curf Center for Undergraduate Research & Fellowships

CURF RESEARCH EXPO

Wednesday, September 11, 2019
5:00 – 6:30 pm
Hall of Flags, Houston Hall

The University of Pennsylvania's Center for Undergraduate Research and Fellowships is the University's hub for undergraduate student research, as well as the launch pad for Penn students seeking to apply for nationally competitive scholarships and fellowships

Welcome to CURF's Research Expo!
Over 300 undergraduate researchers are eager to share their research with you, so enjoy learning about the array of opportunities embraced by undergraduates at one of the world's leading research universities.

Interested in getting involved in research and/or fellowships at Penn?

Visit us at http://www.upenn.edu/curf/ for more information about individual advising and peer support opportunities

Information Sessions and Workshops

Getting Started in Research

"How to" for specific fields of research

Getting to Know Faculty

Research Skills Series

Social Impact Research

Fellowships 101 Information Sessions

Fellowships 201 Information Sessions

Fulbright Scholarship Information Sessions

Graduate Study in the United Kingdom

Pursuing International Summer Fellowship Opportunities

CURF Programs and Academic Initiatives

The President's Engagement Prize (PEP) *supports students with financial support for both living and project expenses to develop and implement a promising local, national, or global initiative*

The President's Innovation Prize (PIP) *provides living and project expenses to envision and implement an innovative commercial venture to make a positive difference in the world*

The Penn Undergraduate Research Mentoring Program (PURM) *matches students with faculty researchers from across all twelve schools*

The Summer Humanities Internship Program (SHIP) *provides students with apprentice positions in a cultural, historical, or archival setting*

Jumpstart for Juniors *provides students the opportunity to gain invaluable investigative skills in the summer after their junior year*

The University Scholars Program *provides support for in-depth research during their undergraduate career*

The Benjamin Franklin Scholars Program *offers intellectually stimulating small seminars*

and many more!

Natalia Acero (SEAS 2021)[5]
Advisor: Deep Jariwala
Temperature controlled technique for clean assembly of multilayered van der Waals heterostructures

Sanjana Adurty (COL 2020), Namita Saraf (COL 2020), and Grace Wu (COL 2020)[6]
Advisor: Sarah Kagan
The Harmony Exchange

Oscar Aguila (COL 2020)[9]
Advisor: Megan Kassabaum
Zooarchaeological Analysis of Fish Remains at Smith Creek

Valery Aguilar (COL 2022)[10]
Advisor: Ann Farnsworth-Alvear
Understanding Immigrant and Refugee Statuses

Fatima Al Rashed (COL 2022)[2,3]
Advisor: Carol Muller
Menstrual Hygiene and Management in Bwiam

Rebecca Alifimoff (COL 2020)[2]
Advisor: Sophia Rosenfeld
Politics In The Personal: Political Postcards of the Dreyfus Affair

Aja Altenhof (COL 2021)[10]
Advisor: Gareth Roberts
Organizing the Adult Lexicon: Does a label alter the way a concept is stored in memory?

Jessica Anderson (COL 2021)[5]
Advisor: Robert Heuckeroth
The Role of BAP1 in the Enteric Nervous System

Anushree Aneja (COL 2022)[10]
Advisor: Ethan Goldberg
Achieving Opsin Expression in Defined Interneurons in Dentate Gyrus and GCaMP in Granule Cells in Juvenile Mice

Julci Areza (COL 2021)[2]
Advisor: Matthew Kayser
Identification & characterization of sleep-wake circuits in Drosophila larvae

Jordy Atencia (COL 2021) and Liam Forsythe(COL 2021)[10]
Advisor: Paul Schmidt
Migration and Risk Taking Behavior in Drosophila melanogaster

Nikhil Avadhani (COL 2022) and Junduo Liu (COL 2022)[3]
Advisor: Douglas Wiebe
Dynamics of Disease Transmission in Dorms: Addressing Social, Spatial, and Structural Determinants of Health

Brian Bae (SEAS/WH 2022) and Sihan Ye (WH 2022)[10]
Advisor: Gad Allon
Delay Announcement

Alejandra Bahena (COL 2022)[3,10]
Advisor: David Irwin
Selective Vulnerability of the Locus Coeruleus in Tau versus TDP Proteinopathies

Junyoung Baik (COL 2022)[10]
Advisor: Paul Goldin
Bibliographies in Traditional Chinese Studies

Daner Baxhija (COL 2022)[10] and Janice Owusu (COL/WH 2022)[10c]
Advisor: Phillip Nichols
Causes of Corruption

Sanaea Bhagwagar (COL 2021)[2]
Advisor: Stephen Strittmatter
Characterization of the P301S Tauopathy Mouse Model with Progranulin Reduction

Greer Bizzell-Hatcher (COL 2021)[10]
Advisor: Jacqueline Corcoran
Systematic review and meta-analysis on prevalence of depression in low-income women

Emma Boey (COL 2021)[2]
Advisor: Erle Robertson
Epstein Barr Virus Encoded BHRF1 miRNAs Have a Role in Maintaining Viral Latency

Selene Bonczok Sotelo (COL 2022)[10]
Advisor: Tulia Falleti
Indigenous Communities and Health Care

Samuel Botterbusch (COL 2022) and Imañia Powers (COL 2021)[10]
Advisor: Tobias Baumgart
Exploring Phase Separation of Endocytic Proteins

Zoe Braccia (COL 2020)[5]
Advisor: Whitney Trettien
Archiving Lost Fragments of 17th-Century Compilations

Daniel Brennan (COL 2020)[4]
Advisor: Walter McDougall
Reconcentration: Spanish Counterinsurgency Doctrine A Century On

Alexis Broussard (COL 2020)[5]
Advisor: Rebecca Waller
Affiliative Stimuli Processing in Psychopathic Individuals

Elizaveta Brover (COL 2022)[10]
Advisor: Mike Abito
WIC and the Infant Formula Market

Isabel Buckingham (NUR 2022)[10]
Advisor: Rebecka Peebles
Comparing Quality of Life in Adolescent Males and Females with Eating Disorders

Catherine Campbell (COL 2020)[2]
Advisor: Meghan Crnic
Libraries: Empowerment and Virtue

Emily Campbell (COL 2022), David Park (COL 2021), and Andrew Perez (COL 2022)[10]
Advisor: Pilar Gonalons-Pons
The Persistent Feminization and Devaluation of Care Work

Minhtrinh Cao (COL 2022) and Lark Yan (COL 2022)[10]
Advisor: Jay Gottfried
Structure and Function of the Human Olfactory System

Alyssa Cavazos (COL 2022)[10b]
Advisor: Karen Goldberg
Iridium and Rhodium Complexes for Alkane Dehydrogenation

Peter Chan (COL 2020)[7]
Advisor: Louis Soslowsky
Establishing a Model of Challenged Rotator Cuff Tendon-to-Bone Healing Using Ovariectomized Rats

Zhun Yan Chang (WH 2021) and Marisa Shu-han Yang (WH 2022)[10]
Advisor: Witold Henisz
Environmental, Social and Governance (ESG) Integration by Asset Managers

Baile Chen (SEAS 2022)[10]
Advisor: Sebastian Angel
From lambda to fault-tolerant transactions: create microservices that can simulate applications

Beryl Chen (COL 2021) and Katelyn Lobo (COL 2021)[10]
Advisor: Melanie Kornides
HPV Vaccination and State Legislation

Billy Chen (WH 2022) and Julian Hunter (WH 2022)[10e]
Advisor: Maurice Schweitzer
A Moral Emotion: Embarrassment, The Prospect and Experience of Embarrassment Promote Antisocial Behavior

Caleb Chen (COL 2021)[3]
Structural Inequality within Data-Oriented Networked Systems

Delia Chen (COL 2021)[2]
Advisor: Foteini Mourkioti
Novel Specialized Properties of Adult Muscle Stem Cells

Joshua Chen (SEAS 2022)[10]
Advisor: Marija Drndic
Automating Atomic Defect Identification in TEM Images of Transition Metal Dichalcogenides

Stacey Chen (WH 2022) and Kenneth Shinn (COL 2021)[10]
Advisor: David Hsu
The Effects of Direct Flights in the Commingling of Inventors in M&A

William Chen (COL 2022)[2]
Advisor: Yi-Wei Chang
Establishing a high-throughput electron cryo-tomography pipeline and database

Yu Jiao (Cecily) Chen (COL 2020)[2]
Advisor: Heather Love
Feeling Good about Feeling Bad: Sex and Desire of the Feminist Sex Wars and the Writings of Kathy Acker

Yue Chen (COL 2022)[12]
Advisor: Jeffery Saven
Molecular Dynamics Simulation of Unlinked Bundle Protein in Vacuum

Zeyu Chen (COL 2021) and Emma Ronzetti (COL 2021)[10]
Advisor: Cary Coglianese
Effects of Regulation on U.S. Society

Olivia Cheng (COL 2022) and Sahill Yadav (WH 2022)[10]
Advisor: Peter Conti-Brown
Legal and Political History of the Federal Reserve

Lanting Chiang (SEAS 2022)[10]
Advisor: Katherine Milkman
Identity, competition and social norms

Justin Choi (SEAS 2022)[3]
Advisor: Victor Preciado
Optimizing Dining Halls through Machine Learning

Joseph Chong (COL 2021)[2]
Advisor: Hyun-Duc Nah
Understanding the Mechanisms of Esrp1 and Sox2 in Early Craniofacial Development

Amira Chowdhury (COL 2022)[10]
Advisor: Catherine Bartch
Mixed-Methods Research To Evaluate The Penn Model OAS Program

Helen Chung (COL 2022) and Jennifer Luo (SEAS 2022)[10]
Advisor: Alex Proekt
Design and Preparation for Awake Multisensory Integration Recordings

Kara Cloud (COL 2021)[5]
Advisor: Geoffrey Aguirre
A cell population model of retinal ganglion cell layer thickness

Abigail Clyde (COL 2022) and Jahnvi Patel (COL 2022)[10]
Advisor: Kelly Jordan-Sciutto
The Effects of the Antiretroviral Therapies, Dolutegravir and Bictegravir, on Oligodendrocyte Maturation

Casey Colleran (SEAS 2021)[10]
Advisor: Michael Shashaty
Increase in the Circulation of Mitochondrial DNA Post Lung Transplant is Associated with the Development of Acute Kidney Injury

Michiyah Collins (COL 2021)[2,12]
Advisor: Mechthild Pohlschröder
Identification and characterization of Haloferax vocanii hypermotile mutants

Nathan Coonts (COL 2020) and Archana Upadhyay (COL 2020)[5]
Advisor: Kathleen Brown
Penn and Slavery Project

Mitchell Cornell (COL 2021)[10]
Advisor: Elliot Lipeles
Dataflow Simulation for the Inner Tracker of the High Luminosity Large Hadron Collider (HL-LHC)

Olivia Crocker (COL 2020)[2]
Advisor: Eric Joyce
Using a Novel PEV Assay to Identify Heterochromatin Clustering Factors

Elena Cruz-Adames (COL 2022)[10]
Advisor: Marc Schmidt
Neurobiology of Courtship Behavior in Songbirds

Kia DaSilva (COL 2022) and Glen Kahan (COL 2022)[10]
Advisor: Lauren Ristvet
Naxcivan Archaeological Project

Sabrina DaSilva (COL 2020)[5]
Advisor: Michael Robinson
Astrocytic mitochondria undergo increased mitophagy following focal ischemic stroke

Tserenpuntsag Davaadorj (COL 2022)[10]
Advisor: Michelle Lopez
Ballast & Barricades

Ashleigh David (COL 2020)[8]
Advisor: Greg Urban
Backpacker Identity in Western Europe

Emma Davies (COL 2022)[10]
Advisor: Jaya Aysola
Assessing Language Services at Penn Medicine: A Mixed Methods Approach

Nathaly De La Paz (COL 2022)[10]
Advisor: Francesca Ammon
Analysis of Sunset Blvd

Merobi Degefa (COL 2020)[8]
Advisor: Meghan Crnic
Giving birth in Ethiopia

Ryan DelGaudio (COL 2020)[4]
Advisor: Walter McDougall
Snipping A Trouser Button: How the British Diplomatic Establishment Gave Away Heligoland

Vaibhav Desikan (COL 2022)[10]
Advisor: Stephen DiNardo
Identifying genetic factors that affect stem cell niche integrity in aged testes

Kartik Devashish (COL/WH 2022)[10]
Advisor: Carlo Bartoli
Evaluating a Model for the Study of Pulmonary Arteriovenous Malformations in Glenn Patients

Michael Di Martino (COL 2020)[3]
Advisor: Krzysztof Laudanski
A Qualitative Assessment of TeleICU Utilization in One Medical System

Michael Di Martino (COL 2020)[5]
Advisor: Krzysztof Laudanski
Evaluating the Capacity of a Microfluidic Device For Blood Cell Separation

Kathryn Di Vitantonio (NUR 2019)[15]
Advisor: Ariana Chao
Readmission Predictions in Patients with Eating Disorders

Daryl Dorch (COL 2021)[5]
Advisor: Allison Lassiter
Source Water Protection Across the East Coast

Allison Dreier (COL 2021)[2]
Advisor: Mariella De Biasi
Development of a mouse model to study the effects of adolescent vaping of Δ-9-tetrahydrocannabinol (THC)

Jacob Dubner (COL 2021)[2,3]
Advisors: Alison Buttenheim, Fernando Chang-Muy, Wendy Voet
Evaluating the Long-Term Viability of the Oral Rehydration Tube in Rural Uganda

Jessica Dubuque (SEAS 2020)[11]
Advisor: Chris Fang-Yen
How Worms Respond to Sleep Deprivation During Stress Induced Sleep

Makhari Dysart (COL 2022)[11]
Advisor: Michael Hanchard
Defining Fascism

Natalie Edman (COL 2022)[10b]
Advisor: Elizabeth Brannon
The Number Line Game: A Tool to Help Children Better Understand the Concept of Order

Donnisa Edmonds (COL 2020)[7]
Advisor: Rebecca Waller
Effect of Psychopathy of Responses to Socioaffective Touch

Jada Edwards (NUR 2021)[10]
Advisor: Jennifer Walter
Improving Interprofessional Teamwork in the Pediatric Cardiac Intensive Care Unit

Emily Eiler (COL 2022)[10]
Advisor: Youhai Chen
NF-κB c-Rel controls metabolism and function of myeloid-derived suppressor cells (MDSC) via Cebpb

Zahra Elhanbaly (COL 2021)[10]
Advisor: Mantha Zarmakoupi
Drawing Archaeological Finds on Paros, Greece

Hannah Erdogan (COL 2022)[10]
Advisor: Elizabeth Bhoj
Evaluating the Effect of p.T46I Mutation in H3.3 on Mouse Development

Alex Farid (COL 2020) and Daniel Kargilis (COL 2021)[2]
Advisor: Chamith Rajapakse
Applications of Finite Element Analysis in Osteoporosis

Kathryn Farrell (COL 2021)[10]
Advisor: Claire Finkelstein
The First Amendment and National Security

Kelly Feng (SEAS 2021)[10]
Advisor: Jonathan Beagan
Quantifying activity-induced enhancer dynamics during mammalian synaptogenesis

Olivia Fielding (COL 2021), Emmie Gocke (COL 2021), and Anna Hardie (COL 2021)[16]
Advisor: Michael Weisberg
Humans and the Galapagos

Taré Floyd (COL 2020)[3]
Advisor: Andrew Carruthers
Queer Identity and Expression in France

Maxwell Frankfurter (COL 2020)[13]
Advisor: Sarah Millar
Elucidating the role of Fzd2 in epidermal development

Caitlin Frazee (SEAS 2022)[10]
Advisor: Xiaolu Yang
The molecular and cellular mechanisms that protect against cancer and neurodegeneration

Elyse Gadra (COL 2020)[7]
Advisor: Stewart Anderson
Pilot Study of the Effects of Acute Prenatal Hypoxic Insult on Perseveration and White Matter Development in Mice

Cassidy Gallagher (NUR 2021)[1]
Advisor: Terri Lipman
Community Health Needs Assessment - Bienvenido Dominican Republic

Quinn Gallagher (SEAS 2022)[5]
Advisor: Bomyi Lim
Characterization of H3K9 Tri-Methylation During Direct Cell Reprogramming

Carlos Garcia (WH 2022) and Claire Medina (COL 2022)[10]
Advisor: Marc Flandreau
Lame ducks

Beverlye Gedeon (WH 2021)[10]
Advisor: Petra Todd
Prospera, a path toward achieving gender parity in secondary schools in Mexico

Alexander Geers *(SEAS 2020)*[7]
Advisor: Liang Feng
On-chip Photonic Circuits to Guide, Sort, and Direct Twisted Light

Ariel Gelrud (COL 2020)[5]
Advisor: Heather Schofield
The Effects of Collaborative Versus Competitive Interactions on Trust: Evidence from India

Kelcey Gibbons *(LPS 2020)*[11]
Advisor: Stephanie Dick
African American Computing Communities: 1940-1980

Sarah Goldfarb (COL 2021)[10]
Advisor: Talya Fishman
Curriculum Redesign: "Jewish Political Thought and Action"

Felipe Gomez (WH 2021)[10]
Advisor: Michael Solomon
Cinema Minimo

Alyssa Gonzalez (COL 2022) and Kayla Kruger (COL 2022)[10]
Advisor: Nicholas Betley
Hunger Inhibits Peripheral Inflammation

Eva Gonzalez (COL 2022)[10]
Advisor: Rudra Sil
Comparative Analysis of Hybrid Regimes: Russia, Kazakhstan and Hungary

Adriana Gonzalez-Camarena (COL 2021)[5]
Advisor: Ann Farnsworth-Alvear
Volunteering with the Philly Latinx Community

Victoria Gonzalez Saldana (COL 2021)[5]
Advisor: Ann Farnsworth-Alvear
Narrative analysis of the effects of migration on gender roles for Mexican women

Jessica Griff (COL 2020)[2]
Advisor: Jennifer Kalish
The Effectiveness of Wilms Tumor Screening in Beckwith-Wiedemann Spectrum

Gaurav Gupta (COL 2022)[10]
Advisor: Elliot Hersh
Determining the Role of Antisense Transcripts in Regulating the Human Inflammatory Response

Natasha Gupta (COL 2022)[10]
Advisor: Marielle Scherrer-Crosbie
Effect of BMP3b Protein on Angiogenesis

Saitej Guttikonda (WH 2021)[1]
Advisor: Pavan Atluri
The Differences in the Composition of Proteomic Profiles of Mesenchymal Stem Cells and Endothelial Progenitor Cells in the Heart

Natasha Guy (COL 2020)[2]
Advisor: Karen Redrobe
French Women Photographers in the First Half of the 20th Century

Eliza Halpin (COL 2020)[4]
Advisor: Antonio Feros
Nationalism and Soccer in Franco's Spain, 1939-1971

Tengqin Han (COL 2021) and Tevye Johnson (COL 2022)[10]
Advisor: Susan Meyer
Nicomachean Ethics Virtue

Connor Hardy (COL 2021)[2]
Advisor: David Barnes
LGBTKH+ Identities in Kolkata: A Community Needs Assessment

Benjamin Harrison (COL 2020)[5]
Advisor: Andrew McKinstry-Wu
Dexmedetomidine-Induced Sedation is Attenuated but not Eliminated in a Novel α2A-AR KO Mouse

Kaila Helm (COL 2020)[2]
Advisor: D. Kacy Cullen
Characterizing the Slit/Robo Pathway in a Tissue-Engineered Rostral Migratory Stream

Gabrielle Hemlick (COL 2021)[15]
Advisor: Ryan Urbanowicz
T.A.R.P.S. (Time-Adaptive Risk Prediction System) using machine learning

Angelina Heyler (SEAS 2022)[10]
Advisor: Gregory Corder
Mapping pain's affective pathway: identifying neural projections from the anterior cingulate cortex

Flora Ho (COL 2021)[2]
Advisor: Jianxin You
Regulation of Merkel Cell Polyomavirus Viral Expression Through LT Antigen Thr297

David Hong (COL 2021)[10]
Advisor: Joanna Hart
Improving Assessment of and Response to Depression in Chronic Obstructive Pulmonary Disease Care

Judy Hong (COL 2020)[5]
Advisor: Danielle Mowery
Identifying Falls Not Documented with Administrative Codes Using Natural Language Processing

Ryan Hood (COL 2021)[1]
Advisor: Youhai Chen
The role of TIPE0 and its regulation of GasderminC in intestinal epithelial cell proliferation and pyroptosis.

Dillon Horwitz (COL 2020)[7]
Advisor: Beth Simmons
Border Crossing Architecture: An Analysis and Typology

Kassidy Houston (COL 2021)[10]
Advisor: Delphine Dahan
How to Reliably Execute the Encoding of Linguistic Expressions

Robin Hu (COL 2022)[3]
Advisor: Pavan Atluri
Optimization of the Langendorff Cardiomyocyte Isolation System for In Vitro MSC-derived Exosome Therapy Studies

Shenqi Hu (SEAS 2021), Sangeun Lee (SEAS 2020), Elaine Ma (COL 2020), Nicholas Magarino (SEAS 2020), Saranya Sampath (SEAS 2021), Enoch Solano (SEAS 2020), and Thy Tran (SEAS 2021)[16]
Advisors: Chenfanfu Jiang, Kristoffel Dumon, David Sigmon, and Norman Badler
Extraction of Abdominal Topology and Simulation (E.A.T.S.)

Jane Huang (WH 2022) and Evan Oh (COL 2022)[10]
Advisor: Mary McDonnell
Corporate Political Activity

Qiuman Huang (COL 2022) and Yat Kit Pei (COL 2022)[10]
Advisor: Winston Dou
Resource Misallocation in Innovation

Yi Qing Huang (SEAS 2022)[10]
Advisor: Kathryn Davis
3D Web-Based Visualization for Intracranial EEG

Johanna Inamagua (COL 2021)[10b]
Advisor: Nancy Bonini
Investigating upregulated expression of H3K27me3 in Drososphilia

Maya Itkin-Ofer (COL 2022)[10]
Advisor: Rebecca Waller
Psychopathic Traits are Related to Poorer Recognition of Emotional Expressions

Aashna Jain (WH 2021)[10]
Advisor: Pinar Yildirim
Women, Rails and Telegraphs: An Empirical Study of Information Diffusion and Collective Action

Akash Jain (SEAS/WH 2022) and Jasmine Wu (COL 2022)[10]
Advisor: Meghan Lane-Fall
Handoffs and Transitions in Critical Care (HATRICC) Sustainability Study

Moiz Ali Jehangir (COL 2021) and Elliot Miciek (COL 2021)[10]
Advisor: Ramya Sreenivasan
Digital Mapping of Political Control in Pre-Colonial South-Asia

Jack Jenkins (SEAS 2022)[10]
Advisor: Deep Jariwala
Heat Scavenging Photovoltaic Cells

Evan Jiang (COL 2021)[10]
Advisor: Ethan Goldberg
Investigation of Cortical Microcircuit Dysfunction in a Mouse Model of Dravet Syndrome

Helen Jiang (COL 2022)[5]
Advisor: Clementina Mesaros
Quantitation of NAD, NADH, NADP, and NADPH in 3T3-L1 cells using stable isotope labeling by essential nutrients in cell culture

Steven Jin (COL 2022)[10]
Advisor: Dylan Small
Effect of Playing High School Sports on Later Life Outcomes

Camila Johanek (COL 2020)[7]
Advisor: Rebecca Pearl
Stress and Weight Change: How Lifetime vs Current Stressors Are Associated with Weight Change

Michael John (COL 2020)[2]
Advisor: Catherine Bartch
Exploring Ethnic Identity in Post Colonial Guyanna

Emma Johnson (COL 2020)[6]
Advisor: Rich Pepino
Gentrification and Lead and their Effects on Health in Philadelphia, Pennsylvania

JAun Johnson (COL 2022)[10]
Advisor: Amulya Sreekumar
Exploration of a Novel Differentiation Axis in Dormant Breast Cancer Cells

Julia Kafozoff (COL 2022)[10]
Advisor: Joanna Parga-Belinkie
Provider & Patient Opinions, Preferences & Knowledge of Podcasting as a Tool for Health Promotion

Santoshi Kandula (SEAS 2021)[1]
Advisor: Kathryn Davis
Semiology Brain Atlas

Min Jae Kang (COL 2020)[5]
Advisor: Fusun Ozer
Testing Dental Acrylic with Added Microbial Resistance

Suganth Kannan (WH 2019)[12]
Advisor: Gilles Duranton
Impact of Florida's Gopher Tortoise Regulation on the Regional Housing Market

Raveen Kariyawasam (SEAS 2021)[11]
Advisor: Chamith Rajapakse
Automated Medical Image Based Anatomical 3D Model Generation for Augmented Reality Applications

Eva Karlen (COL 2021)[10]
Advisor: Melissa Teixeira
Political Economy and Everyday Economic Life in 20th-Century Latin America and Europe

Dhruv Karthik (SEAS 2021)[10]
Advisor: Rahul Mangharam
End-to-End Conditional Imitation Learning for Autonomous Vehicles

Omkar Katta (COL 2020)[5]
Advisor: Femida Handy
Nonprofit Governance: Gender Diversity on Boards

Samuel Kaufmann (COL 2021)[2]
Advisor: Ishmail Abdus-Saboor
Investigating cross-strain variation in pain sensitivity

Rachael Keneipp (COL 2021)[5]
Advisor: Marija Drndić
Optimization of TMD Device Fabrication

Noah Kest (COL 2020)[7]
Advisor: Warren Breckman
The Popularization of Existentialism in the U.S. in the Mid-1900s

Hali Kim (COL 2020)[7]
Advisor: Thomas Leung
The Molecular Mechanism of Imiquimod-Induced Tissue Regeneration

Hyong Min Kim (SEAS 2022)[10]
Advisor: Marija Drndić
Optimization of MoS2 Film Growth by Sulfurization

Joongwon Kim (SEAS 2022)[10]
Advisor: Brian Litt
Quantitative Analysis of Neonatal EEG with Machine Learning

Karen Kim (COL 2021)[10]
Advisor: Sebastián Gil-Riaño
Redeeming Race?: Anti-Racist Science and Postcolonial Development in the Twentieth Century

Daphne Kontogiorgos-Heintz (SEAS 2021)[11]
Advisor: Christopher Fang-Yen
WorMotel Mini: Imaging more worms more easily

Emily Kopp (COL 2022)[10b]
Advisor: Elizabeth Brannon
Number Word Mapping in Children and Adults

Daniel Koropeckyj-Cox (COL 2022)[10] and Heta Patel (COL 2021)[8]
Advisor: Frances Barg
Gaining Control: The Effectiveness of Clubs for Type 2 Diabetics in Guatemala

Brooke Krancer (COL 2020)[4]
Advisor: Warren Breckman
"A Modern and Distinctively Scottish Portrait": Scottish Modern Art and National Identity in the Interwar Period

Bo Ku (COL 2022)[5]
Advisor: Andrew McKinstry-Wu
Antagonizing alpha-2 mediated hypnosis through activation of the LC

Melody-Susan Kulaprathazhe (COL 2022)[10]
Advisor: Jennifer Ponce de León
The "Neoliberal Paradox": How the United States Attracts and Targets Undocumented Immigrants

Priya Kumar (COL 2022)[10]
Advisor: Amelia Eisch
Evaluating for an Increase in Neurogenesis after Traumatic Brain Injury in Adolescent Mice

Isabela Lamadrid (COL 2022)[10]
Advisor: Cynthia Otto
Impact of Training Frequency for Canine Scent Detection

Melina Lawrence (COL 2021)[10]
Advisor: Francesca Ammon
Preserving Society Hill

Anne Lazarus (COL 2021)[5]
Advisor: Vincent Reina
Housing Cost and Value in Metropolitan and Non-Metropolitan Areas of Pennsylvania

Matthew Lebermann (SEAS 2022)[10]
Advisor: Rahul Mangharam
Extracting Useful Racetrack Features from an Image

Christopher Lee (COL 2020)[2]
Advisor: Yali Zhang
Uncovering the salt-preference regulatory neural circuit in Drosophila melanogaster

Mona Lee (SEAS 2021)
Sydney Miller (SEAS 2021), and Sanjana Rao (SEAS 2021)[10]
Advisor: Michelle Lopez
Joplin Project: Digital Video Animation with Mechatronics Robot

Ruth Lee (NUR 2020)[4]
Advisor: Sarah Kagan
Evaluating an Electronic Health Record Implementation in a Limited-Resource Setting

Joy Leeswadtrakul (SEAS 2022) and Alexander Wang (SEAS 2022)[10]
Advisor: Insup Lee
A Standardized Protocol for Transmission of High-Fidelity Wearable Device Data: Prototype Development

Carol Li (COL 2022)[10b]
Advisor: Marc Schmidt
Generative neural network autoencoder for novel song production and visualization of passerine birdsong

Vivian Li (WH 2020)[3]
Advisor: Christian Opp
Information Asymmetry in Corporate Bond Markets

Huilin Liang (COL 2021)
Maria Paulina Megias Canton (COL 2021), and Alexandra Audrey Tirtaguna (COL 2020)[10]
Advisor: Julia Gray
How do International Organizations work?

