in Rural Madagascar

Ellen Pasquale	Kathy Sikkema	Psychology-Graduation with Distinction/ 1pm-2pm	Showing up Isn't Enough: External Motivators are Required for Childhood Obesity Intervention Success
Sabriyya Pate	Robert Korstad	Community Engaged Research/ 1pm-2pm	Applied Conflict Resolution Frameworks in the Nigerian Healthcare Leadership Space
Sera Pekel	Scott Huettel	Psychology-Graduation with Distinction/ 10am-11am	Humanization in the Trust Game: Beliefs mediate effect on prosocial behavior
Anna Petterson	Sarah Gaither	Social Sciences/ 1pm-2pm	The Effect of Social Exclusion on Multiracial Identity
Bryce Polascik	Dilraj Grewal	Biological Sciences/ 1pm-2pm	Association of Optical Coherence Tomography Angiography Parameters with Age and Gender in Normal Older Adults
Ivana Premasinghe	Ornit Chiba-Falek	Biological Sciences/ 1pm-2pm	Single-Cell Analysis and Gene Expression Profiles across Alzheimer's Disease Pathology through Fluorescence-Activated Nuclei Sorting (FANS) Methods
Elena Puccio	Katherine Franz	Physical Sciences/ 10am-11am	Synthesis of a I^2 -Lactamase-Activated Prochelator Based on Clavulanic Acid Core
Malavika Puri	Amanda Hargrove	Biological Sciences/ 12pm-1pm	Development of a High-throughput Screen and an RNA-focused Small Molecule Library to Target the Long Noncoding RNA MALAT1
Khaila Ramey-Collier	Makeba Wilbourn	Psychology-Graduation with Distinction/ 10am-11am	Mommy, Will You Read To Me? Cultural Effects on Story Time between Mothers and Infants

Leah Ramsaran	Brian Hare	Behavioral Sciences/ 1pm-2pm	Can playful learning increase success in Canine Good Citizen training?
Justine Rutter	Kris Wood	Biological Sciences/ 1pm-2pm	Defining and leveraging genetic trade-offs to selectively target drug resistance in acute myeloid leukemia (AML)
Natasha Schmeling	Moria Smoski	Humanities/ 10am-11am	The Effects of DBT Skill Use on Anxiety in Emerging Adults
Ryan Sellers	David Sherwood	Biological Sciences/ 1pm-2pm	Understanding the Role of DDR-2 in C. elegans Germline Development
Meg Shieh	Emily Derbyshire	Biological Sciences/ 12pm-1pm	Bipartite Microbial Interactions of Bacterial Species Isolated from the Anopheles Mosquito
Krishna Sinha	David Madden	Behavioral Sciences/ 12pm-1pm	Examining the Relationships Among Structural and Functional Connectivity, White Matter Hyperintensities, and Adult Age
Elizabeth Snyder-Mounts	George Truskey	Other: Biomedical Engineering/ 1pm-2pm	Establishing a Baseline to Investigate the Effect of SNPs on Tissue Engineered Blood Vessel Function
Chelsea Southworth	Christine Drea	Biological Sciences	What to expect when you're not expecting: hormonal birth control impacts lemur vaginal and labial microbiomes
Radhika Srivastava	Makeba Wilbourn	Behavioral Sciences	Stories for Success: Culturally-Driven Maternal Influences on Children's Language Development
Radhika Srivastava	Sumedha Ariely	Behavioral Sciences/ 12pm-1pm	Trauma, Anxiety, and Depression Outcomes in Caregivers of Orphaned and Separated Children

Claire Stout	Sarah Gaither	Social Sciences/ 12pm-1pm	Be a man, but how? A Qualitative Exploration into Which Aspects of Masculinity Predict Male Aggression
Emily Sun	Henry Tseng	Biological Sciences/ 1pm-2pm	Loss of optineurin disrupts mitochondrial networks and morphology
Dylan Tamayo	James McNamara	Biological Sciences/ 11am-12pm	The role of parvalbumin interneurons in the intra-amygdala kainate mouse model of temporal lobe epilepsy.
Katie Taylor	Jenny Wood Crowley	Social Sciences/ 11am-12pm	STEM Retention Programs in Higher Education
Skye Tracey	Jeremy Kay	Biological Sciences/ 12pm-1pm	Investigation of the latrophilin FLRT protein interaction
Michael Tran	Emily Derbyshire	Biological Sciences/ 10am-11am	Elucidating the Role of Host Aquaporin-3 During Apicomplexan Infection
Victoria Trimm	Margarita Svetlova	Behavioral Sciences/ 10am-11am	Preschoolers' Reactions to Joint Commitment and Remorse
Amulya Vadapalli	Mbaye Lo	Social Sciences/ 10am-11am	Competing Conceptions of Justice in Yemen
Ajay Varadhan	Joel Collier	Biological Sciences/ 10am-11am	Sublingual Immunization Using Self-Assembling Peptide-Polymers
Tanmayi Vashist	Jennifer Tenor	Biological Sciences/ 10am-11am	The Roles of Protein Interactors in Trehalose Synthesis and Other Pathways in <i>Cryptococcus neoformans</i>
Shomik Verma	Nico Hotz	Physical Sciences/ 11am-12pm	Numerical modeling and design optimization of a concentrated solar thermal collector for dry methane reforming
David Wang	Piotr Marszalek	Physical Sciences/ 12pm-1pm	Examining the Refolding of Perturbed Protein Structure intermediates

			Using Various Molecular Mechanics Force Fields
Jennie Wang	Heileen Hsu-Kim	Community Engaged Research/ 11am-12pm	Examining the Impact of STEM Outreach Programs for 4th-6th Grade Girls
Amanda Watts	Tobias Overath	Behavioral Sciences/ 11am-12pm	Incongruent versus Congruent Consonant and Dissonant Target Chords Elicit BOLD Signal in Regions Implicated in Musical Syntax Interpretation
Mary Weggeland	Kristin Huffman	Humanities/ 1pm-2pm	The Rise of Print Culture in Early Modern Venice
Tzu-Chieh (Michael) Wen	David McClay	Biological Sciences/ 10am-11am	Investigating the expression of candidate EMT genes in <i>L. variegatus</i>
Alexander Wilson	Amanda Hargrove	Biological Sciences/ 12pm-1pm	Optimization of High-Throughput Screening Assays to Evaluate RNA-Binding Small Molecules
Jessica Williams	Neil McWilliam	Humanities/ 11am-12pm	Robert Willis (1800-1875) and the Historiography of Italian Gothic Architecture
Barbara Xiong	Sandeep Dave	Biological Sciences/ 1pm-2pm	Predicting Synergistic Combinations of Drugs with Deep Neural Networks
Ziyi Yan/Qiang Zhang	Mark Leary	Psychology-Graduation with Distinction/ 10am-11am	Music and Spirituality: The Psychological Impact of Music on Feelings of Spirituality and Connectedness
Iris Yang	Moria Smoski	Social Sciences/ 1pm-2pm	Can't you feel your heartbeat fast?: Mindfulness as a mediator between interoception and anxiety

Alexander Yearley	Scott Floyd	Biological Sciences/ 1pm-2pm	The BRD4-NUT Fusion Protein Modulates Chromatin Dynamics to Alter DNA Damage Signaling
Stephanie Zelenetz	Ashutosh Chilkoti	Biological Sciences/ 10am-11am	Recombinant Synthesis of Depot-Forming Peptide Polymer for Flt3-L Cancer Immunotherapy
Adary Zhang	Kevin LaBar	Biological Sciences/ 11am-12pm	Modulating implicit race bias in a fear conditioning paradigm

Anika Agarwal

12pm-1pm

Faculty Advisor: Jason Somarelli

Development and Testing of a CRISPR/Cas9-based Lineage Tracing System to Track Metastatic Progression and Therapeutic Resistance

Biological Sciences

Despite advances in cancer diagnosis and control of primary disease, the mortality rates for cancer patients due to metastatic spread of disease have not changed significantly in over 50 years. When cancer cells spread, they undergo selective pressures as they detach from the primary tumor, invade, and disseminate to new tissue environments to colonize distant sites in the body. This process, known as the metastatic cascade, appears to follow principles of evolutionary theory. Like the metastatic process, chemotherapy treatments impose a selective pressure on cancer cells and often leave drug-resistant cells as the fittest survivors able to replicate and render drugs ineffective. Some unanswered questions about these processes include: 1) What population bottlenecks occur during cancer cell invasion and drug treatment? 2) Will multiple selection events applied to the same population result in a bottleneck each time? To answer these questions, we developed a lineage tracing system based on CRISPR/Cas9 editing of barcoded cells. This barcode editing is highly variable, resulting in a diverse accumulation of edits in each cell. When edited cells divide, each daughter cell receives a copy of the edited barcode, which enables ancestry to be inferred by analyzing the pattern of shared edits between cells. We used this system of barcoded cell lines to track population bottlenecks during an in vitro model of invasion and various chemotherapy regimens. A better understanding of the selective forces during invasion and drug treatment could suggest new therapeutic targets and treatment options for patients with metastatic or drug resistant cancers.

Andrea Ball

10am-11am

Faculty Advisor: Nancie MacIver

Metabolic mechanisms by which interleukin-6 (IL-6) regulates T cell differentiation and function
Biological Sciences

Chronic systemic inflammation is one of the hallmarks of obesity. Local inflammation and recruitment of immune cells in the adipose tissue lead to a systematic increase in inflammatory cytokines. Interleukin-6 (IL-6) is a key pro-inflammatory cytokine that systemically increases during obesity and can directly influence immune cells and other metabolically active tissues. It is well known that IL-6 induces insulin resistance in the liver, while the effect of IL-6 on T cell metabolism is largely unknown. The objective of this project is to determine the role of IL-6 in T cell metabolic reprogramming and how it affects the differentiation of regulatory and effector T cells.

Alisa Bedrov

11am-12pm

Faculty Advisor: Mark Leary

What You Don't Know Might Hurt Me: Keeping Secrets in Interpersonal Relationships
Psychology Graduation with Distinction

Despite being an interpersonal phenomenon, secrecy has yet to be extensively studied within the context of the relationship between the secret keeper and target. This study aimed to examine how relationship quality and the target's connection to the secret affected the experience of concealing a personal secret. Participants ($n = 249$) were recruited via Amazon's Mechanical Turk to complete an online self-report questionnaire regarding a secret they were currently keeping from someone else. Certain aspects of keeping the secret correlated with a more negative perceived impact on participant's well-being, particularly the difficulty and effort of keeping the secret, rumination frequency, and expected consequences if the secret were to be revealed. Participants reported using different tactics of concealment depending on how important and personal the secret was and their expected consequences upon revealing. Relationship quality not related to the secrets perceived impact on well-being, but participants did expect the target to perceive the information more positively if they had a high-quality relationship. Keeping a secret that was relevant to the target and could affect the target negatively upon being revealed was related to an increased burden of keeping the secret in terms of difficulty, effort, and perceived impact on the secret keeper's well-being and the relationship. These results highlight the importance of expanding the current focus of research on secrecy beyond the secret keeper and emphasizing the broader context of the interpersonal relationship.

Naime Benitez

10am-11am

Faculty Advisor: Tanya Chartrand

Working harder not smarter: Arousal's influence on Parkinson's Law

Psychology- Graduation with Distinction

Parkinson's law states that work expands to fill the time available for its completion. Numerous mechanisms have been proposed for this effect, but none have received unambiguous empirical support. In two studies, we demonstrate this law and its robustness, while identifying a possible mechanism. Specifically, we demonstrate that people having too much time on a specific task lowers arousal causing individuals to perform worse. Whereas, having the right amount of time creates an optimal level of arousal allowing individuals to finish tasks faster. Overall, assigning the right amount of time to a task will allow an individual to gain back more time. Practical implications for both employers and consumers are discussed.

Tatyana Bidopia

11am-12pm

Faculty Advisor: Nancy Zucker

Food for Thought: How Skipping Lunch and Psychiatric Illness Affect Cognition

Psychology Graduation with Distinction

Meal skipping is a common disordered eating behavior in college-aged individuals. This behavior is associated with a variety of health risks, including nutritional deficits and an increased risk for eating pathology. Research has indicated that meal skipping is also associated with deficits in various domains of cognitive functioning, including in tasks involving working memory, sustained attention, and set-shifting ability. However, a "post-lunch dip" in cognitive performance has been shown in individuals who consume lunch for approximately two hours after consumption. This study investigated how skipping lunch affects various domains of cognitive functioning (working memory, sustained attention, set-shifting ability, and motor speed) after this post-lunch dip period in a sample of college students (aged 18-25; N = 99), primarily focusing on whether depression and/or anxiety symptoms moderate this relationship. Understanding the mechanisms by which meal skipping behavior affects cognition by examining potential moderating effects of common eating disorder comorbidities, such as depression and anxiety, has implications for encouraging healthier eating habits and preventing eating disorder onset in a vulnerable population.

Katherine Bishara

10am-11am

Faculty Advisor: Nicholas Katsanis

Evaluation of the centrosomal protein, CEP76 as a candidate cause for Bardet-Biedl Syndrome

Biological Sciences

Bardet-Biedl Syndrome (BBS) is a genetically heterogeneous autosomal recessive ciliopathy that affects primary cilia. Mutations in twenty-three genes have been associated with BBS and account for ~80% of cases. BBS exhibits pleiotropic effects with an array of phenotypes, that are not consistent across patients; these include retinal degeneration, renal dysfunction, and cognitive impairments. To elucidate the remaining ~20% of cases without a known genetic cause, we performed targeted sequencing of 785 genes encoding the ciliary proteome in 100 BBS cases. We identified a pedigree with loss of function mutations in CEP76, encoding a centrosomal protein implicated in centriolar duplication during the cell cycle. To support the candidacy of CEP76 ablation in BBS, we developed zebrafish (*D. rerio*) models with transient, morpholino-induced suppression of *cep76*. Our preliminary studies indicate that loss of *cep76* recapitulates hallmark retinal and renal BBS phenotypes. To generate additional experimental evidence, we performed CRISPR/Cas9 genome editing of *cep76* in zebrafish embryos to create a loss-of-function mutation that was characterized using RT-PCR. Our ongoing work will involve the structural and functional characterization of relevant phenotypes in *cep76* homozygous mutants. We will perform immunostaining on cryosections of larval retinas to test whether trafficking of rhodopsin through the cilia of rod cells has been disrupted. Furthermore, we will monitor startle response of *cep76* mutants using the DanioVision platform. Completion of this work will improve our understanding of how this protein contributes to cellular signaling in the retina and transmission of visual stimuli to the brain in the context of BBS.

Sean Bissell, Zoe King, Sahil Sandhu, Michelle Wong

1pm-2pm

Faculty Advisor: Jessica Sperling

Facilitating Integration of Electronic Patient-Reported Outcomes into Clinician Workflows: A Qualitative Study

Social Sciences

Cancer patients experience a wide range of symptoms that can go unrecognized or unresolved by their oncologists. Patient-reported outcomes (PROs) help providers better assess and manage their patient's symptoms by allowing patients to directly report symptoms through validated questionnaires. Despite growing evidence that PROs improve patient experience and outcomes, there is limited adoption of electronic versions in routine cancer care, which can create added capacity for information gathering. This study assesses the barriers and facilitators to the integration of electronic PROs (ePROs) into oncologist's workflows. Semi-structured interviews were conducted with nine academic oncologists and the data were coded and analyzed using an inductive approach. Results were categorized into three areas: perceived benefits of ePROs, workflow integration considerations, and non-workflow considerations. Perceived benefits that emerged included improved efficiency and the facilitation of patient-centered care. Within workflow considerations, themes included the potential for information overload, visualization of PRO data in the electronic medical record, customizability of the ePRO tool, and ease of use. Despite the focus on workflow issues in the study, non-workflow considerations including ePRO instrument appropriateness, patient data concerns (including patient response rate), billing utility, and identifying target adopters emerged as significant and necessary themes. The perceived benefits of ePROs can be leveraged to encourage clinicians to use this evidence-based intervention. Oncology clinics implementing ePROs must focus on context-specific needs in the planning stages, as workflow integration is crucial to successful ePRO implementation.

Jordyn Blake

1pm-2pm

Faculty Advisor: Nimmi Ramanujam

Inequitable Risk: Race and Ethnicity as Predictive Factors of High-Grade Precancerous Cervical Lesions

Other: Global Health

The global burden of cervical cancer manifests in over 600,000 new cases and 300,000 deaths annually. Over 80% of the burden of cervical cancer is in low- and middle-income countries. Infection by high-risk human papillomavirus (hrHPV) is a causal risk factor for cervical cancer. Certain populations are at an increased risk for cervical cancer. The risk factors previously reported include oral contraceptive use, smoking, and sexual behavior. This research project examines the incidence of cervical precancerous lesions and assesses the trends between race, ethnicity, and human papillomavirus (HPV). The primary hypothesis is that race and ethnicity are predictive of high-grade precancerous lesion presentation when controlling for other known risk factors: high-risk HPV status, type of contraception use, age, and location in which women receive healthcare.

Bari Britvan**1pm-2pm**

Faculty Advisor: Michael Tomasello

"Simon Says": Young children's understandings of norms modeled by peers

Psychology- Graduation with Distinction

Social norms are mutually agreed upon standards of behavior that are expected among group members and guide essentially all aspects of human social behavior. Previous theory has suggested that children undergo a two-step sequence in development. First, children below age 3 have a dyadic, sympathetic orientation towards potential partners. Then, at around age 3, children are believed to transition into a group-level, norm-based orientation. At this second stage, children begin to interpret norms as group-level expectations (rather than solely as individual directives) and develop the ability to follow and enforce social norms. However, this two-step sequence in normative development was hypothesized based on the results of many studies but has not yet been directly tested. The current study addresses this gap by using preferences as a control to norms, since both have a world-to-mind direction of fit (i.e., they both convey a desire for some state of the world), and therefore should appear the same to children who lack awareness of the difference in generalizability. Furthermore, we investigated whether children would prioritize norms over preferences when they are modeled by peers to further reveal whether children at the age of three begin to respect norms as such, rather than as commands given by adult authority figures. We found that two-and-a-half-year-old children did not prioritize norms over preferences. Although most three-and-a-half-year-old children did not conform to anything or conformed with everything, among those that did favor a testimony type, significantly more favored norms than preferences.

Jason Brovich

10am-11am

Faculty Advisor: Sarah Gaither

Searching for Inclusive Progress: Whites React to Increasing Diversity

Psychology Graduation with Distinction

When presented with U.S. Census data about the impending majority-minority status of the United States, White Americans express more conservative political opinions. But research on this subject has not been directly conducted in young, White populations. This project discusses three studies conducted to examine similar issues in young populations, to shed light on how young populations may be affected. In Study 1, White undergraduates at an elite, private university were exposed to information about disproportionate success of minority students in the job search at their university. Following this study, Study 2 attempted a direct replication of the majority-minority manipulation, again on a White, undergraduate sample. Finally, the job success manipulation created for Study 1 was used again in Study 3 on a sample of young, White participants through Amazon's Mechanical Turk. Taken together, the findings from these studies can help clarify the potential effect of increasing diversity on the political opinions of America's youth.

Brandon Bui

1pm-2pm

Faculty Advisor: Steven Malcolmson

Allylic Alkylation of Azadienes

Physical Sciences

Reverse polarity (umpolung) techniques are of great interest for organic synthesis due to the possibility of expanded chemical diversity. Previous works using this technique have been able to achieve allylic alkylation onto gem-difluoroalkenes using an external fluoride source to afford a variety of homoallyltrifluoromethane derivatives. With this work, we envisioned a similar synthesis with difluoroazadienes as a substrate to yield allylated nitrogen species. This synthesis is highly relevant as a range of trifluoromethylated imines may be obtained with potential stereoselectivity. Ultimately, this synthetic technique provides a route towards a diverse assortment of amines which are highly relevant in drug development.

Angela Caldwell

1pm-2pm

Faculty Advisor: Ruth Day

Understanding Medical Devices: Simulating A Real-World Situation

Social Sciences

Millions of Americans have severe allergic reactions to insect stings. Left untreated, they can experience anaphylaxis and even death. They require an immediate injection of epinephrine to prevent such outcomes. Therefore, self-administered devices are prescribed to deliver needed medication immediately. Their effectiveness is limited by patients' ability to understand and follow the instructions for use. However, people often do not use such devices correctly, so they fail to get the needed medication. Most investigators attribute the problem to poor design of the device or inadequate training for use. However, a recent experiment by Day and Ikner demonstrated that the cognitive accessibility of the instruction leaflet affects how well people understand and remember the information presented. Participants read the instructions in either the Standard version (packaged with the device) or an Enhanced version (modified based on cognitive principles) and then performed comprehension and memory tasks. Few participants in the Standard group would actually get the medication dose in everyday life, while most in the Enhanced group would. The current experiment used a recognition task to test the cognitive accessibility of the two leaflet versions. Participants read either the Standard or Enhanced version and then watched videos of someone else using the device, in correct and incorrect ways. For each video, they decided whether the person performed all the actions needed to deliver the medication. This experiment is more ecologically valid, since it simulates a real-life situation observing a medical treatment and knowing whether it was done correctly.

Phoebe Caplin

1pm-2pm

Faculty Advisor: Rita Svetlova

To Snack or Not to Snack? Children's Delay of Gratification in the Presence of Peers

Psychology Graduation with Distinction

Past research has indicated that children around the age of 4 are able to put off a current small reward in favor of a later and greater reward, demonstrated in the famous Marshmallow Task (Mischel & Mischel, 1983, Mischel & Ebbesen 1970, Mischel 1972). Research has also indicated children around this age delay gratification for the benefit of others as well as themselves (Thompson, C., Barresi, & Moore, 1997). However, little research has been conducted on the effects of having a peer present during delay of gratification. The current study aimed to assess how children choose to delay gratification in a modified Marshmallow Task when they believe a peer is playing with them. Participants (44 children, mean age 3.96 years) were exposed to one of two Skype videos they believed were live. Participants either viewed a patient peer who was able to resist temptation for the entirety of the trial or an impatient peer who failed the task and ate their snack. Participants were also given one of two sets of rules in which their reward was independent or interdependent with the behavior of the other child. Across conditions, children were not significantly more likely to conserve their snack when viewing a peer who was patient and were not significantly more likely to conserve when they were told their behavior affected their peer.

Andy Chen

11am-12pm

Faculty Advisor: Qiu Wang

Scoping the Copper-Catalyzed Aminooxygenation of Alkenes and Conjugated Dienes
Physical Sciences

The 1,2-oxyamino moiety consists of an oxygen and nitrogen attached at adjacent carbons in an organic molecule and is an important motif that appears in a wide array of pharmaceuticals and biologically active substances, including epinephrine and salmeterol (Advair). Given its ubiquitous nature and biochemical importance, efficient and facile synthesis toward this motif is highly valued. A 1,2-alkene difunctionalization strategy offers a valuable synthetic approach as it enables the installation of both moieties across the alkene in a single step. Using this approach, we have developed a series of copper-catalyzed alkene amino oxygenation reactions that utilize an electrophilic amino precursor with a nucleophilic oxygen trapping source to simultaneously install a nitrogen and an oxygen functionality across the two carbons of the alkene. We have previously reported this transformation using carboxylic acids as the nucleophilic oxygen source with O-benzoylhydroxylamines serving as the electrophilic nitrogen source. The use of this electrophilic nitrogen source is particularly attractive because it overcomes several drawbacks associated with prevailing amino oxygenation method in particular, the previous difficulties with accessing electron-rich amines. This work builds upon the substrate scope of our methods. First, we describe the synthesis of additional classes of nucleophilic trapping agents such as alcohols, thiols, and hydroxamic acids to be used as substrates, and report their efficacy within our amino oxygenation transformation. Secondly, we explored the use of 1,3-dienes as an alternative to alkenes.

Vivian Chen

10am-11am

Faculty Advisor: Ornit Chiba-Falek

Characterizing the neuronal aging phenotypes of the SNCA A53T mutation in hiPSC-derived neural progenitor cells

Biological Sciences

Nuclear aging signatures, such as changes in nuclear envelope structure and heterochromatin organization have been associated with aging. They have also been suggested as a possible mechanism of SNCA pathogenesis based on a previous study showing that nuclear aging phenotypes were exacerbated with triplication of the SNCA locus. The SNCA gene encodes for alpha-synuclein protein (aSyn), and aSyn aggregates are the primary component of Lewy bodies and Lewy neurites, a pathological hallmark of Parkinson's Disease (PD). Here, we studied neuronal nuclear architecture changes of induced pluripotent stem cells (iPSC)-derived Neural Progenitor Cells (NPCs) from a patient with the A53T mutation and compared to NPCs derived from the same patient, but with the targeted correction of the A53T mutation to evaluate if the neuronal aging phenotypes observed with SNCA overexpression would also be affected with the A53T mutation. The A53T line displayed changes in nuclear architecture, specifically increased nuclear envelope folding, decreased nuclear circularity, and decreased nuclear membrane integrity, as well increased DNA damage, mitochondrial superoxide production, and decreased cell viability. Furthermore, these neuronal nuclear aging phenotypes could be rescued by targeted correction of the A53T mutation. These results extend the link between SNCA pathogenesis, nuclear architecture changes, and aging, and suggest that abnormalities of the nuclear envelope could be a general mechanism of Parkinson's Disease pathogenesis and neurodegeneration, more broadly.

William Chen

10am-11am

Faculty Advisor: Cagla Eroglu

What is the Role of Muller Glia on Retinal Synapse Formation and Function?

Biological Sciences

Synaptic impairments and synapse loss are key indicators of neurodegenerative diseases. In humans, MER proto-oncogene, Tyrosine Kinase (MERTK) mutation leads to a retina-degenerative disease called retinitis pigmentosa. However, underlying molecular and cellular mechanisms that initiate the disease is not well understood. Previous studies indicate that MERTK is expressed in the retinal pigment epithelium (RPE) and knocking out MERTK leads to retinal degeneration. While RPE cells reside in the subretinal region, Muller glia (MG) is part of the neural retina and highly express MERTK. The MG play vital roles in maintaining structural and functional stability of the retina. My previous study introduces a method of silencing MERTK expression exclusively in MG through adeno-associated viral vectors packaging the CRISPR-Cas9 system (AAV-CRISPR genetic modification strategy) in wild-type Long Evans rat model. Knock-out of MERTK in the MG induces reactive changes, which severely impair excitatory synapse development. Despite the prevalent use of rodent models to study retinal degeneration, it is not well understood whether MG dysfunction contributes to retinal degenerative diseases in humans. My preliminary findings suggest that reactive changes of MG are also present in humans with age-related macular degeneration (AMD). The present study investigates the role of Muller glia on retinal health, metabolic function, and synapse formation. These results will facilitate the development of novel therapies targeting the MG for treating retinal degenerative diseases.

Natalie Chin Wen Yu

10am-11am

Faculty Advisor: Janet Bettger

So You Think You Can Accelerate? A Qualitative Study of Accelerator Program Design and Perceived Helpfulness to Scaling Healthcare Innovation

Other: Global Health

Through an exploratory multiple-case study involving 12 accelerator programs and 14 healthcare ventures in India, we explore accelerator design choices that facilitate the growth of health innovation. Using an inductive approach, we synthesise the growth outcomes that innovators operating in India's healthcare ecosystem hope to achieve, and identify particular program design features that are helpful to this growth. Our analysis reveals 5 accelerator program elements that contribute to innovator growth, proposing a preliminary framework that can be used in accelerator design and innovator due diligence processes. We also attempt to implement a more holistic means of assessing accelerator effectiveness. Collectively, our findings provide preliminary insights into the current accelerator landscape in India, and describe how accelerator programs may help health innovators to grow. As the first accelerator study in the field that focuses jointly on India and the healthcare industry, this course of inquiry contributes to the nascent body of literature on the health innovation ecosystem in India and suggests avenues for future exploration.

Rachel Cohn

10am-11am

Faculty Advisor: Brian Silliman

Small-scale, big impact? The social and ecological effects of small-scale MPAs in Palau
Community Engaged Research

While marine protected areas (MPAs) have increasingly been utilized as a marine management and fisheries conservation strategy, little research has been done that simultaneously integrates both the ecological and social facets of their construction into impact assessments. Using a mixed-methods approach of video transect reef surveys alongside qualitative thematic content analysis of interviews with local fishers, this study serves to assess the socio-ecological efficacy of two small-scale, community-based MPAs in Koror, Palau. Protection status had no significant effect on total reef fish abundance, abundance of highly targeted taxonomic families (Acanthuridae, Scaridae, giant clams), or overall ecological community composition when compared with tangent unprotected sites, while community composition varied significantly between locations. Interview data indicated that while locals note detrimental ecological shifts in the reef over their lifetimes, perceptions of current management strategies were not completely favorable and revealed issues with awareness and enforcement. In light of current plans to increase protected areas in Palau, as well as global trends pushing for MPAs, these results indicate that networks of small-scale MPAs may not be an infallible management strategy and that likely, a more multifaceted conservation approach (managing social incentives, enforcement, etc.) could be beneficial.

Amanda Conti

10am-11am

Faculty Advisor: Brandon Schickling

Smooth Muscle Cell MicroRNA-9 is Transcriptionally Regulated by MicroRNA-25 in Vascular Disease

Biological Sciences

Cardiovascular disease (CVD) remains the leading cause of mortality in the United States despite significant research efforts to understand mechanisms of disease and to develop new therapies. Recently, microRNAs (miRs) have been implicated as important regulators of cardiovascular pathologies. These small, non-coding, RNA molecules act as post-transcriptional regulators of gene expression. While miR-9 and miR-25 have been implicated in several cancer phenotypes, their role in vascular disease is unclear. The goal of this study was to evaluate the relationship between miR-9 and miR-25 in vascular disease. The upregulation of miR-9 and miR-25 was observed in several model systems of CVD. Vascular smooth muscle cells (VSMC) isolated from the aortae of monkeys administered an atherogenic diet showed a 9-fold increase in miR-9 expression and a 5-fold increase in miR-25 expression as compared to VSMC isolated from animals on a normal diet. Further, miR-9 expression was increased in the mouse carotid artery one week after vessel ligation, representing a model of vascular remodeling and neointima formation. In addition, VSMC derived from the intimal layer of rat aorta after balloon injury demonstrated increased levels of miR-9 and miR-25 as compared to medial-derived cells. Finally, the treatment of human VSMCs with proinflammatory cytokines or growth factors significantly increased miR-9 and miR-25 levels. These data provide complementary evidence that expression of miR-9 and miR-25 are increased in VSMC during vascular disease. We next determined the relationship between the expression of these miRNAs. In conclusion, the more nuanced understanding of the microRNA pathways involved in cardiovascular disease informs the development of potential therapeutic strategies.

Margaret Darko

10am-11am

Faculty Advisor: Katya Wesolowski

Theatre of Health: An Ethnographic Exploration of Female Physician Well-being and the Arts in Accra, Ghana

Community Engaged Research

From gender barriers to burnout within medical practice, female physicians in Ghana have navigated professional and sociocultural demands for decades. In this same setting, theatre and the arts also carry an untapped potential to serve as effective communicative and therapeutic tools. This thesis project is a two-pronged ethnographic investigation of female physician well-being and an exploration of arts interventions in urban Accra. Over three months I examined how historical, sociopolitical and cultural factors that affect female physician well-being in Accra. By drawing on the experiences of three female physicians and analyzing data collected through participant observation, interviews, focus group discussions, surveys, and some content analysis, I present a nuanced view of female physician lifestyle in Accra. This project also investigates the use and effectiveness of theatre as a therapeutic and well-being intervention. It presents an evaluation of theatre workshops designed for and used by female physicians. Finally, I argue that female physician well-being in Accra is often taken for granted and neglected. Their unique experiences are worth exploring because they offer critical insights into gender and labor in the Ghanaian health workforce. Further, in this era of a burgeoning health humanities field, I illustrate how theatre and the arts in Ghana could serve as a well-being toolkit for this minority group. I also envision the possibility of having theatre workshops as sustainable well-being models.

Elizabeth Delgado**10am-11am**

Faculty Advisor: Blanche Capel

Generation of Gonad Organoids using Embryonic Progenitors

Biological Sciences

Organoids are three-dimensional tissue cultures used as experimental models for development and disease. Advances in stem cell biology have facilitated the generation of these structures for various organs, such as the kidney, brain, intestine and pancreas. To date, an organoid modeling the fetal gonad has not been established and would enable the study of early gonad development within a physiologically relevant and experimentally accessible model. So far, we have successfully isolated and expanded gonad progenitors in 3D culture, resulting in a sphere-like structure that is positive for gonadal markers. An interesting characteristic of these structures is that they will only form from an initial colony of cells, highlighting a potential community effect for gonad development in vitro. Future experiments will focus on manipulating relevant signaling pathways. The supplementation of different growth factors and their impact on resulting cell composition will aid in the characterization of important signaling interactions during gonadogenesis and their relative contribution to proliferation and differentiation.

Natasha Derezinski-Choo

10am-11am

Faculty Advisor: Dominika Baran

Social Networks and Plurilingualism: A study in the Kabiye speech community

Social Sciences

This project examines how Kabiye-French bilingual speakers in Togo make language choices to index their education level, and how they navigate a multilingual space through their plurilingual repertoires. In the plurilingualism model, multilingual speakers employ available linguistic features to achieve communicative goals (Jorgensen, 2005). This model positions people as languagers that partake in the process of languaging. In Togo, young speakers migrate between multiple localities, learning several language varieties and building complex plurilingual repertoires. I examine the relationship between a speaker's social network and their linguistic backgrounds, migration history, and speech patterns. Through conversation analysis and sociolinguistic interviews, I analyze how speakers access their plurilingual in conversation. The speaker's linguistic and geographic backgrounds come into play when they engage in conversation. These results show that in multilingual context, speakers make language choices based on their linguistic resources and their contact with other multilinguals. communicative goals (Jorgensen, 2005). This model positions people as languagers that partake in the process of languaging. In Togo, young speakers migrate between multiple localities, learning several language varieties and building complex plurilingual repertoires. I examine the relationship between a speaker's social network and their linguistic backgrounds, migration history, and speech patterns. Through conversation analysis and sociolinguistic interviews, I analyze how speakers access their plurilingual in conversation. The speaker's linguistic and geographic backgrounds come into play when they engage in conversation. These results show that in multilingual context, speakers make language choices based on their linguistic resources and their contact with other multilinguals.

Amika Ekanem/Annika Sharma

10am-11am

Faculty Advisor: Christine Drea

Oxytocin receptor antagonist effects on promiscuous Eulemur

Biological Sciences

Oxytocin (OT) is a hormone and neuropeptide commonly associated with parturition, nursing, and maternal behavior across mammalian taxa. OT may have been co-opted in some species to mediate mating bonds. Most of the work in this field has been performed in rodent models, but lemurs offer a more evolutionarily valid study system for human behavioral biology. Accordingly, this project makes use of natural variation in mating systems (i.e., monogamy vs. promiscuity) within *Eulemur*, a genus of Strepsirrhine primates, to investigate interspecific variation in OT functioning. In the pilot phase of this project, conducted at the Duke Lemur Center, we are collecting behavioral data from 6 pairs of promiscuous lemurs (4 *Eulemur* spp., 2 *Lemur catta*) after experimental blockade of central and peripheral OT receptors by oral administration of L-368-899 (a pharmaceutical-grade OT antagonist). Following a counterbalanced order for our four conditions, we are administering the antagonist to 1) the male partner, 2) female partner, 3) both partners, or 4) neither partner. Behavior is being observed under naturalistic conditions, and during behavioral bioassays. For the latter, we are measuring responses to the presentation of scent samples from strangers of both sexes (compared to control scents). Based on previous research in nonhuman primates, we anticipate temporary behavioral changes both in social interaction (e.g., decreased huddling and grooming behavior, and increased distance between pairs) and in response to the bioassay. We expect these changes to be magnified in pair-bonding species, which we will observe in the next phase of this study.