Hannah Listerud (COL 2020)[3]
Advisor: Shari Jager-Hymen
College Counselors Fidelity to Safety Planning

Amy Liu (WH 2021)[10]
Advisor: Eric Clemons
Understanding the Impact of Sponsored Search Systems that appear to be Free-er than Free

Hunter Liu (SEAS 2022)[10]
Advisor: Allyson Mackey
The Changing Brain Lab

Ivy Liu (COL 2021) and Yarden Wiesenfeld (COL 2021)[5]
Advisor: Wenqin Luo
Pain and Itch Processing in the Lateral Habenula

Junduo Liu (COL 2022) and Nicole Mayer (COL 2021)[10]
Advisor: Morgan Hoke
Limitations of Anthropometric Adiposity in Global Health: Evidence from a Rural Peruvian Community

Emily Lo (COL 2022)[10]
Advisor: Gregory Corder
Mapping Pain's Affective Component: Characterizing Neural Circuitry of the Basolateral Amygdala and Nucleus Accumbens

Jennifer Locke (COL 2022)[14]
Advisor: Masao Sako
Studying the Population of Variable Stars in the Dark Energy Survey

Cezanne Lojeski (COL 2022)[10b]
Advisor: Lauren Sallan
Tracking Fish Origins and Biodiversity Over the Last 34 Million Years

Alyssa Lu (SEAS 2022)[10]
Advisor: James Pikul
Discharging a Zinc-Iodine Battery Using a Metal-Air Battery for Low Cost Grid Storage

Louise Yi Lu (COL 2021)[10a]
Advisor: Daniel A. Barber
A Discussion on Energy in Post-War Germany, Bauhaus Architecture

Michael Lu (COL 2022)[10]
Advisor: Cory Tschabrunn
Arrhythmogenic Right Ventricular Cardiomyopathy: Characterization and Demographics of the Disease

Vivian Luong (NUR 2021)[10]
Advisor: Ariana Chao
Convergence of EDE vs EDE-Q of BENTO Study Participants

James Lynch (COL 2021)[10]
Advisor: Jordan Raney
Reconfigurable Origami Tessellations with Tunable Stiffness and Self-Locking Capabilities

Lucy Ma (COL 2020)[2]
Advisor: Daniel Holena
The Impact of Socially Stigmatized Pre-Existing Conditions on Outcomes after Trauma Injury

Mary MacVittie (COL 2021)[10]
Advisor: Wenqin Luo
Examining Gait in a TRPC3 Knock Out Mouse Model

Madison Magee (SEAS 2021)[3]
Advisor: LeAnn Dourte
Accessible Insight to Muscles and Movements

Nikita Maheshwari (COL 2020)[2]
Advisor: Laurence Eisenlohr
MHC Class II-Restricted Cryptic Epitopes in Influenza Infection

Nancy Makale (LPS 2021)
Elysia Baskins (LPS 2020), and Dana Leifert (LPS 2020)[4]
Advisor: Adam Mohr
Dada Safarini

Alexander Massaro (COL 2022)[10]
Advisor: Harsha Thirumurthy
Ending Pandemics: Maximizing U.S. health aid to address today's major diseases and tomorrow's outbreaks

Morgan McLees (SEAS 2022) and Linda Ting (SEAS 2022)[10]
Advisor: Cynthia Sung
TrussBot: A modular, origami-inspired robot

Jonathan Mendelson (SEAS 2022)[10]
Advisor: Mayur Naik
Provenance-Guided Synthesis of Datalog Programs

Patrick Mercho (COL 2022)[10]
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Characterizing the role of H3K27me3 in brain aging

Brianna Messam (SEAS 2022)[10]
Advisor: Kevin Turner
Surface Geometry Manipulation of Magnetically Stimulated Elastomers

Munashe Mhlanga (WH 2022)[10]
Advisor: Sudeep Bhatia
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Mark Michna (COL 2021)[10]
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Sofia Miguez (COL 2020)[2]
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Alekso Miller (COL 2022) and Rachael Villari (COL 2022)[10]
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Silvi Minga (COL 2022)[10]
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Christina Miranda (COL 2021)[17]
Advisor: Sandra Maday
Establishing a Neuron-Glial Co-culture to Examine Autophagy in Response to Cellular Stress

Jewelianna Moore (COL 2021)[10b]
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Amanda Moreno (COL 2021)[2] and Suditi Rahematpura (SEAS) 2021[5]
Advisor: Heath Schmidt
Activation of amylin receptors in the nucleus accumbens shell reduces oxycodone-taking and -seeking behaviors in rats

Suditi Rahematpura (SEAS 2021) and Amanda Moreno (COL 2021)[5]
Advisor: Heath Schmidt
Cell type-specific effects of amylin in the nucleus accumbens on opioid-induced behavioral and analgesic responses

Marvin Morgan (COL 2021)[10]
Advisor: Robyn Sanderson
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Anya Mushakevich (COL 2021)[10]
Advisor: Norman Badler
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Arnaud Mutabazi (COL 2022)[10]
Advisor: Krystal Strong
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Ramya Muthukrishnan (SEAS 2022)[15]
Advisor: Brian Litt
Using Interictal Data to Identify the Seizure Onset and Resection Zones in Epilepsy Patients

Jamie Nash (COL 2022) and Bala Thenappan (COL 2022)[10]
Advisor: Jean Galbraith
Trends in Executive Branch Power

Duc Nguyen (COL 2021)[2]
Advisor: Kushol Gupta
HIV Integrase Catalytic Core Domain Structure

Vanessa Nieto (COL 2022)[10]
Advisor: Gareth Roberts
Code-Switching: Interpretations in Spanish-English Bilingualism

Ryan Norton (COL 2022)[10]
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Investigating How Well Emotion Translates Over Text Messages

Joshua Nouriyelian (SEAS 2022)[10]
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Vowel Categorization in a Conversational Corpus

Chinaza Ruth Okonkwo (COL 2022) Aseal Saed (COL 2022), and Biruktawit Tibebe (COL 2021)[10]
Advisor: Krystal Strong
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Paige Orner (COL 2021)[10b]
Advisor: Alan Stocker
Influence of reported structure on multiple dots recall

John Ortega (COL 2020)[7]
Advisor: Meghan Crnic
Nun Left: The Disappearing Angels of Mercy

Rachel Orth (COL 2020)[5]
Advisors: Jennifer Punt and John Wagner
Measuring Oxidative Burst Following Bacterial Stimulation of Canine Polymorphonuclear Cells

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Relationship Between Canine Insulin-like Growth Factor 1 (IGF-1) Expression and Immunosuppressive Activities

Nicholas Paleologos (COL 2020)[7]
Advisor: D. Kacy Cullen
Activation of Microglia After Closed-Head Diffuse Traumatic Brain Injury in Swine

Michelle Paolicelli (SEAS 2022)[10]
Advisor: Christopher Bonafide
Human Factors Engineering Approach to Address Nurse Workload and Alarm Fatigue

Shreya Parchure (SEAS 2021)[11]
Advisor: Roy Hamilton
Brain Derived Neurotrophic Factor Gene Polymorphism Predicts Response to Transcranial Magnetic Stimulation in Stroke Patients

Jang Jun Park (SEAS 2022)[10]
Advisor: Jason Moore
OMNIREP and Genetic Programming

Seeun Park (COL 2021)[10]
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Effect of Sleep Deprivation on Hippocampus-Dependent Memory

Suh Jung Park (COL 2020)[5]
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The relationship between cognitive insight and symptoms in first episode psychosis

Deep Patel (COL 2021)[10]
Advisor: Seema Bhatnagar
Identifying neural substrates of resilience to stress

Sarah Payne (COL 2022)[10]
Advisor: Chris Callison-Burch
Cognitively-motivated Models of Semantic Composition

Toni-Ann Peck (SEAS 2021) and Mustafa Shabazz (SEAS 2021)[11]
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Alina Peng (COL 2020) and Charles Zhang (WH 2020)[9]
Advisor: Brian Spooner
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Javier Perez (COL 2020)[7]
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Rap1 and Histone Interplay in the Toxic Effects of Rap1

Samuel Pfrommer (SEAS 2021)[10]
Advisor: Michael Posa
Sample-Efficient Learning of Rigid Body Dynamics Models

Mira Potter-Schwartz (COL 2022)[10]
Advisor: Petra Todd
Evaluating the Effect of Mexico's Prospera Program on Access to Education and School Choice

Adriana Purcell (COL 2022)[10]
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An Evaluation of the Maternal Infant Program of Hospitalito Atitlan for High-Risk Indigenous Mothers in Rural Guatemala

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Design Optimization for Truss Robot

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Reducing Mental Health Stigma Among Healthcare Providers in Rural China

Sireesh Ramesh (COL 2022)[10]
Advisor: Neil Sheth
Evaluating the Economic Impact of a Proposed Surgical Center in Moshi, Tanzania

Dana Raphael (COL 2022)[10]
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Microglia in mouse brain tissue: Optimization of immunohistochemical staining using brightfield, epifluorescent, and dual epifl

Alysha Ravendran (COL 2021)[2]
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Racialised Narrative Structures in Malaysia: Looking at May 13th Through the Eyes of Millennials

Anya Reddy (SEAS 2022)[10]
Advisor: Aaron Masino
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Christopher Regan (COL 2021)[10]
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Evaluating Time-Dependent Expansion Models for Galactic Potentials Using Simulated Galaxies

Luiza Repsold França (COL 2020)[2]
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Material Commodity x Art Object: The Hybrid Status of 20th-Century Artist's Textiles

Antonio Rinaldi (COL 2020)[16]
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Considering Possibilities of Urban Expansion in the Galapagos

Maya Robnett (COL 2021)[2]
Advisor: Beatriz Carreno
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Charles Rockhead (SEAS 2022)[10]
Advisor: Brian Litt
Machine Learning and its application to EEG data analysis and seizure detection

Anyara Rodriguez (COL 2022)[10]
Advisor: Matthew Kayser
Drosophila Model Of ALS & FTD

Evan Rosario (COL 2022)[10]
Advisor: Prakash Patel
Patient Satisfaction with the Use of Sedation in Transcatheter Aortic Valve Replacement

Aidan Rubio (COL 2022)[10]
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Bradley Saunders (COL 2021)[10]
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Tiffany Schell (COL 2022)[10]
Advisor: Rebecca Waller
Developing and Validating the Lab Electronic Aggression Paradigm (LEAP)

Ashna Sethi (COL 2022)[2]
Advisor: Michael Abt
Bacteriophage lysin supplementation of Microbiome Therapy in the treatment of C. difficile

Reeti Shah (SEAS 2021)[10d]
Advisor: Dipti Pitta
Interactions Between Bacteria and Archaea

Jordan Shaked (COL 2020)[7]
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Function and Identity of Essential YTHDC2 Binding Domain for Mammalian Meiotic Development

Zhifei Shen (SEAS 2021)[10]
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Analyzing Cassie Simulations

Enrique Henry Sherwood Caballero (COL 2021)[10]
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Tepoztlán Institute for the Transnational History of the Americas

Jackie Shi (COL 2021)[10]
Advisor: Melissa Wilde
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Sherry Shi (SEAS 2022)[10]
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Sumant Shringari (COL 2021)[2]
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Michael Shultz (LPS 2020)[1]
Advisor: Antonio Feros
American Corporate Collusion with Franco's Nationalists During the Spanish Civil War

Erin Siciliano (SEAS 2022)[10]
Advisor: Lee Bassett
Characterizing Conjugation of Primary Amines to Diamond Nanoparticles

Uday Sidhu (COL 2022)[10]
Advisor: Maurizio Cereda
Radiological Analysis of Lung Injury Progression in Large Animal Model

Alex Sislo (COL 2021)[5]
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The Effects of Prefrontal Cortex Stimulation on the Likelihood to Commit Antisocial Behavior

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The Clash Between Rights and Punishment

Emily Solomon *(COL 2021)*[10]
Advisor: Joseph Cappella
Comparing the e-cigarette control advertisements made by the vendors vs public health institutions

Gregory Soos (COL 2020)[7]
Advisor: Robyn Sanderson
The effect of the Andromeda galaxy on the stellar halo of the Milky Way

Erin Spicola (COL 2020)[6]
Advisor: Megan Kassabaum
Exhibiting Mounds in the Wilkinson County Museum: Exploring Familiar Landscapes

John Sproch (SEAS 2022)[10]
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Reducing power consumption of Nitrogen Vacancy spin control circuits

Joseph Squillaro (COL 2021)[3]
Advisor: Brian Hutler
Verifying the Two-Step Verification Protocol: A Feasibility and Efficacy Study of Cybersecurity and Cyberlaw at Penn and Beyond

Adithya Sriram (COL/SEAS 2020)[2]
Advisor: Charlie Johnson
Aptamer Based Detection of Alpha-Synuclein

Liam Stanton (COL 2020)[7]
Advisor: Rajan Jain
A LMNA variant disrupts nuclear organization to result in tissue-specific lineage instability

Christina Steele (COL 2020)[6]
Advisor: Anna Jenkins
A Real World Study of the Contact Hypothesis at Penn

Samantha Stein (COL 2020)[2]
Advisor: Justin Clapp
Reconciling Risk: The Logics and Practices of Community Engagement in Exception from Informed Consent Research

Edward Stevens (COL 2021)[10]
Advisor: Ann Farnsworth-Alvear
History of Mexican and Latin American Immigration to the United States

Maria Suarez (SEAS 2022)[10]
Advisor: Youhai Chen
Diabetes and the TIPE Family of Proteins

Pranshu Suri (SEAS 2022)[10]
Advisor: Ryan Urbanowicz
Evaluation of Bias Across Multiple Machine Learners in Epidemiological Case-Control Studies of Pancreatic Cancer

Melissa Tanaka (SEAS 2021)[10b]
Advisor: Alain Plante
Dissolved Organic Carbon in Pennsylvania Anthracite Soils

Hiab Teshome (COL 2020)[2]
Advisor: Naiara Aquizu
Understanding IMPDH2 Aggregates and Their Role in Neurodegeneration

Tiffany Tieu (COL 2022)[6]
Advisor: Lisa Mitchell
Expanding Mental Health Resources to Asian Communities in Pennsylvania and New Jersey

Omaya Torres (COL 2021)[10]
Advisor: Carolyn Cannuscio
PhillyRespond: Promoting Narcan Acquisition and Carrying Among Philadelphians

Pei Hsuan (Sherry) Tseng (COL 2020)[6]
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Introducing Resettled Refugees to Philadelphia Through Virtual Reality

Huen-Yee Tso (SEAS 2021)[10]
Advisor: Claire Mitchell
Consequences of Astrocyte Stretch on Oxidative Stress and Cytoskeleton

Maria Tu (SEAS 2022)[10]
Advisor: Mayur Naik
Debloating Software Programs

Hannah Uehara (COL 2022)[10]
Advisor: Jonathan Moreno
Screens & Their Effects on the Developing Mind

Kristen Ukeomah (COL 2021)[10]
Advisor: Jaya Aysola
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Sciaska Ulysse (COL 2021)[10]
Advisor: Liisa Hantsoo
Physiological stress response and role of neuroactive steroid hormones in Premenstrual Dysphoric Disorder (PMDD)

Olivia Unger (SEAS 2022)[10]
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Euler and Out-of-plane Buckling of Elastic Beams

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Advisor: Adrianna Jenkins
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Spectrum of Loss of Methylation at Imprinting Control Region 2 in Beckwith-Wiedemann Syndrome

Yiyue Wang (COL 2022)[10]
Advisor: Michael Shashaty
Plasma nuclear and mitochondrial DNA are associated with post-traumatic acute kidney injury

Zhuoyang Wang (COL 2021)[2]
Advisor: Erica Carpenter
Development and Validation of a Liquid Biopsy Assay for Detection of C797S Mutation in cell-free DNA of NSCLC Patients

Adam Watson (COL 2022)[10]
Advisor: Rudra Sil
Continuity or Aggression? Russian Foreign Policy Since 1990

Caleb Watt (COL 2022)[10]
Advisor: Evelyn Thomson
Data Analysis of Proton Collisions at the CERN LHC

William Weiss (COL 2020)[4]
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Trag Leyden Geduldiklich: Medieval Notions of Suffering During the German Mysticism Movement

Micah Weitzman (SEAS 2022)[10]
Advisor: James Pikul
Analysis of the Mechanical Properties of Electro-deposited Thin Nickel Films

Yuxin Wen (COL 2020)[2]
Advisor: Warren Breckman
Of Two Minds: A Critical Study of the Relationship Between Jean-Paul Sartre and Simone de Beauvoir

Meghan Wenzinger (NUR 2022)[10]
Advisor: Danielle Cullen
Complete Eats: Implementation and Effectiveness of Four CHOP Sites as Points of Entry into the Summer Food Service Program

Sarah Werner (COL 2020)[2,5,9]
Advisor: Katie Barott
Algal Competition in Coral Bleaching Recovery

Ana West (COL 2021)[10]
Advisor: Liliane Weissberg
In Circulation: Modern Literature, Philosophy, Art, and the Medium of the Postcard

Josephine Wiklund *(NUR 2021)*[10]
Advisor: Nancy Hodgson
The Impact of Sexual Health Perceptions on the Healthcare Provider- Patient Relationship for African American Women

Daphne Wiredu (COL 2021) and Beatrice Zhang (COL 2021)[5]
Advisor: Christoph Thaiss
The interplay between systemic metabolism and the brain

Eli Wiston (COL 2022)[10]
Advisor: Evelyn Thomson
Pileup Uncertainties in the ATLAS Jet Calibration

Yanet Wossenseged (COL 2022)[10]
Advisor: Peter Kurre
The Potential of Multiplexed Immunofluorescence Imaging in Fanconi Anemia Research and Treatment

Steven Wren (COL 2022)[10]
Advisor: Xialou Yang
Effect of E3 ubiquitin ligase TRIM11 on TDP-43 aggregation

Jason Wu (COL 2022)[10]
Advisor: Lauren Sallan
The Biodiversity of Fish Species from the Late Paleozoic Ice Age

Tina Wu (COL 2020)[2]
Advisor: Jianghong Liu
Effect of Omega-3 Fatty Acids Nutritional Intervention on Behavior and Sleep

Tina Wu (COL 2020)[2]
Advisor: Laura Prosser
The Effect of Motivation to Move on Rehabilitation Outcomes in Children with Cerebral Palsy: Methods and Reliability

Jason Xiao (COL 2022)[10]
Advisor: Christopher Yoo
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Michelle Xiong (WH 2022)[10]
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How Do Song Lyrics and Music Taste Change Over Time?

Luka Yancopoulos (COL/SEAS 2021)[5]
Advisor: Marija Drndic
Fabrication and Applications of Silicon Nitride Substrate Nanopores for Biomolecule Sensing

Alexander Yang (SEAS 2022)[10]
Advisor: Sebastian Angel
CrowdMixer: Differentially Private Anonymous Communication

Wenyao Yang (SEAS 2021)[10]
Advisor: Petra Todd
Drop out From School in Mexico: An Empirical Analysis With Mixed Logit Model

Zhilin Ye (WH 2022)[10]
Advisor: Abraham Wyner
An Analysis of On-road and VDT Data in Ohio

Changyue Yin (COL 2020)[4]
Advisor: Ann Farnsworth-Alvear
Two Families, One Communist Dream: Oral History Accounts of Two Families of the Cultural Revolution of P.R.C.

Aidan Young (SEAS 2022)[10]
Advisor: Ritesh Agarwal
Unique Photoluminescent Patterns in CVD-Grown Tungsten Disulfide Monolayers

Daria Zaitseva (COL 2021)[10]
Advisor: Zhaolan Zhou
Seizure Observations in Adult CDD Mice and Righting Assay of CDG Pups

Lilian Zhang (COL 2022)[10]
Advisor: Delphine Dahan
Investigating establishment of common ground through encoding linguistic expressions

Robert Zhang (SEAS 2022)[10]
Advisor: Ryan Urbanowicz
Developing an LCS Scikit-learn Package

Weichen Zheng (SEAS 2021)[10]
Advisor: Edgar Dobriban
Defense Against the Adversarial Attacks

Qingyang (Freya) Zhou (COL 2020)[4]
Advisor: Simon Richter
Film Exchanges between East Germany and China during the Cold War

Rongxuan Zhou (COL 2021)[10]
Advisor: Andrew Saunders
Baroque Topologies

Chuning Zhu (SEAS 2022)[10]
Advisor: Mayur Naik
Concise Bug Explanation Using SMT Solver

Lucy Zhu (COL 2022)[10]
Advisor: Matthew Kayser
Developmental gating of social behaviors in Drosophila

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1 Class of 1971 Robert J. Holtz Fund
2 College Alumni Society Research Grant
3 College House Research Fellowship
4 Gelfman International Summer Fund
5 Grants for Faculty Mentoring Undergraduate Research
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7 Jumpstart for Juniors
8 Association of Alumnae Rosemary D. Mazzatenta Scholars Award
9 Penn Undergraduate Sustainability Action Grant
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13 Barthmaier Grant
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Acero, Natalia; "*Temperature controlled technique for clean assembly of multilayered van der Waals heterostructures****"***
Stacking layers of different two-dimensional materials allows us to build van der Waals heterostructures with specific and controlled optical and electronic properties for applications in transistors, photodetectors and photovoltaics. However, one of the main challenges of this fabrication is achieving clean interfaces between the layers. Conventional transfer techniques results in blister and impurities that often inhibit the functionality of the device. We have addressed this problem by using the various phases of polypropylene carbonate (PPC) at different temperatures to pick up and deposit materials unto each other, eventually creating stacks of graphene sandwiched in layers of hexagonal boron nitride. We have also managed to make this process for multiple layer thicknesses of both materials, especially between bi- and 10-layered flakes. Our method is believed to allow blisters and any impurities to be pushed to the edge of the device and be expelled thereby staying out of the active layers. The process has been able to take place both inside and outside of a glovebox, making it a less restrictive procedure to reproduce. Our advances in assembly technique is expected to produce complex multilayer van der waals heterostructures for a variety of optoelectronic devices in the atomic thickness limit.

Adurty, Sanjana, Grace Wu and Namita Saraf; "*The Harmony Exchange****"***
he Harmony Exchange is a home visiting program that aims to support aging communities through culturally-guided companionships. The program matches volunteers with seniors who are homebound and/or looking for companionship. These volunteers are generally from the same cultural/ethnic background as the seniors. Through this matching process, we hope to remove lingual and cultural barriers that affect minority seniors. We believe that these cultural matches can foster an increased level of mutual empathy that ultimately serves to combat loneliness and isolation in seniors in New York. Currently, The Harmony Exchange operates under Carter Burden Network (CBN) and is partnered with Disabled Association Support for Seniors and Homebound (DASH) on Roosevelt Island.

Aguila, Oscar; "*Zooarchaeological Analysis of Fish Remains at Smith Creek****"***
Fish are important for the Smith Creek mound site because the prehistoric occupants of the site utilized river resources in sustainable ways which differ greatly from modern fishing practices in the area. Through analysis of fish markets and local fishermen reports, the project can investigate how sustainable fishing methods in the past can compare to modern fish methods. Finally, fish can tell us about food preparation and consumption, given the proximity of the site to both Smith Creek and the Mississippi River, and can indicate changing food patterns from one area of the site to another.

Aguilar, Valery; "*Understanding Immigrant and Refugee Statuses****"***
This PURM project focuses on various immigrant and refugee statuses, as well as the process of developing an educational program around this focus. The first part of this project, my peers and I researched the history of U.S. immigration by reading literature related to immigration in the U.S. throughout different time periods and by different groups of people. Through discussions with my peers and Professor Farnsworth-Alvear, I was able to understand more on how immigrant and refugee statuses have been developed and shaped over time in the U.S.

The second part of the project involved me working with the Aquinas Center of Philadelphia to develop a workshop on immigration for high school and college students. This included compiling the history behind various immigrant and refugee statuses as well as developing fictionalized narratives on mix-status families. These components would then be used to create a collaborative workshop on immigration. Through this stage of the

project, I was able to identify the complexities of immigrant and refugee statuses, and the impact they make on the people who hold the statuses themselves. Ultimately, by understanding the history behind the development of various immigrant and refugee statuses, I have found how the U.S. immigration system has strategically used immigrant and refugee statuses to include, maintain, and exclude people from the U.S.

Al Rashed, Fatima; "*Menstrual Hygiene and Management in Bwiam****"***
My research assesses menstrual hygiene and management in Bwiam, The Gambia, West Africa. The research was conducted at a public junior and senior school in Bwiam.

Alifimoff, Rebecca; "*Politics In The Personal: Political Postcards of the Dreyfus Affair****"***
The Dreyfus Affair represents an astounding instance of how antisemitism, xenophobia, and the anxieties caused by shifting cultural values can cause rule of law to break down, even in a supposedly enlightened liberal democracy. The Affair is a case study for how citizens used media and public opinion to shape and influence the proceedings of their justice system. While the popular posters and newspapers of the Dreyfus Affair can reveal larger societal attitudes towards the Affair, postcards can provide an insight into how individual citizens metabolized media relating to the Dreyfus case and how they interacted with it on a personal level. As objects with both a political and a personal purpose, the postcards of the Dreyfus Affair are a window into how individuals conceived of their own citizenship during the politically charged period of the Affair.

Altenhof, Aja; "*Organizing the Adult Lexicon: Does a label alter the way a concept is stored in memory?****"***
The mental lexicon, "the listener's mental representation of words and what they mean", and its organization have been the subject of many studies. Yet often these experiments do not differentiate between the mental representations of concepts and their respective labels. We are interested in observing which features or relationships determine the organizations of concepts in the mind and, when paired with a label, within the mental lexicon. Moreover, we want to see in what capacity the organization strategies for these two systems, conceptual and lexical, overlap, if at all.

Our study used a between subjects design to examine and compare participants' strategies for organizing words from a constructed "alien language" and their meanings. Subjects were randomly assigned to one of three possible conditions: concept-based, label-based, and overlap.

Experiment 2 (label-based) measured which feature(s) of words, syntactic, semantic, phonetic, or other, determine their organization in the mental lexicon. The other experiments examined how concepts are organized in the mind. Experiment 1 (concept-based) aimed to understand the organization process independent of linguistic information, i.e. a label, whereas Experiment 3(overlap) observed how organization changes (or not) once concepts are named. Each component of the study was conducted as an independent Qualtrics survey.

We predict that in the overlap condition, objects will adopt the properties of their label and subjects' categorization will mirror that of the label-only condition.

Anderson, Jessica; "*The Role of BAP1 in the Enteric Nervous System****"***
The enteric nervous system (ENS) is an extensive network of neural crest-derived neurons and glia that control bowel motility and other aspects of bowel function. The system is split into two main plexuses which are composed of ~20 neuron types and an extraordinary level

of neurotransmitter diversity (1). When the ENS does not develop or function properly, symptoms include constipation, distension, and abdominal pain which impair quality of life. In 2017 we received a mouse from the Bill Harbor lab which died 3-4 weeks post birth with bowel obstruction and megacolon. These mice were Bap1fl/fl; Tyrosinase (Tyr) Cre+. Tyrosinase is expressed in the neuroectoderm and in migrating neural crest cells during embryonic development. As mice grow older, only a subset of the ENS continues to express tyrosinase (6). Reduction in levels of BAP1 have been linked to decreased expression of genes involved in neural crest migration. As an epigenetic modifier, BAP1 is involved in regulating gene expression through chromatin remodeling and deubiquitylation (2-4). Given that preliminary counts of neuron and glia in Wnt1Cre+ and TyrCre+ Bapfl/fl mice do not show obvious differences compared to WT's, this leads us to hypothesize that BAP1 may be involved in regulating genes important for neuronal development and function.

Aneja, Anushree; "*Achieving Opsin Expression in Defined Interneurons in Dentate Gyrus and GCaMP in Granule Cells in Juvenile Mice****"***
It is known that the pathology of Dravet Syndrome manifests from dysfunctional interneurons. In the dentate gyrus (DG), parvalbumin (PV) interneurons project inhibitory signals onto granule cells to prevent them from being overexcited by the entorhinal cortex. In mice with Dravet Syndrome, the granule cells are overexcited. This is thought to be due to the intrinsic dysfunction of the PV interneurons not allowing them to be excited as frequently and therefore not being able to inhibit the granule cells as often. The goal of my project was to achieve opsin expression in PV interneurons as well as GCaMP expression in granule cells to allow for the simultaneous optogenetic activation of PV interneurons and recording its effects on granule cells via two-photon calcium imaging to see if stimulating PV interneurons can "rescue" this dysfunctional circuit. My first method involving a subdural injection in newborn mice resulted in opsin expression in the neocortex, but not the DG itself. My first round of intraparenchymal injections in newborn mice showed expression GCaMP in the neocortex, but not in the DG, and little opsin expression overall. My modified intraparenchymal injections in newborn mice showed some successful GCaMP expression in the DG. My intraparenchymal injection in a P12 mouse had faint opsin expression in the DG. My combined viral mix of both GCaMP and Chrimson was successful as there was expression of both and in the appropriate places in injected adult mice, allowing us to use this mixture in future experiments.

Areza, Julci; "*Identification & characterization of sleep-wake circuits in Drosophila larvae****"***
Sleep is required for normal physiological function in all organisms. In particular, sleep is hypothesized to have a critical role in brain development. However, systems have not effectively studied sleep during the earliest periods of neural development.

The fruit fly, Drosophila melanogaster, exhibits sleep behaviors. Behavioral characteristics of sleep are shared between mammals and flies. While this model is a powerful tool, neurogenesis is almost complete in the adult brain. The Kayser Lab has expanded upon classic fly work to devise methods of studying fly larvae. We have determined that larvae indeed meet the criteria for sleep.

The goal of this work is to map and characterize specific neurons in 2nd instar larvae that play a role in sleep and wake. These experiments are a part of a larger plan to understand how neural control of sleep/wake changes throughout the lifespan.

In this screen, the GAL4-UAS system was used to drive expression of TrpA1 in GAL4-specific tissues. TrpA1 encodes for a thermosensitive cation channel which opens and depolarizes the neuron when the temperature is above 30ºC. Using infrared imaging and pixel analysis, the average number of bouts, average bout length, average activity, and total sleep time was calculated and compared between groups of GAL4-specific larvae. GAL4 lines were selected in which larvae displayed deviations in total sleep, but not in average activity. To visualize the neurons where these GAL4s are expressed, UAS-GFP 2nd instar larval brains were labeled with a GFP antibody and imaged using a confocal microscope.

Atencia, Jordy and Liam Forsythe; "*Migration and Risk Taking Behavior in Drosophila melanogaster****"***
In trying to find phenotypic and genotypic differences in Drosophila melanogaster that are more likely to migrate over others a dispersal experiment was designed. ~10,000 flies from one line are released in one large mesh cage containing lab food and shade from a peach tree. They are given 13 hours to migrate down a mesh tube to another cage 20 yards away. The other cage contains no food or bananas and yeast depending on the treatment for that round. After the 13 hours, the Drosophila that have dispersed to the other cage are collected. These Drosophila are genotyped and their F1 generation is phenotyped. A replicate experiment is run at the same time next to the other. Phenotyping involves an assay for larval development, fecundity, general size, climbing, and an in-lab dispersal assay that identifies what portion of the flies in that population are "risk takers".

Avadhani, Nikhil; "*Dynamics of Disease Transmission in Dorms: Addressing Social, Spatial, and Structural Determinants of Health****"***
When a college student falls ill, it can often be more detrimental to his or her quality of life than for other demographics. This is due to the rigorous lifestyle university demands — students find themselves without the ability to simply take rest and recover, as their courses march on without them. Combined with the uniquely communal nature of college life, this leads to the phenomenon popularly known at various campuses as the "college plague," in which a population of students rapidly becomes infected by certain diseases which persist in each individual longer than would normally be expected.
This study aims at identifying the key factors of disease transmission in college dormitories. By using a longitudinal cohort design, the study intends to use surveys to track various aspects of the students' health and examine their relation to factors such as residence location, social groups, academics, and extracurriculars. Beyond demographics, the study also examines the dynamics of social and spatial networks, and assesses their relative contributions to disease susceptibility and transmission. In doing so, we also take advantage of a natural phenomenon frequently observed amongst first-year students: dynamically shifting social groups, from convenience to common interest.
By examining the relationships between social and spatial determinants with health phenomena, the study hopes to better illuminate the mechanism of disease transmission in college dormitories. More broadly, we aim to better inform student health professionals in combating disease transmission by mitigating disease susceptibility and risk.

Bae, Brian; "*Delay Announcement****"***
We often encounter delay announcements in various forms. For example, when you call customer service, the first thing you are told is usually the estimated waiting time until service. Our research focused on how exactly delay announcements affect customer perception —whether they are able to make rational decisions regarding reneging—and how certain elements can elicit an intended behavior. We started off by creating an online survey through Qualtrics that simulates a delay announcement that participants would face in their daily lives. We conducted experiments on MTurk to both adjust the various

elements of the survey for more realistic responses and understand how customers made decisions based on the limited information given. We devise three different reward systems to make sure that participants of the survey are behaving rationally and analyze what factors are truly shaping their decisions.

Bahena, Alejandra; "*Selective Vulnerability of the Locus Coeruleus in Tau versus TDP Proteinopathies****"***
Frontotemporal lobar degeneration (FTLD) is the third most common pathologic diagnosis in neurodegenerative disorders. Of the proteinopathies that encompass FTLD, tauopathies (FTLD-tau) and FTLD-TDP (transactive response DNA-binding protein of 43 kDa) are the most common. Early evidence from our lab suggests that the locus coeruleus (LC), a brainstem structure that plays a major role in arousal, learning, and many other important cognitive functions, is more vulnerable to pathology and neurodegeneration in FTLD-tau compared to FTLD-TDP. We examined post-mortem LC tissue from 48 patients diagnosed with FTLD-tau and 48 patients diagnosed with FTLD-TDP based on available tissue and generated ordinal score ratings for TDP and tau inclusion burden as well as the extent of neurodegeneration in each group. In a subsample of a FTLD-tau and FTLD-TDP subsample patients, digital imaging software tools were used to quantify levels of pigmentation in LC neurons, resulting in measures of percent area occupied of melanin within LC neurons in addition to the number of LC neurons with melanin. Higher extracellular pigmentation and depigmentation was identified in FTLD-tau compared to FTLD-TDP in the selected cohort. Similarly, LC neurons in FTLD-TDP had a greater percent area occupied by melanin and a greater number of melanin-positive cells than the FTLD-tau group. Our findings suggest that the LC is more vulnerable to abnormal tau inclusions compared to TDP inclusions, and that the greater burden of tau is associated with more neurodegeneration of the LC in FTLD-tau compared to FTLD-TDP.

Baik, Junyoung; "*Bibliographies in Traditional Chinese Studies****"***
The prime aim of this project was on refining and expanding Dr. Goldin's Ancient Chinese Civilization: Bibliography on Western Materials of more than 12,000 items, covering the Neolithic Age to the pre-Buddhist era. We accomplished this by identifying missing items and locating them on UPenn's Franklin Catalog, as well as updating the bibliography via exhaustive searches for recent publications in over 100 journals. The second aim of this project was to identify how this bibliography could serve as a research aide in exploring the academic landscape of Traditional Chinese Studies. We accomplished this by utilizing UMass Amherst's MAchine Learning for LanguagE Toolkit (MALLET). The "topic modelling" function in MALLET allowed us to observe the evolution of the Ancient Chinese Studies' academic landscape over time (e.g., the transferral of academic "hubs" from Continental Europe to the US, an explosive growth in number of academic sources following the opening of China, shifting interests from Chinese Culture to Ancient Political Philosophy and East-West Philosophical Dialogues). The final aim was to apply what we observed in the creation of my own bibliography on the Great Wall of China. Though not comprehensive as Dr. Goldin's, this bibliography is a culmination of a unique experience of learning how a bibliography is created, expanded, and is used to learn about the "academic landscape" of a subject of interest.

Baxhija, Daner and Janice Owusu; "*Causes of Corruption****"***
Throughout this research, we have uncovered several theories that could cause a person to participate in corruption. Through an exploration of the literature on the motivations of corruption, we found theories that could serve as an explanation to the causation. Our research allowed us to uncover theories in the fields of political science, criminology, psychology, and sociology. Our discoveries led us to see the different interpretations of

this causation through the different schools of thoughts. We have connected these theories to experiences and examples in our world today such as certain governments, positions, and companies. Although we have uncovered many theories that can be assigned to explain the causation of corruption, we have not limited ourselves to a single explanation that can be an umbrella to define the cause of corruption.

Bhagwagar, Sanaea; "*Characterization of the P301S Tauopathy Mouse Model with Progranulin Reduction****"***
Progranulin (PGRN) is a secreted glycoprotein that is produced by neurons and microglia. PGRN is involved in frontotemporal lobar degeneration and Alzheimer's disease (AD). Reduced PGRN levels caused by a GRN variant are associated with increased AD risk. While the Grn AD risk variant has no effect on amyloid beta levels, it is associated with increased cerebrospinal fluid tau levels in human ADNI dataset. This suggests that PGRN reduction may exacerbate tau pathology and subsequently increase AD risk. The aim of this study is to examine how PGRN reduction affects tau pathology and tau-associated deficits using PS19 tau transgenic mice with PGRN haploinsufficiency or complete loss.
By tracking the body weights of these mice biweekly, we first found that the PS19 Grn-/- mice show reduced body weight compared to the other groups. In addition, survival rate of PS19 Grn-/- mice at 10 months were significantly decreased compared with that of wild type (WT) mice. Using elevated plus maze test, we also found that PS19 Grn-/- mice exhibit worsened disinhibition phenotype compared with both Grn-/- and PS19 mice.

We then sacrificed the remaining mice and harvested the brains for immunohistochemistry. We observed increased microgliosis and elevated PGRN levels in PS19 mice compared to WT mice. PGRN levels in microglia were also increased in PS19 mice compared to WT mice, although the microgliosis in PS19 mice was not affected by PGRN deficiency. Overall, PGRN reduction altered several phenotypes of PS19 mice, but further studies are required to determine the underlying mechanisms.

Bizzell-Hatcher, Greer; "*Systematic review and meta-analysis on prevalence of depression in low-income women****"***
According to the Substance Abuse and Mental Health Services Administration (2017), low-income women have the highest prevalence of depression at 19%. Depression in mothers is also a risk mechanism for child depression and other mental health disorders (Goodman, 2007; Hammen, Brennan, & Keenan-Miller, 2008). Low-income mothers and especially AfricanAmerican and Latina mothers are less likely to have treatment for depression (Kozhimannil, Trinacty, Busch, Huskamp, & Adams, 2011). Using systematic review, including a statistical method used to quantitatively pool the results of studies called meta-analysis, allowed a more accurate estimate of the rate of depression within the low-income women population alongside the sources of variance, such as ethnicity and region of the U.S.

Boey, Emma; "*Epstein Barr Virus Encoded BHRF1 miRNAs Have a Role in Maintaining Viral Latency****"***
Epstein Barr-Virus (EBV) microRNAs (miRNAs) contributes to the maintenance of EBV latency and tumorigenesis. The overall goal of this project is to investigate and confirm the potential targets of BHRF1 microRNAs, an understudied group of miRNA whose targets are unknown.

Bonczok Sotelo, Selene; "*Indigenous Communities and Health Care****"***
In the tri-border area among Argentina, Bolivia, and Paraguay, access to primary health care among indigenous communities is highly dependent on geographical as well as

cultural distances. The environmental circumstances pose high barriers to access to primary health care and in the case of pregnant women, they pose a high risk to their health and their newborn. In the context of these dispersed and hard to reach populations, mobile health units can make a significant difference for public health outcomes. This research study seeks to compare the effectiveness of ADESAR/Mundo Sano mobile intervention among countries, localities, and indigenous communities and to evaluate the conditions for a successful reproduction of this model of health care.

Botterbusch, Samuel and Imañia Powers; "*Exploring Phase Separation of Endocytic Proteins****"***
Compartmentalization is essential for eukaryotic cellular function. Traditionally, compartmentalization has been explained as occurring through membrane-bound organelles; however, numerous membraneless organelles, such as the nucleolus, have been identified which arise through the process of phase separation. Phase separation occurs when multivalent interprotein interactions lead to the formation of a protein condensate droplet that separates from the cytosol and can significantly increase the local concentration of the proteins involved. Signaling proteins have been documented as exhibiting phase separation behavior, among them are the interactions between the SRC homology 3 (SH3) domain and the proline-rich motif (PRM) of certain proteins. Endocytic proteins that possess these domains include endophilin, a protein with an SH3 domain that is involved in membrane curvature generation, lamellipodin, a protein with many PRMs whose interaction with endophilin's SH3 is critical to endocytosis, and synaptojanin, a PRM-containing protein whose interaction with endophilin is necessary for neurotransmitter reuptake at the synapse. Here, we plan to examine the phase separation capabilities of interactions between the endophilin SH3 domain and lamellipodin's PRMs (using synaptojanin's PRM as a control) to test our hypothesis that the interactions of lamellipodin with endophilin does result in phase separation during endocytosis. We are conducting our experiments using specially-designed disordered proteins, each consisting of 5 identical domains connected by flexible linker regions. We have taken steps to optimize the production and purification of these SH3(5) and PRM(5) proteins from E. coli, and have begun preliminary experiments to examine their interactions with one another.

Braccia, Zoe; "*Archiving Lost Fragments of 17th-Century Compilations****"***
This summer's project with Professor Whitney Trettien was two-fold. At the beginning of the summer, I traveled to the United Kingdom for a week to work in historic libraries in London and Oxford, researching and sourcing fragments of text and images from 17th-century amateur historian Thomas Bagford's many manuscripts. I also worked with Professor Trettien on identifying textual fragments from a 17th-century commonplace book by a member of the Little Gidding group.

Brennan, Daniel; "*Reconcentration: Spanish Counterinsurgency Doctrine A Century On****"***
Overshadowed by the Spanish American War, the Cuban War of Independence (1895-1898) has been overlooked by anglophone scholars despite its potential significance to the study of military history. During the conflict Spanish Governor General Valeriano Weyler directed the first modern counterinsurgency campaign against the Cuban revolutionary forces. His campaign of forced population resettlement resulted in the deaths of hundreds of thousands of Cubans but failed to deliver him a strategic victory against Máximo Gomez's guerrilla army. Through archival and field research this project hopes to explain the reasons for Weyler's failure while addressing his impact on subsequent counterinsurgency doctrine.

Broussard, Alexis; "*Affiliative Stimuli Processing in Psychopathic Individuals****"***
Research suggests that psychopathic individuals do not experience, feel, or resonate with the emotions of others in ways that guide prosocial, empathic, or moral behavior. Because individuals high on psychopathy do not value social relationships characterized by emotional closeness, they are thought to act aggressively towards others without compunction. However, few studies have specifically explored how psychopathic individuals respond to stimuli demonstrating emotional closeness between individuals. The aim of this study was to examine whether psychopathic traits are associated with a reduced preference for watching affiliative videos and whether pleasure in affectionate touch mediates this relationship. In an online version of the CAVE task using participants recruited through Amazon MTurk, participants (n = 407) were asked to examine two images and identify which one was the most affiliative, rate how strongly affiliation was shown in that image, and choose which one they would prefer to watch if the images were commercial previews. Psychopathic traits were negatively correlated with preferences for affiliative videos, with the affective facet of psychopathy exhibiting the strongest negative correlation with affiliative video preferences, over and above total psychopathy scores. Intriguingly, a positive correlation emerged between the antisocial facet and affiliative video preferences after controlling for the remaining three facets and demographic variables, a finding that was somewhat unexpected. Scores on the PATS partially mediated the negative relationship between psychopathic traits and affiliative video preferences. These findings suggest that reduced preferences for affiliative stimuli are driven by the emotional deficits associated with psychopathy, not antisocial tendencies.

Brover, Elizaveta; "*WIC and the Infant Formula Market****"***
Three firms, Mead-Johnson, Abbott Laboratories, and Nestle, compete for the majority of market share in the US infant formula market. Due to the high cost of infant formula, the federal government established the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) in order to provide low-income households with access to proper nutrition and care. WIC hosts auctions in each state for infant formula firms and awards a grant to the firm that offers WIC the highest rebate per unit of infant formula. In exchange, the firm that wins the WIC auction offers vouchers for free infant formula to WIC households. USDA research on market share using Nielsen Retail Measurement data reveals that upon winning the WIC contract in a state, that the market share of the new WIC formula provider rises to the order of 90-95% of that state's infant formula sales. This measure is significant, as WIC households make up around 40% of the formula market. Our first task was to simulate the results of USDA research using the Nielsen HomeScan data. Upon seeing that the trend of the research holds, we moved to measure the effect that the WIC label has on consumer's purchasing behavior. Afterwards, we will be analyzing the effect that the WIC premium has on the pricing behavior of manufacturers.

Buckingham, Isabel; "*Comparing Quality of Life in Adolescent Males and Females with Eating Disorders****"***
Eating disorders (EDs) are illnesses characterized by unhealthy eating behaviors such as restricting, binging, and purging, accompanied by unrealistic, pervasive cognitions surrounding weight and shape. Untreated EDs often lead to medical complications and seriously impair quality of life (QOL). Historically, EDs have been viewed as primarily impacting females. However, recent estimates suggest that up to ¼ of the ED population consists of males, making them grossly underrepresented in clinical and research spheres.

The purpose of this study was to compare QOL of adolescent males and females with EDs. 21 males and 140 females filled out QOL questionnaires-- two generic measures (HRQOL, PedsQL4.0), and one ED-specific (EDQOL). Males scored lower on the EDQOL's psychological and physical/cognitive subscales and its total score, meaning EDs impacted

adolescent males' QOL less. Notably, all measures demonstrated more impaired QOL for both sexes when compared with non-ED populations, and there was no significant difference when comparing generic questionnaires.

These results suggest that while the generic health-related QOL of EDs between sexes is roughly equivalent, the impact of the ED varies between male and female adolescents. It could be that males were truly less impaired; however, given that all ED-specific QOL measures to date have been developed exclusively for females, it is equally possible that the differing items simply didn't resonate for male adolescents with EDs. Further research is necessary to discern the differences in presentation of EDs so that accurate measurements of QOL can be developed and QOL itself improved via successful treatment and recovery.

Campbell, Catherine; "*Libraries: Empowerment and Virtue****"***
This project examines the holdings of the American Library Association (ALA) archives related to the Library War Service. This program, established during World War I by an ongoing collaboration between the War Department, the Red Cross, and the ALA, brought millions of books to military personnel in training camps, hospitals, and convalescent houses throughout the United States and in Europe. I understand these libraries, each attended by an ALA librarian, to have been built around two fundamental ideas. First, they served to place part of the effort of rehabilitation, or "reconstruction," directly in the hands of the patient through the aggressive provision of literature on technical and vocational topics, with the aim of sending a better-prepared workforce back into civilian life than had left it. Second, they were designed around a basically virtuous quality that belonged to books and to (especially woman) librarians, and that was capable in their interactions of providing hope, healing, and improvement by the libraries' presence and use

Campbell, Emily, David Park, and Andrew Perez; "*The Persistent Feminization and Devaluation of Care Work****"***
Care work, both paid and unpaid, is under unprecedented pressure. Population aging and the lengthening of life expectancy are increasing the demand for care labor, at the same time that existing social arrangements to meet care needs for children and adults are falling short. The pool of both paid and unpaid caregivers is compressing, in part due to the high economic penalties to specializing in caregiving, either in the family or in the market. Women are disproportionately represented as caregivers. In unpaid kin care, most full-time working-age caregivers are female-kin. In paid market care, women fill the vast majority of jobs attending care needs, and a large share of these workers are Black and Latina women. This overrepresentation of women in care work has persisted despite sea-changes in gender inequalities and women's social position, also called the gender revolution. These full-time unpaid and paid caregivers receive little to no compensation for the work they do and absorb severe lifelong economic penalties as a result. This project proposes the first comprehensive and comparative study about all types of care work, paid and unpaid and toward children and the elderly, to investigate how the feminization and devaluation of care work is reproduced, how it can be undone, and how it contributes to care labor shortages, gender inequality, and to inequality among women.

Cao, Minhtrinh and Lark Yan; "*Structure and Function of the Human Olfactory System****"***
Despite its importance to daily life for most living animals on this planet, the olfactory system remains an enigma in terms of how it functions. There have been many studies on rodent models of the olfaction, but the Gottfried lab pioneers the research of the human peripheral olfactory system. With the human tissue collected from biopsies and autopsies, we use immunohistochemistry and neuroimaging to characterize pathways and projections

in the human olfactory system in order to study the expression, function, and mapping of odorant receptor genes along the olfactory epithelium, bulb, and middle turbinate.

Cavazos, Alyssa; "*Iridium and Rhodium Complexes for Alkane Dehydrogenation****"***
Alkenes are valuable precursors for fuel and chemical production. Olefins can undergo many types of reactions including polymerization and epoxidation to produce important intermediates for commodity chemicals. Industrial methods to transform alkanes to alkenes are reliant on a process called cracking, which exposes petroleum to high temperatures resulting in a mixture of olefin products. Homogeneous catalysts can effect dehydrogenation at lower temperatures, making the overall process more energy efficient, but are limited by unfavorable reaction thermodynamics. The Goldberg lab is interested in the incorporation of O2 as the hydrogen acceptor, which would result in formation of H2O and improve the overall thermodynamics of the reaction. We are interested in the synthesis of tridentate iridium complexes with both facial and meridional coordination modes as oxidatively stable catalysts to affect aerobic alkane activation and dehydrogenation.

Chan, Peter; "*Establishing a Model of Challenged Rotator Cuff Tendon-to-Bone Healing Using Ovariectomized Rats****"***
Rotator cuff tears affect millions of individuals annually and, despite advancements in surgical technique, rotator cuff failure is common. Pulsed electromagnetic field (PEMF) therapy, a type of non-invasive therapeutic treatment, has been previously shown to be beneficial for supraspinatus tendon healing in a rat model. However, these studies utilized a healthy, young adult rat, which does not replicate the aged human population most affected by rotator cuff healing. Therefore, the objective of this study was to establish a model of "challenged" healing by comparison of the differences in rotator cuff repair healing between female rats and ovariectomized rats (OVX), with ovariectomy modeling postmenopausal osteoporosis. In a pilot study, rats ovariectomized at 3 months of age demonstrated that expected trabecular bone property changes in the humeral head did not occur until after the rotator cuff injury and repair. It was hypothesized that since the ovariectomy occurred when the rats were still experiencing normal skeletal bone growth, normal bone remodeling may have impacted humerus and therefore tendon-to-bone healing properties. Therefore, in this study, animals underwent ovariectomy at 5 months of age, allowing for bone growth to stop before the rotator cuff injury and repair at 7 months of age. After supraspinatus mechanical testing, microCT and histological analysis, it was determined that although trabecular properties of the humerus were significantly altered in OVX rats at the time of injury, there were no differences in tendon mechanics or histological properties between the OVX and healthy female groups. As a result, estrogen deficiency was not able to be established as a challenge model of rotator cuff healing.

Chang, Zhun Yan and Marisa Shu-han Yang; "*"Environmental, Social and Governance (ESG) Integration by Asset Managers"****"***
First coined in 2005, "ESG" refers to Environmental, Social and Governance factors relevant to an investment which may have a tangible financial impact on that investment. Since then, ESG investing is estimated at over $20 trillion in AUM or around a quarter of all professionally managed assets around the world today. Supporters of ESG investing claim that stocks with the worst ESG exposure have higher stock-specific volatility and betas. As a result, assets in mutual funds reached $2.6 trillion, up 34% over 2016, and the number of ETF more than doubled from 25 to 84. Yet while this surge in interest is partly reflected in the positive correlation between ESG performance and financial returns, not all practitioners, academics and general public are convinced. Critics argue that the application of ESG factors to investment strategies must result in lower alpha because such investing works in a subset of the investment universe, thus generating lower expected risk-

adjusted returns. Some argue that some of these funds are using the ESG label but not altering their strategies except in certain industries such as tobacco and ammunition. Other argue that it is unclear that a broader ESG strategy would reduce risk of the stocks; these criticize the data used to evaluate ESG performance because they are not audited and, primarily, voluntarily reported raising concerns about their legitimacy. Therefore, to study the complex relationship between ESG and financial performance, our research seeks to answer the following questions: 1) How do funds labeled as ESG perform according not to voluntary corporate reports but stakeholder discourse about those firms? 2) What is the correlation (if any) between the opinions of stakeholders and financial performance? 3) What distinguishes the strategies of funds who are high on ESG and high on financial performance from their peers?

Chen, Baile; "*From lambda to fault-tolerant transactions: create microservices that can simulate applications****"***
Microservices are self-contained units of computation that can be started up on cloud servers rapidly, whenever there is a demand. AWS lambda provides a platform for developers to build such microservices and has been widely used due to automatic scaling, high availability, and the absence of server-side maintenance. However, costs always come with advantages. In order to ensure outstanding availability, lambda is rendered stateless, meaning results computed during the current execution cannot be reused in later executions. Moreover, when a lambda fails amid an ongoing application, developers have to detect failures and design recovery mechanisms themselves, which can consume many hours, even more than the time taken to actually write the application. In this research, we aim to address the aforementioned problems of statelessness and non-fault tolerance. Statefulness can be achieved by introducing cloud storage devices, such as AWS DynamoDB, where lambda can write to and retrieve data from. To ensure fault tolerance, we adapt a technique known as locks with intent to the context of lambda. The resulting system guarantees that failures can be detected and addressed automatically. With the provision of locks with intent library, developers are able to set up the environment easily, thereby being able to concentrate on the application. During the course of this research, we have also created a new functionality of composing multiple standalone lambdasinto an atomic transaction that acts as if it was a single microservice. We applied this composability of lambdas/ microservicesto simulate ride-sharing applications such as Uber.

Chen, Beryl and Katelyn Lobo; "*HPV Vaccination and State Legislation****"***
In 2006 the Center for Disease Control and Prevention (CDC) introduced vaccination guidelines for a preventative vaccine against Human Papilloma Virus (HPV). This study tracked state-by-state HPV legislative changes to see their effect on vaccination interest and uptake. The study performed a qualitative content analysis on legislation introduced from 2006 to 2018. Bills were initially sourced from the National Conference of State Legislature (NCSL), however, the study expanded to state legislature archives and other legislative monitoring services after finding a number of bills absent from the NCSL website. The content analysis is still being conducted. However, early findings suggest bill passage was less likely after 2009, many bills are updates to previous legislation, and the two most common types of bills introduced were pertaining to education and vaccine cost coverage. Following the conclusion of the content analysis, the resulting data set along with Google Trends and National Immunization Survey data will be analyzed.

Chen, Billy and Julian Hunter; "*A Moral Emotion: Embarrassment, The Prospect and Experience of Embarrassment Promote Antisocial Behavior****"***
Embarrassment Definition: Negatively valence, self-conscious moral emotion that always occurs in the presence of real or imagined others. Current literature conceptualizes embarrassment as: an inducer of prosocial behavior (Tangney et al., 2007), a precursor to avoidance (Miller, 2007), a moral emotion that improves social relations (Keltner & Haidt, 1999). However, despite the prevalence of the emotion, these conceptualizations of embarrassment have not been directly tested.

Chen, Caleb; "*Our Digital Control Society: Emergent Disciplinary Structures and Inequality within Networked Surveillance Systems****"***
We live in the information age where our world is continually remade through the arrival of new and more invasive technological advances. We have been remarkably impacted by the pervasive influence of smartphones, social media, and artificial intelligence. But these advances are not entirely beneficial. Corporations and governments collect our information through these technologies, encroaching upon our social and political lives to control our behavior and beliefs. Data is the currency of power used within an enmeshed system of personal devices and online platforms. These networked surveillance systems constitute our modern society of control which maintains social inequality. Though they have been used for oppressive purposes, this quality is not necessarily an innate feature. Within all technology, each one bears the spark of an emancipatory potential that can be ignited. In this project, I explore: How do these forms of control and inequality arise within these networked surveillance systems and what are ways to design more transparent and accountable systems? In approaching this question, I intend to construct a theoretical framework by synthesizing concepts from critical data studies, computational cognitive science, and the digital visual arts. To understand the first half of this question, I begin with a critique of the history, politics and material conditions surrounding data that traces its origins from rudimentary record-keeping to its current form as complex information collection systems. With this new understanding, I will formulate a socially situated understanding of data that also uncovers its implications for discrimination. To answer the second part of the question, I propose experimental interventions using data visualizations and alternative design principles for egalitarian digital infrastructures. Such visualizations and infrastructures incorporate local narratives, material conditions and interactive dissent which will capture the social context through which data is generated.

Chen, Delia; "*Novel Specialized Properties of Adult Muscle Stem Cells****"***
Muscle stem cells play a major role in muscle regeneration. Following muscle injury, muscle stem cells become active, proliferate, and fuse with the surrounding tissue, allowing for the full regeneration within a few days. Pax7 is a marker of muscle stem cells that is conserved across many species, including humans (Seale et. al., Cell, 2000). To look at muscle stem cells in vivo, a Pax7EGFP mouse model was generated by inserting an enhanced green fluorescent protein (EGFP) cassette in the Pax7 gene (Tichy et. al., Skeletal Muscle, 2018). This allowed for the expression of EGFP driven by endogenous promoter and regulatory elements. Using 2-photon microscopy, we were able to visualize for the first time muscle stem cells in vivo. Traditionally when imaging muscle stem cells, researchers have used a GFP that stains only for the nuclei of muscle stem cells, leading to the general assumption that muscle stem cells assume an ovular shape. However, the Pax7EGFP mouse model incorporated a cytoplasmic GFP, which revealed that muscle stem cells have

protrusions similar to axons in neurons. To study diseased (i.e. chronically injured) conditions, Pax7EGFP mice were crossed with dystrophic (mdx) mice. The goal of this project was to characterize these protrusions under wild type and diseased conditions. Our results show a significant difference in both the number of protrusions per cell and the average length of protrusions per cell, indicating that the muscle stem cell protrusions are implicated in muscle injury.

Chen, Joshua; "*Automating Atomic Defect Identification in TEM Images of Transition Metal Dichalcogenides****"***
Recent advancements in scanning transmission electron microscopy (STEM) technology have generated an influx of new data. Originally, information was extracted from STEM images with "by-hand" analysis--meaning each image (approximately a few hundred angstroms across) was analyzed for defects and contamination manually. The smaller the scale of an image, however, the more images there are to analyze. Currently, manual analysis of so many images is no longer a viable option for labs that continue to analyze nanomaterials with STEM images. The goal of my project is to automate defect identification in angstrom-scale atomic images to address this issue of scalability.

My approach includes using computer vision library OpenCV to create a sequence of filters and functions to isolate atomic defects from pristine areas of the sheet while accounting for contamination and variations in brightness/magnification between images. Much of the project is dedicated to optimizing parameters to best identify atomic defects and recognize false positives, as well as expanding on applications for successful identification of the defects. Although there are multiple types of transition metal dichalcogenides that result in variations of images, I have generalized my program to work for any new nanomaterial, provided a few images of user-created training data. The end product is an approach that is universal for STEM images of TMD's and other 2D nanomaterials.

Chen, Stacey and Kenneth Shinn; "*The Effects of Direct Flights in the Commingling of Inventors in M&A****"***
Air travel is an essential component to the communication between inventors in acquiring and target companies. Our research aims to determine the external causes (non-managerial related) of cross border collaboration and mergers and acquisitions. In particular, we studied the effect of introducing direct flights between R&D locations on the commingling of inventors. It was hypothesized that these direct flights lowered the cost of distant collaboration, and as a result, led to better patents and more mergers and acquisitions. To perform our research, we first gathered addresses of individual inventors from companies' patent data. Then, using our geolocation clustering algorithm, we grouped these locations to pinpoint the companies' R&D centers. Finally, with our direct flight identifier tool, we found the number of direct flights between these R&D centers for each month between 1991 and 2018. This flight data is returned as a list of vectors, where each vector component was an integer describing the number of unique direct flights available between the R&D centers. Each data processing tool was designed and programmed in-house for the purposes of this research project. Despite the different modules used, this project analyzes one component of externalities that impact research discoveries.

Chen, William; "*Establishing a high-throughput electron cryo-tomography pipeline and database****"***
Electron cryo-tomography (ECT) is a unique method to reveal macromolecular structures in their native state and context within cells. Though powerful, the throughput of ECT is limited due to complicated and time-consuming manual data collection and processing. Over the 2019 summer, I established a high-throughput ECT pipeline and database at the

University of Pennsylvania that automates the entire process from data collection, to data processing, and finally data storage. The system has enabled researchers to study difficult structures in situ that require significant amounts of tomography data. The project has also taught me strong computational, programming, and web development skills in the context of a research lab.

Chen, Yu Jiao (Cecily); "*Feeling Good about Feeling Bad: Sex and Desire of the Feminist Sex Wars and the Writings of Kathy Acker****"***
In this project I will investigate how Kathy Acker's unflinching portrayal of the realities of female sexuality in her novel Blood and Guts in High School opens up a new paradigm for feminist discourse. Heavily influenced by recent scholarship in affect and sexuality studies—specifically the works by Sianne Ngai, Lauren Berlant, and Andrea Long Chu—I am interested in how Acker tackles aspects of female sexuality that are often either vilified or neglected in mainstream discourse—namely, why and when women knowingly walk into "bad," dangerous, or destructive sexual encounters—and how she at once validates and problematizes the fundamental issue of feminine body politics.

Further, I will contextualize the era where Acker is writing, bracketed between the feminist sex wars of the late 1970s and the nascent identity politics of queer theory, which complicates the issue of desire. This is especially important in understanding Acker's emphasis on how personal desire and political ideology often contradict each other. Implicitly invoking the sex wars of the 70s, Acker asks the question: If men are The Problem, does our desire for them make us complicit, and is it possible to reshape desire to conform with ideology? Her tentative answers are No, and No.

By giving my own reading of Acker, I wish to complicate the current landscape of feminist discourse, and to re-evaluate female sexuality through the lens of affect as opposed to ethics morality: to consider how a woman feels, rather than what a woman "should" do.

Chen, Yue; "*Molecular Dynamics Simulation of Unlinked Bundle Protein in Vacuum****"***
The bundle protein, designed by Huixi Violet Zhang, is a structure consisting of four identical 29-residue peptides. The four peptides of the bundle are held together by noncovalent interactions. To enhance the stability of this bundle protein, Saven group member Jacquelyn Blum sought to link the four peptides with a covalent link, which is formed by sulfonamide(SFL) and the amino acid cysteine(CYS). To form the link, a certain amino acid on one peptide is replaced with SFL and another with CYS. These changes are applied to all four peptides to form four links. The placement of SFL and CYS on the peptide is crucial; the two amino acids on different chains must be close enough for SFL and CYS to form a bond.
The possibility of link formation is tested by molecular dynamics simulation. The software used are Visual Molecular Dynamics(VMD) and Nanoscale Molecular Dynamics(NAMD). The modified bundle protein is first placed in water using VMD, then a 5 nanosecond simulation is run to see if the bond-forming atoms, S on SFL and C on CYS, ever get close enough for a C-S bond to form. This simulation typically takes 15 hours on a cluster. One way to reduce this time is to run the simulation in vacuum instead of in water. Since less atom is involved, the simulation takes 50 minutes in vacuum. Test simulations of the bundle in vacuum succeeded, and currently the parameters of simulation in vacuum are being optimized.

Chen, Zeyu and Emma Ronzetti; "*Effects of Regulation on U.S. Society****"***
This summer, as part of the Penn Program on Regulation and under the mentorship of Professor Cary Coglianese, we conducted research on the public perception of and reaction

to various federal regulations, as well as the distributional and efficiency effects these regulations have on U.S. society. We composed literature reviews on the Occupational Safety and Health Administration (OSHA) to determine its effectiveness and institutional capacity, analyzed norm shifts regarding the abolitionist movement and public smoking to evaluate the potential conditions for climate change mitigation, and investigated current public trust in government legitimacy. As part of Professor Coglianese's ongoing research projects, we also studied the inequality effects of economic regulations such as environmental, anti-discrimination, and pharmaceutical standards, and ascertained whether regulatory capture has caused the increase in income inequality affecting the U.S. since the 1970s. Finally, we turned our attention to stock behavior. We assisted the professor in observing coal stockholder responses to the announcement, signing, and repeal of the Clean Power Plan, the Cross-State Air Pollution Rule, and the Mercury and Air Toxics Standards to prove that indirect coal regulations do not explain the current decline of U.S. coal companies.

Cheng, Olivia and Sahill Yadav; "*Legal and Political History of the Federal Reserve****"***
Initially created in 1913 by Congress and President Woodrow Wilson to provide the United States with a more stable monetary system, the Federal Reserve has become a major institution in the financial world. However, it is deeply rooted in the political environment as well. The purpose of our research was to help provide a comprehensive overview of the political history of the Federal Reserve. This information was used to assist Professor Conti-Brown in writing his upcoming book on the institution. Our process included traveling to archives across the country, gathering primary documents, and writing research memos on specific events in the central bank's history. We handled the quantitative aspects inherent in historical research (such as data entry and light coding), and we wrote memos on topics such as the secrecy of Jimmy Carter's replacement of Arthur Burns with G. William Miller, Congressional influence in drafting the Fed's dual mandate of managing inflation and unemployment in the Humphrey-Hawkins Act, the Fed's swift action managing the rapid and severe downturn in stock prices in 1987, and so much more. We also created data visualizations for Prof. Conti-Brown's book and an upcoming paper on proposals for a national real-time payment system.

Chiang, Lanting; "*Identity, competition and social norms****"***
The first project that I worked on aims to investigate how a person's identity affects competition. Specifically, could people stand out by identifying as belonging to a specific social group? Could they benefit in competition from joining identity groups? Will people prefer competing with those that don't make their identity salient?

The second project that I worked on aims to study how outliers in a group affect what behaviors people perceive as pertaining to social norms. Volunteers of different races and genders were filmed opening a door. Given the scenario that the volunteers in the video are attending a conference at different time points, participants will be asked what time they believe is an appropriate time to arrive at the conference. The results are expected to be correlated to the race and gender composition of the people in the videos.

The third project aims to study how accurate researchers predict the success of their research designs, and whether this is related to their academic fields and expertise, which is approximated by the number of years since they received their PhD and the number of citations they have. Overly optimistic researchers would potentially lead to biased results.

Choi, Justin; "*Optimizing Dining Halls through Machine Learning****"***
Utilizing scikit-learn, NumPy, SciPy, and matplotlib packages on a Python code base, this project intends to train a simple regression machine learning model that will predict the student attendance at a selected dining hall any given day, as well as select which items will be more or less popular given a menu of items. This allows the dining hall staff to optimize their meal prep and make best use of what foods they purchase and how much cooking space they dedicate to certain items, ultimately saving costs for Penn.

Chong, Joseph; "*Understanding the Mechanisms of Esrp1 and Sox2 in Early Craniofacial Development****"***
Cleft lip and/or palate (CL/P) are the most common craniofacial birth defects, yet the molecular and cellular mechanisms underlying CL/P formation remain poorly understood. One of the critical steps in upper lip and palate formation is the epithelial adhesion and fusion between facial prominences, which occurs at specific embryonic stages. The goal of this project is to delineate the molecular pathways involved in the epithelial adhesion/fusion process during upper lip formation. In this study, two unique genetic mouse models are utilized: (1) Esrp1-/- mice, a novel genetic mouse model for CL/P, and (2) Esrp1-/-/Sox2+/- mice, a rescue model for CL/P. Ectodermal and mesenchymal layers of facial prominences are dissected from wild type, Esrp1-/- and Esrp1-/-/Sox2+/- mouse embryos during the E11.5 developmental stage and harvested for RNAs. The RNAs will be processed for high throughput sequencing (RNAseq) and analyzed for gene expression profiles to identify candidate molecular pathways critical for upper lip formation.