Morgan Ferrans

12pm-1pm

Faculty Advisor: Makeba Wilbourn

What's in a Face? Facial Cues Facilitate Emotion-word Learning

Psychology Graduation with Distinction

By 14 months, infants are readily able to make associations between labels and referents (e.g., objects, facial expressions). The ability to form these types of associations is a precursor for early word learning. For object labels, babies can use cues from the physical world, or see the actual object/referent being referred to (i.e., the cat). However, babies must also learn labels for referents that are not as concrete or tangible, such as labels for emotions. Emotion learning, the process through which humans understand their own and others affective states, is an extremely important skill. Thus, as social beings, humans need to learn to understand emotional labels. In order to be able to understand the meaning of these words, babies must gain information about their own invisible mental states, arduously more difficult than learning about the external world. Babies do have facial expressions as external indicators of these internal states, and use these expressions (e.g., smile) as proxies for emotions (i.e., happy) during the learning process. The purpose of the current study is to investigate the degree to which infants recruit the same skills used for word-object learning as they do for learning emotion labels. The present study seeks to investigate previous findings, which found that 14-month-olds could not form word-emotional expression links when presented with video stimuli of human faces making happy and sad expressions, yet these infants could form these associations when presented with video of cartoon faces. Did these babies need different cues to make label-expression combinations in the human face condition? In the current study, we tested the hypothesis that these babies need facial stimuli to say or emit the word, similar to how babies learn emotions in the real world, in order for them to recruit the right skills for word-learning, versus a voiceover label in previous studies. Fourteen-month-old infants ($N = 23$) were habituated to label-expression combinations and then tested with one combination from the habituation phase and one with changed relations or a switch event. Average looking times (in seconds) for the two conditions, emitted label stimuli and voiceover label stimuli (non-emitted), were compared. The results show that babies looked significantly longer at the novel switch combination relative to the "same" trial ($M_{\text{difference}} = 10.38$ seconds, $p = .004$) in the emitted.

Gianna Giordano

10am-11am

Faculty Advisor: Kathryn Whetten

Building a Trauma-Informed Foster Care System: Giving Foster Parents the Tools to Help Children Heal

Social Sciences

There is an emerging scientific body of knowledge on childhood trauma and its long-term effects, but it has not yet produced major changes in the policies and practices of the foster care system. Trauma-informed care is an approach that recognizes that people's behaviors are a direct result of coping with adverse experiences, and it takes measures to help people recover through policies, procedures, and practices, such as reinterpreting bad behaviors as consequences of trauma and increasing staff training on trauma theory. One of the reasons that key actors in the foster care system have not yet acted on recent information about trauma is that they lack concrete skills on how to use this information to help children. To address this gap between information and action amongst foster parents, I answer the question: What concrete skills, informed by current findings on childhood trauma, do foster parents need to help children in foster care heal from past traumatic experiences?

Jeffrey Gu

12pm-1pm

Faculty Advisor: Ornit Chiba-Falek

SNCA Intron 1 Methylation in Post-Mortem Human Brain Tissues Using Fluorescent Activated Nuclei Sorting (FANS)

Biological Sciences

Genome wide association studies have implicated alpha-synuclein gene (SNCA) as a risk factor for synucleinopathies such as Parkinson's Disease (PD). Additionally, accumulating evidence showed that elevated levels of SNCA contribute to disease pathogenesis. In my independent study project, I am focused on examining the role of methylation in the regulation of SNCA gene expression. Differential methylation levels at the Intron 1 region were reported between disease and controls; however, previous studies look exclusively at whole brain homogenate tissue rather than neuron-specific cells. My goals include using fluorescent activated nuclei sorting (FANS) to compare the methylation levels between whole brain tissue and neuron-specific cells in the Intron 1 region. This data will be informative in determining if neuronal cells have differential methylation levels compared to non-neuronal cells, such as glia. If so, that may lead to changes in the way we approach methylation as biomarker for disease.

Hana Hajda

12pm-1pm

Faculty Advisor: Makeba Wilbourn

Looking at the Big Picture: How Children's Family Drawings Differ Across Cultures
Psychology Graduation with Distinction

Families serve as the primary socializing agents for children and provide a major protective factor, with greater family closeness being associated with beneficial psychological outcomes. While much research has investigated family structure in general across cultures, there is still a need to explore the conceptualization of family from the perspective of children themselves. Thus, the current study seeks to examine the ways that children from the United States and Nicaragua represent their families. They were asked to draw a picture of their family. A coding scheme was adapted to analyze the drawings and included 5 categories (essential details, inessential details, attachment + family, spatial orientation, and additional details). Results show that Nicaraguan children included more people in their drawings than American children ($p < .001$). Neither sample was more accurate in depicting the correct number of people who live in their household ($p > .05$), but Nicaraguan children were more likely than American children to include more people in their drawing than then number in their household, while American children were more likely to include less ($p < .05$). While there were no differences between the two samples in the amount of details included per person, there were differences in the types of details included. Nicaraguan children were more likely to draw ears ($p < .001$), while American children were more likely to draw mouths ($p < .01$) and smiles ($p < .001$). Understanding how children's drawings are shaped by culture will provide insight into their early concepts of their social world.

Haley Hedrick

12pm-1pm

Faculty Advisor: Timothy Strauman

Who You Are, Who You Wish You Were, and Who You Should Be: How Augmented Attained Goal Priming May Be Used Therapeutically

Behavioral Sciences

We used an augmented rapid masked idiographic goal priming paradigm and fMRI to present individually-selected triggers for attained ought or ideal goals that had been previously reported. This data was compared with a previous study in which participants received the same procedure in its unaugmented form, meaning they received 15 exposures to goal triggers instead of the 60 exposures received by those in the augmented conditions. Whereas a previous study found that standard attained ideal goal priming discriminately increased activation in the left orbitofrontal cortex while standard attained ought goal priming discriminately increased activation in the right orbitofrontal cortex, our study's augmented attained ought goal priming produced the greatest activation in both regions (L/R MFG BA9). As expected, all augmented attained goal priming conditions elicited greater activation than the corresponding standard condition in all areas analyzed, with the exception of attained ideal goal priming in the right orbitofrontal cortex (MFG BA9) in which the augmented and standard conditions produced approximately equivalent activation. As a proof of principle study, our study does not have a body of literature within which to be interpreted; however, our findings seem to indicate that the interrelationships between goal type, goal priming procedure, and orbitofrontal cortex activity may be more complex and attained ought goal priming may have more powerful effects than originally predicted. Further exploration within a larger sample with greater statistical power and more extensive behavioral data is necessary in order to better understand the interplay between goal priming and these complex neural networks.

Annabella Helman**12pm-1pm**

Faculty Advisor: Marcella Kelly

Frequency of Scavenging Activity Among Carnivore Species

Biological Sciences

Black bears (*Ursus americanus*), coyotes (*Canis latrans*), and Bobcats (*Lynx rufus*) are the three-target species of this study completed in the Jefferson National Forest in northwestern Virginia. They are all carnivores that display various scavenging behaviors and activity. To understand the differences in these behaviors, we set up motion-triggered video and picture cameras deployed at deer carcasses. We are in the process of analyzing thousands of recorded images to compile a better picture of each species acquisition of carrion, the time spent scavenging, and possible interactions between these target species. The results are pending.

Katherine Herrmann

12pm-1pm

Faculty Advisor: Bridgette Hard

Stressed for Success: An Anxiety Reappraisal Video Intervention for Undergraduates
Psychology- Graduation with Distinction

Students everywhere can feel anxious about exams and are commonly met with the advice to calm down. However, researchers have found that it is the worries, not the bodily feelings associated with anxiety, that impair student performance, and thus advice to calm down does not target the harmful part of anxiety. Researchers have instead turned to anxiety reappraisal messages that target worry by encouraging the belief that anxiety is neutral or beneficial, instead of harmful. These messages, delivered in the form of emails or paragraphs, have showed promising results for improving student performance. Is there a more compelling way to deliver this message that can shift student's beliefs about anxiety and improve performance? We tested whether a reappraisal animated video would help student performance on a real college exam, compared to a control video describing study tips. We first ran an online feasibility study (Study 1) to ensure that videos were effective in shifting participant's beliefs, and then ran the reappraisal message in an introductory economics course (Study 2) using Qualtrics. Baseline anxiety and beliefs about stress, pre and post-exam feelings, feelings of anxiety ability to help or hurt, and course performance were measured for each student. The reappraisal message was successful in shifting student's beliefs about anxiety but demonstrated no effect on performance compared to the control. Student baseline measures of anxiety were prominent indicators of performance and thus there is an indication of a target student population for whom anxiety reappraisals will be most effective.

Bing Ho

10am-11am

Faculty Advisor: Paul Agris

The Role of Codon Usage Bias in Fine-Tuned Expression of Proteins Integral to Cardiac Physiology

Biological Sciences

Recent studies demonstrate that human tRNA expression levels physiologically enhance the activity of mechanistic Target of Rapamycin complex 1 (mTORC 1)- central kinase regulator of cardiomyocyte growth- to upregulate protein synthesis in human fibroblast. Additionally, upregulated aminoacylated tRNA expression and cardiomyocyte regeneration after a myocardial infarction (MI) suggests that the discovery of unique therapeutic developments for heart disease lies in the characterization of how codon usage bias and cellular availability of tRNA isoacceptors influences cotranslational protein folding and activity. Using relative codon usage software analysis tools, proteins integral to heart contraction such as phospholamban 4 have been identified as users of infrequent synonymous codons relative to the heart's protein population. Thus, this project looks to characterize the potential effects of codon usage bias on regulating heart specific proteins through computational analysis and directly altering synonymous codon usage of such proteins in pig/bovine stem cells to observe the translational repercussions altered codon usage may impose on cardiac-integral proteins.

Gvantsa Ivanishvili

11am-12pm

Faculty Advisor: Michael Tomasello

Children Creating Rules: A Comparison Between Individual and Joint Commitments

Psychology Graduation with Distinction

Our investigation explores the question of whether children understand the difference between the rules they come up with on an individual level and those they create within a group of peers. In other words, are children as likely to enforce a rule they created on their own as they are to enforce one that they created within a social context? We approached this question by comparing the behavior of children who we asked to create a game on their own with that of children who we asked to create a game collaboratively, with the active participation of other individuals. More specifically, our participants were divided into two conditions: group's and individual's. Those in the group condition were encouraged to come up with a game as a group, in collaboration with two puppets controlled by one of our research assistants. Those in the individual condition were asked to come up with a game on their own and teach it to the puppets later on. Once the game had been created (in both conditions), another research assistant walked into the room and asked the child to teach him or her the game; he or she then played the game incorrectly to see if the child would protest, then suggested an alternative way to play the game to see if the child would be flexible. The children appeared to be equally likely to protest in both conditions, our statistical analysis revealing no significant difference between the group's condition and the individual's condition.

Anna Jenkins

1pm-2pm

Faculty Advisor: Bridgette Hard

Worried Sick: The Impact of Student's Stress Mindsets on Health and Productivity

Psychology- Graduation with Distinction

The goal of this study was to evaluate how beliefs about stress, also known as stress mindsets, relate to health and productivity in an undergraduate sample. College students (n=499) were surveyed on their general and stressor-specific mindsets and self-reported on a variety of measures about stress, health, coping, and GPA. Our findings suggest that beliefs about stress vary as a function of stressor type (acute versus chronic, and controllable versus uncontrollable), and that some stressor-specific mindsets may be more predictive of health than others. General mindsets were associated with health, consistent with prior findings. Chronic controllable mindsets were most pervasively related to health. Specifically, believing that chronic controllable stressors are harmful was related to worse mental and physical health. Consistent with prior findings, we found that measures of stress were associated with health, however this relationship was moderated by stress mindsets. Believing that stress is enhancing rather than debilitating appears to provide a psychological buffer against the negative effects of stress. Our work suggests that interventions which challenge student's beliefs about stress may help students handle large amounts of stress with a lessened impact on their health. Future work calls for the development of student-oriented, stressor-specific stress mindset interventions.

Shiyu Jing

12pm-1pm

Faculty Advisor: Herman Nijhout

Developmental regulation of wing size and shape in Lepidoptera

Biological Sciences

The growth and morphogenesis of Lepidoptera wings are governed by many factors such as hormonal signaling, nutrition, and organized cell death. However, the mechanisms that actually determine the final shape and size of the wings are largely unknown. Research aims to explore how certain signaling molecules and morphogens may impact the developmental process. In particular, the project will aim to understand the role of BMP and WNT in wing growth and patterning. I believe that the presence of a BMP inhibitor introduced to the animal via injection is likely to cause a decrease in wing size. However, it is possible that the changes in wing size may be more localized on either the forewing or hindwing, thus also affecting the overall shape of the wing. WNT has a role in cell division and thus a WNT inhibitor is likely to cause a decrease in wing size. Although, it is unclear how an increased concentration of WNT will affect the final structure of the wing since cell division is limited by nutrients and space. I hypothesize that an up-regulation of WNT may cause increased proximal-distal growth, which should result in a wider wing shape. Experimental procedures will involve injecting samples with set dosages of certain morphogen inhibitors at different stages of development to induce changes in the growth pattern. Adult wings will be analyzed to obtain data regarding overall size, shape, and size of eyespots. Larval wings will be stained and analyzed to obtain data regarding the relative amount of growth factors and morphogens.

Trinity Johns**10am-11am**

Faculty Advisor: Sarah Gaither

Racial Prejudice and Essentialism in Elite University Traditions

Social Sciences

At Duke University, undergraduate students choose to camp out for 6 weeks every year to attend the Duke University versus the University of North Carolina basketball game. This year, more than 800 undergraduate students entered to secure a spot to this game. During this time, students create imagined communities among their peers, becoming 10-person tenting groups. From a psychological perspective, it is important to consider the outcome of these constructed communities (i.e., minimal groups) in relation to race, a societally meaningful group membership. This independent study, *Racial Prejudice and Essentialism in Elite University Traditions*, investigates how racial prejudice plays a role in the Duke tenting experience and how prejudice manifests itself for undergraduates depending on each person's racial identity.

Jill Jones

10am-11am

Faculty Advisor: John Evans

Expressive Writing for Resilience: Writing to Heal

Community Engaged Research

Expressive writing, writing only for one's self, is a low-cost, accessible therapeutic intervention that uses writing about a traumatic, stressful, or emotional event to improve both emotional and psychological health. Past studies have demonstrated that expressive writing (EW) can lead to a reduction in pain, better sleep and higher daytime functioning, higher white blood cell counts, improved mood and performance on various tasks, and lower heart rate and blood pressure. Over the past year, our Bass Connections team explored whether EW might be a meaningful exercise for our college-aged peers. We asked 32 participants to engage in the most common form of EW (the Pennebaker Paradigm), writing for 15-20 minutes on four prompts centered around a traumatic event in each person's life. After each prompt, participants completed a post-writing reflection to assess how valuable/meaningful each prompt was to them (on a scale of 1 to 10) and to briefly describe how each writing session went. We then calculated the median meaningfulness values for each prompt and extracted themes/quotes from participants' brief descriptions. Ultimately, we found that participants viewed the intervention as valuable; all meaningfulness ratings were above 5/10, and themes of hope and forgiveness, self-reflection, and emotional release all emerged. These data suggest that EW may be meaningful to other populations including pediatric cancer survivors and their caregivers. Future work will thus entail optimizing our EW intervention for use with this population and assessing whether EW can mitigate the physical/psychological late effects of illness (and increase resilience) among its members.

Jill Jones

10am-11am

Faculty Advisor: Eric Thompson

Inhibiting Abelson (ABL) family kinase activity as a potential treatment for leptomeningeally disseminated medulloblastoma

Biological Sciences

Medulloblastoma (MB), a tumor arising from various cerebellar progenitor cells, accounts for 15-20% of all pediatric brain tumors and is a leading cause of cancer-related pediatric deaths. Over 80% of recurrent MB patients are diagnosed with leptomeningeal dissemination: the extension of cancerous cells into the delicate membranes (meninges) surrounding the brain. Since current standard-of-care (surgery plus chemoradiotherapy) is notoriously ineffective, it has become increasingly important to identify and develop new therapies that promote less adjuvant toxicity. Of particular interest are small-molecule inhibitors, which target protein families including Abelson (ABL) kinases. ABL kinases are intermediaries between extracellular stimuli and signaling pathways that govern cell proliferation, survival, adhesion, and invasion/migration, and previous studies established that (1) these kinases are preferentially expressed in MB cells and (2) their inhibition can suppress metastasis of other solid tumors. We in the Thompson Lab have thus hypothesized that ABL kinases may mediate leptomeningeal dissemination in MB, possibly through upregulation of the c-Myc oncogene (also preferentially expressed in many MB cells). My work with a highly specific ABL kinase inhibitor, GNF-5, suggests this may actually be the case. Through multiple cell viability assays and Western blots, I have demonstrated that inhibiting ABL kinase activity with GNF-5 seems to induce cytotoxicity in patient-derived MB cells by decreasing c-Myc expression in a time- and concentration-dependent manner. Though future work will necessitate replication in multiple cell lines as well as studies with MB mouse models, ABL kinase inhibition therefore seems to hold potential as a treatment for leptomeningeally disseminated MB.

Kushal Kadakia

Faculty Advisor: David Kirsch

1pm-2pm

Metabolic Modulators of Soft Tissue Sarcomas

Biological Sciences

This investigation characterizes and exploits the metabolic requirements of soft tissue sarcomas to enhance tumor radiosensitivity. Primary tumors were generated in Pax7CreE, LSL-Nras, p53 FL/FL mice following intramuscular delivery of 25L of 4-OH Tamoxifen. Mass spectrometry analysis was performed on tissue extracted from mice infused with ^{13}C -labeled nutrients to characterize nutrient production and consumption before and after radiation exposure. Metabolomic modeling revealed a significant role for glutamine as a Krebs Cycle substrate, with reliance on glutamine increasing due to depressed carbon flux from glucose following radiation. Proliferation assays of primary sarcoma cells cultured in glutamine-restricted media and in the presence of a glutaminase inhibitor revealed the absence of glutamine to diminish cell viability. Clonogenic assays indicated glutamine-restriction to also reduce in vitro survival following radiation exposure. To evaluate how this metabolic vulnerability manifested in vivo, sarcoma-bearing mice were subjected to radiotherapy following the administration of CB-839, a glutaminase inhibitor. Mice with GLS-deficient tumors were also generated and exposed to radiation to compare the effects of glutaminase inhibition through both genetic and pharmacological avenues. The results from this study demonstrate that (1) glutamine is essential for sarcomagenesis and growth and (2) inhibition of glutaminase can increase the radiosensitivity of sarcomas.

Celia Kohler

10am-11am

Faculty Advisor: Rita Svetlova

Linking Parenting Style to Parenting Behaviors & Child Helping Behavior

Psychology- Graduation with Distinction

Parenting undoubtedly plays a role in children's development of prosocial behaviors, such as sharing, helping, and cooperating. Parenting is often empirically measured solely by self-report questionnaire data, which may introduce self-report biases to the data. Therefore, this study aims to develop a short behavioral parent-child play task that allows researchers to collect more robust data on parenting, as well as determining the relationship between certain parenting behaviors and child helping. Data was collected via a parenting styles and dimensions questionnaire, two parent-child dyadic behavioral tasks, and a short task to measure child helping. Exploratory analyses will determine the relationships between parenting behaviors and parenting questionnaire data, as well as the relationships between parenting behaviors and child helping tendencies.

Shourya Kumar

10am-11am

Faculty Advisor: Ashutosh Chilkoti

Development and validation of a point-of-care test for liver cancer

Other: Biomedical Engineering

Hepatocellular carcinoma (HCC), the most common form of liver cancer and the sixth deadliest cancer worldwide, is a significant global health problem. Though not as common in developed countries, HCC is highly prevalent in low- and middle-income countries (LMICs). Due to the silent, yet aggressive disease progression, diagnosis typically occurs at later stages of the disease (obtained by imaging and biopsy), beyond the window for curative options (surgical removal). Therefore, early diagnosis is crucial to achieving positive patient outcomes. Recent studies have shown that the joint measurement of serum biomarkers alpha-fetoprotein (AFP), dickkopf-1 (DKK-1), and osteopontin (OPN) provides high sensitivity and specificity for HCC. In LMICs, however, standard laboratory approaches for protein detection are challenging due to a lack of infrastructure and resources. Thus, we describe a portable, blood-based point-of-care-test (POCT) for HCC, which incorporates a multiplexed cassette, allowing for simultaneous detection of multiple biomarkers using an immunoassay format. This device will greatly impact patient outcomes by allowing for early and accurate screening, enabling life-saving clinical interventions before fulminant disease progression. We have developed a completely self-contained, multiplexed immunoassay against three markers of early-stage HCC. The performance of our assay will be further validated with a reference set of known HCC samples, larger trials at Duke University Medical Center, and abroad in China, where more than 50% of HCC cases occur. Ultimately, we anticipate this device will have a large global health impact by allowing for non-invasive, widespread screening for HCC. Moreover, the multiplexing methodologies described here are widely-applicable to any target for which Ab reagents are available, laying the foundation for rapid, on-the-fly development of other multiplexed D4 POCTs germane to clinical medicine.

Eliana Lauder

1pm-2pm

Faculty Advisor: Karen Murphy

Seeing through the enemy's eyes: Using virtual reality to increase empathy in the Palestinian-Israeli conflict

Psychology- Graduation with Distinction

Two cameras were sent to two 23 year-old boys living parallel lives in Tel Aviv, Israel and Ramallah, Palestine. Each of them filmed a full day of their lives from the first-person perspective while narrating their story. These videos were given to 20 Palestinian and 20 Israeli study participants in Jerusalem to watch through a virtual reality headset (with the exception of 10 control participants who watched the video on a computer screen). This study investigates their response to these videos and thus the degree to which a VR experience has the power to elicit an empathic response in an region of extreme social polarization and turbulent conflict. Empathy was measured behaviorally, declaratively and altruistically across five markers: prejudice towards the out-group, positive affect associated with the out-group, degree of perceived similarity to the out-group, strength of personal identification to in-group and openness to social proximity with out-group members. The results of this study showed that when the 3 minute video was viewed from the first-person perspective in virtual reality, all empathy markers increased and strength of personal identity group and prejudice markers decreased (which was not the case in the control condition). This study has powerful implications for the potential of this technology to bring unlikely peoples together through perspective-taking in the face of deepening societal rifts that challenge our world today. This study has been done in hopes of spurring a conversation about our shared humanity and this technology's potential for good.

Nathan Liang

Faculty Advisor: Bridgette Hard

1pm-2pm

Mapping the Structure of Metaphorical Lay Theories in Education

Behavioral Sciences

According to a popular cognitive science metaphor, people are amateur scientists who develop and test intuitive theories about reality. Lay theories guide responses to perceptual experiences. One conduit for conveying intuitive beliefs is metaphor, which allows people to apply familiar knowledge of a source domain to communicate about abstract target domains. Identifying metaphors' entailments, the associated inferences licensed by metaphorical comparison is crucial. These entailments expose mental models manipulated to represent the target domain and guide predictions about metaphors impact on thinking. One approach to mapping entailments is examining figurative language in everyday speech and applying a commonsense understanding of observed source domains. We developed a novel, systematic method for mapping the structural entailments of a complex metaphor, focusing on metaphors for teaching. Our first study used participant ratings from an online sample to identify four common, apt metaphors for the college teacher-student relationship and explored language used to extend each metaphor. In the subsequent two studies, participants considered one metaphor and rated how a large set of teacher or student attributes conceptually cohered with the metaphor. We used exploratory factor analysis to uncover meaningful dimensions underlying the larger set of attributes. The teaching metaphors reflected systematically different intuitions about college teachers and students, captured by clusters of attributes: the coach and tour guide metaphors hold students more responsible while gardener and sculptor entail the most impressionability on students' development. This work lays the groundwork for future research on metaphorical reasoning and educational interventions on shifting lay theories of teaching.

Angela Liu

11am-12pm

Faculty Advisor: Amanda Hargrove

The Development of a High-Throughput Differential Scanning Fluorimetry Method to Identify Small Molecule Probes for the MALAT1 Triple Helix

Biological Sciences

MALAT1 is a long non-coding RNA that has been found to be over-expressed in prostate, colon, breast, and other cancers. Its oncogenic effects have been found to be localized to its 3-end, which contains a blunt-ended triple helix structure. It is proposed that the triple helix region provides stability to MALAT1 to avoid degradation, thereby aiding in its accumulation, and consequently enabling prolonged cancer-related effects. We hypothesized that a small molecule probe which is able to modulate the triple helix stability can illuminate its role in oncogenic processes. This study aims to develop and apply differential scanning fluorimetry (DSF) as a novel high-throughput screening (HTS) method to identify small molecule probes and deduce their effects on the MALAT1 triple helix stability. DSF allows for the utilization of the sensitive measure of fluorescence change as an indicator of RNA stability while simultaneously test binding effects of small molecule probes in a high-throughput fashion. In this work, we successfully optimize the DSF method for use with the MALAT1 triple helix and small molecules for the first time, conduct Z-factor experiments to evaluate assay quality for HTS purposes, and screen an RNA-focused library (n=589). Promising small molecule hits that caused differential stability effects on the MALAT1 triple helix have been identified. Future work is focused on validating these hits and testing their effects on MALAT1 decay and oncogenic phenotypes in cells, providing novel insights into the role of the MALAT1 triple helix in oncogenic processes.

Kiera Lunn

12pm-1pm

Faculty Advisor: Megan Holmes

Muscle Fiber Phenotype Distribution and Size Across Papionins

Biological Sciences

The expression of MyHC alpha-cardiac fibers has been associated with mammals that spend a considerable portion of their day chewing. MyHC alpha-cardiac was recently discovered in the superficial masseter and temporalis of *Cercocebus atys* (sooty mangabeys), who specialize on hard seeds. In the present study we investigated whether *C. atys* expresses a higher proportion of MyHC alpha-cardiac fibers per muscle area compared to closely related papionins that are less dietarily specialized (*Macaca mulatta*, n=3; *Macaca fascicularis*, n=4; *Papio anubis*, n=4). Immunohistochemistry was used to determine the proportion of type I and type II fibers in the superficial masseter of all specimens. Muscle cells (n=50) from each specimen were measured to quantify the cross-sectional area of the superficial masseter that expressed a given fiber type. MyHC alpha-cardiac and hybrid (a single fiber coexpressing distinct MyHC isoforms) fibers were abundant in the superficial masseter of all species. *C. atys* (70%) and *P. anubis* (68%) demonstrated the greatest amount of MyHC I + MyHC alpha-cardiac + MyHC II hybrid type per cross-sectional area. However, *C. atys* expressed the greatest amount of type I fibers when only considering cells that stained with an intermediate to dark intensity. Results indicate that the superficial masseter is dominated by type I fibers across all species, but these fibers are more common in sooty mangabeys. The abundance of type I fibers suggests that a slower phenotype is advantageous to *C. atys* and facilitates the frequent production of force over an extended duration.

Siera Lunn

12pm-1pm

Faculty Advisor: Christine Drea

*Exploring variability in the skin microbiome by examining hormonal effects in Coquerel's sifakas (*Propithecus coquereli*) and ring-tailed lemurs (*Lemur catta*)*

Biological Sciences

The skin microbiome is a community of trillions of microbes that helps shape the host's immune response to foreign microorganisms and protects against pathogens. Skin microbial assemblages vary greatly between host taxa, and even between body sites on a single individual. Although the hosts' phylogenetic placement and environmental settings are known to account for variation in skin microbiome structure, the effects of other endogenous host traits remain unclear. Variation in hormone concentrations, for instance, has been linked to changes in gut and genital microbiota of humans, but the relationship between endocrine processes and skin microbiota is less well-studied. We therefore aimed to determine whether varying levels of natural and synthetic hormones affect the axillary, or armpit, microbiome in two lemur species, the Coquerel's sifaka (*Propithecus coquereli*) and the ring-tailed lemur (*Lemur catta*). We collected sample swabs from the right armpit of 10 adult females of each species that were either given hormonal contraception (depot medroxyprogesterone acetate), or cycling naturally. To assess axillary microbiome structure, we used 16s rRNA sequencing. We found that axillary microbiota differed between species and that synthetic hormones influenced the axillary microbiome structure of these lemurs. Because synthetic hormones affected the makeup of armpit microbiota, and could thus impact lemur skin health and immune function, this research has implications for lemur husbandry and conservation efforts.

Kara Madey

11am-12pm

Faculty Advisor: James Davis

Predictors of Smoking Behavior and Medication Adherence

Other: Smoking Cessation

Introduction: Tobacco use is the number one cause of preventable morbidity and mortality in the US. At any one time, approximately 70% of people who smoke would like to quit. Unfortunately, only 3-5% of unassisted quit attempts are successful. The use of smoking cessation medications roughly doubles the chance of quitting. Adherence to medication may also play a role in smoking reduction and cessation. In addition, smokers with high nicotine dependence, as measured by the Fagerstr Test for Nicotine Dependence (FTND), may have an increased difficulty quitting. Purpose: The purpose of this poster is to describe the relationship between baseline nicotine dependence and smoking reduction within a randomized controlled trial assessing the use of an investigational smoking cessation drug (dextromethorphan + bupropion). Hypothesis: We hypothesize that nicotine dependence measured via FTND will be significantly associated with smoking reduction on treatment medication as measured via cigarettes per day on a daily smoking calendar. Conclusion: The results of this analysis will help us better understand predictors of smoking behavior and specifically how individual characteristics may affect response to smoking cessation treatment. As efforts to decrease current smoking rates are ongoing, an understanding of smoking cessation predictors is important for implementation of clinical practice and policy.

Jesse Mangold

Faculty Advisor: Sallie Permar

1pm-2pm

Characterization of viral evolution and rebound in a preclinical model of pediatric HIV therapy

Biological Sciences

In 2017, >180,000 infants were infected with HIV and 1.8 million children were living with HIV. While lifelong antiretroviral therapy (ART) can suppress virus replication, children are predisposed to metabolic consequences and drug-resistant viral strains. A functional cure able to overcome viral reservoirs will be required to attain an ART-free life. Thus, we sought to determine the impact of combination ART and subsequent treatment interruption on the development of viral diversity in an Simian-Human Immunodeficiency Virus (SHIV)-infected, ART-treated, infant and adult rhesus macaque (RM) model. In this study, six infant and adult RMs were infected with SHIV.C.CH0505.375H.dCT transmitted/founder (T/F) virus via oral and intravenous challenge, respectively. Twelve weeks post infection (wpi), infant and adult RMs were placed on triple ART for 8 and 12 weeks, respectively. ART was then interrupted and the kinetics of viral rebound was measured using qRT-PCR. Viral diversity was measured pre-ART and post-ART using single genome amplification of the HIV envelope gene. Plasma viral RNA (vRNA) in infants and adults displayed similar kinetics, peaking at 2 wpi. Upon ART initiation, plasma vRNA load was suppressed in infants and adults to undetectable levels within 2-4 weeks. Upon ART interruption, 5/6 infant and 3/6 adult RMs rebounded to >150 vRNA copies/ml of plasma within 1-3 weeks. Pre-ART and post-ART, adult plasma virus populations were more diverse than that of infants. Of rebounding RMs, while 3/3 adults controlled virus to <150 vRNA copies/ml within 3-4 weeks of rebound, only 3/5 infants demonstrated viral control. Differences in infant and adult viral evolution and rebound outline a clear need for a pediatric-specific preclinical model of HIV reservoir and rebound.

Julia Marshall

Faculty Advisor: Gustavo Silva

Emily Marun

Faculty Advisor: James Davis

12pm-1pm

An Evaluation of Patient Distress and Assertiveness during Lung Cancer Screening Process
Other: Clinical Research

The purpose of this review was to analyze the variation in distress and assertiveness exhibited by patients during the lung cancer screening process as dependent on provider interaction and education level, respectively. The primary objectives were to identify whether there a relationship exists between patient distress and the type of provider involved in the interaction, as well as to identify if there is a relationship between patient assertiveness and his or her level of education. Distress was dependent on whether a primary care physician, screening nurse coordinator, or another individual exclusively discussed the screening process with the given patient. Implicit and explicit distress were taken into consideration given individual variation in the manner in which stress is manifested across the human population. Implicit distress levels were quantified by the degree to which the participant was satisfied with their screening decision, as well as the degree of ease in decision making. Explicit distress was quantified by the degree to which the participant currently felt stressed and worried, as well as to the extent to which their current feelings affect their mood. The second area on which this review focused concerned the degree to which individual educational level affected their assertiveness during the lung cancer screening process. Assertiveness was quantified by the extent to which the participant was actively involved in the decision-making process regarding their lung cancer screen. Results of this investigation will aid in the identification of factors that contribute to the lung cancer screening experience, including distress. This will be especially critical in-patient populations that exhibit an increased vulnerability distress and/or lack assertiveness in decision making associated with the lung cancer screening process.

Madison Mastrangelo

Faculty Advisor: Jennifer Lansford

12pm-1pm

A Policy Analysis of No Hit Zones: What are barriers to No Hit Zone implementation?

Social Sciences

No Hit Zones (NHZs) represent a new policy to prevent corporal punishment and to ensure healthy environments for children and their families. NHZs designate spaces where no hitting of any kind is tolerated and serve as an intervention to shift cultural norms away from physical discipline, starting at the institution-wide level. This mixed-methods thesis is divided into two studies that address the substantial research gap in this nascent field. Study 1 provides an overview of the approximately 50 NHZs nationwide and answers the research question, What are the barriers to No Hit Zone implementation in institutions, such as hospitals and District Attorney's offices Through the analysis of qualitative data from 44 interviews with professionals involved in NHZ implementation, this thesis establishes a comprehensive list of NHZs and their distribution across states and institution types. Study 1 identifies four central barriers to NHZ implementation: social norms surrounding corporal punishment, framing of the NHZ policy, resource issues, and lack of data surrounding training initiatives. Based on Study 1's identification of the training barrier, Study 2 analyzes quantitative data from surveys administered before and after NHZ training at Children's Hospital New Orleans and provides preliminary evidence that training programs can impact healthcare professional's views about the use of corporal punishment and increase their perceived ability to intervene when they witness hitting.

Hannah McDaniel

12pm-1pm

Faculty Advisor: Francis Keefe

Parenting concerns, psychological distress, and relationship satisfaction in parents coping with cancer

Psychology- Graduation with Distinction

Studies have found that cancer patients with dependent children exhibit particularly high symptoms of anxiety, depression, and worry. Patients parenting concerns can negatively impact their own and their family's adjustment. Little is known about parenting concerns of partners of cancer patients, or associations between parenting concerns and couple's relationship functioning. This study investigated parenting concerns in both patients and partners, and their associations with psychological and relationship functioning. Patients with stage II-IV cancer ($n=38$; 74% female) and their partners ($n=34$; 26% female) completed questionnaires assessing parenting concerns, depression, couple cancer-related communication, and relationship satisfaction. Correlations and paired t-tests were used to examine associations between patient and partner parenting concerns. Multilevel modeling for dyadic data were used to examine associations between parenting concerns, psychological distress, communication, and relationship functioning among both patients and partners. Results indicated patient and partner parenting concerns were significantly correlated ($r=.65$, $p<.0001$). There were no significant differences in the levels of parenting concerns between patients and partners ($p=.78$). For both patients and partners, higher parenting concerns were associated with significantly poorer cancer-related communication ($B=.55$, $SE=0.16$, $p=.001$) and higher depression (approaching significance; $B=1.89$, $SE=0.99$, $p=.06$). Parenting concerns were not significantly associated with relationship satisfaction ($p<.05$). These findings suggest patients and partners have similar levels of parenting concerns and that parenting concerns are associated with higher levels of depression and poorer communication. This indicates the need for additional psychological support and mutual spousal support for couples raising dependent children while navigating the cancer experience.

Jonathan Michala

10am-11am

Faculty Advisor: Alex Watson

Edge states in disordered media and the Clifford index of three almost-commuting matrices

Physical Sciences

Faculty Advisor: Katherine Franz

Understanding how specific histidine residues and their modifications modulate chemical properties of Cu-binding peptides

Physical Sciences

Peptides with an amino terminal Cu(II)- and Ni(II)- high affinity binding (ATCUN) motif and bis-His motif have been observed to hold a high binding affinity for Cu(II) and Cu(I), respectively. One example is the Histatin-5 (Hist-5) peptide where Cu-binding motifs potentially mediate Cu-induced ROS and confer antifungal activity. Another example is the amyloid-beta (AB) peptide where Cu-binding motifs of further distance apart are implicated in the progression of Alzheimer's disease. However, the exact mechanism is unclear and called for an investigation with an interest in translatability of chemical properties between Hist-5 and AB. Hist-5- and AB-derived peptide fragments were synthesized to exploit the ATCUN and bis-His motifs and their mutations and test for copper redox and electrochemical properties. UV-Vis spectroscopic studies showed that adding ascorbate to Cu(II)-AB complex solutions resulted in the formation of a band at 360-380 nm, a feature that has been associated with highly reactive copper-oxygen species. This feature was strengthened upon the addition of hydrogen peroxide and modified with an ATCUN motif His-to-Ala mutation. To further investigate the redox mechanisms, cyclic voltammetry assays were performed for Hist-5- and AB-derived peptide fragments. These assays revealed that Cu(II)-AB4-16, Cu(II)-Hist1-12, and Cu(II)-Hist1-12H3M underwent an oxidative mechanism in an irreversible manner. Together, these observations offer further insight into the potential translatability of redox activity for Cu-binding peptides with specific histidine residues.