Chowdhury, Amira; "*Mixed-Methods Research To Evaluate The Penn Model OAS Program****"***
Working with Dr. Catherine Bartch, I conducted mixed-methods research to evaluate the Penn Model OAS Program, a community based program engaging undergraduate and high school students in experiential learning to explore solutions to the most pressing problems facing the Americas through democracy, development, security, and human rights.

I drafted extensive IRB submission documents and received IRB approval for our research. Using library databases, I first reviewed extensive literature, related books, and academic articles on quantitative and qualitative measures used to evaluate and assess public service and civic engagement programs in the social sciences and psychology. I combined critical findings of my literature research to draft a critical literature review on the "Methods of Evaluation and Assessment to Measure Student Civic Outcomes in Service Learning Programs." Dr. Bartch used my literature review to supplement her proposal for evaluation of the program to the department. I aggregated and analyzed data collected from pre and post surveys of the program, and ran two-paired T-tests to conduct a pilot quantitative study of the program. I further produced reports, analyzing related complex statistical and non-statistical measures used in the field to evaluate such service learning programs, and proposed a consolidated set of qualitative and quantitative metrics the department should use to evaluate the program. Crafting a set of qualitative interview questions, I travelled across Philadelphia and conducted 45 minute qualitative interviews with 10 past participants of the program. I transcribed over 300 minutes of interview audio files for the qualitative portion of the research evaluation.

Chung, Helen and Jennifer Luo; "*Design and Preparation for Awake Multisensory Integration Recordings****"***
While anesthetics have been used for centuries, exactly how they work is still uncertain. Previously, scientists believed that anesthetics disrupt the brain's ability to take in new information. However, that hypothesis has been disputed by researchers Hodgkins and

Huxley when they discovered that anesthetized cats respond to visual stimuli in the visual cortex. Thus, we hypothesize while the brain is able to perceive stimuli from its surroundings, there is a disruption in the integration and accurate interpretation of sensory information. To test this hypothesis, we show anesthetized mice multisensory stimuli and measure their brain activity with a grid electrode to later compare with recordings from awake mice to determine differences in spatial integration. For this project, we created appropriate visual, auditory and tactile stimuli in PsychToolbox. Also, we designed a bracket to securely head-restrain mice during awake recordings.

Cloud, Kara; "*A cell population model of retinal ganglion cell layer thickness****"***
The aim of this project is to relate psychophysical measurements in vision to cell population data. Within the field, there exists a difficulty in isolating and measuring the thickness of the RGC layer, because of its similarity to the inner-plexiform layer (IPL) in OCT imaging data. Collected cell population data provided us with the numbers of each type of cell in the RGC layer in the retina, including: midget cells, parasol cells, bistratified cells, and amacrine cells displaced from the IPL. Given the number and size of each of these cells, we are able to derive the estimated thickness of the RGC layer given an estimated spherical packing density of 0.54mm3. We determined the thickness of the RGC layer peaks at about 1mm from the fovea at roughly 55mm thick and follows a roughly inverse exponential decay function until it reaches a roughly constant slope at about 3mm eccentricity, about 30mm thick. Several important applications of this model exist: individual subjects can be tested to create a personalized individual model of their retina. The density of the midget ganglion cells has been shown to be predictive of visual acuity at any given eccentricity, so the models of visual acuity across a subject's visual field can be compared to their model of RGC density across the retina. Additionally, the fraction of midget retinal ganglion cells (mRGCs) supports the Dacey (1993) midget fraction function as opposed to the Drasdo (2007) model of exponential decay midget fraction function.

Clyde, Abigail and Jahnvi Patel; "*The Effects of the Antiretroviral Therapies, Dolutegravir and Bictegravir, on Oligodendrocyte Maturation****"***
HIV-associated neurocognitive disorder (HAND) develops in approximately 50% of HIV (+) people and causes cognitive, motor, and behavioral impairments. Antiretroviral therapies (ART) led to a decrease in the most severe forms of HAND, but less severe manifestations still occur in 30-50% of the HIV (+) population. Previous studies from our lab have shown that some antiretroviral drugs inhibit the differentiation of oligodendrocytes, the myelin-producing support cells in the brain, and could be contributing to the neurocognitive deficits seen in HAND (Jensen et al, 2015). We tested two different front-line ART drugs from the integrase strand transfer inhibitors (INSTIs). We hypothesized that the antiretroviral therapies dolutegravir and bictegravir would alter oligodendrocyte differentiation. To determine the direct effect on oligodendrocytes, oligodendrocyte progenitor cells (OPCs) were isolated from brain of postnatal rats and cultured. The OPCs were placed in medium to induce differentiation while simultaneously being treated with three different concentrations of each ART drug for 72 hours. After treatment, the cells were labeled with antibodies to immature marker GalC, mature marker PLP, and nuclear label DAPI. The slides were imaged and the cells counted. Cells treated with the highest dose of bictegravir showed significantly lower numbers of GalC(+) and PLP(+) cells compared to the DMSO control, while cells treated with the high or medium dose of dolutegravir showed the same significant effects. Exploration of the effects of these drugs will provide insights into the effect of ART on HAND pathologies and the role of oligodendrocyte differentiation in HIV (+) individuals.

Colleran, Casey; "*Increase in the Circulation of Mitochondrial DNA Post Lung Transplant is Associated with the Development of Acute Kidney Injury"*
Acute kidney injury (AKI) occurs in up to 70 percent of lung transplant patients. Past studies have discovered connections between the circulation of cell free mitochondrial DNA with increased inflammatory responses and organ injuries. We hypothesized that the development of AKI post transplant would be associated with an increased level of mitochondrial DNA after lung reperfusion. Analyses of mtDNA levels were performed on blood samples taken from the lung transplant donor and three samples from the recipient (a baseline sample, a 6 hour sample, and a 24 hour sample) from a single centered, prospective cohort study of 40 lung transplant patients. The results of these tests showed little to no association between donor mtDNA levels and recipient baseline mtDNA levels to the development of AKI. There was evidence of borderline association between the 6 hour mtDNA levels ($p = 0.106$) and the 24 hour mtDNA levels ($p = 0.092$). When looking at the 6 hour samples and 24 hour samples in regards to AKI staging, it appears stage 2 and stage 3 AKI are more closely associated with higher levels of mtDNA. Study limitations include the fact this is a single centered study, and the small sample size precluded adjustments of AKI beyond pre-specified confounders. In conclusion, the post reperfusion levels of mtDNA are associated with the development of AKI, however with a small study like this one it is impossible to say if these results are definitive and if this relationship is causatory.

Collins, Michiyah; "*Identification and characterization of Haloferax vocanii hypermotile mutants"*
Cells dispersing from biofilms, cell aggregates that allow microorganisms to be protected from stress conditions, such as the presence of antibiotic, swim faster than planktonic cells. 22 hypermotile mutants have already been identified by screening a Haloferax volcanii transposon (Tn) library. The goals of this project are to identify additional mutants, identify the genes that were disrupted and to characterize knockout mutants of these genes, particularly with respect to their motility, morphology and biofilm formation phenotypes. Revealing the regulatory mechanism(s) involved in biofilm dispersal may allow to render antibiotic resistant biofilm cells susceptible to antibiotic treatments.

Coonts, Nathan and Archana Upadhyay; "*Penn and Slavery Project"*
The Penn and Slavery Project was established in 2017 to investigate what, if any connections the University of Pennsylvania has to the institution of slavery. Initially focusing on the original trustees and early donors ownership of enslaved individuals, the Penn and Slavery Project expanded on their definition of complicity. That is, Instead of limiting complicity to strictly the ownership of enslaved individuals, students in the project began to investigate all the ways in which the university supported, justified, and benefited from the Atlantic slave trade.

Cornell, Mitchell; "*Dataflow Simulation for the Inner Tracker of the High Luminosity Large Hadron Collider (HL-LHC)"*
The Large Hadron Collider will undergo an upgrade by 2026 that will allow protons to collide at roughly 10x the current rate. As such, new electronics are in various stages of development that will be able to handle this increase in luminosity within the physics detectors. My project focused on a section of the ATLAS detector called the Inner Tracker, or (ITk), and the goal was to construct a data flow simulation for these new electronics within ITk. In different terms, the goal was to write a program that would take simulated hit data as input, and produce the combined readout of the new electronics as output. This required detailed research of three different Application-Specific Integrated Circuits (or ASIC's), as there are different ways that the hit data is molded at various stages in the data

flow, and each way is reflected in the design of the ASIC. The ultimate result is a stream of data that is able to be unpacked and used for the construction of particle tracks. The purpose of simulating this stream stream is to have testable data, or test vectors, that will help verify and optimize the design of ITk. Likely next steps include translating the programs into C++ in order to improve efficiency as well as to develop the framework that will use the simulated data flow for verification.

Crocker, Olivia; "*Using a Novel PEV Assay to Identify Heterochromatin Clustering Factors****"***
Higher-order chromatin organization is defined by both global segregation of active (A) and silent (B) chromatin compartments and local contact frequency enrichment within topologically associated domains (TADs). Despite the large amount of literature about the role of cohesin and CTCF in facilitating chromatin contacts within TADs, the mechanisms driving compartmentalization are still largely explored. In this work, we demonstrate the use of the D. melanogaster bwD mutation as a novel position-effect-variegation assay capable of assessing B-compartment integrity. This PEV assay functionally measures how candidate factors affect either general heterochromatin formation and/or the coalescence of silent chromatin into a segregated B-compartment. Over 50 suppressors of variegation were identified in this screen, with cell-cycle components, nucleolar proteins, and condensin II subunits being especially prominent. Furthermore, through immunofluorescence staining for heterochromatin markers, we have identified a potential role of the suppressor of variegation tlk in regulating heterochromatin integrity. Ultimately, the preliminary results of this study suggest the role of novel factors in modulating B-compartment formation and/or maintenance.

Cruz-Adames, Elena; "*Neurobiology of Courtship Behavior in Songbirds****"***
There is a neural circuit present in songbirds, also known as the "song-system" that connects song specific nuclei that constitute the vocal-motor pathway with the auditory forebrain pathway. The song-system was believed to exist only in males and consequently was primarily studied in male songbirds. However, studies have shown that the song-system is also present in female songbirds, even in species in which the females do not sing. We propose that the song-system is in fact a neural circuit that plays a role in courtship behavior. In female brown-headed cowbirds, a species in which the females do not sing, an essential courtship behavior is the production of a copulation solicitation display (CSD) in response to song. In normal circumstances, there is significant selectivity in the production of a CSD; females will only produce CSDs in response to high quality songs. When the song-system is disrupted, more specifically when a nucleus in the vocal-motor pathway known as HVC is lesioned, there is little to no selectivity. This suggests that the song-system is able to receive an input or stimulus (song) and produce an output or motor command (postural response of CSD). We aim to identify these structures in the female cowbird and trace the pathways in the circuit using histological techniques combined with retrograde tracers.

DaSilva, Kia and Glen Kahan; "*Naxcivan Archaeological Project****"***
While working on the Naxcivan Archeological Project, we were given the opportunity to participate in the creation of a new excavation site. On a hill that had previously been excavated by the UPenn Archeological Museum over the course of multiple years, our team set to work mapping, excavating, and recording the data from UPenn's newest areological dig in the Sharur region. Working in 9x9 meter trenches, we each oversaw the complete excavation of an area which had been inhabited over multiple time periods: having been used both as a cemetery and as the foundation for a roman structure (presumed to be either a military encampment or the home of one of the many wealthy Romans). After a month

in Naxcivan, we returned to Philadelphia to go over the data we had collected, finalize our notes for others to be able to use, create publishable renderings of the pottery we had found, and research roman structures to help determine what it was we were actually digging.

DaSilva, Sabrina; "*Astrocytic mitochondria undergo increased mitophagy following focal ischemic stroke****"***
Astrocytes are vital in synaptic signaling, regulating neurotransmitters, and controlling local blood flow and nutrient uptake. These processes are heavily dependent on oxidative energy metabolism, which occurs in astrocytic mitochondria. Following stroke, neurons undergo rapid cell death, whereas astrocytes remain alive for a period of time while undergoing rapid changes in morphology, metabolic state, and intracellular signaling cascades. These changes are heavily dependent on energy metabolism fueled by astrocytic mitochondria, which may have a protective role following ischemic insult. Thus, we investigated changes that occur in astrocytic mitochondria following focal ischemic stroke. The Robinson lab previously examined changes in astrocytic mitochondria following oxygen-glucose deprivation in organotypic hippocampal slice cultures. We sought to determine if similar changes occur in astrocytic mitochondria in an in vivo model of focal ischemic stroke. Mice injected with adeno-associated viral vectors to fluorescently label astrocytic mitochondria were subjected to middle cerebral artery occlusion by targeted photothrombosis. Using this system, we found that astrocytic mitochondria within the peri-infarct region have punctate morphologies. Mitochondria undergoing mitophagy adopt fragmented, punctate morphologies, similar to the mitochondria within the peri-infarct region. Using the specific autophagy marker LC3-II, we have examined if astrocytic mitochondria undergo increased mitophagy following stroke. Examination of optical cross sections revealed increased co-localization between LC3-II positive staining and eGFP-labeled mitochondria. 3-dimensional quantitative analysis of co-localization between eGFP-labeled mitochondria and LC3-II is currently being conducted to confirm these observations. Examining the rapid changes in astrocytic mitochondria may reveal potential neuroprotective abilities following ischemic brain injury.

Davaadorj, Tserenpuntsag; "*Ballast & Barricades****"***
Developed and built Sculpture and Installation for Solo Exhibition of Michelle Lopez at ICA Philadelphia opening September 2019

David, Ashleigh; "*Backpacker Identity in Western Europe****"***
Over the last summer, I spent 2 ½ months conducting field research for my senior thesis which is an ethnographic account on the backpacker culture and identity and the role of the hostel in Western/Central Europe. I specifically examined how backpackers create their identities and perform them within hostels. I travelled for 78 days, across 12 countries in Western/Central Europe, and stayed in 27 different hostels.
As I begin to analyze my data and findings, I will examine and evaluate how globalization, historical contexts, economic circumstances, and cultural experiences have contributed and influenced the tourism practice of backpacking. From initial analysis, other themes I will likely focus on included technology, repeated meetings, sharing, alcohol, sex, and peer pressure.

Literature about the phenomenon of backpacking is largely absent from current academia, especially ethnographic work that focuses on cultures created by backpackers and hostels. Perhaps a reason for the lack of ethnographic work on backpackers is that many scholars are hesitant to consider backpacking a "culture" but instead a sub-lifestyle or practice. One main reason for this distinction is because the community has very little fixity, with membership being constantly in flux. However, while the members (the backpackers) may

be temporary as they are constantly moving, the community (the hostel) is constant. I argue that hostels work as an "imagined community" (Anderson 1983) in that, while hostels are not implicitly connected to each other, they are intrinsically linked to create one connected community among those who inhabit them.

Davies, Emma; "*Assessing Language Services at Penn Medicine: A Mixed Methods Approach****"***
In order to access the current state of language access services at Penn Medicine facilities, semi-structured interviews with key stakeholders were conducted. Questions explored the decision processes of these stakeholders, their experiences operating language services, and their suggestions for improvement. Preliminary findings show common trends related to the operational tasks of language services, the current state of language access, and for opportunities for improvement. This was paired with data on interpreter usage across entities. Results show that though progress has been made in increasing access and options to language services, there is still a call for more unification across entities, more options for patients, and reduced expenditures.

De La Paz, Nathaly; "*Analysis of Sunset Blvd****"***
Over the course of various years, Ed Ruscha photographed the buildings lining Sunset Blvd. The project focuses on a racial analysis of the "Sunset strip" in Los Angeles, California. It is based on both the photos of Ed Ruscha as well as Census information collected for the years 1960 - 2010. The census information was used in order to better understand what was going on in the photos provided by Ruscha. We are able to view how the section of Sunset has developed and evolved through the use of the census.

Degefa, Merobi; "*Giving birth in Ethiopia****"***
The research is a comparative case study on access to dignified and timely care in NGO and Public facilities during child birth in Ethiopia. Researchers have concluded that there is an immense amount of disrespect directed at mothers during childbirth within public hospitals in Ethiopia. However, there has not been attention given to the effects of social factors such as, SES and gender play in these settings.This study will aim to identify the different factors that play a role in the care provided to patients. Additionally, current literature examines the lack of quality, respectful care within public facilities in Ethiopia, however, lacks in highlighting the similarities and differences of the mother's experience of care in NGOs versus public facilities. My research will fill the gap in literature by lending a comparative lens to the assessment of experience of care during childbirth by focusing on dignified and timely care.

The purpose of the study is to identify how the care provided in public hospitals is similar or different to that of the care that is provided in non-governmental facilities and why those differences and similarities exist. Additionally, the study will examine how socio-economic factors affect the care received.

DelGaudio, Ryan; "*Snipping A Trouser Button: How the British Diplomatic Establishment Gave Away Heligoland****"***
Through an examination of the Heligoland-Zanzibar Treaty of 1890 and its background, I intend to study the apex of the Anglo-German relationship prior to World War I. Using British Colonial Office and Foreign Office sources, I will analyze how British colonial officials managed German attempts to influence the British island colony of Heligoland's affairs as well as the British negotiations with the German government, which resulted in the colony's cession in 1890. This thesis will provide an innovative perspective to the

existing cannon of thought as to why a broader Anglo-German alliance did not emerge, leading to the breakout of war in 1914.

Desikan, Vaibhav; ***"****Identifying genetic factors that affect stem cell niche integrity in aged testes****"***
Stem cells are undifferentiated cells, which produce daughter cells important for tissue formation, maintenance, and regeneration. However, stem cell productivity often declines with age. Stem cell renewal and differentiation are regulated by factors sent from the local tissue environment where these cells reside; called a 'niche.' The Drosophila melanogaster testis has proven to be a favorable model to understand the niche. Our laboratory has shown that there are changes in surface area and volume of aged niches. We are conducting a screen to identify factors that might cause these age-induced changes. We will knock down gene function of signaling and cytoskeletal regulators in niche cells using the Gal4-UAS system and test for changes in niche morphology. First, we asked which GAL4 line, unpaired-GAL4 (updGAL4) or hedgehog-GAL4 (HhGAL4), is expressed most strongly and consistently in the niche. To answer this, we crossed each driver with UAS-green fluorescent protein (GFP) flies, and used GFP as a readout for GAL4 activity. Both drivers produced a high percentage of GFP+ cells per niche. However, there was greater variability with HhGAL4, resulting in a lower average percentage of GFP+ cells. This difference was statistically significant ($p<0.0001$, Mann-Whitney Test). Therefore, updGAL4 should be used for the screen. However, the mosaicism of HhGAL4 activity provides an internal control to compare knockdown cells to non-knockdown cells in the same niche. These data will inform our decision about which Gal4 driver to use when we perform our screen to assay for genes that affect aging of the niche.

Devashish, Kartik; ***"****Evaluating a Model for the Study of Pulmonary Arteriovenous Malformations in Glenn Patients****"***
BACKGROUND: Infants with single-ventricle congenital heart disease who are surgically palliated with a superior cavo-pulmonary connection (Glenn circulation) often develop pulmonary arteriovenous malformations (AVMs), which lead to progressive cyanosis and significant clinical deterioration. The mechanism of this abnormal pulmonary angiogenesis is unclear. We evaluated a cell line of pediatric pulmonary microvascular endothelial cells as a more physiologically appropriate model for in vitro study of pulmonary AVM formation in Glenn patients.

METHODS: Whole blood samples were obtained from patients with single-ventricle Glenn physiology (n=12) and adult controls (n=4). Pediatric pulmonary microvascular endothelial cells (PPMVs) were cultured. An EdU uptake assay was performed to quantify differences in PPMV proliferation between EDTA- and heparin-anticoagulated plasma using adult control samples (n=4). A second EdU uptake assay was used to compare PPMV proliferation in heparin-anticoagulated plasma from the SVC and aorta of Glenn patients, versus heparin-anticoagulated pediatric control samples (n=12).

RESULTS: Pediatric pulmonary microvascular endothelial cells showed a significantly higher proliferation rate in heparin-anticoagulated plasma samples as compared to EDTA ($p<0.01$). PPMV proliferation rates were also significantly elevated in Glenn plasma as compared to pediatric controls ($p<0.0001$).
CONCLUSIONS: Using heparin as the anticoagulant, the significant increase in PPMV proliferation rates upon exposure to Glenn plasma is representative of the abnormal angiogenic patterns which have been clinically observed in Glenn patients. Pediatric pulmonary microvascular cells, therefore, may be a physiologically appropriate model for the in vitro study of pathologic angiogenesis in Glenn patients.

Di Martino, Michael; "*A Qualitative Assessment of TeleICU Utilization in One Medical System****"***
TeleICU is an audio-visual system for ICU clinicians to remotely monitor and care for critically ill patients in partnership with bedside ICU clinicians. Studies evaluating teleICU have mixed outcome data. One challenge in evaluating teleICU interventions is the variation in program implementation and models of use. Understanding how teleICUs are used is an important component in evaluating current practice and informing future use. We sought to understand how nurses routinely collaborate with teleICU by identifying facilitators and barriers to teleICU practice in one medical system. Semi-structured interviews were conducted on a one teleICU/hospital dyad using semi-structured interviews from a convenience sample of nurses. Interviews were analyzed using deductive and inductive content analysis to identify categories that describe nurse experiences with teleICU practice. The AACN Tele-Nursing Practice Guidelines guided the deductive analysis. We conducted 30 one-on-one interviews with ICU (n=19) and teleICU (n=11) nurses. Three main categories that were described in the content analysis: quality improvement (i.e. articulating the value of teleICU program), unique teleICU skillset (i.e. ability to see big picture when monitoring many ICU patients), and collaborative work environment (i.e. effective communication between ICU and teleICU clinicians). Nurse use of teleICU is influenced by previous individual and unit experiences with teleICU. Modifiable systems-level factors within the work environment may be important targets to influence ongoing implementation and future teleICU use.

Di Martino, Michael; "*Evaluating the Capacity of a Microfluidic Device For Blood Cell Separation****"***
Sepsis is an overexaggerated immune response that results in autoimmunity. National initiatives are in place to develop more-effective diagnosis and treatment methods, but phenotypic variability in the disease continues to challenge treatment methods and devices. A downstream consequence of sepsis is a systemic dysfunction of patient immune cells. These cells can be difficult to analyze in whole blood. Blood is a mixture of cells of various sizes and morphological properties. Erythrocytes (red blood cells) and leukocytes (white blood cells) are two cellular populations whose constituency and behavior can serve as an indication of patient stability and homeostatic condition. Due to differences in size, these two cell types behave differently in the vasculature: leukocytes, being larger, tend to flow near the edges of vessels, whereas erythrocytes congregate in the center. These flow principles can be exploited via microfluidic devices, which take advantage of fluid flows at the micron scale. In this work, a microfluidic device was analyzed in a model system consisting of microcapsules and droplets of different sizes to assess its flow profile-based separation. Results suggest sample enrichment was low. Optimization of flow conditions may lead to increased enrichment.

Di Vitantonio, Kathryn; "*Readmission Predictions in Patients with Eating Disorders"*
Purpose: This study examined readmission predictors to inpatient/residential settings in eating disordered patients. Utilizing the Transitional Care Model, we hypothesized that readmitted patients readmitted would report worse transitional care and continuity of care compared to those who were not.

Methods: A cross-sectional, online survey of individuals from the US diagnosed with an eating disorder requiring inpatient/residential treatment. Participants completed questionnaires on demographic and clinical characteristics, the Care Transition Model-15, and the Continuity of Care Questionnaire. Data analysis used univariate statistics and a series of logistic regression models.

Results: Participants were a mean±SD age of 31.3±7.5 years; BMI of 24.4±6.8 kg/m2; 55% female; 75% white; 38.8% were diagnosed with anorexia nervosa, 22.5% with binge eating disorder, 20.0% with bulimia nervosa, and 18.7% with other specified eating disorder. Increased readmission odds were associated with better transitional care (adjusted OR (AOR)=1.11; p<0.001), and better continuity of care during their hospitalization (i.e., relationships in hospital (AOR=3.59, p=0.01) and community (AOR=11.88, p<0.001), information transfer (AOR=4.91, p=0.003), management of forms (AOR=2.81, p=0.03), and management of communication (AOR=4.57, p=0.004)). Gender, race, age at hospitalization, weight change during treatment, current BMI, admission type, and eating disorder diagnosis were not significantly associated with readmission (ps>0.05).

Conclusions: Contrary to our hypotheses, we found that better transitional care and continuity of care were associated with higher odds of readmission.

Policy Implications: Additional studies are needed to examine predictors of readmission in eating disordered patients. Policies that support transitional care and continuity of care may help eating disordered patients needing additional treatment.

Dorch, Daryl; "*Source Water Protection Across the East Coast****"***
This project focuses on determining where cities across the East Coast get their main water supply. Then, based on that we've evaluated how those cities and their supplies will be impacted by sea level rise, and what can be done to combat it.

Dreier, Allison; "*Development of a mouse model to study the effects of adolescent vaping of Δ-9-tetrahydrocannabinol (THC)****"***
Cannabis is the most frequently used illicit drug in the world. Increased legality of cannabis, and therefore availability, has occurred alongside a widespread popularization of electronic cigarettes (e-cigs) among youth. The present study utilized an SVS200 e-cig vapor machine (La Jolla Alcohol Research, Inc.) to deliver vaporized e-liquid containing Δ-9-tetrahydrocannabinol (THC) dissolved in Propylene Glycol (PG) to adolescent C57/BL6J mice of both sexes. Subcutaneous body temperature was measured before and after an acute exposure to either 100 or 200 mg/ml THC vapor or to vehicle control vapor (100% PG) using Implantable Programmable Temperature Transponders (IPTTTM-100; BioMedic Data Systems Inc.). These animals were tested in the open field arena for locomotor activity 30 minutes after the acute e-cig vapor exposure. 24-h after acute exposure to THC or vehicle vapor, tissue punches were collected from brain regions relevant in reward processing for analysis of post translational histone modifications (HPTMs). Adolescent C57/BL6J mice of both sexes exposed to THC via e-cigarette vapor show dose-dependent responses in physiological endpoints (e.g. subcutaneous body temperature and locomotor activity) compared to controls (PG vapor only) and THC is detectable in their serum via ELISA assay. By using commercially-available products, this study establishes a highly translational method to study THC vaping in adolescents, which is a rising epidemiological concern. This research not only provides a highly translational method of THC delivery to use in preclinical mouse models, but it also could increase our understanding of the effect of THC exposures on the adolescent epigenome.

Dubner, Jacob; "*Evaluating the Long-Term Viability of the Oral Rehydration Tube in Rural Uganda****"***
Diarrheal diseases are the second leading cause of death among post-neonatal children under the age of five. Oral rehydration solution (ORS)—a solution made from a 1:1 molar ratio of salt and sugar—has been hailed as "potentially the most important medical advance

of the 20th century" for its remarkable ability to combat the life-threatening dehydration associated with diarrheal disease. Despite its effectiveness, only 2 out of every 5 children with diarrhea receive ORS, and ORS coverage is lowest in regions where the risk posed by diarrheal diseases is the greatest. The Oral Rehydration Tube (ORTube) is a tool that is specially designed to improve upon methods of homemade ORS preparation by allowing individuals to measure the exact amounts of salt and sugar that are needed to prepare safe and effective ORS. By equipping individuals with this specialized tool, it is hoped that ORS usage will increase on a community level due to an increase in perceived medical legitimacy of homemade ORS. This study aims to the extent to which the ORTube becomes integrated into community health practices within Ugandan villages over a 9-month period. Formal results will not be known until May 2020, but initial reactions to the ORTube among Ugandan community health workers was very positive, which suggests a potential for long-term acceptance and integration as a first-line of defense against diarrheal dehydration.

Dubuque, Jessica; "*How Worms Respond to Sleep Deprivation During Stress Induced Sleep****"***
Homeostatic regulation has been demonstrated in PERIOD-regulated sleep, but not stress-induced sleep (SIS). The constant cycling of PERIOD-regulated sleep in adult mammals makes it impossible to study stress-induced sleep in isolation. Our goal is to characterize homeostatic regulation of stress-induced sleep in C. elegans, in order to use it as a model of stress-induced sleep in all animals.
Dysart, Makhari; "*Defining Fascism****"***
Although widely used, fascism is a term whose true definition has been widely contested. Its interdisciplinary nature has led to scholars from many different ideological backgrounds providing definitions of varying validity. In my project I intended to explore the varying definitions as a way to discover the cultural implications of the ideology defining global regimes. Upon furthering my studies it became clear that cultural implications may be a driving factor for our lack of a clear model basis. By using the Italian and German iterations of fascism, or classical fascism, present during the European interwar period as the primary basis of fascist model, we have created definitions based on inductive reasoning that is exclusionary of non-European and contemporary regimes within the fascist label.

Edman, Natalie; "*The Number Line Game: A Tool to Help Children Better Understand the Concept of Order****"***
One part of The Developing Minds Lab Ordering Project asks children to state whether a series of three numbers are in the correct order (verification). When asked to do this, they perform better when the magnitudes are closer together or consecutive. For example, verifying that 6,7,8 are in the correct order tends to be easier for children than 4,6,8. It was hypothesized that if children are presented with a physical number line, then they will be better able to understand that non-consecutive numbers are in the correct order because they can physically move across the number line from smaller to larger numbers. Therefore, a tool was created to help the children better understand what is meant by the word "order". To do this, children are presented with a board game and 16 playing cards containing a 3-number sequence. They are asked whether those numbers are in the correct order and then asked to "check" by jumping on the number line. Piloting this game will begin in the fall. After they play the game, they will repeat the same verification task tested in ordering. The immediate future for this study is to begin piloting and analyzing the data to see if there are any significant results. A longer-term direction is to look at the semantics

that are used when teaching children the concept of order. It could be that children are simply not understanding the meaning of the word order but are understanding the concept.

Edmonds, Donnisa; "*Effect of Psychopathy of Responses to Socioaffective Touch****"***
Psychopathy is often correlated with a general lack of empathy which can impede emotion recognition in social situations. While many studies have determined that psychopathic traits can be associated with a deficit in facial emotion recognition, researchers have not fully determined if that deficit exists for other physical emotional cues. In this study, we looked at the socioaffective touch, which can be used to convey information about both emotion and intentions in social contexts. The ability to recognize socioaffective touch is critical to the formation of genuine connections with other people. To examine the relationship between socioaffective touch and psychopathy, we presented 407 MTurk participants with 26 short clips that show examples of positive touch, neutral touch, and negative touch. Each participant was asked to rank these touches based on pleasantness and intensity of emotion. These participants also completed a self-report psychopathy test. When the results for high psychopathic traits and low psychopathic traits were compared, it was found that those who reported high psychopathic traits rated positive stimuli as less positive and negative stimuli as less negative. The antisocial subscale of psychopathy appeared to play a key role in participants ratings of stimuli. Further research will need to be conducted to fully understand the deficits that lead to this decreased sensitivity to socioaffective touch.

Edwards, Jada; "*Improving Interprofessional Teamwork in the Pediatric Cardiac Intensive Care Unit****"***
Most parents of children with complex medical conditions want to work closely with their children's doctors in making medical decisions. The large teams caring for these patients do not always communicate optimally with each other about care plans making parents frustrated and confused in their decision-making. To improve the lives of seriously ill patients and the caregivers making decisions for them, there must be evidence-based interventions that provide guidance to clinicians on how to effectively communicate with families. In order to develop these evidence-based interventions, data needs to be collected in a pre-intervention phase. The pre-intervention phase of this study involves learning more about the way that clinician teams communicate with families in the CICU. The study hopes to improve communication and teamwork for clinician teams in the ICU by surveying parents about their experiences with communication in the CICU, in addition to audio-recording CICU clinicians (including by not limited to attending intensivists, cardiologists, cardiac surgeons, nurses, and social workers) in team and family meetings. The plan in the intervention phase of this study is to implement evidence-based interventions by training the clinician teams and communication skills and want parental and put about challenges with the clinician team. The study aspires to improve how families and clinician teams talk about what is most important to them and their child when making decisions about their child's care.