Ernesto Morfin Montes de Oca

11am-12pm

Faculty Advisor: Anne West

Using dCas9 for Functional Epigenomic Editing of Arc

Biological Sciences

The brain is an adaptable organ that is constantly by reshaped by the external environment. This happens at a large level through the continuously shifting neural circuits encoding memory or at a molecular level through AMPA endocytosis that governs synaptic plasticity. Arc is a rapid IEG that is indispensable for the developing brain, specifically for the processes of learning and memory. We use a functional epigenomic system which consists of dCas9 tethered to activators and repressors to modulate the activity of the Arc gene. We identified prominent candidate gRNAs targeted to the enhancer domain of Arc to drive transcription. Through this project we developed this molecular method by validating Arc RNA and protein. In the future, this system can be expanded to drive the activity-dependent inducibility of Arc thus giving the ability to control AMPA endocytosis through Arc.

Arjun Nanda

1pm-2pm

Faculty Advisor: Emily Derbyshire

A potential anti-malarial weapon: understanding microbial dynamics in a 1:1 ratio

Biological Sciences

Malaria is a widespread tropical disease that affects millions of people worldwide. Half of the world's population is at risk of contracting the disease and close to 500,000 deaths are reported annually, making malaria one of the most devastating infectious diseases. The lack of an effective vaccine and increasing drug-resistance to first-line treatments highlight the need for new antimalarial therapeutics for malarial control. The female *Anopheles* mosquito is the primary vector for transmitting the *Plasmodium* parasite, the causal vector of malaria. Research has revealed that the mosquito's microbiome reduces its permissiveness to *Plasmodium* infection, when compared to microbe-free mosquitoes. The mosquito's myriad microbes coexist in a dynamic microbial community, where interactions range from cooperative to competitive. My project aims to understand and elucidate the undiscovered microbial dynamics. Furthermore, it seeks to identify microbial competition and inhibition, measure its significance, and determine its cause. Using a disk-diffusion assay and replica plating, pure culture and co-culture mosquito-associated bacterial strains were tested against each other. These assays tested for microbial inhibition and its possible sources including small molecules, reactive oxygen species, and nutrient acquisition. The observed inhibition data offers valuable insights into microbial dynamics in a 1:1 ratio and offers a foundation for further research with a promising new avenue to potentially control the *Plasmodium* parasite.

Mahnoor Nazeer**10am-11am**

Faculty Advisor: Rita Svetlova

Friend or Foe? Building Empathy Across Demographics

Behavioral Sciences

Preschoolers often operate under essentialist thought- forming in-group and out-group attitudes, assigning common characteristics to members of a group, and evaluating in-group members more positively than out-group members (Gelman, 2004; Dunham, 2018). The current study explored whether presenting groups in particular ways and helping children connect to characters on a personal level could influence children's group attitudes. Preschool children (N = 88, age range = 3.08 to 6.97 years, 53% girls) were introduced to paper characters, some of whom belonged to the same arbitrary group as the child (in-group) and some who belonged to a different group (out-group). The study employed a two-by-two factorial design; In one between-subjects manipulation, children either did not receive any information about characters (Baseline condition), or were told that some characters across groups shared their characteristics and preferences (Similarity condition). In another between-subjects manipulation, the two groups were presented either in a competitive context (Competition condition), or in a neutral context (No-competition condition). After assessing children's attitudes toward both in-group and out-group characters in a series of measures, we found differential effects of similarity and competition. Children in the Similarity condition were significantly more likely to choose out-group individuals over in-group individuals than children in the Baseline condition. Additionally, children in the No-competition condition were more likely to share resources with the out-group than children in the Competition condition. These results demonstrate the role of context and personal experience in the formation of children's group attitudes and suggest that finding commonalities with individual group members can override group bias.

Stephanie Ng

10am-11am

Faculty Advisor: Nancy Zucker

The Clash of Culture and Cuisine: Conflicting Expectations and Disordered Eating in Chinese Adolescent Women

Psychology- Graduation with Distinction

Although eating disorders have commonly been considered to affect predominantly white female populations, they have found to be increasingly prevalent in Chinese contexts. However, despite the well-established negative consequences of eating disorders, there has been a significant lack of cross-cultural research on the development and prevention of these disorders in Chinese individuals. The purpose of the present study is to fill this research gap by using existing research to develop a conceptual model to explain how conflicting expectations regarding cultural eating norms and body shape can contribute to the development of disordered eating behaviors in Chinese adolescent women, and to explore the validity of this model through qualitative interviews. Thirty-four Chinese adolescent women (aged 18-22) participated in semi-structured interviews involving questions about typical mealtime scenarios, their perceptions of conflicts between expected eating behaviors and body shape standards, and how these conflicting expectations affected their emotions and satisfaction with their bodies. The results of this study provide initial support for the proposed conceptual model of conflict resolution, by demonstrating that conflicting cultural expectations was a significant reason for distress reported by a majority of participants, and that different strategies of conflict resolution resulted in adaptive or maladaptive emotional and behavioral outcomes. Risk and protective factors for the development of disordered eating behaviors and attitudes were identified following an analysis of responses, and implications of these findings for future prevention, treatment and research efforts were reported.

Julia Nicholas

1pm-2pm

Faculty Advisor: Nancy Zucker

The Weight of Stigma: The Effects of Internalized Weight Bias on Eating Behaviors in Young Adults Across the Weight Spectrum

Psychology- Graduation with Distinction

Internalized weight bias occurs when an individual view their own self-worth through the lens of common negative stereotypes and attitudes about people who are overweight. Prior research has linked internalized weight bias to disordered eating behaviors, including binge eating. Internalized weight bias may contribute to binge eating by perpetuating an all-or-nothing cycle of rigid dieting and binge eating, fueled by body shame and shame triggered by episodes of binge eating. The current study explored the potential relationship between internalized weight bias, restrictive eating, binge eating, with a particular focus on restrictive eating in social settings as a possible mediator in the relationship between internalized weight bias and binge eating. First, the study aimed to characterize the potential role of restrictive eating in social settings in binge eating behavior. It was predicted that internalized weight bias would be associated with both restrictive eating in social settings and binge eating, and that restrictive eating in social settings would mediate the relationship between internalized weight bias and binge eating. Additionally, this study explored the types of experiences that contribute to internalized weight bias in individuals across the weight spectrum.

Moreen Njorge

12pm-1pm

Faculty Advisor: Megan Huchko

Using GIS Spatial Mapping to Enumerate the Risk of Loss-to-Follow up for Cervical Cancer Treatment in Western Kenya

Community Engaged Research

Cervical cancer is the second most common cancer in women worldwide and the most common cancer among women in Western Kenya. A major barrier to accessing screening and treatment services for cervical cancer in this region is poor health literacy especially for women as well as inability to access healthcare due to distance and cost. This project uses both quantitative and qualitative measures to address how we can utilize visual data from GIS spatial mapping tools to examine the association between treatment rates and sociodemographic characteristics that function as risk factors for loss-to-follow-up. The maps are used as a reference and tool for community health workers and health administrators to ensure that their referral services are targeting the populations at greatest risk for loss-to-follow-up. A survey was created that can be used by community health volunteers to gather sociodemographic data and GPS coordinates of women who had previously attended a community screening event. Using ArcGIS tools, specific villages within Migori County were mapped with population characteristics and spatial locations of various resources such as hospitals/clinics providing cryotherapy treatment. Further mapping was conducted to visually display data such as distance to the nearest treatment site, women's access to counseling services, occupation, and frequency of outreach by community health volunteers. Volunteers were trained on how to effectively collect GPS coordinates and sociodemographic data for women who live in the most rural areas. The spatial maps were then presented to stakeholders including the County Health Management Team in order to ensure their accuracy. This also provided a space for discussion of how community health volunteers can continue the practice of mapping traditional health data to ensure more targeted outreach. To date, the maps are reliably used by the Reproductive Health Director as well as community health volunteers to inform them of areas where women are less likely to access treatment. However, we hope to integrate data collection services into community screening events to ensure the sustainability of the creation of these dynamic spatial maps. Ongoing challenges include the need to update the maps which requires constant funding in order to collect the data.

Melina Nolas

12pm-1pm

Faculty Advisor: Susan Alberts

Strategies for inbreeding avoidance in the absence of dispersal: do fathers and daughters avoid breeding in baboons (Papio cynocephalus)?

Biological Sciences

Inbreeding between fathers and adult daughters in mammals is minimized due to patterns of male dispersal which reduce the duration of co-residence. Yet father-daughter co-residence does occur in many species, which opens up the possibility of inbreeding and thus sets the requirement for other inbreeding avoidance strategies. Baboons, *Papio cynocephalus*, offer a useful model to test for co-residence and inbreeding avoidance. In this project, I examine how common father-daughter co-residence is in baboons and the inbreeding rates when it occurs. I found that adult baboon father-daughter pairs do co-reside in the same group and do employ inbreeding avoidance strategies other than dispersal. Baboon fathers avoid mating with their daughters, especially when the probability of conception is high, such as during the adult-fertile phase and while the female is ovulating. Additionally, no offspring of father-daughter pairs were ever conceived or born in the study populations. This information increases our understanding of the implications of father-daughter co-residence, specifically inbreeding avoidance strategies to reduce the heavy genetic costs of close inbreeding.

Damilola Oke

11am-12pm

Faculty Advisor: Nancy Zucker

The Company You Keep: The Relationship between Friendship Qualities and Mental Health among College Students

Behavioral Sciences

Prior research has shown that stress and mental illnesses increase during college years. Strong social support may contribute to better mental health while weak social support may exacerbate mental illnesses. Because college students tend to be in an environment away from family and childhood friends, I hypothesize that college friendships have an important impact on mental health. This study investigated how friendship qualities contributed to mental conditions among Duke University undergraduates. Data were collected through a mixed methods online survey. Positive Friendship Qualities (PFQ) was composed of measures of stimulating companionship, help, intimacy, reliable alliance, self-validation, and emotional security. Negative Friendship Qualities was composed of measures of conflict resolution ease, conflict resolution frequency, dishonesty, competitiveness, and superficiality. Negative Outcomes was composed of measures of depression, loneliness, and social anxiety. Positive Affect was also used to measure mental conditions. Participants answered the friendship qualities questions for their closest friend at Duke. As predicted, PFQ was inversely correlated with Negative Outcomes. PFQ significantly predicted Negative Outcomes and Positive Affect. Reliable alliance was the most significant predictor of mental health conditions; among negative outcomes, loneliness was the most significantly correlated with friendship qualities. All of the correlations between friendship qualities and mental conditions were significant among women while none were significant among men. These results suggest that women who have a positive relationship with a close friend may have stronger ability to navigate life stressors. Recommendations for future directions include studying friendship qualities among best friends and acquaintances.

Margo Orlen

10am-11am

Faculty Advisor: Marc Caron

Characterization of the dopamine D2 receptor internalization and signaling using BRET
Biological Sciences

The dopamine D2 receptor (D2R), an important target for antipsychotic drugs, is a G protein-coupled receptor (GPCR) that modulates intracellular signaling pathways upon binding dopamine. Following canonical signaling through G proteins, D2R phosphorylation by G protein-coupled receptor kinases (GRKs) promotes binding of beta-arrestins and recruitment of endocytic machinery leading to internalization. Additionally, beta-arrestins can directly activate distinct signaling cascades by acting as protein scaffolds, bypassing classical G protein signal transduction. My investigation sought to characterize these mechanisms of internalization and beta-arrestin-mediated signaling at the D2R to provide insight for the development of functionally selective antipsychotics, or drugs that can target either signaling pathway - G protein or beta-arrestin. Using a bioluminescence resonance energy transfer (BRET) assay, I found GRK2 overexpression increases the efficacy of D2R internalization in response to dopamine and other ligands, internalization is characterized by a clathrin-mediated mechanism, and the D2R can directly recruit GRK2 without G protein activation. Additionally, this investigation utilized a novel BRET assay capable of monitoring receptor/arrestin/effector complex formation in real time. Evidence shows this assay can measure D2R signaling through beta-arrestin by showing an increased association with the prototypical downstream effector, Erk, in response to ligand. The results of this study will further elucidate the complex role of beta-arrestin in mediating activation of separate, yet important pathways for D2R signaling so that we may formulate more effective antipsychotics. This study will also provide a method for measuring functional selectivity of drugs targeting GPCRs to screen for biased ligands in the future.

Christiana Oshotse

12pm-1pm

Faculty Advisor: Cheryl Lin

Self-Efficacy and Adherence Behaviors in Rheumatoid Arthritis Patients

Behavioral Sciences

Rheumatoid arthritis (RA) is a common disease that requires patient self-management with chronic medications. Adherence rates for RA medications are suboptimal. This study explores medication adherence and self-efficacy behaviors among RA patients. We conducted a qualitative study comprising focus groups and individual interviews. Nineteen participants were recruited and screened to participate in three 90-minute focus groups (n = 13) and six 60-minute individual interviews. We created and maintained a codebook to analyze data. Interviews were analyzed by using NViVo qualitative analysis software. Key points in participant interviews were 1) self-efficacy as influenced by the ability to establish routines, and having an understanding relationship with their healthcare provider; 2) self-efficacy to adjust medications depended on having permission from providers to adjust medications, perceptions of the effectiveness of medications, and confidence in self-knowledge to make appropriate adjustments; and 3) changes in self-efficacy over time were influenced by initial denial and later acceptance of the diagnosis. Participant interviews revealed that medication adherence is a spectrum that ranges from adherent to non-adherent. Participants experience with RA medications revealed varied underlying reasons for adherence behaviors. Recognizing adherence as a dynamic behavior has important implications for how adherence interventions are designed. For example, participants reported adjusting medications in response to the unpredictable nature of RA. Interventions could collect information about RA symptoms and be tailored to provide adherence support at times when patients need it most. The importance of self-efficacy in influencing participants adherence behaviors is an area for continuing research among patients and providers.

Ajile Owens

11am-12pm

Faculty Advisor: Randall Kramer

Understanding Social Networks for Disease Transmission and Information Interventions in Rural Madagascar

Social Sciences

The spread of infectious diseases is almost completely dependent on the contact that individuals have with one another. These contacts are the basis of social networks, which can be used to understand how relationships between individuals impact transmission of infections and information. I collected sociodemographic and health information from Mandena villagers and created social networks based on three different types of relationships. The sociodemographic and health information were used to illuminate health challenges in the area; while, the social networks were used to analyze how infections and information could spread throughout the village. To understand if potential super-spreaders were present, and to determine if this role was gendered, individuals on the social networks were measured for connectedness. The network itself was measured on how difficult it would be to diffuse an infection or information. The results suggest infection, evidenced by febrile illness, is a health concern in Mandena, exacerbated by difficulties in financially and physically accessing health services. Within the network, there were a small number of well-connected people, who could facilitate infection and information spread, with men more well-connected than women. At the structural level, there was variation in how divided a network was based on the relational ties that formed the network, suggesting that infections diffuse differently across networks of the same individuals, with different relationships. These findings can inform future disease research, as the applicability of the social networks extends to a host of infectious diseases.

Ellen Pasquale

1pm-2pm

Faculty Advisor: Kathy Sikkema

Showing up Isn't Enough: External Motivators are Required for Childhood Obesity Intervention Success

Psychology- Graduation with Distinction

The present study examined predictors of success among diverse, low-income participants in a childhood obesity intervention, as well as participant expectations, motivators, facilitators, and barriers to program attendance and engagement. A sequential mixed-methods study design was employed: first, a retrospective analysis of the Bull City Healthy and Fit cohort to identify predictors of success in the intervention. Then, the most and least successful participants and their parents were recruited to participate in in-depth semi-structured audio-recorded interviews. Transcripts were analyzed with a thematic analysis approach. Themes were grouped into categories including: (1) barriers and (2) facilitators of program attendance and engagement, (3) motivational factors, (4) program expectations, (5) lifestyle effects, and (6) parent perceptions of effects on child health. Only race was found to be a significant predictor of intervention success, with Hispanic/Latino children having a greater BMI reduction at 6-month follow-up. Prominent barriers to program attendance and engagement included distance, parent work schedule, and lack of childcare. Motivators included social support from family members and enjoyment of program sessions. All participants cited at least one lifestyle change due to participation, including improved diet choices and increased physical activity levels. All parents expressed satisfaction with some aspect of the program, even if their child did not lose weight. Results suggest that attendance isn't enough for BMI reduction; rather, external motivators are required to change habits and maintain them over time. Additionally, the program spurred important lifestyle changes in participants other than weight loss.

Sabriyya Pate

1pm-2pm

Faculty Advisor: Robert Korstad

Applied Conflict Resolution Frameworks in the Nigerian Healthcare Leadership Space
Community Engaged Research

I am not receiving assistance with poster printing costs and would like to apply to Duke's Service-Learning Program to reimburse the cost of printing my poster. Doctors, village health workers, and government bureaucrats often conflict in the Nigerian health space, creating prolonged strikes that often leave millions of Nigerians without healthcare access whenever hospitals and clinics shut down. This is a result of inadequate organizational management and capacity building across the health ecosystem, among other factors. In 2013, former Nigerian President Goodluck Jonathan created the Presidential Committee on Inter-Professional Relationships in the Public Health Sector. The Committee found various areas of conflict including organizational management, leadership and team work, remuneration, motivation, career management, and capacity building. Working at the Healthcare Leadership Academy (HLA), which trains African healthcare leaders to improve managerial competencies, Pate's research focused on designing and introducing collateral on conflict resolution into the HLA curricula. HLA seeks to develop the next generation of healthcare leaders in Africa who excel in governance and the provision of quality services, using curricula developed at the University of Cambridge Judge Business School and Duke Fuqua School of Business. Pate's research also involved reviewing all capstone projects created by cohorts from the Leadership Enhancement and Accountability for the Public Sector (LEAPS) and Patient Centered Care (PCC) programs. Drawing on formal academic study of conflict and negotiation, Pate investigated means of improving managerial competencies of doctors, nurses, and health officials. The deliverables the conflict resolution guide and recommendations for changes to the curriculum at the conclusion of analysis on the capstone projects were successful adopted into the program curricula.

Sera Pekel

10am-11am

Faculty Advisor: Scott Huettel

Humanization in the Trust Game: Beliefs mediate effect on prosocial behavior

Psychology- Graduation with Distinction

Beliefs about trust and trustworthiness of the other play a significant role in determining the nature of human relationships. When attributing trust in a relationship, people tend to have more favorable beliefs about people more like themselves, or ingroups. Yet, mentally categorizing people as ingroup and outgroup might yield to missed opportunities regarding interactions with outgroup members, both socially, but also in terms of financial transactions. We looked at whether introducing humanizing factors, such as someone's ideal pet or favorite TV show, could change people's beliefs about their counterparts, and thus alleviate discrimination against outgroups. Our results indicate that learning humanizing information in the Trust Game results in higher giving behavior for outgroups, but lower giving behavior for ingroups. The effect of humanization on prosocial behavior was mediated by change in participant's beliefs about what their counterparts expected them to send, and what the participants themselves expected counterparts to return in the game.

Anna Petterson

1pm-2pm

Faculty Advisor: Sarah Gaither

The Effect of Social Exclusion on Multiracial Identity

Social Sciences

Group membership is fundamental to satisfy our need to belong. Multiracial individuals can uniquely claim membership in two or more groups, making multiracial identity highly variable. As Multiracials experience exclusion from their respective racial groups as they often defy prototypicality, we investigate how this exclusion from their racial in-groups may affect their racial identification.

Bryce Polascik

1pm-2pm

Faculty Advisor: Dilraj Grewal

Association of Optical Coherence Tomography Angiography Parameters with Age and Gender in Normal Older Adults

Biological Sciences

Purpose: To quantify parameters characterizing the retinal microvasculature on optical coherence tomography (OCT) and OCT angiography (OCTA) according to gender and age in healthy older adults. **Methods:** Cross-sectional study. Subjects 50 years or older without diabetes, uncontrolled hypertension, glaucoma, dementia, stroke, retinal or optic nerve disease, or visual acuity (VA) < 20/40 were imaged using Zeiss Cirrus HD-5000 AngioPlex. Generalized estimating equations estimated the association between age and ganglion cell layer (GCL-IPL) thickness, foveal avascular zone (FAZ) size, central subfield thickness (CST), choroidal thickness (CT) and superficial capillary plexus (SCP) vessel density (VD) and perfusion density (PD) in Early Treatment Diabetic Retinopathy Study (ETDRS) subfields. VD and PD were assessed in 3x3mm SCP in ETDRS 3mm circle (both excluding (inner) and including (full) the central 1mm). **Results:** 254 eyes of 141 adults were analyzed. Median age was 69 years; 72.9% were female. Mean VA = 0.11 logMAR. Females had greater CT, GCL-IPL thickness, and FAZ size, and a smaller CST. After controlling for gender, CT ($p=0.001$) and GCL-IPL thickness ($p<0.001$) decreased as age increased (all $p<0.05$), whereas FAZ size and CST were not associated with age. As age increased, PD ($p<0.001$) and VD ($p<0.001$) in full 3mm ETDRS circle, PD ($p<0.001$) and VD ($p<0.001$) in inner 3mm ETDRS subfield, and PD and VD in full 6mm ETDRS circle ($p=0.033$ and $p<0.01$ respectively) decreased, after controlling for gender (all $p<0.05$). **Conclusions:** Loss of PD and VD in 3x3mm SCP and decreased CT and GCP-IPL thickness may be associated with aging, even beyond the 6th decade.

Ivana Premasinghe

1pm-2pm

Faculty Director: Ornit Chiba-Falek

Single-Cell Analysis and Gene Expression Profiles across Alzheimer's Disease Pathology through Fluorescence-Activated Nuclei Sorting (FANS) Methods

Biological Sciences

Single-cell capture is an upcoming method for human brain analysis, which is a field dominated by whole brain or bulk tissue examination. The use of single-cell capture methods allow for specific analysis of the functions of individual cells. The goal of this project was to utilize single-cell capture to analyze gene expression profiles of normal, mild-cognitive impairment (MCI), mild Alzheimer's disease (AD), and severe AD frozen human brain samples. The study took place in two parts. The first part of the study focused on the optimization and comparison of two single-cell capture techniques. The two methods- Laser capture microdissection (LCM) and Fluorescence-activated nuclei sorting (FANS)- were conducted, analyzed, and compared on the basis of counts, efficiency, and experimental process. Through this analysis, it was determined that the FANS process was the preferred method of choice- due to more consistency, increased number of counts and greater experimental efficiency. The second portion of the project involved the continuation of the FANS method and post-FANS analysis- including ATAC-Sequencing, RNA extraction, and DNA methylation. The ultimate goal of the project was to utilize data from the post-FANS analysis to examine genetic trends across pathology. The results from downstream applications show that there is indeed a decrease in the proportion of neuronal nuclei and an increase in the proportion of non-neuronal nuclei from normal to severe AD. There is also a noticeable change in the chromatin structure for females from normal to severe AD, yet this trend is not visible in males.

Elena Puccio

10am-11am

Faculty Advisor: Katherine Franz

Synthesis of a \hat{I}^2 -Lactamase-Activated Prochelator Based on Clavulanic Acid Core

Physical Sciences

Beta-lactam antibiotics kill bacteria by binding to penicillin binding protein, an essential enzyme in cell wall synthesis. Numerous strains of pathogenic bacteria have developed a method to resist antibiotics through expression of beta-lactamase enzymes, which degrade beta-lactam drugs through hydrolysis. Beta-lactamase inhibitors, such as clavulanic acid, can covalently bind to the active site of the enzyme, preventing beta-lactam hydrolysis. This is useful against serine beta-lactamases, which use a serine residue to hydrolyze beta-lactam rings; however, metallo-beta-lactamases use catalytic zinc ions, which prevents covalent binding of the inhibitor. The aim of this work is to synthesize and test a novel prodrug, CA2DPA (Bis-clavulanic acid-dipicolinic acid), that can inhibit metallo-beta-lactamases in resistant bacteria through the release of a chelator, a molecule that coordinates with metal atoms, after activation by beta-lactamase. The core of the prochelator is based on the inhibitor clavulanic acid, which does not have activity in non-resistant bacteria, providing specificity for activity in drug-resistant strains only. The chelator, dipicolinic acid, was chosen because it is known to inhibit the metallo-beta-lactamase NDM-1 by chelating the catalytic zinc ions. By attaching the chelator by one of its metal binding atoms, it is ineffective until it has been activated by beta-lactamase, preventing activity in non-resistant bacteria. The stability of this prochelator and its ability to be cleaved by beta-lactamase will be assessed using chromatographic and spectroscopic assays. Inhibition of NDM-1 will be assessed in vitro and in bacterial cells using purified enzyme kinetics and antimicrobial susceptibility assays.

Malavika Puri

12pm-1pm

Faculty Advisor: Amanda Hargrove

Development of a High-throughput Screen and an RNA-focused Small Molecule Library to Target the Long Noncoding RNA MALAT1

Biological Sciences

The long noncoding RNA MALAT1 is overexpressed in many different cancers and is correlated with low survival. A triple helix structural motif at the 3-end of the sequence was found to protect the transcript from degradation by deadenylases, thus allowing accumulation of the transcript and contributing to cancer phenotypes of invasion, migration, and metastasis. The goal of this study is to utilize small molecules to probe the role of the triple helix stability in cancer processes. To expedite the discovery of triple-helix-disrupting small molecules, we concurrently designed a high-throughput screen (HTS) and an RNA-targeted small molecule library. Our HTS used Differential Scanning Fluorimetry, which allows us to monitor RNA stability changes in a 96 well plate. A screening window coefficient, the Z factor, was used to assess assay quality and with a Z score of 0.55 ± 0.10 , the screen was confirmed as suitable. Next, we performed computational analyses on a 5,120-member in-house library to select for molecules with favorable RNA-binding properties. Specifically, we conducted principal moments of inertia calculations to characterize the 3D shape, and calculated 20 cheminformatic descriptors to determine the physicochemical properties of the small molecules. Nearest neighbor analysis was used to filter for molecules that were alike to known RNA-binding molecules, yielding 589 molecules for screening. Ongoing efforts are focused on screening these small molecules, and a few promising hits have been identified. The identified probes will then be utilized in cellular assays to measure their effects on MALAT1 accumulation and associated oncogenic processes.

Khaila Ramey-Collier

10am-11am

Faculty Advisor: Makeba Wilbourn

Mommy, Will You Read To Me? Cultural Effects on Story Time between Mothers and Infants

Psychology- Graduation with Distinction

Parents play a special role in child development. As they foster various skills (e.g. speaking and eating) and values (e.g. morals and responsibility), parents prepare their children for proper integration into society. Studies show that parents use story time as an age-appropriate tool to introduce language and lessons. Previous research primarily focuses on school-age (e.g. at least 3 years old) children's language outcomes. There is little research on how mother's messages may vary based on maternal demographics (e.g. race, income, education) during story time with their infants. Using a cultural lens to understand parenting strategies, socialization priorities, and narrative styles, this research seeks to investigate whether culture influences what black and white mothers emphasize while reading to their 10-24-month-old infant. We hypothesized that narrative themes would vary between black and white mothers, with black mothers emphasizing behavioral values and lessons, and white mothers focusing on object labeling, specifically among 18- to 24-month-old infants. Story time interactions were transcribed and coded. There was no significant difference between the frequency with which black and white mothers labeled overall or with respect to their infant's age. However, we found that black mother's stories were significantly shorter and used more critical behavioral themes (e.g. Disapproval and Behavior Modification) than white mothers. Implications of the findings are discussed.

Leah Ramsaran

1pm-2pm

Faculty Advisor: Brian Hare

Can playful learning increase success in Canine Good Citizen training?

Behavioral Sciences

Behavioral issues are the primary reason cited for relinquishment of companion animals into the shelter system, ultimately leading to overpopulation in shelters and euthanasia to relieve space constraints. While obedience training would seem like a solution, few studies have examined the efficacy of different training methods or provided psychological justification for their practices. Our study attempts to test the effects of the playful learning hypothesis on increasing successful retention of the sit and stay training commands on the Canine Good Citizen Test. Thirty-one dogs were trained to perform sit and stay behaviors for five minutes using reward-based training. Subjects were randomly assigned to the play or rest group intervention. Dogs in the play group were allowed ten minutes of play with experimenters and owners whereas dogs in the rest group remained inactive while maintaining consciousness. Subjects returned twenty-four hours later to repeat the five-minute training session to determine if learned behaviors were successfully retained. Results indicated that subjects in the play group that were not able to sit for more than thirty seconds on either day of training had significantly higher rates of retention, evidenced by an increase in average difference in wait times from day 1 to day 2 of 8.97 ± 10.21 seconds. Subjects in the rest group had an average difference in wait times from day 1 to day 2 of -1.75 ± 4.28 seconds. These results provide dog owners a strategy of increasing training success by incorporating play into training sessions, hopefully translating to a decrease in the influx of pets relinquished to shelters for behavioral issues.

Justine Rutter

1pm-2pm

Faculty Advisor: Kris Wood

Defining and leveraging genetic trade-offs to selectively target drug resistance in acute myeloid leukemia (AML)

Biological Sciences

Populations adapt to match their local environment. Importantly, evolution necessarily occurs blind to the future state of the environment. Consequently, when the environment changes suddenly and drastically, locally adaptive traits may be maladaptive in the new environment. This phenomenon is described as an evolutionary trap and has been recognized in the local demise of many populations in the natural world. Cancer, a disease whose persistence is enabled by local adaptation to drug, may also be vulnerable to such a trap. We propose that evolutionary traps (in cancer and otherwise) are set by genes that permit local fitness while reducing fitness in alternative contexts, a genetic property known as antagonistic pleiotropy (AP). To test this, we performed CRISPR/Cas-9 loss-of-function screens across nine distinct drug contexts in acute myeloid leukemia (AML) cells and identified AP genes whose loss increased sensitivity to one drug and decreased sensitivity to another. ABT-199 (BCL-2 inhibitor) and JQ-1 (bromodomain inhibitor) were found to share the greatest fraction of AP interactions which included MYC as a resistance modifier with bromodomain inhibition and susceptibility with BCL-2 inhibition. The potential of MYC to spring an evolutionary trap was validated in the context of resistance to bromodomain inhibition, where adaptive upregulation of MYC exposes hypersensitivity to BCL-2 inhibition. In sum, rational design of evolutionary traps to target drug resistant cancers is facilitated by understanding the AP gene interactions between drug contexts.

Natasha Schmeling

Faculty Advisor: Moria Smoski

10am-11am

The Effects of DBT Skill Use on Anxiety in Emerging Adults

Humanities

The purpose of this study is to explore other treatment options for anxiety, specifically dialectical behavior therapy skills due to their originally being designed to improve emotion regulation. Risk of onset for anxiety disorders peaks during adolescence, and most people who will develop an anxiety disorder will do so by the end of adolescence. Emerging adulthood is still a relatively new concept; however, there is convincing evidence distinguishing emerging adults aged 18-25 years old from both adolescents and adults, particularly when it comes to social roles, demographic information, and areas of stress. This study regards emerging adulthood as a potentially critical time to treat anxiety and includes both emerging adults and their parental figures in a DBT skills training group with the goal of teaching skills for improving individual emotion regulation and collective communication skills as a family. Using questionnaires (Beck Anxiety Index, DBT Ways of Coping Checklist, and Difficulties in Emotion Regulation Scale), anxiousness and emotion dysregulation were tracked in the emerging adult patient, and skills use was tracked in both patient and caregiver at pre-, mid- (3 months), and post-treatment (6 months). Analyses were done to determine whether anxiousness, emotion regulation, and skills use changed over the course of treatment, as well as if skills use was correlated with change in anxiousness and emotion regulation. The hope is that this study will add to the limited research done on the efficacy of DBT in treating anxiety and on the importance of DBT skills use in treatment.

Ryan Sellers

1pm-2pm

Faculty Advisor: David Sherwood

Understanding the Role of DDR-2 in C. elegans Germline Development

Biological Sciences

Germline stem cells are undifferentiated cells that self-renew and generate differentiated gametes required for reproduction. Germline stem cells reside in a microenvironment known as a niche, which contacts germline stem cells and promotes cell proliferation. An essential component of stem cell niches, the basement membrane, imparts structural and signaling properties to drive self-renewal and differentiation. Basement membranes (BMs) are conserved, dynamic sheets of extracellular matrices in tissues of nearly all multicellular organisms. Collagen is a major component of BMs. An essential collagen receptor, discoidin domain receptor-2 (DDR-2), is a receptor tyrosine kinase that is essential for cell growth and differentiation. Mutations of DDR-2 in humans lead to pathologies including cancer and sterility. It has been particularly challenging to study DDR-2 function in vivo because murine models homozygous for DDR-2 mutations are sterile. Consequently, the function of DDR-2 in germline development and fertility is relatively unexplored. Using *C. elegans*, we established a viable DDR-2 knockout strain by CRISPR-Cas9 gene editing. The *C. elegans* germline is syncytial, meaning that germ cells are connected by a common cytoplasmic core the rachis. Initial analysis of nuclear morphology using DAPI staining revealed proximal germline tumors. Additionally, RNAi-induced knockdown of DDR-2 lead to germline architectural defects. We used markers of the rachis and germ cell membrane to comprehensively assess germline defects. Future studies will investigate the signaling pathway through which DDR-2 acts. Our findings will advance our understanding of fertility, tumorigenesis, and inform therapeutic strategies.

Meg Shieh

12pm-1pm

Faculty Advisor: Emily Derbyshire

Bipartite Microbial Interactions of Bacterial Species Isolated from the Anopheles Mosquito
Biological Sciences

Anopheles mosquitoes are the main vectors for the transmission of the Plasmodium parasite, the causal agent of malaria. After a female Anopheles mosquito takes a blood meal of an infected-host, Plasmodium gametocytes are ingested into the mosquito gut. It has been speculated that the gut-microbiome of mosquitoes may reduce the transmission capability of the Plasmodium parasite thus, a greater understanding of the microbial dynamics in the mosquito microbiome will drive efforts to manipulate the microbiome to decrease the malaria burden. In this study, we investigated the in vitro bipartite interactions of 9 bacterial species isolated from the Anopheles gambiae and Anopheles stephensi mosquitos and examined potential mechanisms of growth inhibition, including iron acquisition. Our results demonstrate the competitive nature of interactions occurring between bacteria in the mosquito microbiome ultimately revealing numerous inter-species growth inhibitory relationships with unknown mechanisms. Advancing our understanding of the microbial relationships between mosquito-microbiome members will provide a basis for future manipulation of the Anopheles microbiome to potentially reduce the transmission capability of the Plasmodium parasite.

Krishna Sinha

12pm-1pm

Faculty Advisor: David Madden

Examining the Relationships Among Structural and Functional Connectivity, White Matter Hyperintensities, and Adult Age

Behavioral Sciences

Structural and functional connectivity changes in the brain accompany healthy aging. However, whether the relationship between age and functional/structural connectivity is direct or mediated is unclear. This study examined whether white matter injury, measured through imaging markers called white matter hyperintensities (WMHs), mediated relationships between age and both resting-state functional and structural (white matter) connectivity. 135 healthy individuals (19-79 years) underwent an MRI session, from which resting-state functional and structural DTI scans were obtained. Functional and structural (white matter) connectivity measures were derived using the graph theoretical approach, which views the brain as composed of nodes (regions), edges (connections), and modules (highly connected sets of nodes). System segregation, which compares the node connections within a module to the node connections between modules, was the main connectivity measure. WMH volume was calculated both around the ventricles (periventricular) and deep white matter. A statistical model tested the relationships among age, WMH volume, and both functional/structural system segregation. An age-related decrease in functional system segregation and increase in WMH volume was found; however, WMH volume did not mediate the age-related decrease in functional system segregation. Neither direct nor WMH-volume-mediated relationships between age and structural system segregation were found. Age is related to white matter integrity, as measured by WMH volume, and functional connectivity, as measured through system segregation. The relationship of age to these variables, however, appears to be independent, and WMH volume is not a significant mediator of the relationship between age and functional connectivity.