Eiler, Emily; "*NF-κB c-Rel controls metabolism and function of myeloid-derived suppressor cells (MDSC) via Cebpb****"***
Myeloid-derived suppressor cells (MDSCs), generated as a result of sustained and aberrant myeloid cell differentiation, potently suppress immune responses, but remain to be one of the least understood subsets of myeloid cells. Furthermore, metabolic pathways could also regulate the phenotype and function of myeloid cells. It is unclear whether c-Rel, a transcription factor that is one of the five members of the mammalian NF-κB family, regulates metabolism and suppressive functions of MDSCs. In this study, we found that c-Rel knockout MDSCs have reduced mitochondrial respiration but enhanced glycolysis. In

addition, there is reduced suppressive activity and higher inflammatory gene expression in c-Rel-deficient MDSCs. Moreover, rescuing Cebpb, a master transcription factor important for MDSC development, in c-Rel knockout MDSCs normalized these phenotypes. Taken together, our results indicate that c-Rel controls MDSC mitochondrial respiration and suppressive function through regulation of Cebpb.

Elhanbaly, Zahra; ***"****Drawing Archaeological Finds on Paros, Greece****"***
Underwater excavations in the port of Paros, Greece, yielded over four hundred marble fragments that date back to antiquity. Some were funerary objects that belonged to a nearby cemetery, and others were large architectural members. These architectural pieces were the focus of this PURM project. We began by selecting the most striking or interesting finds: one column and four unfinished capitals. Two of these capitals in particular are interesting because they would have belonged to a structure larger even than the Parthenon in Athens, yet no such structure exists today. After taking careful measurements and inspecting each piece I began constructing plans and elevations. Each drawing denotes the parts of the marbles that have been corroded by the water and which parts have been damaged in the excavation process. Ultimately these drawings will be included in a larger volume of writings about these archaeological finds in an effort to understand what happened to them, how they came to be in the water, and why they remained unfinished.

Erdogan, Hannah; ***"****Evaluating the Effect of p.T46I Mutation in H3.3 on Mouse Development****"***
Histone H3.3, a variant of H3, is encoded for by the genes H3F3A and H3F3B. De novo missense mutations in these genes have been identified in an international patient cohort to cause a novel neurodevelopmental disorder with no current treatment. Patients yield a similar phenotype including neurologic dysfunction, limited locomotion, developmental delay, and dysmorphic facial features. From genetic analysis of the patient cohort, it was discovered that four unrelated patients have the p.T46I missense mutation, a heterozygous germline mutation in H3F3A, making it the most common mutation. Consequently, we designed a mouse model with the heterozygous p.T46I mutation in H3F3A to reflect the patients in study. We found that the offspring of a cross between a male heterozygous for H3.3p.T46I and a wildtype female is skewed toward wildtype pups, and the expected Mendelian ratio is not seen. Because clipping for genotyping occurs on postnatal day six, it is uncertain whether the viability for H3.3p.T46I heterozygous pups is reduced prenatally or early postnatally. In addition, the heterozygous pups were found to be less mature and smaller in weight and length than their wildtype littermates, which is similar to the patient phenotype. Future tests are needed to determine when p.T46I pup viability is reduced, identify specific developmental delays in the p.T46I pups, and evaluate learning, memory, and locomotion in the adult mice. Altogether, this project will help us to better understand the neurodevelopmental implications of this specific mutation as well as novel disorders in H3.3.

Farid, Alex and Daniel Kargilis; ***"****Applications of Finite Element Analysis in Osteoporosis****"***
Half of the women who sustain a hip fracture would not qualify for osteoporosis treatment based on current DXA-estimated bone mineral density criteria. Thus, a better approach is needed to determine if an individual is at risk for hip fracture from a fall. MRI provides an ionizing-radiation free approach for assessing proximal femur microstructure in human subjects. The objective of our study was to determine the association between MRI-derived strength values and strain simulations compared to direct mechanical testing of cadaveric femora. Additionally, we tested CT derived finite element analysis values of bone strength

and strain in order to determine the validity of our model, and experimented with UTE or ultra short echo time MRI which provides bone resolution in a similar manner to CT.

Farrell, Kathryn; "*The First Amendment and National Security****"***
On June 30th, 1971, the Supreme Court ruled in the New York Times v. the United States that the Times and Washington Post could publish the then-classified Pentagon Papers without risk of government censorship. Yet, it left open the question of a post-publication punishment. Almost half a century later, the superseding indictment under the Espionage Act against WikiLeaks Founder, Julian Assange, sets out to answer that question. The allegations against Assange have elicited more than an uncomfortable squirm and shudder across major, respected journalism outlets who report on national security and publish information that governments would prefer to be occluded from the public eye; as it is in an eerily similar vein to the charges brought against Assange. I argue that not only is Assange a journalist, but also that it is fundamental to the First Amendment's guarantee of press freedom that we treat him as such.
Additionally, the Pentagon Papers case and First Amendment concerns carry into the lives of national security current and ex-governmental employees. The process of prepublication review requires that this group of individual submit writings through the government before publication. While seemingly innocuous in theory, the standards imposed invite governmental action which violates the rule of law, while undermining our national security by discouraging participation by academic experts.
Rather than the pressing concerns of national security and steadfast values undergirding the First Amendment drawing a crosshair, it is notable to use the two in conjunction to challenge their blind spots and develop their strengths.

Feng, Kelly; "*Quantifying activity-induced enhancer dynamics during mammalian synaptogenesis****"***
Post-mitotic neurons in the mammalian brain form synapses that dynamically remodel throughout an individual's lifetime to encode learning and memory. Synaptic plasticity requires precise spatiotemporal fine-tuning of gene expression in response to neural activity, including rapid transcription of immediate early genes (IEGs) on the time scale of minutes and longer-term global chromatin remodeling. However, the epigenetic phenomena regulating such rapid changes in gene expression remain unclear. Here, we confirm that RNA signal at enhancers correlates with enhancer activation, enabling the simultaneous detection of gene expression and enhancer activity via total RNA-seq performed on murine cortical neurons in varying activity states. We identify enhancers that connect to the IEGs Fos, Arc, and Bdnf via dynamic long-range looping interactions and find that enhancer activation and loop formation kinetics correlate with gene expression timing. Bdnf, a delayed-response IEG, had slower enhancer and loop kinetics than Fos and Arc, rapid-response IEGs. Together, our data reveal three-dimensional enhancer-promoter loops as a new dimension in understanding synaptic plasticity by linking topological complexity to transcriptional kinetics.

Fielding, Olivia, Emmie Gocke and Anna Hardie; "*Humans and the Galapagos****"***
This research project investigated various aspects of human interactions with the environment in the Galapagos Archipelagos, as part of the LAVA lab (Laboratorio para Apreciar la Vida Ambiental) led by Dr. Michael Weinberg of the University of Pennsylvania and Dr. Deena Weinberg of Villanova University. The team of Penn undergraduates collaborated with the local community in San Cristóbal, Galapagos to investigate human interactions with sea lions, water quality in the municipal area, and potential ways to reclaim farmland from invasive blackberries in the highlands.

The LAVA Lobos team worked with local high school students on a protocol for observing sea lions, as well as engaging in community outreach. Sea lions were observed on two beaches for sex, age, and behaviors around humans. It has been observed that on beaches with more humans, sea lions are less aggressive toward humans but more aggressive toward each other, while the opposite is true on beaches with less humans.

The LAVA Aqua project investigated water quality throughout the municipal area, using petri films that tested for bacteria, and chlorine tests. This yielded the surprising result that the tap water was actually less contaminated than expected.

Finally, LAVA Invasives began an ongoing project this summer that will work to reclaim land in the highlands from an invasive blackberry species that has made much of the land unusable for farming. 24 plots of land were cleared of blackberry, and other species were transplanted in order to observe which plants compete the best with the blackberry.

Floyd, Tare; "*Queer Identity and Expression in France****"***
This segment of my research includes summer research findings in France via photography, written and auditory data. This segment is part of a larger project, "Gender Identity and Expressions in Romance Languages" that explores the rapidly changing discourse over queer identities around the world.

Frankfurter, Maxwell; "*Elucidating the role of Fzd2 in epidermal development****"***
Wnt signaling is critical for proper development and maintenance of a variety of mammalian tissues. In the canonical pathway, Wnt ligand binding to a Frizzled (Fzd) receptor and a Lrp co-receptor results in stabilization and nuclear accumulation of β-catenin, leading to activation of Wnt target genes. Wnt/Fzd interactions can also mediate β-catenin-independent (non-canonical) signaling pathways leading to release of intracellular Ca+2 or cytoskeletal remodeling. Here we used a K14-poromoter driven Cre to delete Fzd2 in mouse epidermis. Epidermal Fzd2-deletion mice die within hours of birth due to a severe defect in stratification and lack of barrier formation, phenotypes not seen with reduction in canonical Wnt signaling. RT-qPCR of flow-sorted E13.5 keratinocytes, confirmed effective reduction in Fzd2 mRNA. Control and mutant skin were assessed via immunofluorescent staining for changes in proliferation and apoptosis. Mutant skin shows increased cell death at E14.5 that is not a result of Cre activity, although no significant change in the number of M-phase cells was seen at this stage. These results suggest loss of Fzd2-mediated signaling may induce cell death and prevent stratification. Futures studies will assess these mice for changes in canonical-Wnt activity and analyze differential gene expression via RNA-seq on flow-sorted keratinocytes.

Frazee, Caitlin; "*The molecular and cellular mechanisms that protect against cancer and neurodegeneration****"***
Misfolded proteins stick together and form clumps known as "aggregates." These misfolded proteins and aggregates are believed to be one of the primary causes of neurodegenerative diseases such as Alzeimer's and Parkinson's. Finding methods to break down or degrade these aggregates could open up new treatment options for those with neurodegenerative diseases.

This summer, I looked at the protein quality control system in the cells and its role in neurodegenerative diseases and cancers as a part of Dr. Xiaolu Yang's lab in the Perelman School of Medicine. In his lab, I primarily worked with my mentor Dr. Chantal Maghames to assist her in further screening and analyzing the Trim family of proteins.

We have previously found that Trim 11 has potential to degrade misfolded proteins in-vitro. Therefore, she was screening the other Trim proteins to find if they can carry out the same function as Trim 11. After finding that Trim 10 is also able to degrade misfolded proteins in-vitro, she wanted to isolate the process Trim 10 proteins undergo to degrade misfolded proteins in order to better understand their potential in therapeutic applications. I also analyzed Trim 7's effectiveness.

Gadra, Elyse; "*Pilot Study of the Effects of Acute Prenatal Hypoxic Insult on Perseveration and White Matter Development in Mice****"***
Preterm and term hypoxic ischemic encephalopathy (HIE) due to perinatal global oxygen deprivation is a leading cause of neurocognitive dysfunction. White matter injury (WMI) is a frequent long term consequence of HIE; extent of WMI is correlated to severity of abnormal neurodevelopmental outcome. In particular, WMI has been associated with increased perseverative behaviors. We have developed a model of global prenatal hypoxic insult to the fetal brain to recapitulate human HIE. We hypothesize mice exposed to prenatal hypoxic insult will have increased perseverative behavior and demonstrate WMI. Pregnant dams are placed in a Biospherix hypoxia chamber at E17.5. Chamber was left at 21% FiO2 for 8 hours for normoxic condition. For prenatal hypoxic insult, the fraction of inspired oxygen (FiO2) was titrated from 21% to 5% FiO2 over 30 minutes and the mouse remained in the chamber for 4 or 8 hours. Pregnant mice were removed from hypoxia and allowed to give birth. Survival and weight of mice were measured. Morris water maze (MWM) was done over 8 days to assess for learning and memory in adult mice (3-4 months old) from prenatal exposures. Animals were tracked for time to platform in learning trials and time spent in platform quadrant for memory trials. Ex vivo MRI was performed on adult mice for diffusion tensor imaging (DTI) sequences. Eriochrome Cyanine (EC) staining for white matter was performed on adult mice and quantified with Image J. This is a viable model to study long term effects of prenatal hypoxia.

Gallagher, Cassidy; "*Community Health Needs Assessment - Bienvenido Dominican Republic****"***
The focus of this research project is to identify the social determinants of health that impact the residents in the town of Bienvenido, an impoverished community located on the southern coast of the Dominican Republic. For four weeks, I visited the Dominican Republic to learn about the health conditions and common issues that exist within batey communities on the island. During the first three days, I stayed in the town of Consuelo to observe the Niños Primeros en Salud (NPS) pediatric clinic, directed by the Children's Hospital of Philadelphia (CHOP) Global Health Center, to learn of the common health problems among patients as well as medical interventions the clinic has implemented to resolve these issues. For the remainder of the four weeks, I collaborated with a local nonprofit organization, the Bienvenido Project, to conduct a community health needs assessment in the town of Bienvenido. Through surveys of residents, the assessment identified the common diseases and conditions, availability and accessibility of medical services, and health education programs offered in the community. The results from this assessment evaluate the social determinants of health and potential barriers to accessing health care for the residents of Bienvenido. The results from this study contribute to enhancing current scientific research literature that focuses on the social determinants that impact the health of low-resource Hispanic communities similar to Bienvenido throughout the globe. I hope to conduct further research investigations in Bienvenido focused on the main health problems that have been identified and analyzed within this study.

Gallagher, Quinn; "*Characterization of H3K9 Tri-Methylation During Direct Cell Reprogramming****"***
Direct cell reprogramming, the process by which one type of somatic cell is turned into another, is useful for treating medical conditions like organ failure. For example, in the event that a patient's liver is failing, scientists can take a patient's healthy skin cells and reprogram them into healthy liver cells. While this sort of medical treatment would be convenient, the presence of heterochromatin, i.e. non-active, densely-packed DNA, impedes this process. Skin and liver cells have different distributions of heterochromatin, which prevents transcription factors from binding to liver genes located in the heterochromatin region of the skin cell genome. This causes the efficiency of "reprogramming" to be very low. In order to increase the efficiency of this process, we investigated the presence of a heterochromatin marker, H3K9me3, in human fibroblast cells, and sought to understand what proteins, when active, are associated with heterochromatin formation. Therefore, by knocking down the candidate proteins with siRNAs, we can reduce heterochromatin density and increase the efficiency of direct cell reprogramming. In addition, we investigated the relationship between cell cycle and heterochromatin distribution and identified the G1 phase as the ideal point in the cell cycle to attempt "reprogramming" due to decreased levels of heterochromatin. We are in the process of using CRISPR-Cas9 mediated genome editing techniques to create constructs that allow us to visualize the kinetics of liver gene activation during the skin-to-liver cell transition in order to identify further methods of improving the efficiency of the process.

Garcia, Carlos and Claire Medina; "*Lame ducks****"***
The research focused on lame ducks, as was referred to those who defaulted on their debts in the 18th century stock markets. Newspapers from the period were scanned for the phrase, and their numbers, along with their behavior was collected for review. It was found that being labeled as such would result in ruined careers, and that large numbers of them may result in large amounts of newspaper clippings to be published.

Gedeon, Beverlye; "*Prospera, a path toward achieving gender parity in secondary schools in Mexico****"***
The Conditional Cash Tansfer program has been successful at increasing girls' participation in middle and secondary school in Mexico. To test this hypothesis, this poster compares the conclusions from the reference paper written by Professor Todd, Professor Behrman and Professor Sengupta in 2001 using the 1997 and 1998 data to those obtained from manipulating the 2010 data regarding the effectiveness of the program to reduce drop out rates for girls.

Geers, Alexander; "*On-chip Photonic Circuits to Guide, Sort, and Direct Twisted Light****"***
Information is transmitted through light. This can be in the form of fiber optic cables or through open air. For many years, the amount of information per second has been increasing due to advancement in electronics. With the approach to the physical limit of electronics, the speed of signals is not improving at the same rate as in the past. Additionally, the encryption of a signal is very important when sending sensitive information. The increase in complexity of encryption has led to less of the signal being the relevant information. This has created the need for signals the contain more information, in order to quickly send large amounts of information securely. The use of Orbital Angular Momentum (OAM), is used to increase the amount of information in a signal. Using OAM solves the security issue two-fold. First, OAM allows for more of the signal to be devoted to encryption because of the increase information in the signal. Secondly, OAM is phase dependent, that means there is a reduction in eavesdropping because a direct line of sight is needed to receive a non-corrupt transmission. In order to

maintain OAM in signal transmission, special waveguide structures need to be created. This research uses PEARL glass to write the waveguide into. By using the focused energy of a femtosecond laser beam, the index of refraction in the glass sample can be changed. With the increase in index of refraction, structures that maintain OAM can be created.

Gelrud, Ariel; "*The Effects of Collaborative Versus Competitive Interactions on Trust: Evidence from India****"***
The primary objective of this ongoing study is to compare the effects of a single short episode of collaboration or competition on trust among school children. The primary hypothesis being tested in this project is that children who have recently collaborated together in a game will demonstrate higher levels of trusting and trustworthy behavior than children who have recently competed against one another in the same game. The study also aims to test whether these effects are heterogeneous along different socioeconomic dimensions. Of particular interest is the question of whether school children's trusting behaviors differ when interacting with other children from differing levels of the wealth distribution. Additionally, the study includes a confidence component in which a series of short confidence tasks are conducted among school-age children to pilot for a potential future study on confidence. The project builds on existing literature that looks at different elements that affect trust among individuals and it further explores the effects of intergroup contact on social preferences. It hopes to generate conclusions that are relevant to economic and education policy.

Gibbons, Kelcey; "*African American Computing Communities: 1940-1980****"***
In efforts to expand the history of computing beyond the history of computers and individual innovators, historians have examined different communities in which computers were developed,used, and imagined. Histories of computing (both software and hardware) must pay attention to the politics, conflicts, and imaginations of those who built these information machines. Existing accounts, however, have overwhelmingly neglected the contributions of African Americans as members of cultural networks bound by social responsibility. My research contributes to filling this gap in the literature. Using print media made by and for African Americans, and the archival collections of HBCUs, I look at the computer as a war machine, a business machine, a middle-class technology, and a supposedly unbiased tool for decision making. The resulting narrative shows that the computer revolution of the mid 20th century was not just a time in which predominantly white businesses, the defense establishment, and countercultural visions sponsored the growth of the computer. It was also a time where the computer was incorporated into accounts of racial betterment by a modernizing minority community.

Goldfarb, Sarah; "*Curriculum Redesign: "Jewish Political Thought and Action"****"***
This summer, I had the pleasure of assisting Dr. Talya Fishman in restructuring her twice weekly "Jewish Political Thought and Action" course. As a double major in Jewish Studies and English, I came into this internship not only excited to expand my breadth of knowledge in Jewish political history, but particularly intrigued by the behind-the- scenes work, so to speak, that went into building a university class curriculum. Combing through chronologically organized readings and a variety of films, I constantly discussed my feedback with Professor Fishman, and the two of us worked to integrate the best content of various sessions to create a curriculum that contrasted 'pre-modern' sources with 'contemporary' sources.

Gomez, Felipe; "*Cinema Minimo****"***
The basic goal of this project is to catalogue, annotate, analyze and archive micro-short films from Spain and Latin America.

Gonzalez, Alyssa and Kayla Kruger; "*Hunger Inhibits Peripheral Inflammation****"***
Previous research has shown that food restriction can inhibit behavioral responses to inflammatory pain (Alhadeff et al 2018). Therefore, we asked how hunger affects peripheral inflammation and focused our research on understanding what happens to systemic inflammatory response during inflammatory pain in food restriction. With this said, through a paw injection of Complete Freund's Adjuvant (CFA) or formalin, we induced inflammation and used a new device in the lab called a plethysmometer, as a means to measure paw volume. Following this chemically induced paw injury, we observed that hungry mice had smaller paw volumes compared to sated mice, therefore demonstrating that hunger attenuates peripheral inflammation. How does hunger inhibit peripheral inflammation? We proposed two different hypotheses: (1) hunger hormones such as corticosterone are released to reduce inflammation and/or (2) vagal efferents release acetylcholine during hunger to reduce inflammation. To test these hypotheses, we explored peripheral signaling with corticosterone and the corticosterone antagonist (RU486) as well as the alpha7 nicotinic acetylcholine receptor agonist (GTS-21) and antagonist (MLA). While none of these manipulations yielded conclusive evidence as to what mediates the effects of hunger on inflammation, we cannot exclusively rule these out as future experiments can incorporate a variety of these mechanisms to explore a possible multifaceted system influencing hunger-induced reductions in inflammation. Nonetheless, advancing our understanding of how central and peripheral signals interact to suppress inflammation can aid the development of analgesic therapies.

Gonzalez, Eva; "*Comparative Analysis of Hybrid Regimes: Russia, Kazakhstan and Hungary****"***
This project consists of a comparative analysis into the authoritarian aspects of the hybrid regimes of Russia, Hungary and Kazakhstan. Based on papers and books in the field, this paper seeks to compare the similarities and differences between the three regimes that help inform Western democracy organizations such as V-Dem or Freedom House to create their indices. This research project both analyzes Russia's strong centralized state, while addressing the biases held by organizations which provide global democratic rankings that influence these scores. This research provided a broader contextual foundation of the political systems on which these rankings are based, rather than solely accepting them at face value. Through comparison of the authoritarian elements of these three countries, I was able to better understand where Russia exists on the geopolitical spectrum of hybrid regimes. This research project suggests that Russia is less-Authoritarian than Kazakhstan and closer to that of Hungary, despite that which is often argued by the scores given from organizations such as Freedom House and V-Dem.

Gonzalez Saldana, Victoria; "*Narrative analysis of the effects of migration on gender roles for Mexican women****"***
Recent studies have viewed the effects of migration on the liberalization of women as a complex experience, rather than a rigid dichotomy in which migration can either reinforce gender inequities or empower women with the exposure of egalitarian gender norms in the host country. The relationship between migration and gender norms is experienced differently across families, with acculturation, marianismo, labor, and power all being significant influences. In this project, life-history based interviews with Mexican immigrant couples were conducted in Texas' Rio Grande Valley in order to analyze gender relations within the couples. These interviews were used to gain an understanding of the effects of migration on gender roles. In these narratives, women's experiences as migrant workers provide an understanding of how women dealt with new roles within their family unit, how women reflected upon these new roles, and whether their newfound responsibilities provided a significant change in their empowerment.

Gonzalez-Camarena, Adriana; "*Volunteering with the Philly Latinx Community"*
This summer I worked with Professor Farnsworth to research Latinx organizations in Philadelphia and how students can get involved. While I read about immigration for Professor Farnsworth, I also reached out to different organizations to start creating a database for students to access to find out about volunteering opportunities with the Latinx community in Philadelphia. My poster will highlight some of the organizations I spoke with and detail what each organization does, what volunteer opportunities there are, and what the process to become a volunteer looks like.

Griff, Jessica; "*The Effectiveness of Wilms Tumor Screening in Beckwith-Wiedemann Spectrum"*
Purpose: It is well documented that patients with Beckwith-Wiedemann spectrum (BWS) have a significantly higher risk of developing Wilms tumor (WT) than the general population. There has been little research on the timing of WT diagnosis in BWS in regard to optimizing suggested screening protocols.
Methods: A literature search was performed to identify all reports of patients with BWS and WT. This data was combined with unpublished data from patients in the authors' cohorts. Age at WT diagnosis was compared against data collected through the NIH Surveillance, Epidemiology, and End Results Program (SEER) registry.

Results: Patients with BWS had a significantly higher incidence of WT diagnoses between age 12 months and 84 months compared to patients in the SEER registry. Patients with BWS and WT diagnosed through screening had significantly lower stages at diagnosis compared to patients with BWS that were not screened.

Conclusions: Screening until age 7 years is effective in detecting close to 95% of all WT in patients with BWS.

Gupta, Gaurav; "*Determining the Role of Antisense Transcripts in Regulating the Human Inflammatory Response"*
Although opioids are an important part of post-operative pain management, they are often over-prescribed, which contributes to the opioid epidemic in the US. Thus, alternative analgesic treatments must be explored, namely non-steroidal anti-inflammatory drugs (NSAIDs). NSAIDs function by inhibiting COX-1 and/or COX-2, which catalyze the synthesis of prostanoids and thromboxane (byproducts of inflammation). Variability in analgesic response is dependent on the COX pathway activation: NSAIDs are more effective if the activation of the COX pathway is the primary cause of pain. In this project, I investigated the role of two antisense transcripts (asRNAs) in regulating the human inflammatory response. These transcripts were highly expressed in patients immediately following third molar extraction. Antisense transcripts are important because of their ability to regulate gene expression and silence genes. The first step in investigating the transcripts was to conduct PCR to verify product size and location. Then, qPCR was conducted on the regions amplified by the PCR to compare the relative expression of those regions. Although the PCR amplified large portions of each transcript, GeneRacer will be used to identify the ends of each transcript. Additionally, antisense oligonucleotides (ASOs) have been designed and will be used to silence each transcript in THP-1 cells. The cells will be injected with lipopolysaccharide (LPS), an inflammatory agent, and their inflammatory response will be measured via prostaglandin formation. Identifying regulatory factors of the human inflammatory response like these antisense transcripts can contribute to the development of more effective and individualized analgesic regimens that minimize side effects.

Gupta, Natasha; "*Effect of BMP3b Protein on Angiogenesis****"***
Approximately every 38 seconds, an American will experience a myocardial infarction (MI). The prognosis after MI depends on the amount of myocardial death. Therefore, finding cardioprotective therapies is an important field of research. From past research conducted in our laboratory, results were obtained to show that a protein called BMP3b, secreted by brown adipose tissue (BAT), protects mice hearts during myocardial infarctions.

This summer, we went a little further in our investigation by looking at how BMP3b affects angiogenesis, the development of new blood vessels, as it is already known that the protein modulates the process. This was completed using human umbilical vein endothelial cells (HUVEC) in which half of the cells had BMP3b protein introduced to them and the other half had a saline solution introduced to serve as a control. Then half of the cells introduced to BMP3b and saline solution were introduced to normoxic conditions and the other half was introduced to hypoxic conditions. Normoxia would simulate normal heart conditions whereas hypoxia, a lack of oxygen, would mimic myocardial infarctions. Angiogenesis is stimulated by HIF1a, the most important transcription factor on hypoxia.

Using these four conditions, a qPCR was made to see where there was more RNA expression of genes important for angiogenesis. Additionally, there was a chance that there would not be much variation in RNA expression amongst the different conditions, so western blotting and a proteome profiler human angiogenesis array kit were used to see which condition produced more proteins that are important in angiogenesis.

Guttikonda, Saitej; "*The Differences in the Composition of Proteomic Profiles of Mesenchymal Stem Cells and Endothelial Progenitor Cells in the Heart****"***
Proteomics is the study of proteomes, a set of proteins produced by cells within a biological context, in this case the heart, and their respective functions. The process involved isolating MSC and EPC extracellular vesicles from rats, sending them through a multifunctional core processor, and collecting the intensity data that was given back. The data that we received allowed us to determine specific pathways, markers, and protein overlaps that these two types of cells share. Some specific diagrams that were created include principal component analysis, gene-ontology, and cluster-based heat maps. These are all various ways to analyze and present the proteomics data, and specifically, we focused on the following pathways: angiogenesis/vasculogenesis, immunosuppression, anti-apoptosis and cell growth.

Guy, Natasha; "*French Women Photographers in the First Half of the 20th Century****"***
Women photographers are often overlooked in the art historical canon; the aim of my research was to shed light on this essential but often forgotten facet of a larger photographic lineage. I was eager to gain experience in art history research, specifically in French, while also having the opportunity to focus on the intersection of gender, nationhood, and photography. By looking at writings and photos about and by early French women photographers, in various archives in France, I was able to gain insight into this topic. I primarily conducted my archival research at the Société Française de Photographie, the Centre Pompidou, and l'Institut National d'Histoire de l'Art looking at various techniques of photography ranging from autochromes to cyanotypes to gelatin silver prints. A key finding in my research was the artwork of Russian-French photographer Hélène Adant who had hundreds of photos and correspondences donated to various archives, and is nearly entirely absent from any writings on photography. This became a common trend in my research, wherein even if a photograph was correctly attributed, there was frequently little to no information about the woman who had taken the photograph. Ultimately, my research

allowed me to narrow in on a few French women photographers as well as gain a larger understanding of French women photographers.

Halpin, Eliza; "*Nationalism and Soccer in Franco's Spain, 1939-1971****"***
My project will investigate soccer during Franco's regime, fro 1939-1975 focusing primarily on the connection between soccer and politics following the Spanish Civil War. With my thesis, I intend to analyze how Franco and the Falangist regime used soccer to create a strong sense of Spanish nationalism and how the success of Real Madrid and the Spanish National team influenced how Spain was viewed by other European countries. Alongside analyzing these teams, my project will study how Franco's regime led to the creation of large soccer institutions and how these institutions were run primarily by members of the Falangist party. These objectives are accomplished through analysis of official governmental documentation located in the National Archives at Alcala de Henares and through analysis of the newspapers ABC Madrid, El Mundo Deportivo, Marca, El Alacázar, and Arriba.

Han, Tengqin and Tevye Johnson; "*Nicomachean Ethics Virtue****"***
A neglected passage in Aristotle's discussion of the social virtues shows that virtuous motivation has a two-level structure. The virtuous person aims both at the good and at such concrete and determinate objectives as being helpful or pleasant to others. His characteristic motivation is to regulate his pursuit of such concrete goals in the light of his overriding commitment to the good. Is this a valid interpretation? If so, what are some implications?

Hardy, Connor; "*LGBTKH+ Identities in Kolkata: A Community Needs Assessment****"***
During June 2019, a Needs Assessment was conducted in and around Kolkata's LGBTKH+ community, detailing experiences of violence, discrimination, and support across a range of identities and lived experiences. This Community Needs Assessment was conducted through a partnership between the University of Pennsylvania and Kolkata Anandam for Equality and Justice (KAEJ). KAEJ has its origins as a sister organization of a large sex workers' collective in Kolkata, and is unique in that it serves a community of lower social and economic status – many members are sex workers or children of sex workers, and the organization is based out of red-light districts. This gave researchers to explore the intersection of support, violence, and needs in a community that experiences multiple layers of marginalization, in an initiative that was led by the community and carried out through the Penn-KAEJ partnership.

"I'm expecting/hoping that by giving this interview, something, some aid will be given back to me and my community. Besides this, nobody has cared to talk to or listen to me," one participant stated. Although there are Penn programs that are interview-based, interviews are generally taken from the community, not given back. In a disruption of the institution-community power dynamic, the 44 interviews collected this summer were used to present data however the community saw fit, then create a research briefing that was returned to and can be used by the community itself.

*Here, LGBTKH+ means lesbian, gay, bisexual, transgender, kothi and hijra, plus any and all other gender and sexual minorities.

Harrison, Benjamin; "*Dexmedetomidine-Induced Sedation is Attenuated but not Eliminated in a Novel α2A-AR KO Mouse****"***
Dexmedetomidine (dex) is a commonly used sedative and hypnotic in the clinical setting, producing sedation and hypnosis that is reversible with stimulus. A nonspecific α2-AR

agonist, it has previously been shown to exert its sedative-hypnotic and antinociceptive effects through the A subtype (α2A-AR), which also mediates the drug's effects on vascular tone and hypothermia. Genetic knockout of the α2A-AR ablates or significantly attenuates these behavioral and physiologic effects. Interestingly, genetic knockouts of the α2A-AR display decreased spontaneous activity in response to α2 agonists, despite being immune to hypnosis by these agents. Electroencephalographic (EEG) response to dex to characterize this behavioral change in α2A-AR knockouts, as well as the mechanism of this apparent sedation has yet to be fully investigated. Here, we describe a novel constitutive knockout of the α2A-AR protein in a mouse model, confirm previously described changes in behavioral, antinociceptive, and thermoregulatory response to dex in the mutant line, examine EEG correlates to the observed behavioral changes, and evaluate reversal of those effects with the specific α2 antagonist atipamezole.

Helm, Kaila; "*Characterizing the Slit/Robo Pathway in a Tissue-Engineered Rostral Migratory Stream"*
A key part of early nervous system development and neurogenesis is the movement of immature neuroblasts along the rostral migratory stream (RMS) to end targets (Sun et al., 2010). Micro-tissue engineering strategies can be used to fabricate neural and glial constructs in vitro capable of mimicking the cytoarchitecture found in vivo. Micro-tissue astrocytic constructs mimic endogenous mechanisms for neuronal migration. Furthermore, Slit/Robo pathway plays a significant role in neuroblast migration through the glial tube. Given the many neurological diseases that involve altered neuroblast migration, studying this signaling mechanism would enhance the ability to facilitate and direct migration of immature neurons.