Elizabeth Snyder-Mounts

1pm-2pm

Faculty Advisor: George Truskey

Establishing a Baseline to Investigate the Effect of SNPs on Tissue Engineered Blood Vessel Function

Other: Biomedical Engineering

High levels of low-density lipoprotein cholesterol (LDL) increase a person's risk of developing cardiovascular disease. Proprotein convertase subtilisin/kexin type 9 (PCSK9) negatively regulates the uptake of plasma LDL by binding to and targeting the LDL receptor for degradation. As a result, the loss-of-function mutation of PCSK9 reduces plasma cholesterol, making PCSK9 a good target for clinical trials to lower cholesterol levels. In this work, we provide a baseline to investigate the PCSK9 gain and loss of function mutations using CRISPR/Cas9 in tissue engineered blood vessels (TEBVs). TEBVs provide a useful platform to study cardiovascular disease and perform drug testing, especially when used in combination with induced pluripotent stem cell (iPSC) derived cells. The DU11 iPSC cell line was selected as the control for the CRISPR/Cas9 gene-editing project. To validate the DU11 cell line for this research, we differentiated iPSCs into vascular smooth muscle (viSMCs) and endothelial (viECs) cells, and characterized these cells by immunofluorescence staining and incubation with enzyme-modified LDL (eLDL).

Chelsea Southworth

11am-12pm

Faculty Advisor: Christine Drea

What to expect when you're not expecting: hormonal birth control impacts lemur vaginal and labial microbiomes

Biological Sciences

The trillions of microbes that live on and within female genitalia, collectively known as female genital microbiomes, are increasingly recognized for their importance to host health and reproduction. In human females, healthy genital microbiomes are associated with reduced likelihood of disease and adverse birth outcomes. Perturbations of these communities can result in negative health outcomes for the host and offspring. Hormonal contraception is used across taxa, and has been shown to cause significant changes in microbiome composition. Although well-studied in humans, genital microbiome composition in non-human primates is relatively unknown. Lemurs are an ecologically diverse but closely related group of primates that are a promising system in which to examine genital microbiome variation across taxa. Here, we analyzed vaginal and labial microbiomes from captive *Lemur catta* and *Propithecus coquereli*, that were either cycling naturally or receiving contraception via depomedroxyprogesterone (DMPA) injections. To characterize microbial communities, we used 16S rRNA sequencing and analyzed microbial data in QIIME. We present the first data on the vaginal and labial microbiome compositions of these species and show that microbiome composition and diversity vary across species and body sites. Within a species and body site, there were significant differences between the microbiomes of treated and untreated lemurs. Future research should focus on the influences of other variables (i.e. age, parity, social group) on these microbiomes, as well as the differing functional capacities of these microbial communities. With further investigation, this research may allow us to better predict and treat reproductive health issues in captive lemurs.

Radhika Srivastava

12pm-1pm

Faculty Advisor: Makeba Wilbourn

Stories for Success: Culturally-Driven Maternal Influences on Children's Language Development
Behavioral Sciences

Maternal responses to child speech are usually spontaneous. As a result, these responses serve as instantaneous, yet valuable learning opportunities for the child. Mothers provide simple descriptions and labels during their infant's first year of life, but then shift to using novel words and more complex labels as the child ages. How mothers communicate with their infants varies culturally, socioeconomically, and developmentally. While previous research has focused on race, socioeconomic status, or education level of the mother individually, we know little about how these factors collectively shape mothers' responses. In the current observational study, mother-infant dyads (N=50) participated in an interactive picture-book task. Our sample of mother-infant dyads consisted of 26 self-identified black mothers and 24 self-identified white mothers. Infants were aged 10 months, 14 months, 18 months, or 22 months. While the distribution of education level among the sample did not differ based on race, there was a significant difference in income between the white and black mothers. The picture-book task was recorded, transcribed, and coded to analyze maternal total word count, discrete word count, and word categories (common nouns, pronouns and proper nouns, verbs, adjectives, and emotion words). Results indicate a significant main effect of race in that white mothers used more total and discrete words than black mothers overall. Additionally, black mothers used significantly more total and discrete words when speaking to their daughters than their sons, indicating a race by gender interaction. However, this interaction did not emerge among the white mothers. Findings will also discuss potential differences in word categories as well as the degree to which mothers' culture and socioeconomic status interact and predict children's vocabulary development. This study has important implications for the early vocabulary and literacy gap between black and white children in the United States.

Radhika Srivastava

12pm-1pm

Faculty Advisor: Sumedha Ariely

Trauma, Anxiety, and Depression Outcomes in Caregivers of Orphaned and Separated Children
Behavioral Sciences

WHO has declared mental health a critical focus area in global health. Approximately 4.5 percent of the global and Indian populations suffer from depression. Orphaned and separated children (OSCs) and their caregivers are both vulnerable populations at risk for poor mental health often due to potentially traumatic life histories. Thus, caregiver and OSC mental health are inextricably linked, with caregiver mental health often influencing child mental health. Currently, India has over 25 million OSCs and Udayan Care provides residential care for this population in Delhi, India. In 2018, we interviewed and investigated the mental health of 33 Udayan Care caregivers: 8 males and 25 females. Of these 33 caregivers, 5 male and 16 female caregivers are part of a 2-year longitudinal sample. Psychometric measures focused on anxiety, depression, and trauma. Results indicate that significant percentages of caregivers have experienced potentially-traumatic life events. While depression scores have improved over time, 24 percent of caregivers still show depression scores above clinical depression and 54.5 percent exhibit mild-to-severe anxiety. Of the caregivers who experienced potentially traumatic events, 60.6 percent have experienced parental or family death and 51.5 percent financial difficulty. Qualitative analysis suggests various themes of resilience, but also risk factors including feeling isolated or lacking a social support system. The findings demonstrate that more frequent and higher-quality support programs for caregivers would be beneficial for caregiver and OSC mental health. Recommendations include working with Udayan Care to enhance social support systems and increasing counseling and psychiatric services for caregivers.

Claire Stout

12pm-1pm

Faculty Advisor: Sarah Gaither

Be a man, but how? A Qualitative Exploration into Which Aspects of Masculinity Predict Male Aggression

Social Sciences

This study builds upon Stanaland & Gaither's (in prep) previous findings that a high amount of pressure motivation for gender behavior predicts physical aggression cognition in response to gender stereotype threat. I use qualitative and quantitative analysis to explore how masculinity is conceptualized differently between men who feel a high amount of masculine pressure (who were also found to be more prone to aggression) and men who feel a low amount of masculine pressure. Word frequencies for 134 male participants' responses to the free response question, Think about when you were growing up. What did it mean to be a man to the people you grew up around? In about 1-2 sentences, describe the kind of man people around you admired were calculated using NVivo 12. Family was the most frequent word mentioned for both low pressure men (3.65%) and high pressure men (5.06%). The words care (2.99%) and strong (1.99%) were frequent for low pressure men, and the words strong (2.47%) and provide (2.21%) were frequent for high pressure men. This preliminary evidence suggests that men who feel high amounts of pressure have more defined hegemonic responses. Although the groups differed in their response phrasing, both groups had hegemonic responses. Building from this study, I am interested in the spaces associated with men feeling more pressure to conform to masculinity, particularly in regards to fraternity membership and sports participation. Participants in Stanaland et al ongoing study will disclose their social group and athletic involvement to further explore this relationship.

Emily Sun

1pm-2pm

Faculty Advisor: Henry Tseng

Loss of optineurin disrupts mitochondrial networks and morphology

Biological Sciences

Mutations in the autophagy-gene optineurin (OPTN) are associated with primary open-angle glaucoma, but the mechanism linking OPTN mutations to this neurodegenerative disease is unclear. Recent studies have demonstrated that OPTN may be important for regulating mitochondrial homeostasis. Our research aims to test the hypothesis that loss of normal OPTN function disrupts mitochondrial networks and morphology. We used primary mouse embryonic fibroblasts (MEFs) purified from wild-type (WT) OPTN, E50K OPTN and OPTN knock-out (KO) transgenic mice. The cells were treated with inhibitors of mitochondrial respiration called oligomycin, antimycin (OA) at varying time lengths to induce mitochondrial oxidative stress. Immunofluorescent staining of mitochondria using antibodies to TOM20 was used to visualize morphology. Quantification of mitochondrial morphology was performed using Mitochondrial Network Analysis software. WT OPTN MEFs had fewer individual puncta than E50K and KO OPTN cells, and a higher number of networks. Furthermore, WT OPTN mitochondrial networks had a greater number of branches, and a greater branch length than both E50K and KO OPTN networks. OA treatment resulted in all three cell groups to demonstrate a similar fragmented morphology with fewer mitochondrial networks and more punctate mitochondria. Our data suggests that OPTN plays a role in the maintenance of a healthy mitochondrial network. This was disrupted by the glaucoma-associated E50K mutation, genetic deletion of OPTN, and treatment with mitochondrial inhibitors. Future work will be needed to determine if fragmentation and dysfunction of mitochondrial networks might increase oxidative stress and cellular apoptosis as a possible mechanism for retinal ganglion cell neurodegeneration in glaucoma.

Dylan Tamayo

11am-12pm

Faculty Advisor: James McNamara

The role of parvalbumin interneurons in the intra-amygdala kainate mouse model of temporal lobe epilepsy.

Biological Sciences

Temporal lobe epilepsy (TLE) is the most common form of human epilepsy, and is commonly devastating. Moreover, 30% of patients with TLE become resistant to current anticonvulsant drugs. Understanding the molecular mechanism underlying the development of TLE will provide insight towards developing novel therapeutic targets for prevention of TLE. The McNamara lab has discovered that brain-derived neurotrophic factor (BDNF) receptor TrkB is one of the molecular mechanisms promoting the development of TLE. One of the cellular targets of this signaling are parvalbumin (PV) interneurons, inhibitory cells in the hippocampus. It has been found that numbers of PV interneurons become reduced following an episode of prolonged seizure activity. This project aims to further investigate the impacts of temporal lobe seizures on PV cell populations. To address this question, I modeled TLE in mice. By delivering an excitatory neurotransmitter to the amygdala, a mouse undergoes a prolonged seizure episode. The brains of these mice can then be compared to mice that have not experienced such an injury, determining morphological differences between the two conditions through histological analysis. I found an increased number of degenerating cells and a reduced count of PV interneurons in hippocampal regions of mice that experienced seizures. These results suggest a correlation between increased cell activity, neuron degeneration, and decreases in PV cell counts in the hippocampus following a seizure episode, confirming similar results to other models of TLE in literature. Future studies will investigate how BDNF signaling impacts the preservation of PV cells following seizures.

Katie Taylor

11am-12pm

Faculty Advisor: Jenny Wood Crowley

STEM Retention Programs in Higher Education

Social Sciences

The Duke SPIRE (STEM Pathways for Inclusion, Readiness and Excellence Fellows) Program aims to provide mentorship and a support system to undergraduate students interested in pursuing a STEM major. The program is built to attract and work with students from diverse backgrounds. Simultaneously, they are working with STEM departments in order to address possible structural changes that are necessary. The literature review gave insight into the success that small, currently known as Wise, interventions can have on students. It also provided ideas for how small curriculum changes or environmental changes in a department can have a positive impact. From this stemmed my research question: What is the best combination of high-touch intervention with students as well as the structure of intro mathematics courses that can increase the persistence of women and underrepresented minorities interested in a STEM major? Literature review along with visiting various Universities allowed us to recognize a few patterns of success in STEM Retention Programs. These visits are to meet with leaders of programs similar to SPIRE as well as meet with leading researchers in the field of Mathematics Education in order to learn more about the current research surrounding mathematics curriculum and the success of intervention programs around the nation. Conclusions from the meta-analysis point to focusing less on merit when admitting students to similar programs and taking steps towards creating a positive environment for the students to learn and grow in both in and outside of the classroom.

Skye Tracey

12pm-1pm

Faculty Advisor: Jeremy Kay

Investigation of the latrophilin FLRT protein interaction

Biological Sciences

The nervous system requires a diverse set of cell surface molecules for proper spatial organization and correct wiring. The Kay lab has developed a genetic screen of alternative splicing in the retina, which has identified novel isoforms and previously unobserved abundance of various retinal cell-surface proteins. These previously unstudied isoforms are predicted to have differing protein domains, which may change protein-protein interactions and thereby change protein function. To ask whether the newly discovered isoforms can in fact change protein function, we focused on two proteins in particular: Latrophilin-2 and Latrophilin-3. These were selected because their binding partners are known, which provides a useful positive control to compare functionality of the novel isoforms. Through this study, I hope to fill the knowledge gap of the unknown interactions of latrophilin-2 and latrophilin-3 and how alternative splicing might change protein interactions. I validated the binding of latrophilin-3 to known binding partners, the FLRT proteins. In order to do so, eukaryotic expression vectors were transfected in HEK293 cells to express proteins. Soluble FLRT protein flooded on the cells demonstrated ligand interactions, which was observed using immunohistochemistry and confocal microscopy. In order to investigate alternative splicing, I will create constructs of isoforms observed from the RNA-seq screen that lack extracellular domains. The binding assay will be repeated to observe potential changes in protein interactions.

Michael Tran

10am-11am

Faculty Advisor: Emily Derbyshire

Elucidating the Role of Host Aquaporin-3 During Apicomplexan Infection

Biological Sciences

Plasmodium, the parasite that causes malaria, exploits host aquaporin-3 (AQP3) during liver infection by inducing its expression. It was shown that AQP3, which is a water and glycerol channel, localized to the parasitophorous vacuole membrane (PVM) during infection, suggesting that it may transport essential nutrients to the parasite for its growth and development. Further, it was shown that knockdowns of host AQP3 levels decrease parasite load during the liver stage of Plasmodium. Our project focuses on confirming that either the delocalization of AQP3 to the PVM or the disruption of AQP3s nutrient flux is the underlying mechanism to the importance of this protein during infection. Toxoplasma, which is from the same phylum (apicomplexa) as Plasmodium, will also be studied. Toxoplasma has a close evolutionary background, similar development patterns, and higher infection rate, thus it may prove to be an accurate model of Plasmodium infection. An expression profile of AQP3 for HuH7 hepatocytes and other cells lines infected with Toxoplasma will first be obtained via qPCR to elucidate transcriptional levels, potentially upregulated and similar to AQP3 levels during Plasmodium infection. Additionally, to uncover more about the AQP3 pathway, its anticipated transcription factor, FOXA2, will be knocked down. The resulting AQP3 levels can be studied to determine if there is a relationship between the two. After obtaining the expression profile of AQP3 in various cell lines infected with Toxoplasma, AQP3 mutants will be created through CRISPR. These mutants, YRLL, Y19A, LL, will have altered amino acids at the region that localized to the PVM. Therefore, when these AQP3 mutants are over-expressed in green fluorescent protein (GFP) tagged Toxoplasma, they should not localize to the PVM. Fluorescence microscopy will confirm the inability to localize to the PVM and the decreased parasite load. Should such be the case, the data would suggest that there is something in Toxoplasma that specifically communicated with the host cell to recruit host AQP3 to bind to the PVM.

Victoria Trimm

10am-11am

Faculty Advisor: Margarita Svetlova

Preschoolers' Reactions to Joint Commitment and Remorse

Behavioral Sciences

Beginning around 3.5 years, children understand the function of joint commitment and react negatively when an actor breaks it (Kachel, Svetlova, & Tomasello, 2018). Children also understand the basic purpose of guilt and remorse beginning around age five (Vaish, Carpenter, & Tomasello, 2011). What is yet to be understood, however, is how children of that age react when a defecting actor in a joint commitment attempts to repair their behavior with a remorse display. In the current study, 64 children between the ages of 4-6 participated in a collaborative coloring task with two partners, one of whom defected. Children were randomly assigned to either a remorse condition in which the defector expressed remorse for their transgression, or a no-remorse condition in which the defector was unrepentant. Results showed that children take remorse into account when distributing resources and answering basic questions about their collaborators sharing more and feeling more positively towards defecting actors who expressed remorse than towards those who did not. These findings expand upon prior research on early childhood pro-sociality and indicate that children have an understanding about the functionality of remorse following a broken joint commitment and take remorse into account when interacting with their collaborators.

Amulya Vadapalli**10am-11am**

Faculty Advisor: Mbaye Lo

Competing Conceptions of Justice in Yemen

Social Sciences

The war in Yemen is defined by the United Nations as the world's worst humanitarian crisis, but remains chronically underreported. The war involves almost 10 countries, including the United States, and has recently come into the limelight after Jamal Khashoggi's murder. Once celebrated as a success story of the Arab Spring, 80 percent of Yemen's population now needs some form of humanitarian aid. My project attempts to crystallize three conceptions of justice related to the world's worst humanitarian crisis: the war in Yemen. The first is the government perspective, explored through the US and Saudi Arabia. I use State Department statements as a proxy for US views, and Al-Araby, a state-funded publication as a proxy for Saudi Arabia. The second is how international humanitarian law views justice, explored through case studies of countries with internationally-mediated justice settlements. The third is how the Yemenis themselves view justice, constructed through interviews with Yemenis. My analysis focuses on how these conceptions of justice differ from each other, and the impact this will have on a sustainable peace process.

Ajay Varadhan

10am-11am

Faculty Advisor: Joel Collier

Sublingual Immunization Using Self-Assembling Peptide-Polymers

Biological Sciences

As research with immunologically active biomaterials continues to grow, it is important to develop practical and effective modes of delivery. One such route, sublingual the mucosal space below the tongue has been shown to raise responses in many anatomical locations. Sublingual immunization eliminates the need for needles and can be delivered as drops or dissolvable wafers. The 11-amino acid peptide Q11(QQKFQFQFEQQ) forms beta-sheets in salted solution, which self-assemble into nanofibers and raise immune responses against conjugated peptide epitopes. We have found that dense coatings of mucus-inert polymers such as polyethylene glycol (PEG) promote sublingual delivery by reducing surface interactions resulting in strong immune responses against several epitopes. It was also found that antibody responses were positively correlated with the size of PEG conjugated to OVA-Q11. In contrast, shearing nanofibers, which was shown to significantly reduce lengths, had no effect on sublingual immunization responses. While previous formulations used cholera toxin adjuvant to achieve consistent responses, here we explored the use of nucleotide STING (Stimulator of Interferon Genes) agonists as an alternative. A molecular strategy, involving favorable hydrogen bonding and electrostatic interactions between nucleotide adjuvants (AMP and GMP) and poly-valent arginine, promoted increased activation of dendritic cells in vitro. Broader applications of these findings may lead to improved methods of delivery for nanomaterial based vaccines.