Hemlick, Gabrielle; "*T.A.R.P.S. (Time-Adaptive Risk Prediction System) using machine learning"*
Patients in time-sensitive environments, such as the emergency room and post-surgery situations, often receive belated or inadequate care because of immutable risk prediction models and missing data. The purpose of this research is to create a time-adaptive machine learning system that is able to update a patient's health outcome instantly as soon as a new data feature enters the electronic health record system.

Background: Currently, machine learning systems make health predictions when all data features or a specified subset of data features is available concurrently. By this method, health outcome is predicted via multiple static models, which produce prediction time-gaps and delayed patient care.

Relevance: The rate of death, severe sickness, and infection in the emergency room and post-surgical situations is not negligible. Patients often wait multiple hours to receive treatment in the emergency room when, in fact, the severity of their medical condition may be made known to healthcare providers at some earlier time if using software.

Heyler, Angelina; "*Mapping pain's affective pathway: identifying neural projections from the anterior cingulate cortex"*
Chronic pain debilitates millions of people worldwide, affecting an estimated 20% of adults. However, we do not fully understand how sensory information is processed into the unpleasant affective experience at the root of chronic pain patients' suffering. Dr. Corder and colleagues recently identified a critical neural ensemble in the basolateral amygdala (BLA) implicated in this negative affective dimension of pain. To better understand the neural pathway of affective pain, our next focus is the anterior cingulate cortex (ACC), a prefrontal brain region that receives input from the BLA and is implicated in negative

emotion, cognition, and pain processing. We first investigated whether pain increases activation of the ACC by exposing mice to a painful pin prick stimulus or a control environment. Using in situ hybridization, we labeled neurons expressing cFos, an immediate early gene, to identify active neurons. With this method, I found that pain increased the number of active neurons in the ACC. Next, we mapped outputs from pain-activated ACC neurons to better understand the pain affect circuit. Using a combination of novel viral and genetic strategies, we labeled ACC neurons and their pain-activated projections. We plan to use these techniques in conjunction with chemo- and opto-genetic tools to further target and manipulate ACC activity. Affective pain processing, including that in the BLA and ACC, is a potential target for novel, non-addictive analgesics for treating chronic pain.

Ho, Flora; "*Regulation of Merkel Cell Polyomavirus Viral Expression Through LT Antigen Thr297****"***
Merkel cell polyomavirus (MCPyV) is a small circular DNA virus that causes Merkel Cell Carcinoma. Large T (LT) antigen encoded by MCPyV is responsible for virus transcription and DNA replication, which is mediated by the origin binding domain (OBD). After viral DNA replicates, viral capsid protein 1 (VP1) is transcripted and virus is assembled. T297 is a phosphorylated site located in a non-conserved region next to the OBD in LT antigen (aa. 309-403). We performed T297 site-directed mutagenesis into rest of the amino acid residues. The missense mutations result in an alteration in VP1 expression rate. Mutagenesis of T297 into all of the hydrophobic amino acid residues and two of the polar amino acid residues increases capsid protein expression rate by at least ten-fold, with one peaking at almost twenty-fold. In contrast, wildtype and positively charged mutants remain low VP1 expression. We then predicted mutants' protein structure and the collective result of site-directed mutagenesis and structural prediction indicate a potential novel function in the LT non-conserved region next to OBD that influences MCPyV DNA binding.

Hong, David; "*Improving Assessment of and Response to Depression in Chronic Obstructive Pulmonary Disease Care****"***
Chronic obstructive pulmonary disease (COPD) is a leading cause of death in the United States, affecting over 16 million individuals. Previous work has demonstrated that COPD patients experience symptoms of depression that exceed the prevalence of depression among patients with other chronic conditions. This project aims to pilot test behavioral economic-based approaches to protocolize depression screening and mental health service referrals of patients with COPD at high risk for depression. Conducted at three pulmonary centers within the University of Pennsylvania Health System (UPHS), the goal of this project is to develop a formative evaluation, using semi-structured interviews with key stakeholders, to assess the barriers to assessing patients with COPD for depression and referring appropriate patients for treatment. The researchers will then refine and test the implementation of a protocolized depression screening combined with clinician-directed nudges to increase the assessment of depression and referral for mental health services to appropriate patients. The project will deliver a novel approach of implementing behavioral economic approaches to improve the assessment and referral of mental health services to high-risk patients with COPD.

Hong, Judy; "*Identifying Falls Not Documented with Administrative Codes Using Natural Language Processing****"***
Falls are the leading cause of injuries among the elderly, particularly the home health care (HHC) population. Existing standardized fall risk assessments require additional effort to collect and have low specificity; falls are also underreported in coded administrative data. To capture fall cases not documented in structured data, we developed a natural language

processing (NLP) approach to identify falls from clinical notes. We utilized the pyConText algorithm, which leverages networkX digraphs to relate targets (falls) with contextual modifiers i.e., negation and temporality. Based on information from 47,500 clinical notes from a set of 3,000 HHC patients, we generated an initial lexicon and incorporated the syntactic knowledge into pyConText. Notes were classified into "positive", "possible" and "negative" categories, then validated by manual review. For the three categories, our NLP approach scored 0.76, 0.95 and 0.89 for prediction accuracy, respectively.

Hood, Ryan; "*The role of TIPE0 and its regulation of GasderminC in intestinal epithelial cell proliferation and pyroptosis.****"***
TNF-a induced protein 8 (TIPE) is crucial in the regulation of cell survival and proliferation and is recognized as a phospholipid transfer protein. TIPE has been shown to be a negative regulator of apoptosis and a positive regulator of proliferation. Knocking out TIPE has been shown to exacerbate DSS-induced colitis and to be more susceptible to Listeria monocytogenes induced cell death. However, we have recently found that loss of TIPE leads to decreased ischemia and radiation induced injury and increased tolerance to TNF, growth factor deprivation, and hypoxia. We have also recently discovered by single cell RNA sequencing (scRNA-seq) that GsdmC is upregulated in intestinal epithelial cells in TIPE knockout mice. GsdmC is a member of the highly homologous Gasdermin family which are responsible for the execution of pyroptosis. We have established a TIPE knockdown (TKD) CMT-93 cell line using CRISPR/Cas9 to investigate the relationship between TIPE and GsdmC in the regulation of cell death and proliferation. We found that in the TKD cell line proliferative B-catenin signaling was upregulated. However, we have observed by scratch assay that TKD CMT-93 cells have a slower wound healing response. Additionally, we have found by co-immunoprecipitation that both GsdmC and Akt bind to TIPE. We have also found by confocal microscopy that membrane localization of both PIP2 and PIP3 are increased in TKD cells. These data may represent a mechanism by which TIPE and GsdmC interact and could help explain the varying effects that TIPE has on homeostasis.

Horwitz, Dillon; "*Border Crossing Architecture: An Analysis and Typology****"***
Architecture is, at its core, an expression of human desire, a physical articulation and delimitation of space and physical material into useful configurations. Built structures, then, can serve as reasonable barometers for judging their builders' intentions. By extension, architecture can reflect the commissioning institution's priorities and capacity. This conceptual framework is applied to the task of recording and analyzing states' physical presence at international border crossings, under the premise that to better understand countries' posturing at their geographical perimeters, one can look at their built interventions in the immediate landscape. This endeavor is an auxiliary component of the Perry World House Borders and Boundaries Project, which seeks, among a couple of other concerns, to document and classify state architecture at international border crossings. The goal of this sub-project is to review existing literature about border architecture, derive a well-defined, empirical typology of border architecture structures and configurations, and subsequently represent this information diagrammatically in a way that the descriptive drawings can be used to further assess the built structures that have been identified by the Borders and Boundaries Project.

Houston, Kassidy; "*How to Reliably Execute the Encoding of Linguistic Expressions****"***
Many variations of linguistic expressions can be used to express the same idea, and a speaker's decision to use certain expressions over others can be very pointed and might be tied to certain characteristics of the speaker. These characteristics therefore could be driving language use and would be very important to compare. This an important part of

linguistic data and therefore must be preserved when we are encoding this data for later analysis. However, there are also many nuances in the ways that different people say the same things that are actually not relevant to answering questions about language, such as the difference between saying “man’s coat” and “men’s coat", so this puts forward an important question when looking at coding protocol: How can we preserve the importance of the speaker’s specific choices of linguistic expression without dissolving the data to the extent that overlap between linguistic expressions with insignificant differences cannot be compared as well? And how can we execute this coding protocol such that coding is reliable across multiple different coders who are all looking at the data from different perspectives? One of the most important things about a sound experiment is that it is replicable and that the data lead to similar conclusions across replicated experiments. During my time in the Dahan lab, we worked to ensure reliability by testing the reliability of three coders against one original coder and working to standardize the process of encoding language.

Hu, Robin; “*Optimization of the Langendorff Cardiomyocyte Isolation System for In Vitro MSC-derived Exosome Therapy Studies****”***
In vitro primary cultures of isolated adult rat cardiomyocytes are crucial for studies of cardiovascular functions and diseases. Previous methodologies have developed various techniques to help isolate cardiomyocytes directly from intact small mammalian hearts. One such technique is the Langendorff retrograde perfusion system. However, despite these advancements, obtaining high quality yields of cardiomyocytes remains a challenge given unique complexities with technical and logistical barriers. Here, I present the details of an optimized Langendorff retrograde working heart perfusion system for the isolation and culture of viable rod-shaped cardiomyocytes. Optimization experiments involved reagents, perfusion times, culturing characteristics, and system set-up. The cultured cardiomyocytes with this system may be employed for further studies investigating MSC-derived exosome therapy in infarcted hearts. The Langendorff system represents an indispensable bridge between utilizing in vitro assays and utilizing in vivo approaches with translational relevance through intact animals.

Hu, Shenqi, Sangeun Lee, Elaine Ma, Nicholas Magarino, Saranya Sampath, Enoch Solano and Thy Tran; “*Extraction of Abdominal Topology and Simulation (E.A.T.S.)****”***
Hiatal hernias are a common condition in which the gastroesophageal junction (GEJ) and part of the stomach slide up through the esophageal hiatus. Currently, there is a lack of tools to help surgeons in approximating how tightly to repair the diaphragmatic hole which varies in size and shape, and a lack of a general consensus in which repair strategy is appropriate for specific scenarios. Surgeons must rely heavily on experience and intuition, since two-dimensional CT scans are the basis of pre-surgery visualization at the moment. Failure to repair with appropriate “tightness” results in several post-operative complications. The goal of the project is to develop a pipeline that will take a patients’ CT scan and produce a dynamic model for visualization, analyzation and manipulation. Doing so may not only help surgeons in the planning stage of the surgery, but also act as a tool in the retrospective analysis of hiatal hernia surgery strategies. We came up with a pipeline to reach this goal by first segmenting organs of interest from CT scans using ITK Snap, smoothing the meshes in Maya, and simulating them in Houdini.

Huang, Jane and Evan Oh; “*Corporate Political Activity****”***
This project on corporate political activity explores the possible predictors and consequences of increased corporate spending on judicial elections. In order to determine whether such a relationship exists, the scope of this study focuses on companies that have appeared on the Fortune 500 list between 2000 and 2018. Having determined 1012

candidates, we looked to standardize cross-referencing by assigning GVKEYs, a six-digit number key taken from the Capital IQ Compustat database, as well as internally referencing to companies by their ranking on a randomly sorted list. With standardized cross-referencing method in check, we underwent a systematic review of datasets from proprietary databases including FollowTheMoney.org, Goodjobs Violations Tracker, and Westlaw. From these databases, we are able to cross reference companies with recorded judicial campaign contributions as well as find information on the penalties and legal cases against the firms that are of interest. As research is ongoing, we intend on proceeding with an analysis of the compiled data to see if there is a connection between companies who hold numerous lawsuits against them and whether or not it correlates to an increase in donations to judicial elections.

Huang, Qiuman and Yat Kit Pei; "*Resource Misallocation in Innovation****"***
As technological innovations have been the key stimulus for the growth of each individual firm and the overall economy, efficient investments in Research & Development have become increasingly important and beneficial for the society. This project investigates resource allocation in innovation across industries in the past fifty years through analyzing US patent citation data and hedge fund activity data.

Huang, Yi Qing; "*3D Web-Based Visualization for Intracranial EEG****"***
In order to facilitate interpretation of intracranial EEG in the treatment of drug-resistant epilepsy among neurosurgeons, epileptologists, radiologists, and researchers, a web-based 3D visualization for iEEG was designed from 2016-2017 by Dr. Joel M. Stein and researchers from the departments of Radiology, Neurology, and Psychology. The viewer takes cortical meshes, electrode contact names and coordinates, and the MRI-CT fusion matrix/images to render an interactive web model through Blender and its add-on, Blend4Web. However, the process requires stepwise manual interaction, which is time-consuming and can be difficult for those who are unfamiliar with Unix and/or the multiple software tools employed. To mitigate these challenges, my project was to create a shell script for Unix systems that automates the processing pipeline from inputs to website, with the goals of streamlining the process and removing it from human supervision, and making it more organized and accessible. The script, freesurfer2web.sh, has two parts: (1) processing of the surface files and electrode coordinates, and (2) creating the web visualization with Blender + Blend4Web. When run inside a subject's directory, the script will automatically return a .json file that can be modified through JavaScript to create the finished webpage. Although there still remains multiple area of improvement, the project ultimately aims to provide a foundation for an efficient, open-source, and user-friendly tool that can be used to create robust 3D visualizations for use in an array of clinical and research settings.

Inamagua, Johanna; "*Investigating upregulated expression of H3K27me3 in Drososphilia****"***
Tri-methylation of lysine 27 on histone 3 (H3K27me3) is an epigenetic mark for silenced regions of chromatin. H3K27me placement is regulated by the activity of both Polycomb Repressive Complex 2 (PRC2), the methyltransferase, and by Utx, the histone demethylase. Modulation of PRC2 activity has been shown to dramatically influence lifespan and neurodegeneration in a Drosophila model for aging– animals with reduced H3K27me3 have decreased mortality rates and are protected against neurotoxicity. In order to better understand the impact of global H3K27me3 on brain aging, we turned our attention to animals with increased H3K27me3. We hypothesized that animals with increased H3K27me3 would have increased mortality rates, decreased brain health, and be vulnerable to neurotoxicity. Animals with increased PRC2 activity had shortened lifespans

and increased brain vacuolization, compared to wild-type animals. In parallel studies, we identified that animals with reduced Utx activity were more susceptible to polyglutamine (PolyQ)-induced neurodegeneration. We identified that Utx-reduced animals had increased PolyQ protein accumulation, suggesting the aggregation led to increased tissue degeneration. These findings indicate that increased H3K27me3 expression has detrimental effects on Drosophila health, complimenting previous findings on the protective feature of reduced H3K27me3. Future studies will work to address the impact of increased H3K27me3 on transcriptional silencing to better understand its role in brain aging and neurodegenerative disease.

Itkin-Ofer, Maya; "*Psychopathic Traits are Related to Poorer Recognition of Emotional Expressions****"***
Psychopathic traits encompass harmful interpersonal and behavioral features, such as lying, conning, shallow emotions, impulsivity, violence, and crime. One mechanism thought to contribute to these harmful features is reduced recognition of expressions of emotion. However, prior studies have typically only used still images of emotional expressions, which lack ecological validity. This poster presents results from a study that tested whether the relationship between psychopathic traits and poorer emotion recognition differed if the emotional stimuli were more ecologically valid. In a survey distributed via Amazon MTurk (N=472), participants' psychopathic traits were assessed using the Self-Report of Psychopathy (Paulhus et al., 2014). In the same survey, participants were randomly assigned to be presented with either a full-body 1 second video presentation of different emotions, close-up face-only 1 second video, or close-up static image of a face showing different emotions. For each trial, participants stimuli presenting one of 5 emotions: happiness, sadness, anger, fear, and a neutral expression, which they had to identify by choosing from the options presented below, including an "I don't know" option. Participants also rated the intensity and naturalness of the stimuli. We found that participants who scored high on psychopathy performed more poorly when attempting to recognize all emotion types and this deficit did not differ for the different conditions or when controlling for intensity or naturalness.

Jain, Aashna; "*Women, Rails and Telegraphs: An Empirical Study of Information Diffusion and Collective Action****"***
I assisted with data-work of a project to answer questions about how information diffusion in networks helps social learning, especially in the context of collective action and protest. To answer these questions, the study examines the Temperance Crusade, one of the earliest instances of organized political mobilization by women in the U.S. This wave of protest activity against liquor dealers spread between the winter of 1873 and the summer of 1874, covering more than 800 towns in 29 states. This series of events provided a worthwhile case-study because towns were connected mainly through two national networks -- the railroad and the telegraph. If a town lost railroad or telegraph connection, it would effectively be isolated from the national informational network, and serve as a control variable in this study. Thereby, this study used econometrics and network science techniques to identify to what extent the spread of information within networks was responsible for a protest event taking place in a given town. I worked on collecting and cleaning data about railway accidents to identify breaks in the railway network, and on newspaper archives chronicling Temperance Crusade protests. The study concluded that railroad and telegraph-mediated information about neighboring protest activity were the main drivers of the diffusion of the protest movement, through a mechanism of social learning and not mere imitation. It also found strong complementarities between both networks.

Jain, Akash and Jasmine Wu; "*Handoffs and Transitions in Critical Care (HATRICC) Sustainability Study****"***
The Handoffs and Transitions in Critical Care (HATRICC) is a study of the handoff process of critically ill patients in a mixed surgical population. It is designed with the intent to decrease errors and improve the transfer of information between the anesthesia, surgical and intensive care unit teams. The standardized handoff process occurs between the operating room and surgical intensive care unit of two ICUs with no prior standardized handoff process. The study is a hybrid effectiveness-implementation trial that uses mixed methods to survey needs while adapting existing handoff processes, and engineering the implementation of a new standardized handoff process. Data was collected on error rates, information omissions, transfer time, etc. Effectiveness is currently being evaluated using the data collected post-implementation.

Jehangir, Moiz Ali and Elliot Miciek; "*Digital Mapping of Political Control in Pre-Colonial South-Asia****"***
Modern historians continue to use maps of pre-colonial South Asia that do not accurately reflect the political realities of the era. These maps are based on the incorrect assumptions that bureaucracies operated efficiently, identity was rigid and inflexible, and that military control could be absolute. Such assumptions create states with geographic boundaries like a modern state with borders and a central government. However, state machinery did not always function as intended. Revenue collection could be inconsistent and it was difficult for the capital to assert its political will, so imperial boundaries were constantly in flux. Likewise, ethnic and caste-based identities like "Afghan" and "Ujjainiya Rajput" could change between generations, or even in an individual's lifetime. Furthermore, local peoples frequently rose up against conquering powers. There are multiple accounts of peasants winning military victories against armed forces. Political control in South Asia was fragile and fluid, yet modern historical maps portray the opposite.

Our research focused on creating a new way to map the political history of South Asia with greater accuracy and precision. Instead of drawing political borders, we have decided to create maps that show the control of strategic forts and cities by various empires over time.

Jenkins, Jack; "*Heat Scavenging Photovoltaic Cells****"***
This summer I worked under Dr. Deep Jariwala to design, build, and test a new generation of infrared photovoltaics. Utilizing the equipment in the Singh Center for Nanotechnology, I exfoliated few-layer materials including molybdenum disulfide and black phosphorus in order to target the absorption of infrared light or heat. This project is part of a recent wave of innovation in nanoelectronics that uses two-dimensional materials due to their surprisingly unique properties when limited to only a few layers of atoms.

Jiang, Evan; "*Investigation of Cortical Microcircuit Dysfunction in a Mouse Model of Dravet Syndrome****"***
Dravet syndrome (DS) is a severe neurodevelopmental disorder defined by temperature-sensitive seizures that progress to treatment-resistant epilepsy and intellectual disability with features of autism spectrum disorder. DS is caused by loss-of-function mutations in or deletions of the human gene SCN1A, leading to haploinsufficiency of the voltage gated sodium channel subunit Nav1.1. Studies using Scn1a(+/-) mice have revealed preferential dysfunction of the three major classes of GABAergic inhibitory interneurons (INs) in the cerebral cortex, which forms the basis of the "interneuron hypothesis" of DS pathogenesis. However, the exact mechanism through which interneuron dysfunction causes seizures, intellectual disability, and autism spectrum disorder remains unknown. Here, we investigate a disinhibitory circuit composed of vasoactive intestinal peptide interneurons

(VIP-INs) and somatostatin interneurons (SST-INs), both of which are dysfunctional in DS. We used whole-cell recordings of spontaneous inhibitory post-synaptic currents (sIPSCs) in SST-INs in acute brain slices using a cesium chloride internal solution to determine whether this cortico-cortical disynaptic inhibition is impaired in DS. Although further confirmation is necessary, preliminary data suggests that, in Scn1a(+/-) mice, activation of cortical microcircuits with acetylcholine fails to yield a normal increase of sIPSC frequency in SST-INs. Furthermore, we confirmed that optogenetic activation of VIP-INs was able to produce evoked IPSCs in SST-INs of wild-type mice. This data suggests impaired suppression of SST-IN mediated inhibition by acetylcholine in Scn1a(+/-) mice. VIP-INs have critical roles in sensory integration, learning, and attention, thus VIP-IN dysfunction may underlie non-seizure comorbid conditions in DS, such as intellectual disability and/or autism spectrum disorder.

Jiang, Helen; "*Quantitation of NAD, NADH, NADP, and NADPH in 3T3-L1 cells using stable isotope labeling by essential nutrients in cell culture****"***
Nicotinamide adenine dinucleotide (NAD+) is an essential cofactor synthesized by enzymes known as nicotinamide mononucleotide adenylyl transferases (NMNATs) which exists in different subcellular compartments of the cell (NMNAT-1 in the nucleus, NMNAT-2 in the cytoplasm, and NMNAT-3 in the mitochondria). When 3T3-L1 cells undergo adipogenic differentiation, a study using NAD+ biosensors with nuclear and cytoplasmic localization signals has shown that there is an increase of NAD+ in the cytoplasm and a decrease of NAD+ in the nucleus. The aim of this experiment is to build off the biosensor based studies of NAD+ and to quantify the levels of NAD+, NADH, NADP+, NADPH in the cytoplasm, nucleus, and whole cell lysate of 3T3L1 cells during adipogenic differentiation. Using this previously validated biological model, we tested an alternative analytical method to sub-cellular metabolite quantification- stable isotope labeling by essential nutrients in cell culture (SILEC) using whole cells as an internal standard for fractionation studies. SILEC cells were created to generate isotopically labeled [13C315N1] nicotinamide in cells, and a nuclear fractionation experiment was carried out to quantify the levels of NAD+, NADH, NADP+, and NADPH in subcellular compartments of the cells. By coupling this approach with detection of the unlabeled analyte and stable isotope labeled internal standards via liquid chromatography- high resolution mass spectrometry, we were able to measure multiple NAD metabolites in the same experiment. The consistency of our results with the prior studies on NAD suggests that the NAD SILEC system is useful for quantitative studies of sub-cellular metabolism.

Jin, Steven; "*Effect of Playing High School Sports on Later Life Outcomes****"***
We examine the effect that playing high school sports has on certain life outcomes. Much research has been conducted on the impact that high school sports participation has on academic success, health, and educational attainment. Our study focuses on how playing high school sports impacts later life outcomes, such as standard of living, financial situations, substance abuse, and intimate relationship behavior, by using data from the National Study of Youth and Religion, a longitudinal study that periodically surveyed individuals from their high school years until their mid-twenties. We used survey questions and responses to identify covariates that would allow us to account for family life, education, socio-economic status, race, and other confounding factors that may lead to bias. We can then utilize a propensity score matching method to effectively analyze how the relevant outcomes are impacted by participation in high school sports. Our findings will provide a greater understanding of how people are positively or negatively affected by high school sports participation in the long term.

Johanek, Camila; "*Stress and Weight Change: How Lifetime vs Current Stressors Are Associated with Weight Change****"***
Obesity is a state of chronic stress that affects two thirds of adults in the United States. Stress can lead to unhealthy coping behaviors, including eating high-fat foods and decreasing physical activity. At the same time, some people may cope with stress by eating less and increasing physical activity, leading to differences in weight change when exposed to stress. This study aims to explore the sources of perceived stress, broken down into lifetime and current stressors, to determine which stressors may be most strongly associated with weight change. This study hypothesizes that greater stress levels is negatively correlated with weight loss. Additionally, this study hypothesizes that the number of stressful life events is strongly correlated with weight loss. Data were collected on 72 participants (61 included in final analyses), seeking weight-loss treatment as a part of a Penn study. Participants completed the Weight and Lifestyle Inventory. This survey was used to collect the number of self-reported current and lifetime stressful events. Each response was coded into a stress category, such as occupation, health, family, psychosocial, and more. Perceived stress and weight were measured at weeks 1 and 12. The results partially support the first hypothesis, as perceived stress at week 12 was associated with less weight loss. The results show the opposite association stated by the second hypothesis, as lifetime occupational stress was associated with greater weight loss. Participants had an average of six lifetime and four current stressors, specifically endorsing lifetime emotional health and current health the most.

John, Michael; "*Exploring Ethnic Identity in Post Colonial Guyanna****"***
Guyana is a country located on the South American continent with strong ties to the anglophone Caribbean, due to its colonial legacy. The historical progression of this small nations' political institutions has been driven by a stark racial agenda. The country is divided between three main ethnic groups composed of East Indian, African and Indigenous descent. As a very ethnically diverse country, racial politics has had an important role in the performance of democracy in the country. My project will question the implications of ethnic diversity on the performance of political institutions and challenges of economic development within Guyana in the post-colonial era.

Johnson, Emma; "*Gentrification and Lead and their Effects on Health in Philadelphia, Pennsylvania****"***
The goal of this project is to evaluate how gentrification and construction in Fishtown have affected the health of the changing populations that have both been pushed out of the area and those that have moved in. This will be done by looking at the risk perception of these two groups of people and by evaluating the effects of lead-based paint being released as dust during demolition, and by evaluating the new living conditions of the population that is forced from their past residence by increasing cost of living.

Johnson, JAun; "*Exploration of a Novel Differentiation Axis in Dormant Breast Cancer Cells****"***
Breast cancer is the leading cause of cancer-related mortality in women worldwide. While there are effective modalities to treat primary tumors, remnant tumor cells have the ability to enter into a state of dormancy, survive, and seed lethal recurrent tumors. Several potential pathways underlying the survival of dormant cells have been identified using tumor cells derived from a genetically modified, inducible model of breast cancer progression developed in the laboratory. Surprisingly, SOX9, RUNX2, and VDR transcription factor activity that are upregulated during chondro/osteogenic differentiation are predicted to be increased during breast cancer dormancy. To test their contribution to breast cancer cell survival and aberrant differentiation during dormancy, these transcription

factors have been excised using CRISPR/Cas9 technology. We hypothesized that removal of these transcription factors will inhibit survival and chondro/osteogenic differentiation, and ultimately delay tumor recurrence. Using multiple assays, removal of targeted genes was confirmed at the protein level, cell proliferation and viability were tracked, and chondro/osteogenic differentiation was assessed over the dormancy time course. Removal of these transcription factors resulted in reduced viability that needs to be confirmed with further analysis. Furthermore, gene expression of downstream targets suggests a potential link between SOX9 and VDR that is particularly interesting for further investigation.Together, these data suggest that chondro/osteogenicdifferentiation in dormant breast cancer cells may constitute a targetable node to eliminate dormant breast cancer cells and thus prevent lethal breast cancer recurrence.

Kafozoff, Julia; "*Provider & Patient Opinions, Preferences & Knowledge of Podcasting as a Tool for Health Promotion****"***
Podcasting is increasingly being used in medical education for healthcare providers and public consumption. Although research has emerged on the use of podcasts for educating physicians, this work has not extended to healthcare providers' views of podcasts as educational tools for their patients rather than themselves, or their patients' perceptions of the medium. Podcast listenership has steadily grown since 2006 with the majority of listeners being white, young, well-educated, and of high socioeconomic status – though there is currently an emergent shift towards more diversity in podcasting. Pediatric patient parents and caregivers are more likely now to be of a digital-native generation, accustomed to seeking medical information from digital sources, but little is known regarding about preferences of one medium over another for patient and family medical education and information. The objective of this research is to assess the perceptions that various demographic groups (among health care providers, parents/caregivers, and patients) have towards podcasting as an educational medium in medicine. Secondary aims include assessing the current state of podcast listenership for medical education, provider referral to podcasts for patient education, patient and family engagement with medical education podcasts compared to other digital media, and medical education topic preferences of listeners.

Kandula, Santoshi; "*Semiology Brain Atlas****"***
Approximately one-third of all epilepsy patients are resistant to treatment with antiepileptic drugs. For these patients, epilepsy surgical intervention is the only chance for cure. Clinicians use multiple variables to make the clinical decision as to whether surgical intervention will be successful 1. One of the most critical variables to consider is the seizure semiology (what the patient does or feels during a seizure); however, the current semiology literature is difficult to interpret and utilize in a clinical setting. We propose to create a 3-dimensional web-based platform in Blender (javascript software) to display the seizure semiology data by brain region and localize already existing data. Addition data will be able be uploaded into the system and this platform will be shared worldwide with other epilepsy researchers and clinicians (starting with the Penn Medicine clinics first). The amalgamation of data will also entail collecting seizure semiology data from Penn Epilepsy patients undergoing intracranial EEG (Electroencephalography), so that the interactive platform can be integrated with current studies and data. We expect to publish a methods paper from this work in addition to releasing our web-based platform to the epilepsy community and clinics worldwide. This platform will require data analytics, utilization of MATLAB, Python, C++, Javascript, and HTML, as well as database creation and manipulations. The relevance of this project is to curate an efficient method to evaluate areas in the brain, so that the onset of future seizures is prevented.

Kang, Min Jae; "*Testing Dental Acrylic with Added Microbial Resistance****"***
Standard appliances, such as retainers, are composed of Polymethyl methacrylate (PMMA) acrylic resins that are conducive to bacterial growth. This project tests the effects of incorporating a quaternary pyridinium salt (QPS) into PMMA to give the dental acrylic material antibacterial resistance. On top of testing for antibacterial resistance, we are also investigating the effect of QPS on the physical properties of PMMA by measuring surface hardness, flexural strength, and water sorption. We hope that our initial screenings will lead to clinical applications that will find effective reduction of periodontal disease and plaque accumulation without sacrificing the physical integrity of the dental acrylic.

Kannan, Suganth; "*Impact of Florida's Gopher Tortoise Regulation on the Regional Housing Market****"***
Real estate development in Florida has been impacted by the Florida Fish and Wildlife Commission's (FWC) regulation on new construction on vacant lots which contain burrows of gopher tortoises. FWC has imposed the gopher tortoise regulation because the tortoises are keystone species. Keystone species are species that are important to the functioning of an ecosystem, serving as a bridge between the different organisms. This study attempted to examine the impact of gopher tortoise regulation on housing markets. The study looked at the local jurisdiction of Cape Coral, Florida to understand the effects. Data was acquired from GIS database of Lee County Property, FWC databases, and Cape Coral permits database. The study compared values, adjusted for other metrics, of lots with gopher tortoises compared to those without gopher tortoises. It found a statistically significant difference between the two types of land. This research helps us understand the supply-constraining impact of gopher tortoise regulation. Further research needs to be conducted for other jurisdictions.

Kariyawasam, Raveen; "*Automated Medical Image Based Anatomical 3D Model Generation for Augmented Reality Applications****"***
This study aims to display the efficiency and quality of three-dimensional ("3D") models generated for augmented reality ("AR") applications. The traditional, manual workflow for 3D model generation involves manual segmentation, mesh refinement and file conversion. Our method automates the above procedures and reduces the workflow time compared to the manual method by ~48%.†

As an assessment of our automated workflow, 3D models for bone and skin were generated from five sets of Computerized Axial Tomography (CT) medical images using both the automated workflow and a previously published manual workflow1. Each set corresponds to one of five different regions of the body. The workflow duration was recorded automatically by the software. The quality of the 3D models were visually evaluated on a computer monitor and on Microsoft HoloLens.