Tanmayi Vashist

10am-11am

Faculty Advisor: Jennifer Tenor

*The Roles of Protein Interactors in Trehalose Synthesis and Other Pathways in *Cryptococcus neoformans**

Biological Sciences

The trehalose pathway has been identified as an attractive antifungal target because it is essential to the virulence and/or fitness of *Cryptococcus neoformans*. The Tps1 enzyme is critical to the pathway because it is responsible for the first step in the production of trehalose where it converts glucose-6-phosphate into trehalose-6-phosphate. Among others, eleven different proteins are predicted to interact with Tps1 based on yeast two-hybrid experiments performed in the Perfect laboratory. The impact of these genes on trehalose production is unknown. I examined the effect of mutants carrying deletions for eight out of eleven genes. By indirectly measuring trehalose levels, I identified two genes (CNAG_05768 and CNAG_07869) that were significantly altered in trehalose levels compared to wild-type strain (H99) when grown at 37 °C, supporting a previous undergraduate's evaluation. To further evaluate these two genes, I have restored wild-type copies of the genes into their respective deletion constructs. Construction of these strains will confirm that the observed phenotype is causal to the reduction in trehalose and allow me to characterize the interaction of the two genes with Tps1 and the trehalose pathway.

Shomik Verma

11am-12pm

Faculty Advisor: Nico Hotz

Numerical modeling and design optimization of a concentrated solar thermal collector for dry methane reforming

Physical Sciences

This study details the modeling of a solar thermal collector designed to maximize absorption of solar heat. The heat is used to drive a dry methane reforming reaction to produce H_2 and CO from CH_4 and CO_2 . The finite element method based numerical model takes into account all modes of heat transfer, fluid flow, and chemical reaction. The goal of this study was to improve a previously designed collector to optimize absorber temperature. Various operational parameters were varied to obtain the final simulated results of optimized collector design. Different tube materials were considered to improve insulation given the high temperatures of the collector. Catalyst characteristics were tuned to accurately match experimental data. Absorption coating optical properties were optimized to maximize temperature. The results show a vacuum-insulated, high-temperature solar thermal collector for dry methane reforming can be manufactured, and is capable of achieving high temperatures even with low concentration ratios.

David Wang

12pm-1pm

Faculty Advisor: Piotr Marszalek

Examining the Refolding of Perturbed Protein Structure intermediates Using Various Molecular Mechanics Force Fields

Physical Sciences

Molecular dynamics simulations allow for the prediction of protein folding trajectories in all-atom resolution, thereby providing information about the folding process which is difficult to obtain experimentally. If the molecular mechanics force field is incorrect however, molecular dynamics simulations may fail to accurately predict folding intermediates and replicate the folding trajectory. Therefore, experimentally known protein refolding intermediates based on force spectroscopy data may prove to be a helpful tool in validating the ability of molecular dynamics simulations to refold proteins. We created models of the perturbed titin I91 (I27) domain and consensus ankyrin repeat structure, NI3C, intermediates based on atomic force spectroscopy data. We then conducted refolding simulations on the structures using five different force field/water model combinations. In doing so, we observed that the Charmm22*, Amber fb15, and Amber ff14SB without dihedral correction force fields had the easiest time refolding both protein intermediates. Additionally, it was observed that the dihedral correction to the Amber ff14SB force field prevents the timely refolding of both intermediates. These results suggest that the parameterization of side chain torsion angles can significantly help the refolding of protein structures. Additionally, the ad hoc adjustment of dihedral angles might impede refolding more than anticipated.

Jennie Wang

11am-12pm

Faculty Advisor: Heileen Hsu-Kim

Examining the Impact of STEM Outreach Programs for 4th-6th Grade Girls

Community Engaged Research

The gender gap in STEM fields has been widely recorded and in recent years, there have been increased efforts to encourage female participation and engagement in STEM. In particular, literature has indicated that extracurricular programs focusing on younger girls and female mentorship show effectiveness in increasing female involvement and retention in STEM fields. Females Excelling More in Math, Engineering, and Science (FEMMES) is a STEM educational outreach program based for 4th-6th grade girls located in Durham, North Carolina that whose mission is to engage young girls in STEM fields through exciting hands-on activities and mentorship from female university students and research faculty. This research project focused on analyzing the impact of two FEMMES programs: the FEMMES Capstone event and the FEMMES After-school and Saturday programs. Data was collected from pre-surveys and post-surveys, and interest, knowledge, and perceived skill level were compared before and after participation in the enrichment programs. Additionally, analysis of interpersonal relationships and mentorship were also conducted.

Amanda Watts

11am-12pm

Faculty Advisor: Tobias Overath

Incongruent versus Congruent Consonant and Dissonant Target Chords Elicit BOLD Signal in Regions Implicated in Musical Syntax Interpretation

Behavioral Sciences

The understanding of how humans process aspects of music is fundamental in further uncovering the evolutionary purpose of music and its relation to the human condition. Elucidating the brain structures instrumental in processing musical consonance and congruence is paramount to studying music perception and emotion. We conducted a functional magnetic resonance imaging experiment using two participants to determine the brain areas in which blood oxygen-level dependent (BOLD) signals were evoked while listening to consonant, dissonant, congruent, and incongruent musical chord sequences. In Brocas area and the posterior temporal cortex, we found that the difference in BOLD activation between incongruent and congruent conditions was significantly greater for sequences with dissonant target chords than those with consonant target chords. Significant activation was found in the inferior frontal gyrus and ventral striatum in response to consonant sounds and in the bilateral hippocampus and temporal poles in response to dissonant sounds. Brocas area and the posterior temporal cortex were also significantly activated while hearing incongruent sequences. These findings demonstrate the important roles of consonance and the context surrounding a sound in music perception.

Mary Weggeland

Faculty Advisor: Kristin Huffman

The Rise of Print Culture in Early Modern Venice

Humanities

1pm-2pm

Although the origins of the print industry is typically associated with Germany, Venice dominated the print industry in the fifteenth-sixteenth century. The emergence of the print-publishing industry in early modern Venice revolutionized the city economically and culturally, bolstering its dominant tourist environment, providing depictions its vibrant festival and carnival culture, and creating new practices, such as the need for copyright and print privileges. As a destination on the Grand Tour, Venice was a unique city through its spectacles and carnivals, its theater and Ridotti, and its vibrant and diverse culture, all of which were topics highlighted through the print industry. The dissemination of content drove innovation in typesetting, imagery, and formatting yet the print and mapmaking industries bred mimicry as printers and cartographers looked to one another for inspiration. This concept of forgery or flattery resulted from the Venetian government's laissez-fair license and reproduction rights distribution and competition amongst venetian printers. Further, Venice's position as a renowned stop on the Grand Tour led to the creation of the album format and other alterations to Grand Tour souvenirs in order to facilitate travel and portability. This research has contributed to our understanding of print culture and map-making in the early modern Venice, printed souvenirs collected by travelers on the Grand Tour, and the concept of forgery or flattery. In July 2019, this research will serve as a part of a larger installation in the Chappell Gallery that will include a selection of books printed in Venice from the Rubenstein collection.

Tzu-Chieh (Michael) Wen

10am-11am

Faculty Advisor: David McClay

*Investigating the expression of candidate EMT genes in *L. variegatus**

Biological Sciences

An epithelial-mesenchymal transition (EMT) is the process where polarized epithelial cells develop the cell surface properties of mesenchymal cells, become motile, breach the basement membrane and enter the blastocoel. The EMT is important in understanding embryogenesis, tissue regeneration, and cancer progression. In sea urchin embryos both the skeletal cells and many non-skeletogenic mesoderm (NSM) cells go through an EMT and the process can be studied directly in vivo. This study attempts to understand the genes involved in an EMT and how they are regulated in different cell types. We use results from a transcriptome analysis that show effector genes expressed in various cell types during late blastula and gastrula stage of *Lytechinus variegatus*. By screening for genes that are highly expressed in the skeletal cells, we were able to uncover potential genes involved in EMT. We successfully cloned candidate genes from the screen, synthesized RNA probes, and performed in situ hybridization experiments to see where the genes are expressed in different stages during sea urchin development. We show that Pak1, a kinase involved in cell motility and morphology, is expressed in both the skeletal cells and a subpopulation of NSM before and after they go through an EMT, showing that it may be involved in a cellular process of EMT such as adhesion.

Alexander Wilson

12pm-1pm

Faculty Advisor: Amanda Hargrove

Optimization of High-Throughput Screening Assays to Evaluate RNA-Binding Small Molecules

Biological Sciences

Non-protein coding RNAs have been implicated in biological processes and are often dysregulated in disease. The use of small molecule probes has proven to be a viable strategy to attenuate RNA-specific disease-state interactions and study unknown RNA functions. While trends in the design of RNA-binding small molecules have emerged, guiding principles to rationally and selectively target an RNA are not well understood. Therefore, there is a need to identify selective RNA-binding small molecules and important recognition properties. Herein we describe efforts to rapidly identify unique RNA:small molecule interactions and correlate RNA binding preferences to small molecule properties. To begin, we rationally designed and curated an RNA-focused small molecule library enriched in molecular properties that have been observed to be prominent for RNA recognition. Next, two fluorescence-based, high-throughput screening (HTS) assays were optimized to evaluate binding and selectivity of library members to biologically relevant RNAs. For assay optimization, the dissociation constant of two different fluorescent indicators and respective assay quality (Z-factor) was assessed for each RNA target. Current work is focused on applying the HTS assays to screen the RNA-focused library and comparing hits identified with each indicator for a given RNA to discriminate lead molecules from false positives or negatives. Future efforts will include analyzing properties of small molecules that selectively bind an RNA to elucidate physicochemical, structural, and spatial properties important for recognition. Altogether, these efforts will provide further guiding principles for the rational targeting of RNA and potentially lead to selective chemical probes to study unknown RNA functions.

Jessica Williams

11am-12pm

Faculty Advisor: Neil McWilliam

Robert Willis (1800-1875) and the Historiography of Italian Gothic Architecture
Humanities

Cambridge engineer Robert Willis is known by scholars as "the father of architectural history." He established a novel and deeply influential methodology for the study of Gothic architecture, including hundreds of terms for building elements that are still in use today. In spite of his continuous importance in the study of medieval buildings, little research has been done on the impact of Willis's engineering background on his view of architecture, particularly on his earliest book concerning the Italian Gothic. To understand Willis's conception of Italian Gothic architecture, this thesis will examine Willis's methodology through a detailed analysis of his personal drawings. Focusing on Naples, but within the context of Italy as a whole, the paper looks to contextualize Willis's reaction to the Italian Gothic through the lens of his methodology as an English scientist during the early nineteenth century. Willis lived during a time of immense change to the fields of both architectural history and the sciences, in which they defined themselves into the disciples of today. The thesis will ultimately argue that, as shown by Robert Willis's extensive scholarly career, science and architectural history may not be as mutually exclusive as they may initially appear.

Barbara Xiong

1pm-2pm

Faculty Advisor: Sandeep Dave

Predicting Synergistic Combinations of Drugs with Deep Neural Networks

Biological Sciences

In 2012, the National Cancer Institute (NCI) released the DREAM7 Drug Synergy Challenge to predict synergistic and antagonist compound-pair activity from individual compound perturbations. However, of the thirty-one participating teams, even their best-performing methods still yielded far from optimal accuracy. Here, we explored whether Deep Learning approaches could better predict synergistic combinations. Genomic transcription profiles across individual treatments of 14 drugs on the OCI-LY3 cell line, as provided by NCI, were used to train a neural network to predict the Error over Bliss (EOB) of the 91 pairwise combinations. Before training, the input gene set was experimentally filtered by maximum gene-expression and fold change to determine the pre-cutoff and fold-change thresholds that would yield the best model. Transcription profiles for each drug pair were combined by taking the product of the log fold changes of each gene, yielding a similarity score vector for each pair of drugs. The performance of a model was assessed by the area under its receiver operative characteristic curve (ROC-AUC). The best model from the deep learning approach achieved a ROC-AUC of 0.84 for the validation set, compared to 0.81 from that of the best model from the DREAM7 challenge. The sensitivity, specificity, and precision of the deep learning model were 0.72, 0.88, and 0.67, respectively, with 25% of the combinations being truly synergistic. These are marked improvements over the existing methods, which have been difficult to improve upon. Further studies will evaluate whether these methods are extendable to novel drugs.

Ziyi Yan/Qiang Zhang

10am-11am

Faculty Advisor: Mark Leary

Music and Spirituality: The Psychological Impact of Music on Feelings of Spirituality and Connectedness

Psychology- Graduation with Distinction

Music is a powerful tool that has connected individuals across space and time. Within music psychology, the emotion of spirituality has gotten a particular amount of attention in recent years. However, there remains a lack of consensus on what spirituality entails, and studies primarily view spirituality primarily from a religious context. To address these gaps, my thesis explores the effects of instrumental music on feelings of spirituality and connectivity in listeners. In particular, I seek to find the features of music that elicited strong reactions of spirituality in listeners. I first conducted a pilot study where I mapped 48 instrumental clips onto characteristics based on the 3 fundamental psychological dimensions of music- intensity, valence, and depth in order to locate each of the clips as a specific psychological blueprint point on a three-dimensional space. In the subsequent study, I determine how spiritual responses to music relate to the dimensions of each piece, and how individual differences moderate these effects. I found that music that had been rated as more negative in valence and as greater in depth was associated with deep emotional feelings, connection to a higher power, and feelings of sadness/wistfulness. Through this study, I hope to contribute to an unexplored area in music psychology literature and illuminate further directions through which to study music and spirituality.

Iris Yang

1pm-2pm

Faculty Advisor: Moria Smoski

Can't you feel your heartbeat fast?: Mindfulness as a mediator between interoception and anxiety

Social Sciences

Interoception is the perception of physical and emotional sensations within the body, such as hunger, respiration, and pain. Interoception is conceptualized in different components, including interoceptive accuracy (IAc), operationalized in this study as the objective ability to detect heartbeats within the body and interoceptive sensibility (IS), measured by self-reports of subjective interoception. There is conflicting literature on whether or not interoception is helpful or hurtful in emotion regulation. In an undergraduate, nonclinical sample, we hypothesized that: (1) IAc will not significantly correlate with IS during the heartbeat perception task; (2) mindfulness will moderate the effect of IS on anxiety such that IS will predict higher anxiety at low levels of mindfulness while noticing will predict low anxiety at high levels of mindfulness; (3) mindfulness will moderate the effect of IAc on anxiety such that better IAc will predict higher anxiety at low levels of mindfulness while better IAc will predict low anxiety at high levels of mindfulness. As hypothesized, accuracy on the heartbeat perception task was not significantly correlated with IS ($p = .52$). In contrast to the hypotheses 2 and 3, multiple linear regression models did not show interoception mediating the relationship between mindfulness and anxiety. Further studies should be conducted in clinical populations to investigate the relationships between interoception, mindfulness, and anxiety.

Alexander Yearley

1pm-2pm

Faculty Advisor: Scott Floyd

The BRD4-NUT Fusion Protein Modulates Chromatin Dynamics to Alter DNA Damage Signaling

Biological Sciences

NUT Carcinoma is a rare, but aggressive type of squamous cell cancer that is genetically defined by a t(15;19)(q13, p13.1) chromosomal translocation in chromosome 19, where the N-terminal domain of BRD4 is fused to the C-terminus of the NUTM1 gene. This translocation creates the fusion oncoprotein BRD4-NUT. There is currently no effective treatment for NUT Carcinoma; however, the use of BET bromodomain inhibitors (BETi), which competitively inhibit bromodomain proteins from binding to histones, have shown promise as a potential treatment. Previous experiments have shown that BRD4 endogenously inhibits DNA damage response (DDR) signaling at the chromatin level; however, this mechanism is not well understood. In this study we seek to further understand the relationship between the fusion protein BRD4-NUT and the DDR through computational analysis. NUT Carcinoma stands out compared to other cancers for its strong radio sensitivity. This project evaluates the hypothesis that BRD4-NUT blocks DNA damage signaling by compacting chromatin. The main data sets for computational analysis already exist. These include previously generated ATAC-seq data, which represents chromatin compaction on a genome-wide scale, and published BRD4-NUT ChIP-seq data sets, which provides genome-wide analysis of BRD4-NUT's interaction with the chromatin. Using statistical methods, this project shows that a negative association exists between Brd4-NUT ChIP-seq and ATAC-seq data, which could confirm the hypothesis that chromatin compaction is involved in Brd4-NUT mediated decreases in DNA damage signaling.

Stephanie Zelenetz

10am-11am

Faculty Advisor: Ashutosh Chilkoti

Recombinant Synthesis of Depot-Forming Peptide Polymer for Flt3-L Cancer Immunotherapy

Biological Sciences

Checkpoint blockades and adoptive T cell therapy have highlighted recent breakthroughs in cancer immunotherapy, but clinically effective cancer vaccines have yet to be achieved. The growth factor FMS-like tyrosine kinase 3 ligand (Flt3-L), is an appealing candidate for cancer vaccines due to its ability to recruit and direct the differentiation of dendritic cells (DCs) to enhance antigen presentation. By leveraging biomaterials for protein delivery, it is possible to control and prolong the immune response initiated by Flt3-L. Here, we describe the design of a Flt3-L fusion to an elastin-like polypeptide (ELP) to be utilized for the sustained delivery of Flt3-L. The thermoresponsive behavior conferred by the ELP can facilitate the formation of a coacervate-like depot upon injection in vivo, resulting in sustained release of Flt3-L. Ultimately, by exploring a variety of constructs and purification strategies, we were able successfully produce and purify a novel Flt3L-ELP fusion. Further engineering of the fusion, including the investigation of different ELP variants and fusion orientations will be used to modify the construct, promoting the proper phase behavior necessary for a depot-forming cancer vaccine.

Adary Zhang**11am-12pm**

Faculty Advisor: Kevin LaBar

Modulating implicit race bias in a fear conditioning paradigm

Biological Sciences

Implicit race bias is a root cause of a number of pressing problems in today's world, including jarring disparities in health and socioeconomic status across different racial groups. This study tracks implicit and explicit race bias during a standard fear conditioning paradigm to explore the differential effects of gradual and standard fear extinction techniques on race bias in American university students.