The study revealed that the automated workflow consistently produced 3D models of greater quality and smaller file size than the manual workflow. Additionally, the average time to calculate models was considerably faster for the automated workflow compared to the manual workflow. The automated workflow's code architecture allows for integration with a variety of AR devices and laboratory computers. While further study must be made to assess the potential integration of our methodology into preoperative or intraoperative care, the automated workflow can ideally improve anatomic understanding and reduce operating times. Automation may also eliminate human errors during model generation which may lead to greater risks for the patient.

Karlen, Eva; "*Political Economy and Everyday Economic Life in 20th Century Latin America and Europe****"***
I assisted with research of contemporary political, legal, and economic history in Latin America, the Portuguese-speaking world, and Europe. This research allowed me to study political economy and political ideology across regions, cultures, and in multiple languages. I completed several reading assignments dealing with Fascism in Italy and other areas in the 20th Century, including works by philosopher Ugo Spirito and economist Corrado Gini. I read Ugo Spirito's "Memoirs of the 20th Century" along with other texts on Fascist ideology, racial ideology, and economic life in Fascist Italy. Within these readings, I was particularly interested in discussion of economic systems like corporatism. Additionally, I studied political economy and political ideology in the mid-20th Century US in Thurman Arnold's "Folklore of Capitalism." I also gained research experience using microfilm and other materials in the library. I utilized digital historic documents, and analyzed and organized information from volumes of the "Jurisprudencia," Brazilian legal documents from the 1940s. Cases which deal with popular economy will be useful in Dr. Teixeira's research. Work on the "Jurisprudencia" allowed me to conduct historical research in both Portuguese and English.

Karthik, Dhruv; "*End-to-End Conditional Imitation Learning for Autonomous Vehicles****"***
Imitation Learning enables autonomous vehicles to learn directly from labelled driving data, thereby learning to drive itself from example. However, a key issue faced by such systems is the error propagation encountered when the autonomous agent drifts from examples it has seen in its training data. We propose a solution to this method that uses the LIDAR as a 'training wheels' sensor, that automatically collects out of distribution data for better driving performance.

Katta, Omkar; "*Nonprofit Governance: Gender Diversity on Boards****"***
Because of their tax-exempt status, nonprofit organizations are accountable to the general public, which tends to hold the sector to high ethical expectations. Nonprofits maintain these standards and signal their ethical conduct through board composition as well as the adoption of good governance practices. However, due to the diversity of nonprofits, a universal measure of good governance remains elusive. Drawing on existing governance literature and data from IRS 990s, this study first explores ways of conceptualizing and operationalizing good governance, and then analyzes whether the gender composition of nonprofit boards influences the adoption of these practices.

Kaufmann, Samuel; "*Investigating cross-strain variation in pain sensitivity****"***
Chronic pain is a health burden affecting tens of millions of Americans, but our ability to treat it remains seriously limited. Modern pain treatments such as anti-inflammatory drugs, local anesthetics, and opioids are non-specific to neuron type and are not equally effective for all patients. Some, especially opioids, are also dangerous to the user. To help build a scientific basis for the creating of pain treatments which are specific to pain-causing neurons and safe, the Abdus-Saboor lab is devoted to investigating the molecular basis of pain sensation. For this project, we have collected mice from six of the most common strains used in biological research to study how and why their sensitivity to pain varies. We have begun the project by conducting baseline testing of the mice's sensitivity to thermal pain. Substantial differences have been found: the threshold at which heat and cold become painful is different for different strains, and although all strains are capable of jumping, apparently only one strain will do so in response to noxious heat. As the project continues, we will examine how our pain sensitivity data relates to variations in the structure and expression of Trp channels, a set of pain-sensing ion channels conserved across mammal species. We will also investigate other possible reasons for the apparent

differences in pain sensitivity, such as differences in central nervous system processing of pain and in behavioral responses to pain.

Keneipp, Rachael; "*Optimization of TMD Device Fabrication****"***
Transition Metal Dichalcogenides (TMDs) are a family of compounds with the generalized formula MX2, where M is a transition metal typically from groups 4–7, and X is a chalcogen. In the bulk form, TMDs are layered van der Waals solids with strong intralayer bonding and weak interlayer bonding—a structure which allows for the TMDs to be exfoliated down to ultrathin or monolayer. The isolation of monolayer TMDs leads to dramatic changes in the TMD's properties, which gives them many potential applications, including quantum computing, clean "blue energy" generation, and uses in DNA sequencing. To investigate these applications, TMD devices are fabricated, but this process is often multi-faceted with many variables affecting the quality of the final device. In this project, TMD device fabrication for the TMDs Vanadium Selenide (VSe2), Bismuth Selenide (Bi2Se3), and Molybdenum Sulfide (MoS2) was optimized from previous standard methods. The aspects of device fabrication investigated included methods of TMD preparation, TMD transfer, substrate preparation, and others. These parameters were altered to enhance device quality, reproducibility, and to reduce time necessary for total fabrication, overall optimizing the process of TMD device fabrication.

Kest, Noah; "*The Popularization of Existentialism in the U.S. in the Mid-1900s****"***
My history undergraduate thesis explores the popularization of existentialism in the United States in the mid-1900s in both academic and public spheres. I particularly focus on several individuals: John Wild, Walter Kaufmann, William Barrett, and Hazel Barnes. There are several major driving questions in my thesis. The first is who were these popularizers of existentialism and what allows them to be categorized as popularizers? While I have homed in on some distinct characters, I will answer why these characters are the most important. The second is why and how did these characters devote much of their careers to this goal? For this question, I will examine what motivated individuals to spread existentialism, what means they did it through, and the obstacles they faced. This is the primary question I will consider in my thesis. The third driving question asks what effects these characters had. Did they change the face of American philosophy? Did they impact the culture or the lives of average Americans? I used the Jumpstart for Juniors grant to explore archives in Boulder, CO and at Harvard and Yale. These archives contained material related to the lives and ideas of Hazel Barnes and John Wild.

Kim, Hali; "*The Molecular Mechanism of Imiquimod-Induced Tissue Regeneration****"***
Wounds repair by scar formation or scar-less wound healing (also known as tissue regeneration). Despite scar formation being a hallmark feature of human skin wounds, no clinical treatments exist to prevent scar formation, and this treatment gap remains a clinical unmet need. Our lab studies mammalian scarless wound healing in mouse skin, and our preliminary data demonstrates that activation of transient receptor potential ankyrin 1 (TRPA1) promotes scar-less wound healing. My project aims to elucidate the molecular mechanism underlying this behavior.

Kim, Hyong Min; "*Optimization of MoS2 Film Growth by Sulfurization****"***
My PURM experience this summer in Professor Drndic's Lab was an immersion in the ongoing research on transition metal dichalcogenides (TMDs), a class of materials garnering much attention and under extensive research for their intriguing properties and promising applications. Throughout my fellowship period, I explored various stages of TMD research, from preparation of materials to their application in a plethora of fields. I then undertook a personal project of optimizing the conditions for growing monolayer

MoS2 films, a type of TMD that the Drndic Lab uses profoundly in many of its research projects. After extensive reading into published research and repeated growths to test a range of variables, I was able to zero in on a set of conditions for growing such samples. My PURM experience was an opportunity for me to reaffirm my passion for natural science research while being involved in a scientific community that pools knowledge and expertise in various areas to great success. I am excited to continue pursuing research at Penn, and PURM 2019 served as an excellent first step.

Kim, Joongwon; "*Quantitative Analysis of Neonatal EEG with Machine Learning****"***
Forty-thousand neonates are born annually in the U.S. with congenital heart diseases (CHD), and 1% of these patients experience cardiac arrest. With seizures occurring in many neonates after cardiac surgery, clinicians have monitored CHD patients' EEG recordings and observed that EEG background patterns change preceding cardiac arrest. Although continuous EEG recordings of CHD patients have been manually reviewed by clinicians, this method has demonstrated the inevitable drawbacks of high cost and subjectivity. To address this problem, this project introduces a novel computational method to extract quantitative EEG features and incorporate machine learning to classify neonatal EEG backgrounds.
Data were obtained from EEG recordings of neonates in Cardiac Intensive Care Units (CICU) at the Children's Hospital of Philadelphia. Each patient's EEG was recorded through 27 scalp electrodes, along with clinician-verified annotations. Upon loading the dataset, EEG channels with improper recordings and individual segments containing noise artifacts were eliminated. The recordings were then segmented into 5-second intervals and quantitative EEG features from the time and frequency domains were calculated for each segment. Finally, statistical measures of these features were computed over a 2-minute window of each EEG background. Once the data were fully preprocessed, PCA was applied to each window of EEG features to reduce the dimensionality of the features. The modified features were then fed into a random forest model to identify the EEG background of each window. Using a cross-validation method, the model returned an accuracy of 55% and demonstrated significantly improved results compared to a baseline accuracy of 20%.

Kim, Karen; "*Redeeming Race?: Anti-Racist Science and Postcolonial Development in the Twentieth Century****"***
The study of social Darwinism and cultural evolutionism was used to create and support racist ideas through biological determinism. While such racist science was being popularized, anti-racist science was created to combat racism. Dr. Sebastián Gil-Riaño's project examines the history of international anti-racist efforts and the influence of scientists in the Global South in efforts, like the UNESCO Statements on Race. The research that I was involved in looks at the efforts of 19th and 20th century anthropologists in Brazil in fighting racism through social sciences. It also looks into the paradoxical co-existence of racist and anti-racist thinking during their time. Through summarizing sources, translating correspondences, and creating research tools such as timelines, I have learned about the scientific studies on race, the controversial discussions on race-mixing, and the sociocultural evolution in Brazil. Most importantly though, through my conversations with Dr. Gil-Riaño, l have learned how to historicize anti-racist and racist thought through a critical lens. Ultimately, I have learned about the complexities of historical research and have discovered a newfound excitement for it.

Kontogiorgos-Heintz, Daphne; "*WorMotel Mini: Imaging more worms more easily****"***
C. elegans is an important model organism because it reproduces and ages rapidly, is transparent allowing use of optogenetics, and has all 302 of its neurons mapped. The WorMotel, (Churgin et al. 2017) confines worms to individual wells that are like mini

petri-dishes. This device allows hundreds of individual worms to be studied longitudinally, and is useful for research on lifespan and healthspan. The WorMotel Mini offers a threefold spacial improvement, and is coupled with a new preparation protocol is faster, more consistent, and creates conditions more similar to what C. elegans are typically studied under.

Kopp, Emily; "*Number Word Mapping in Children and Adults"*
Today, little is understood about the neural basis for learning math. Bridging this gap can help us better develop math curricula to complement how kids learn best. One major goal of the study is to see if patterns of brain activity are linked to how well a child understands numbers. Another complementary goal is to see if the same brain regions light up in adults. Two groups, one of 49 children and one of 13 adults, were scanned in a 3T MRI machine. In the scanner, the groups watched a video and were instructed to focus on whether a quantity of eggs on screen either matched or did not match an audio number word. The adults completed a secondary task where they rewatched the video and pressed buttons to indicate a match or mismatch. In preliminary data, it was found that adults had activation in the left intraparietal sulcus (IPS), replicating work from other labs. In children, no brain area (including the left IPS) had statistically significant activation. Some activation was seen in the right hippocampus and left middle occipital gyrus, but a larger sample is needed to confirm this. There are a few potential reasons for this outcome. First, it is difficult to keep young children still; any motion in the MRI blurs pictures and makes data less precise. Additionally, activation of the hippocampus may suggest activation of learning circuits, as it is linked to learning and memory. More data will be collected before the study is complete.

Koropeckyj-Cox, Daniel and Heta Patel; "*Gaining Control: The Effectiveness of Clubs for Type 2 Diabetics in Guatemala"*
Lifestyle changes and population ageing have contributed to a global rise in diabetes prevalence from 4.7% in 1980 to 8.5% in 2014 (World Health Organization). In the communities around Lake Atitlán, Guatemala, data have shown a significantly higher prevalence of 13.81% (Hospitalito Atitlán Data 2014-2015). In response to the need for type 2 diabetes prevention and treatment in the region, Hospitalito Atitlán developed a diabetes program in 2012--Manejando la Diabetes en el Departamento de Sololá. As part of this program, diabetes clubs, which are located in health centers throughout Sololá, are supposed to provide monthly diagnostic, educational, and therapeutic services according to standards of care. During the summer of 2019, the diabetes clubs were evaluated using semi-structured interviews, participant observations, and patient blood glucose data to determine whether they achieve their aim to assist diabetics in the management of their condition. Among clubs, results demonstrated significant heterogeneity in services provided, personnel training, and implementation of protocols set forth in hospital-led trainings. Inconsistencies extended to perspectives on treatment affordability, with some club personnel reporting that diabetic patients may not prioritize their health expenses, while patients reported that medications are expensive. At the observed diabetes clubs, men were significantly underrepresented. Furthermore, analysis of existing blood glucose data revealed its inability to accurately inform type 2 diabetes control on a longitudinal basis, resulting in recommendations to improve data fidelity and substitute monthly blood glucose readings with quarterly HbA1c measurements.

Krancer, Brooke; "*"A Modern and Distinctively Scottish Portrait": Scottish Modern Art and National Identity in the Interwar Period"*
Although the Scottish Renaissance in the early 20th century is largely considered a literary movement, visual artists significantly contributed to it as well. In so doing, they helped

legitimize Scotland as an intellectual force in Europe separate from the broader British tradition, thus making important contributions to the burgeoning Scottish nationalist movement, which was largely based on a newfound perception of a Scottish rather than British national identity. Four modern artists who were active in the interwar period serve as examples of Scottish artists both consciously contributing to the Scottish Renaissance at home and deliberately engaging with the European art movement abroad: J.D. Fergusson, William Johnstone, William McCance, and Edward Baird. Identifying politically as Scottish nationalists, they showcase the link between the Scottish modern art movement and the building of a Scottish national identity during the period that contributed to the rise of Scottish nationalism as a political force.

Ku, Bo; "*Antagonizing alpha-2 mediated hypnosis through activation of the LC****"***
It had long been presumed that α2 adrenergic agonists produce hypnosis by acting presynaptically on adrenergic neurons of the LC to both inhibit their arousal-promoting output and releasing their inhibition of sleep-promoting neurons of the lateral hypothalamus. The evidence to support this presumption is largely circumstantial. Localization of causal effects in microinjection experiments is inexact, as there is inevitably a drug gradient radiating outward from the site of the injection. If adrenergic neurons are necessary for dexmedetomidine's effect, then mice genetically engineered to lack α2A receptor on adrenergic neurons should be resistant to dexmedetomidine. If adrenergic neurons of the LC are necessary for α2-mediated hypnosis, the LC adrenergic-specific α2A receptor knockout mice should also show resistance to dexmedetomidine hypnosis compared to controls. In both cases our goal was to determine whether this is true by determining the concentration sufficient to elicit righting reflex loss. We selectively delete α2A adrenergic receptors from adrenergic neurons in the LC and test for any resistance to hypnotic effects of α2 adrenergic agonists, which would indicate adrenergic LC neurons place a role in α2-agonist-mediated hypnosis. Using optogenetic stimulation of LC neurons, we determined if adrenergic activity at the LC is sufficient to antagonize α2-mediated hypnosis. We confirmed necessity of LC adrenergic neurons for α2-agonist-mediated hypnosis using novel α2-agonist photolabels and attempt to reverse any extended hypnosis after photolabelling through artificially driving firing at the LC optogenetically.

Kulaprathazhe, Melody-Susan; "*The "Neoliberal Paradox": How the United States Attracts and Targets Undocumented Immigrants****"***
Headlines regarding the hot topics of undocumented immigration and mass deportation regularly cycle. However, in the current landscape of sensationalist media, the history of the issue is often overlooked and the true underlying causes are ignored. Thus, the objectives of this study include determining 1) why Latin American and Caribbean nations have high rates of emigration 2) how policies regarding immigration disproportionately impact Latinx and Caribbean populations. By analyzing legislation bills that were conceived during major shifts in the national mood and cross-examining them with detention and deportation statistics, numerous unforeseen connections began to appear. Firstly, the economic model pursued by the United States forces its allies in the Western Hemisphere to comply with its demand for immigrant labor. With few options for legal immigration, a rather disposable labor force is created consisting of entirely undocumented immigrants. During trying times, such as the aftermath of the September 11 attacks, politicians capitalize on national sentiment to expand immigration law enforcement. Subsequent increases in detention numbers demand the institution of more prisons, the privatization of which ensures less government spending, but more profits for big business. Corporate interests in national affairs lead to the need for more apprehensions, which signals the creation of border patrol agencies that enforce immigration law in the name of national security. By understanding what other forces stand to benefit from the targeting of

undocumented immigrants, action can be taken to more effectively handle the issue and without sacrificing the democratic ideals the United States was founded on.

Kumar, Priya; "*Evaluating for an Increase in Neurogenesis after Traumatic Brain Injury in Adolescent Mice****"***
Traumatic brain injury impacts millions of people in the country each year, and after a traumatic event we see cognitive decline. A lot of recent work has gone into determining the underlying cause of this cognitive decline. Additionally, much research in the past 60 years has delved into neurogenesis (the birth and maturation of new neurons) in adolescents and adults. This project evaluated for an increase in neurogenesis in adolescent mice after a traumatic brain injury given by lateral fluid percussion injury.

Lamadrid, Isabela; "*Impact of Training Frequency for Canine Scent Detection****"***
Canines possess a superior sense of smell that humans have employed for use in forensic, narcotics, explosives and cancer detection. At the Penn Vet Working Dog Center dogs begin their journey into scent detection by imprinting on and spending significant time detecting Universal Detectant Calibrant (UDC). Both working dogs and citizen science dogs (privately-owned) after successfully detecting UDC are used in human-relevant cancer detection research studies. The objectives of this study are to assess how training frequency impacts UDC detection success and observe whether working dogs' characteristically higher drive, compared to citizen science dogs, has a positive impact on UDC detection. In order to assess the hypothesis, video footage and live canine detection results were recorded and analyzed for the target groups. A scent detection wheel, consisting of eight ports with UDC in one and controls for the others, was used for each trial. Working dogs were found to have quicker average search times (AST) and a higher % success overall. The results were overall, as we expected. I would conduct further analysis with a greater number of dogs in order to control for individual dog variability. Additionally, there were a few instances of missing data, so future research should ensure to have a solid eight weeks of data to make sure analysis is equalized amongst all individuals as well as groups.

Lawrence, Melina; "*Preserving Society Hill****"***
Building upon Dr. Ammon's existing work regarding the relationship between demolition and historic preservation in Philadelphia's Society Hill Neighborhood during the 1950s through 1970s, the goal of this project was to analyze, spatialize, and breathe life into various forms of historical data to gain a better understanding of the neighborhood and its residents prior to urban renewal.

Lazarus, Anne; "*Housing Cost and Value in Metropolitan and Non-Metropolitan Areas of Pennsylvania****"***
This project analyzes trends in housing costs for owner-occupied house values and rental prices in the Pennsylvania housing market. It looks at indicators such as house values, gross rent and the and household income in order to determine housing cost burden in metropolitan and non-metropolitan areas of Pennsylvania. The project relies on data from the American Community Surveys(ACS) by the US Census Bureau and was analyzed using the statistical software, Stata. The findings from this project are a small segment of a Comprehensive Housing Study for the Pennsylvania Housing Finance Agency which will provide a picture of the current state of housing in Pennsylvania. Overall, the data reveals that in both metropolitan and non-metropolitan areas of Pennsylvania, a greater proportion of renter-occupied housing suffers from severe housing cost burden compared to owner-occupied housing.

Lebermann, Matthew; "*Extracting Useful Racetrack Features from an Image****"***
When developing algorithms for self-driving cars it is often much easier to perform tests in simulation than in the physical world. Not only can hundreds of simulated runs be performed in the time it takes to complete one physical run, a simulated car costs nothing and has no risk of being damaged. An important step in simulating a car is to create a virtual representation of physical racecar tracks. Virtual tracks can be used to tune algorithm parameters or to perform machine learning. With tools such as Cartographer that use LIDAR scans and Simultaneous Localization and Mapping (SLAM), it is possible to generate an image that closely matches the bird's-eye-view of a racecar track. However, this raw image is not directly useful for many self-driving techniques. There are three primary features of a racecar track that are of most use in developing self-driving algorithms: the centerline, the walls, and the signed-distance field. The purpose of my research is to develop a technique to extract these three features from a binary image of a racecar track.

Lee, Christopher; "*Uncovering the salt-preference regulatory neural circuit in Drosophila melanogaster****"***
The decision whether to eat or reject a potential food is determined by a variety of factors, including both intrinsic (hunger state, genetic disposition) and extrinsic (chemical composition, nutritional value) factors. Sodium chloride (table salt) is an indispensable part of most organisms' diet. Sodium plays a key role in a wide variety of functions, such as action potential generation and maintaining osmotic balance. However, tight control of salt intake is critical due to health concerns such as hypertension and heart attack associated with salt overconsumption (Cook 2008; Brown 2009; Mohan, 2009). Therefore, determining what physiological mechanisms control salt intake may prove useful to treating health concerns associated with overconsumption.

The fruit fly, Drosophila melanogaster, exhibits similar salt preference behavior as humans, preferring low-salt foods to high-salt foods. We propose that there exists a neural circuit in the fly brain, which receives signals from the peripheral taste organ and regulates food acceptance behavior based upon salt concentration. Because of the fruit fly's genetic tractability and amenability to various neurogenetic tools, we will use it as an animal model to decipher the salt-preference regulatory neural circuit.

Lee, Mona, Sydney Miller, and Sanjana Rao; "*Joplin Project: Digital Video Animation with Mechatronics Robot****"***
Our summer research involved working on a robotics-based component of a larger sculpturing project under Professor Michelle Lopez. The goal of our summer research was to write Arduino code to improve the nuanced motions and dexterity of a Stuart Platform robot to be used in a musical choreography. The pre-existing program allowed the actuators to move to specified coordinates but would stop the robot rigidly at each target point. Starting with this basic system, we aimed to gain enough control of the robot to move it in a fluid motion that could run concurrently with a soundtrack.

In order to reach our final desired motion, we experimented with various implementations for the mathematical logic. Our first attempt used a combination of parabolic and linear equations to control the speed from one given point to another. Another approach involved prescribing a series of trajectory points and a threshold to determine the motion of the robot.

Our final approach involved scrapping the pre-existing code architecture and rebuilding the program to incorporate fluid motion at every level of the design. In the end, we were

able to achieve a fluid motion by controlling the extend and retract of the actuators individually in relationship to time, rather than having the actuators move in unison to a specific point. We set the speed of the actuators to increase and decrease with parabolic equations. This method eliminates the stopping of the robot when it reached a point, allowing for a fluid motion.

Lee, Ruth; "*Evaluating an Electronic Health Record Implementation in a Limited-Resource Setting****"***
This project resulted in an electronic health record (EHR) that replaced the paper documentation system for a children's home in Eswatini. The EHR was made considering the needs and challenges of low-resource settings. The study includes a pre-post trial to measure the short- and long-term effects of the EHR at the children's home. The evaluation includes qualitative and quantitative data from both before and after EHR implementation at initially monthly then yearly time marks. Since the EHR was implemented in July 2019, only initial results are available. Qualitative evaluation focuses primarily on how the EHR impacts workflow and the quality of data documented. Quantitative evaluation is obtained by surveys and direct observation.

Leeswadtrakul, Joy and Alexander Wang; "*A Standardized Protocol for Transmission of High-Fidelity Wearable Device Data: Prototype Development****"***
The U.S. population over the age of 65 will grow an estimated 60% to 78 million by 2035 (1), with a concomitant increase in age-related illnesses, specifically cardiovascular disease (CVD), and related health care costs (already $200 billion/year (2)). Using new technologies to collect and analyze CVD-related data in real-time may hopefully improve medical outcomes while helping control costs.

Wearable devices (WD) which transmit information via Internet of Medical Things connectivity for processing using big-data analytics are a promising technology in this regard. These devices provide unprecedented quantities of data, but accessing this data for real-time analysis can be challenging. While specific manufacturers provide proprietary APIs for access of data, there is no API currently available to allow for a standardized download of high-fidelity waveform data. This proves to be problematic in a clinical setting where essential patient data comes from multiple WD platforms. This paper describes a novel application for the transmission of high-fidelity WD data for display and analysis on broker specific applications.

This study concludes and suggests that an MQTT-based communications protocol may allow efficient, high-fidelity connectivity between WDs and clinical environments. Future research efforts may include integration of SSL/TLS brokers over all platforms, as well as incorporation of internal logging systems if an unauthorized disconnect were to occur.

Li, Carol; "*Generative neural network autoencoder for novel song production and visualization of passerine birdsong****"***
Passerine songbirds are integral to fields of neuroscience. The specialized neural circuit, the song system, is the source of active signalling from males. Male songbirds sing in varying potency, eliciting different rates of CSD production. This trait generates selectivity in female songbirds, and the precise neural circuitry for the behaviour remains poorly understood. That is to say, the effect of male birdsong subtleties on female courtship behaviour are unknown to date, as we do not know specifically which song qualities the females use in order to make their mating choices. In order to classify and thereby represent the patterns in passerine birdsong, this project visualizes sequences of inputted birdsong through a generative neural network designed for training an autoencoder to produce novel

syllables and further represent them as clustered categories via an unsupervised UMAP/HBDSCAN algorithm. That is, this project segments files from WAVs, performs syllabification on songs, trains the autoencoder network, performs dimensionality reduction and clustering, and visualizes sequences. It outputs interpolations, grid sampling, spectrograms, and clustering representing clustering into discrete categories.

Li, Vivian; "*Information Asymmetry in Corporate Bond Markets****"***
Using data from all U.S. corporate bond transactions in 2008, intermediation chains are identified. Dealer centrality and past experience are used as proxies for the amount of information that a dealer has about the valuation of a given bond. It is shown that dealers that are closer together on a given intermediation chain are also expected to have closer levels of information. These relationships hold for both investment grade bonds and junk bonds, as well as both before and after the onset of the 2008 financial crisis. This implies that intermediation chains in an over-the-counter market can be an effective way of responding to the presence of high information asymmetries between dealers, end buyers, and end sellers.

Liang, Huilin, Maria Paulina Megias Canton, and Alexandra Audrey Tirtaguna; "*How do International Organizations work?****"***
In this project, we researched into activities of international economic organizations and created timelines to understand the factors that determine their vitality. Specifically, we looked at various news articles and scholarly publications to see how frequently these international organizations (IOs) meet, their budgets and internal structures, as well as how or why some IOs succeed or fail in attaining their goals. Our research results are used for further data and text analysis for hypothesis testing.

The data we collected directly contribute to the project of Professor Gray, which aims to provide a better understanding of what makes an international organization succeed or fail. Given the prevalence of international organizations in a globalized economy, such study would not only be useful for scholars interested in how international organizations function, but could also serve as a reference on building and managing them in the future.

As a side project, we also did short-term team exercises where we looked into specific elections and recorded which election monitor groups attended them. These exercises allowed us to have a fuller understanding of the functions and influences of IOs.

Apart from that, we also investigated the participation of female speakers in the United Nations by researching speakers' profiles in the United Nations throughout the years. Through data wrangling using a query-language-based software, we were able to construct a dataset for future studies on women's participation in IO.

Listerud, Hannah; "*College Counselors Fidelity to Safety Planning****"***
Despite the existence of evidence-based practices (EBPs) for suicide prevention, little research has been conducted to determine fidelity to Safety Planning. Within the college context, a large study (n = 95,761) by the American College Health Association (2016) found that in the past 12 months 9.8% of college students had seriously considered suicide while 1.5% had attempted suicide in the same timeframe. Furthermore, Eisenburg's study (2011) on service utilization found that 862 students reported experiencing suicidal ideation, and, of those students, the vast majority cited campus counseling centers as their source of treatment. Previous literature, however, has identified a large training gap in suicide prevention within the field of clinical psychology. Despite the extensive training of clinical psychology pre-doctoral interns (ie. 5-6 years of coursework and hundreds of hours

of clinical experience), previous literature found that only 53% of these interns had received any training in suicide prevention (Dexter-Mazza & Freeman, 2003). Given more recent concerns about the rates of suicide on university campuses, many administrators have focused on the improvement of college mental health centers. Evidenced-based practices (EBPs), or interventions, have proven to be effective in the reduction of suicidal ideation or number of suicide attempts. Safety Planning is a hierarchal list of steps that a suicidal individual can follow while in crisis, and has demonstrated to be extremely effective for clients in treatment or awaiting treatment. The objective of this study is to investigate college clinician knowledge of and fidelity to Safety Planning.

Liu, Amy; "*Understanding the Impact of Sponsored Search Systems that appear to be Free-er than Free****"***
The rise of online business and information platforms like Airbnb, Facebook, and Google, have transformed society, but not always for the better. A striking example of their unintended externalities occur in mandatory participation third party payer systems, or MP3PP's, in which these platforms enjoy immense power by becoming the primary channels through which merchants reach their customers. Our research focuses on online sponsored search, one of most profitable MP3PP industries, and the complex regulatory issues that come with manipulating search results for profit. Merchants have no choice but to pay search engines in order to gain any exposure, some compensating for poor service by paying more exorbitant amounts and thus hurting consumers.

Liu, Hunter; "*The Changing Brain Lab****"***
In order to better understand the factors that influence child persistence, a semi-longitudinal study over a two week period was used to study daily fluctuations in 3 year old teeth brushing. Previous studies support the idea that sleep affects cognitive and behavioral performance. As an activity that requires young children to listen to directions without receiving substantial short term benefits, teeth brushing length was one of the main variables of interest. Because of the substantial connections between sleep and child performance, two surveys were sent to each subject's parent every day. This allowed for data collection on length of sleep, child mood, parent mood, parent stress, and other factors that may influence teeth brushing length. Daily video submissions were individually viewed to calculate length of brushing and parental encouragement. From the 9 subject sample collected over the summer as well as the 19 subject sample collected beforehand, 26 subjects successfully completed the study by submitting a majority of the daily surveys with accurate teeth brushing videos. Analysis of the 26 subjects suggested a statistically significant positive correlation between the coefficient of variation of parental encouragement and coefficient of variation of teeth brushing length.

Liu, Ivy and Yarden Wiesenfeld; "*Pain and Itch Processing in the Lateral Habenula****"***
Chronic pain and itch are common disorders that substantially impair quality of life. For many years, itch-sensing neurons were believed to be a sub-modality of pain. The previous reigning model, called the intensity-coding theory, considered itch to be a sensation evoked by weak activation of neurons, whereas pain was elicited by strong neuronal activity. Experimental evidence has found specific molecular markers and itch-sensitive receptors that label itch neurons, suggesting a population coding theory in which pruriceptive nociceptors respond to both itch and pain stimuli while pain is detected by an additional population that only responds to noxious stimuli. Though recent research has clarified where itch and pain differ in the periphery, the circuitry and cellular mechanisms by which these two sensations are differently processed in the CNS remains unclear. The lateral habenula (LHb), a key brain region in the epithalamus that mediates aversive responses to unpleasant events, is robustly activated by pain and itch stimuli. This project aims to

develop techniques to accurately label neuronal activation in order to determine whether the LHb mediates divergent or shared processing of pain and itch. Through c-fos immunostaining of TRAP2 mouse brain and spinal cord sections, we quantified the efficiency and specificity of neuronal labeling after administering chloroquine (itch) and capsaicin (pain). While endogenous TRAP2 line marking and viral injection labeling proved successful, future steps include optimizing efficiency and specificity and determining the extent of pain and itch segregation within the spinal cord specifically.

Liu, Junduo and Nicole Mayer; "*Limitations of Anthropometric Adiposity in Global Health: Evidence from a Rural Peruvian Community****"***
The utility and simplicity of anthropometric measurements in clinical diagnostics has been widely recognized across the medical field, and measurements such as BMI (body mass index) are now standard benchmarks in any medical check-up. Anthropometrics are particularly useful in low-resource settings such as rural health clinics, as the measurements and calculations do not require advanced technology. However, much of the past research regarding anthropometrics has been conducted predominantly within Caucasian populations, and is therefore limited in scope and applicability. Further, given the rapid rise of metabolically-related and adiposity-based chronic diseases across much of the developing world, it is clear that in order to address these emerging health needs, anthropometric measurements and calculations must be revised to fit the diverse populations within developing nations.

In this study, the investigators explore the reliability and usefulness of widely-used anthropometric measurements towards predicting adiposity within a rural, high-altitude Peruvian community undergoing significant economic and nutritional transitions. Additionally, the authors also discuss potential implications and future directions for anthropometrics: how we can improve them, and their place in global health.

Lo, Emily; "*Mapping Pain's Affective Component: Characterizing Neural Circuitry of the Basolateral Amygdala and Nucleus Accumbens****"***
Chronic pain is a devastating and wide-spread condition, impacting approximately 20% of U.S. adults. Chronic pain has also been tied to opioid misuse, which alone costs the U.S. approximately $78.5 billion every year. Given the prevalence and consequences of chronic pain, there is an urgent need to comprehend the underlying neural circuitry of pain to identify non-addictive therapeutic targets. Recently, Dr. Corder and colleagues identified a subset of neurons in the basolateral amygdala (BLA), a brain region responsible for the unpleasant, negative affective component of pain. Future painkillers could potentially alleviate this negative affect to provide patients with pain relief without eliminating their nociception, or ability to detect and respond to damaging/potentially damaging stimuli. Thus, to further characterize the neural circuits responsible for the negative affective component of pain, the aims of my project were: 1) to quantify neurons activated by a painful stimulus in the nucleus accumbens (NAc), a brain region that receives input from the BLA; and 2) to identify neural regions that project to the BLA and are activated by pain. We hypothesized that neuronal activation in the NAc, measured with fluorescence in situ hybridization for the immediate early gene cFos, would increase upon painful stimuli. My quantification found that a pin prick stimulus increased neuronal activation in the NAc, particularly in anterior regions. To visualize projections to the BLA, I infused a Cre-dependent retrograde virus into transgenic mice, targeting their BLA with the aim of differentially labelling neurons that will be activated by noxious pin prick stimuli. We will eventually image the brains of the transgenic mice to examine whether input regions to the BLA will be labelled by the fluorescent virus. My projects suggest the BLA, NAc, and

other regions tied to this neural circuitry of pain could serve as promising targets for future painkillers.

Locke, Jennifer; "*Studying the Population of Variable Stars in the Dark Energy Survey"*
It has been proven that locating variable stars such as quasars and RR Lyrae can be very helpful for observational cosmology, such as probing galaxy evolution and mapping black hole growth, and locating low-luminosity dwarf satellites in the Milky Way, respectively. In order for the Large Synoptic Survey Telescope (LSST) to discover more objects when it opens in the early 2020s, algorithms need to be put in place to locate helpful variable stars first. The most common method is using the periodogram. We used DES data in the SN fields, which has a 6-day cadence in griz filters. Since the data is sparse, we needed to test the method's reliability. We aim to implement an algorithm that can build statistical samples of different types of variable stars in DES and LSST data, and to find the best method of implementation through simulation testing.

Lojeski, Cezanne; "*Tracking Fish Origins and Biodiversity Over the Last 34 Million Years"*
The first fishes of the earth made their appearance around 500 million years ago. Since then, these swimming organisms have only diversified. Whether it be the result of a rapid extinction or a more gradual environmental trend, fish species have continued to recover and develop throughout time. Environmental events, in other words, have had significant impacts on fish biodiversity and evolution. Ray-finned fishes, in fact, particularly survived a major extinction event around 66 million years ago and today make up one of the most diverse and dominant groups of vertebrates on the planet. Where these currently living fish specifically come from is not well understood, however; this is largely due to a lack of apt datasets that more accurately reflect the more recent fossil record. This study therefore seeks to create the first-ever database of fish biodiversity that spans the last thirty-four million years. To date, its catalogued data has been found to double, and in some cases nearly triple, that which was documented by the Paleobiology Database--a publicly accessible online database of fishes put together by paleobiologists since 1998. As this newly collected data will only continue to grow in the future, it will further be used to both track and predict the more recent evolutionary trends of fishes and their response to both glacial and interglacial periods as well as other climatic changes. As humans too are vertebrates, any diversification patterns of these fishes only further hold important implications for human evolution.

Lu, Alyssa; "*Discharging a Zinc-Iodine Battery Using a Metal-Air Battery for Low Cost Grid Storage"*
Renewable energy is taking hold in many global economies as a step toward prevention of the furthering of climate change, but its growth is limited by the high cost of grid storage—a necessary component to commercial scaling of green energy. This project examines a novel approach to grid storage by creating a profitable chemical that can be easily extracted from the battery and sold to offset the cost of the energy storage. This is done using two known batteries: zinc-iodine and zinc-air. Zinc-iodine batteries are normally used as secondary batteries with the coupling of the iodide/triiodide redox reaction, but in this project we demonstrate that charging the battery past this normal reaction to triiodide's conversion into iodine will cause higher energy density and a solid iodine precipitate that has commercial value. However, by charging to solid iodine, the zinc-iodine battery is no longer able to be discharged. For completing the purposes of grid storage, we examined removing the zinc electrode from the zinc-iodine system to place into a potassium hydroxide electrolyte and allow us to discharge using a conventional zinc-air battery setup.

These two batteries combine to make one useful way to store energy while creating a profitable off-product.

Lu, Louise Yi; "*A Discussion on Energy in Post-War Germany, Bauhaus Architecture****"***
This research project centers on looking from a more general perspective of the growth and changes in world energy systems starting from the 1900s till the early 2000s. A particular focus on how these energy systems impacted Germany and more specifically, Germany during and thereafter the Second World War. This study looks at how energy systems impacted the nation's political, economic and social customs through the architecture conceived at that time period. Bauhaus architecture sought to redefine human interactive experiences with space and the environment, and a focus on how energy systems such as the heating systems within the Bauhaus school symbolize a greater discovery on the at times obscure and ineffective energy solutions within these architectural ingenuities.

Lu, Michael; "*Arrhythmogenic Right Ventricular Cardiomyopathy: Characterization and Demographics of the Disease****"***
Arrhythmogenic right ventricular cardiomyopathy/dysplasia (ARVC/D) is an inherited cardiomyopathy that is characterized by significant myocardial fibrosis. Similar to other nonischemic cardiomyopathies, the extensive replacement of functional RV myocardium with fibrosis precipitates inhomogeneous conduction with slow and discontinuous electrical propagation, serving as a substrate for ventricular arrhythmias. In the modern day, catheter mapping/ablation therapy is the primary curative strategy to localize the associated abnormalities for ventricular tachycardia (VT) and to target the triggering area of tissue or arrhythmia circuit with ablation energy. As a premier center for electrophysiology research and clinical care, the University of Pennsylvania Health System (UPHS) has treated a large population of patients with ARVC. To organize the extensive patient health data for better understanding the disease and the underlying pathophysiologic arrhythmogenic substrate involved, a database of patients with ARVC managed within UPHS was generated. The patient population consisted of 107 patients who met the task force criteria for ARVC (78 men, mean age at onset of symptoms, 54.4 ± 16.2 years) from electronic medical records (EMR). Research Electronic Data Capture (REDcap), a browser-based, metadata-driven EDC software solution developed by Vanderbilt University, was utilized for data acquisition and analysis of patient EMR from the UPHS EPIC system. In general, the patient population's demographics and clinical manifestations resemble previous reports on ARVC (Tschabrunn et al., 2017; Hulot et al., 2004). This database of patients with ARVC will allow us to identify risk factors for cardiovascular mortality, while providing a focus on electroanatomical mapping data from mapping/ablation procedures.

Luong, Vivian; "*Convergence of EDE vs EDE-Q of BENTO Study Participants****"***
The Eating Disorder Examination (EDE) is the gold standard assessment for binge-eating disorder (BED). It's administered either as a structured interview (EDE) or a questionnaire (EDE-Q). This poster examines the convergence of scores between EDE and EDE-Q for participants from an ongoing IRB approved cross-sectional analysis of study participants recruited for a psychological treatment study for BED.
EDE was administered by a trained clinician, and EDE-Q was completed online through REDCap. Calculations included means, standard deviations, correlation coefficients, Cohen's d, and cronbach's alpha for four EDE subscales, global eating disorders psychopathology, and BE episode frequency: objective binge-eating episodes (OBE-episodes), objective binge-eating days (OBE-days), and objective overeating (OO's).

Participants scored higher on EDE-Q than EDE for all measures. There are strong or moderate positive linear relationships between all mesaures except Eating Concern and OO's, which have low or no relationship. In terms of Cohen's d in effect sizes, OBE-days are small, OBE-episodes and Eating Concern are medium, and OO's are large. Cronbach's alpha values are high for all subscales and global eating disorders psychopathology for both examinations, except for Weight Concern in EDE-Q.
Overall, participants over-reported on EDE-Q when compared to EDE. Most subscales and BE frequencies are positively correlated between the examinations, except Eating Concern and OO's. The largest difference between EDE and EDE-Q is OO frequency. All measures have high internal consistency, except Weight Concern in EDE-Q. A possible reason for over-reporting is that our treatment-seeking sample, with many participants recruited from inpatient settings, may have higher desire for treatment that may inflate their scores.

Lynch, James; "*Reconfigurable Origami Tessellations with Tunable Stiffness and Self-Locking Capabilities****"***
The ability for a system to change its function based on user-specified criteria is very advantageous in the design of smart structures. In the direction of versatility, we introduce a tristable origami unit cell with one degree of freedom and self-locking behavior called the rigid origami bellows. The construction parameters, initial configuration, and stable state of the rigid origami bellows unit cell dictate its reaction to an applied force. These various levels of customization provide a large parameter space in which the user can modify the unit cell's stiffness at particular instances in the folding motion. Certain combinations of construction parameters, however, yield internal self-locking of the rigid origami bellows unit cell. When self-locking occurs, two opposite vertices touch before the folding motion is complete, and the unit cell experiences a sudden and substantial increase in stiffness. Our analysis shows the existence of unit cells that can both fold flat and self-lock in the same direction depending on the unit cell's stable state. As such, the origami bellows can be stored in a flat state, deployed, and locked as a stiff structure without the need for external support mechanisms. This behavior is particularly advantageous in space structure design, where objects must remain compact during launch and ideally be deployed to large, versatile structures. With its significant level of customization and self-locking capabilities, the rigid origami bellows shows great potential as a stiff, stand-alone deployable structure.

Ma, Lucy; "*The Impact of Socially Stigmatized Pre-Existing Conditions on Outcomes after Trauma Injury****"***
BACKGROUND
Socially stigmatizing pre-existing conditions (SSPEC) may lead to provider minimization of patient symptoms and have been associated with negative outcomes. However, the impact of SSPEC on failure to rescue (FTR; death preceded by a complication) has not been evaluated. We hypothesized that increased SSPEC burden would be associated with increased complications, mortality, and FTR.

METHODS
In our retrospective analysis, we included adult patients (≥18 years) from the 2015 National Trauma Data Bank (NTDB), excluding burn victims and patients with Injury Severity Score (ISS)<9. We defined SSPEC using NTDB's comorbidity codes for alcohol use disorder, drug use disorder, and major psychiatric illnesses. We assessed injury intent and mechanisms by SSPEC. With SSPEC as the primary exposure of interest, we built multivariable logistic regression models on complications, mortality, and FTR while controlling for patient characteristics.

RESULTS
Of 366,370 patients (68% male, 72% white, median age 56, ISS 11), falls were the most common injury mechanism. Injury intent was more often homicide or suicide for SSPEC patients. In multivariable regression analyses, we found SSPEC patients were more likely to have complications (odds ratio [OR] 1.70, 95% CI 1.65-1.74), less likely to die (OR 0.43, 95% CI 0.38-0.48), and less likely to have FTR (OR 0.35, 95% CI 0.27-0.44). SSPEC patients show increased risk for unplanned intubation, drug or alcohol withdrawal syndrome, and deep vein thrombosis.

CONCLUSIONS
While it is reassuring that SSPEC patients have lower risk of mortality and FTR, the higher complication rates may indicate important morbidity that deserves further investigation.

MacVittie, Mary; "*Examining Gait in a TRPC3 Knock Out Mouse Model****"***
TRPC3 is a calcium activated cation channel that is expressed throughout the central and peripheral nervous system. The Luo Lab has previously investigated the role of TRPC3 in the sensation of itch. Ms. Beattie, an MD/PhD student in the Luo Lab, has found that TrpC3 KO mice show a significant increase in scratching behavior compared to wild type control mice. These experimental results suggest that TrpC3 may play a role in modulating itch behavior. A different TrpC3 null mouse line, named Moonwalker (Mwk) mice, have a gain-of-function point mutation (T635A) in the TrpC3 gene and show cerebellar ataxia. Footprint patterns were quantitatively assessed for gait width and step alternation uniformity in comparison to WT mice. Mwk mice displayed a significantly wider gait and irregular step alternation compared with WT controls. My goal was to investigate if mice from the TrpC3 KO line used in the Luo Lab exhibited a similar ataxia. After analyzing and comparing the footprint patterns for TrpC3 KO and WT mice, the results show that the gait of each genotype is very similar and does not indicate a large phenotypic difference. In addition, the WT mice presented with a larger alternation coefficient than the TrpC3 KO mice, illustrating that the TrpC3 KO mice did not exhibit noticeable ataxia or motor deficits. My findings reassure us that our TrpC3 KO mice do not exhibit motor or coordination deficits that could affect our studies on the role of TRPC3 in the sensation of itch.

Magee, Madison; "*Accessible Insight to Muscles and Movements****"***
The application of surface electromyography (sEMG) to the human body allows for an analyzation of muscle activity in a specific muscle area. Combining sEMGs and motion sensors may offer a greater understanding of how muscles are changing their output to match the needs while the body is in a certain position. Due to this, this project investigates the outputs of the triceps and biceps brachii during a strict bicep curl to determine if there is a relationship between muscles' output a degree of the forearm. If there is such a relationship, then the technology can be used to determine if the user is performing the bicep curl correctly. The project lastly proposes to investigate the validity of using an athletic compression sleeve integrated with sEMG electrodes and the motion sensors with the hopes of creating a low cost, easy method for others to obtain and study this data as well.

Maheshwari, Nikita; "*MHC Class II-Restricted Cryptic Epitopes in Influenza Infection****"***
Virally infected or cancerous cells present parts of proteins called epitopes on their surface, allowing immune cells to recognize and target them. Understanding which epitopes can be presented to the immune system during dysfunctional states like cancer and autoimmune disease can help us better understand the causes of these diseases and how to better treat them. It is possible that epitopes resulting from errors in protein production can be

presented and provoke immune responses in these diseases. Here, in a model of influenza (flu) infection, we hypothesize that a subset of immune cells called helper T-cells can recognize these non-canonical epitopes, termed "cryptic epitopes". Using mass spectrometry, we have discovered one potential cryptic epitope. This has the potential to greatly expand the current model of antigen presentation and to influence how immune therapies are designed.

Makale, Nancy, Elysia Baskins, and Dana Leifert; "*Dada Safarini****"***
Dada Safarini will travel to Kenya to distribute feminine hygiene kits to vulnerable girls aged 12-16. While distributing the kits, we will conduct an anonymous survey regarding their current improvised techniques to deal with menstruation. We will conduct informal group interviews. We will also visit a children's home in Mombasa for collecting information about subject's unmet feminine hygiene needs, as well as an informal settlement.

Massaro, Alexander; "*Ending Pandemics: Maximizing U.S. health aid to address today's major diseases and tomorrow's outbreaks****"***
This research was based around estimating lost GDP due to infectious and parasitic diseases in various regions around the world. When somebody gets sick and dies prematurely, (or if the disease forces them to leave the labor force) their potential labor productivity decreases which translates into lost GDP. By compiling a large data set of various diseases and GDP statistics from each country and performing some calculations using macroeconomic concepts, such as purchasing power parity, it is possible to actually calculate this lost GDP. Most of this lost GDP comes from low and middle income countries (LMIC) and can be prevented with proper public health measures. With a significant increase in GDP due to increased health, a LMIC country will be more likely to become developed in the future and the overall quality of life will increase. This data was then used in a larger study meant to influence US foreign aid policy and was even presented to a 2020 presidential campaign.

McLees, Morgan and Linda Ting; "*TrussBot: A modular, origami-inspired robot****"***
The TrussBot originated from a string and straw structure created by Mike Tanis, the resident artist under Penn physics professor Dr. Randall Kamien. In line with its structure, the TrussBot's main function is to be able to climb pipes of any radii. With our design, we aim to create a modular robot that can be assembled and disassembled intuitively, with the ultimate goal of making robot design more accessible.

Mendelson, Jonathan; "*Provenance-Guided Synthesis of Datalog Programs****"***
We propose a new approach to synthesize Datalog programs from input-output specifications. Our approach leverages query provenance to scale the counterexample-guided inductive synthesis (CEGIS) procedure for program synthesis. In each iteration of the procedure, a SAT solver proposes a candidate Datalog program, and a Datalog solver evaluates the proposed program to determine whether it meets the desired specification. Failure to satisfy the specification results in additional constraints to the SAT solver. We propose efficient algorithms to learn these constraints based on "why" and "why not" provenance information obtained from the Datalog solver. We have implemented our approach in a tool called ProSynth and present experimental results that demonstrate significant improvements over the state-of-the-art, including in synthesizing invented predicates, reducing running times, and in decreasing variances in synthesis performance. On a suite of 40 synthesis tasks from three different domains, ProSynth is able to synthesize the desired program in 10 seconds on average per task—an order of magnitude faster than baseline approaches—and takes under a second for 28 of them.

Mercho, Patrick; "*Characterizing the role of H3K27me3 in brain aging****"***
MicroRNA-34 has been shown to be an important regulator of brain aging in Drosophila melanogaster. Loss of miR-34 leads to reduced lifespan and brain degeneration. Importantly, miR-34¬ has been shown to inhibit Pcl and Su(z)12, two protein subunits of the Polycomb Repressive Complex 2. PRC2 adds a trimethyl group to lysine-27 on histone 3, and this histone mark (H3K27me3) is a known silencer of transcription. Interestingly, loss of miR-34 leads to an increase in global H3K27me3 due to the lack of suppression of PRC2. We hypothesize that global increase in H3K27me3 leads to a reduced fitness capacity of animals, with shorter life spans and adverse response to stress. Further, we hypothesize that there are important links to epigenetic activity of H3K27me3 in brain tissue. To explore this, we either increased the activity of PRC2 or decreased the activity of Utx, the H3K27me3 demethylase. Initial studies show that animals with increased H3K27me3 have a negative response to a heat shock and an increased total ubiquinated protein, a hallmark of aging - similar to animals with miR-34 loss. Further studies will characterize the impact of H3K27me3 in brain tissue, looking at both the epigenetic and transcriptional profile of animals with increased H3K27me3 This research will provide new insight into the epigenetic regulation of aging within the brain and potentially have relevance in understanding susceptibility to neurodegenerative diseases.

Messam, Brianna; "*Surface Geometry Manipulation of Magnetically Stimulated Elastomers****"***
Magnetorheological elastomer, also known as MRE, is an organic silicone polymer incorporated with iron particles. When exposed to a magnet, the iron particles roughly align with magnetic field lines. This changes the MRE surface roughness and surface geometry. An experiment was performed to further understand the characteristics of MRE surface geometry. MRE was fabricated by combining a mixture of two silicone rubbers with differing elastic moduli and carbonyl iron powder. A replica molding process was utilized to get cylindrical hole geometries into the surface of the MRE. Specially designed 3D printed molds were created with cylindrical pillars. After applying a release agent to the molds, the pillar geometries were embedded into the MRE, creating holes in the surface. Change in cross-sectional area of the +holes were observed and imaged using a white light interferometer. Image analysis software processed the images obtained with the white light interferometer. The analysis demonstrates that the cross-sectional area of the geometries increased by an average of 60% of its original area with increasing magnetic flux density. This significant increase in size has implications for use in tunable adhesives, which are adhesives that can switch between high and low adhesive states. Tunable adhesives have promising applications in surgical adhesives and wearable electronics.

Mhlanga, Munashe; "*Data Science methods and Human Behavior****"***
The Drift Diffusion Model (DDM) is a model that describes the decision processes in risky choice scenarios. It suggests that the deliberation process in binary choice can be described by a stochastic dynamic variable which is either moving toward acceptance or toward rejection. The DDM predicts that the starting point of the process determines the amount of time taken to decide, as well as the likelihood of accepting and rejecting. Through experiments measuring reaction time and computational modeling, we investigate how changing the starting point influences the decision made and the time taken to reach the decision

Michna, Mark; "*myDEx: An HIV Prevention Intervention for Single YMSM Dating Online****"***
We created an online HIV intervention called myDEx, short for My Desires and Expectations.This mHealth trial focused on creating an online app/website to give sexual

health and risk reduction information to young men who have sex with men, the group experiencing the greatest increase in HIV infections in the US. I was responsible for computing participants' engagement in the app, as measured by each user's time and use of different sections and activities within myDEx. After working through a few large spreadsheets,some interesting patterns emerged that could help create a more effective intervention system in the future.Moving forward, our online intervention can be better designed to encourage safer sex practices and reduce the transmission of HIV.

Miguez, Sofia; "*Bio 3D Printing of Bone Grafts for Non-Healing Bone Defects****"***
Bone disorders are becoming an increasing issue, especially with rising median age throughout the country. Traditionally, bone grafts, usually in the form or allografts, autografts, or synthetic grafts are used to restore damaged or missing bone. All options have major disadvantages. An allograft, bone from a donor, leaves a patient prone to rejection of the foreign species, disease transmission, requires time to find and coordinate and is expensive. When using autografts, bone from another location in the patient's body, one risks donor site morbidity, increased surgical time, more scar formation, and higher costs. Synthetic bone grafts of various stock sizes and shapes have been developed in an attempt to reduce cost and surgical procedures. However, the major challenge in creating successful bone grafts is obtaining a balance between sufficient mechanical stability and proper bone integration; without which, the graft could induce stress shielding, lose integrity, and not stimulate proper bone formation. The solution to these complications is to mimic the natural microstructure and shape of the patient's bone, but current grafts lack this much needed patient specificity.

Thus, this project proposes a novel technique to rapidly create a musculoskeletal graft that is generated from CT and MRI patient scans and 3D printed to obtain patient specificity. The goal of the project is to use different ratios of hydroxyapatite (HA) to polycaprolactone (PCL) to create scaffolds to compare the microstructure, cellular adhesion and biomechanical properties of the different ratios in order to investigate the optimized ratio of HA:PCL in bioink.

Miller, Alekso and Rachael Villari; "*Examining the Role of VTA Dopamine Neurons in the Control of Food Intake****"***
In this project we look at how stimulating VTA dopamine neurons affects feeding behavior and food-evoked dopamine release in the ventral striatum. Fiber photometry was used to record dopamine release, while feeding assays were used to assess food intake. It was found that stimulating dopamine neurons led to a decrease in both food intake and food-evoked dopamine release in the ventral striatum. A subset of dopamine neurons expressing leptin receptors was then explored. Stimulating only this subset of dopamine neurons also resulted in decreased food intake and food-evoked dopamine release. Lastly, it was observed that infusing leptin into the lateral ventricle decreased food intake. In conclusion, dopamine neurons expressing leptin receptors may be the driving force for the observed decrease in food intake. Further experiments may include inhibiting these neurons and observing the effect on feeding behavior.

Minga, Silvi; "*Is Interleukin-6 (IL6) signaling responsible for JAK1/STAT3 activation during dormancy in breast cancer cells?****"***
Current research and literature suggests that the IL6 cytokine family plays a role in the activation of the STAT3 transcription factor. There is evidence to suggest that STAT3 regulates the expression of genes that inhibit anti-tumor immune responses, promote tumorigenic inflammation, and help cells survive during dormancy. Understanding what happens upstream of the STAT3 phosphorylative pathway is important in developing

therapies to target the activities of this transcription factor. I executed a series of assays to define STAT3 activity during dormancy and assess the role of IL6 in the activation pathway for this transcription factor. After performing immunofluorescence (IF) and image analysis with cells from different timepoints during dormancy, I noticed that the percentage of STAT3 phosphorylation increased with time. I hypothesized that if there is something in the media that induces STAT3 phosphorylation, then if conditioned media (CM) from later timepoints in dormancy is applied to earlier timepoints I should expect to see more STAT3 activation than normal. Using IF I obtained evidence to support this hypothesis only for one timepoint. I also hypothesized that if IL6 signaling is indeed responsible for STAT3 activation, then the concentration of IL6 in the conditioned media should increase overtime during dormancy. I performed an ELISA assay to test this hypothesis, however the assay was not sensitive enough to detect the cytokine of interest. I then used qPCR to evaluate the expression of genes in the IL6 family and found that some genes are up-regulated with time during dormancy while others are down-regulated.

Miranda, Christina; "*Establishing a Neuron-Glial Co-culture to Examine Autophagy in Response to Cellular Stress****"***
Neurons depend on glia to maintain homeostasis and proper functioning of the nervous system. Neurons also depend on robust quality control pathways, such as autophagy to maintain cellular homeostasis by eliminating damaged proteins and organelles from the cytoplasm (Kulkarni & Maday, 2018). However, how neurons and glia work together to coordinate autophagy and regulate homeostasis in the brain is unknown. During the process of autophagy, an autophagosome engulfs proteotoxins and fuses with a lysosome to allow for degradation of cargos. This mechanism of waste elimination is essential to neurons as they are post-mitotic and cannot rely on cellular division to reduce toxins. In fact, defects of autophagy are linked to neurodegenerative diseases in humans, such as Parkinson's and Alzheimer's disease. Thus, studying the interactions between neurons and glia may illuminate the role that glia play in autophagy and their potential protective function against neurodegenerative disease.

My primary aim was to establish a robust system to co-culture neurons and astrocytes to examine cell-type specific differences in how autophagy and degradative pathways are regulated in response to various paradigms of cellular stress. The co-culture system that I established results in star-like morphologies of astrocytes, reminiscent of structures observed in vivo, in contrast to polygonal morphologies when cultured in isolation. This co-culture system works with neurons and astrocytes sourced from various brain regions and rodent species. Using this co-culture paradigm, I have conducted functional assays to examine how neurons and astrocytes regulate autophagy in response to synaptic activity and metabolic stress.

Moore, Jewelianna; "*(Hexamethylbenzene)Ru Complexes for the Aldehyde-Water Shift Reaction****"***
The conversion of aldehydes to carboxylic acids was investigated using a (hexamethylbenzene)ruthenium dimer and a series of (hexamethylbenzene)ruthenium monomers. As opposed to traditional heavy metal oxidants which produce hazardous waste, this reaction, the Aldehyde Water Shift (AWS), uses water as the oxidant and produces dihydrogen as a byproduct. A variety of aldehyde substrates were screened for selectivity of the acid product as well as the yield. High acid selectivity was found across precatalysts and substrates, but acid yield was highly dependent on the system. Precatalysts investigated were superior to previous catalysts systems for the AWS.

Moreno, Amanda and Suditi Rahematpura; "*Activation of amylin receptors in the nucleus accumbens shell reduces oxycodone-taking and -seeking behaviors in rats"*
While prescription opioid analgesics are efficacious in treating nociceptive and inflammatory pain, long-term use of these medications may lead to opioid use disorders. Thus, there is a critical need for the development of novel adjunct pharmacotherapies that can treat pain while reducing the abuse liability of opioid analgesics. Recent studies indicate that systemic administration of amylin, an endogenous metabolic factor produced by pancreatic β-cells, reduces oxycodone taking- and seeking-behaviors in rats. Amylin crosses the blood brain barrier and binds to amylin receptors expressed throughout the brain, including the nucleus accumbens, a brain region known to mediate the reinforcing effects of opioids. Emerging evidence indicates that amylin produces analgesic effects in rodent pain models. Together, these findings suggest that activation of central amylin receptors may modulate both the reinforcing and analgesic effects of prescription opioids. The current study sought to identify the effects of amylin receptor activation in the nucleus accumbens shell on opioid reinforcement and analgesia. We hypothesized that amylin administration directly into the nucleus accumbens shell would reduce oxycodone taking- and seeking-behaviors without producing adverse feeding effects or compromising oxycodone-induced analgesia. Our data show that activation of amylin receptors in the accumbens shell attenuates oxycodone self-administration and the reinstatement of oxycodone-seeking behavior, an animal model of relapse. These behaviorally-relevant doses of amylin did not affect ad libitum food intake, body weight, or oxycodone's antinociceptive effects. Overall, these preclinical findings suggest that central amylin receptors may be targeted to treat opioid use disorder.

Rahematpura, Suditi and Amanda Moreno; "*Cell type-specific effects of amylin in the nucleus accumbens on opioid-induced behavioral and analgesic responses"*
Opioid abuse has become a public health epidemic, for which it is crucial to develop novel pharmacotherapies. Emerging evidence from our lab suggests that activation of central amylin receptors attenuates oxycodone self-administration in rats without compromising the antinociceptive effects of oxycodone. Amylin is a neuropeptide secreted from pancreatic β-cells that binds to and activates central amylin receptors in nuclei known to regulate the reinforcing effects of drugs of abuse, including the nucleus accumbens. The goal of the current study was to expand these studies and identify the neural circuits and cell types that regulate the effects of amylin on opioid-induced reinforcement and analgesia. Specifically, we determined the functional significance of amylin receptors expressed on D1R- and D2R-expressing medium spiny neurons (MSNs) in oxycodone-mediated behaviors. While our sample sizes are small, our preliminary data suggest that amylin receptors expressed on D1R, but not D2R, -expressing MSNs in the accumbens shell play a critical role in the suppressive effects of systemic amylin on oxycodone taking in rats. Specifically, viral-mediated knockdown of amylin receptors in D1R-expressing MSNs reduced oxycodone self-administration and motivation to consume oxycodone, without affecting the antinociceptive properties of oxycodone. Overall, this study is the first to determine cell type-specific roles of nucleus accumbens amylin receptors in motivated behaviors generally and addiction-like phenotypes specifically.

Morgan, Marvin; "*Close Encounters of Stars in the Solar Neighborhood"*
I began my undergraduate research by studying the galactic dynamics of the Milky Way Galaxy. I specifically investigated the rotation curves and mass distributions of the Milky Way based on stellar orbits in the solar neighborhood. Under the supervision of Professor Robyn Sanderson, I then began exploring close encounters of stars with possible oort clouds and exoplanets with nearby stars using data from the Gaia and Kepler Space Telescopes. This research is very important because if two stars (large gravitational

presences) come too close to each other they can cause disturbances and perturbations in both systems.

Mushakevich, Anya; "*SPACES****"***
The SPACES project focuses on developing a VR tool allowing audiences to experience ceremonial processions in the Penn Museum. The subsection of the project my group focused on was modelling and animating the musical instruments utilized in the Qoyllur Rit'i Festival processions. The models were placed in context through rigging and animating the clothed human models in walk cycles and carrying the musical instruments with a number of software tools, including Marvelous Designer, Autodesk Maya, Advanced Skeleton, Substance Painter, and ZBrush. The final products can be synthesized with the crowd simulation and landscape portion of the SPACES project.

Mutabazi, Arnaud; "*African youth Leadership project****"***
This study explores the impact of youth leadership programs targeting the African youth and aims to understand the leadership experiences of those young leaders during and post those programs. To understand this recent phenomenon, the earliest stage of the research entailed collecting information and mapping different leadership initiatives across the world that targets young Africans. As part of the second phase of the study, leadership experiences have been collected through surveying and interviewing programs' alumni. Currently, the study is still in the data collection phase which will be followed by an analysis to better comprehend the leadership trajectory of those young leaders, and assess the effectiveness of those initiatives on the continent.

Muthukrishnan, Ramya; "*Using Interictal Data to Identify the Seizure Onset and Resection Zones in Epilepsy Patients****"***
Patients with drug-resistant focal epilepsy often undergo surgical removal of epileptogenic tissue to prevent further seizures. Prior to surgery, the epileptogenic zone (EZ) must be identified using intracranial EEG (iEEG) data recorded during seizures. Clinicians often withdraw medication to induce these seizures, causing patient inconvenience and even morbidity. This study aims to use interictal data to identify the EZ. For each patient in the study, we selected 6 hours of continuous interictal iEEG data and generated two features of interest: interictal spikes and network control centrality. We calculated the number of spikes per electrode using a spike detector. We computed functional connectivity matrices, representing the pairwise correlation in iEEG signals, to calculate control centrality, which measures each electrode's ability to synchronize the network. We used the clinically identified seizure onset zone (SOZ) and the surgically removed resection zone (RZ) as proxies for the EZ. The SOZ/RZ showed significantly greater spike counts in comparison to the rest of the brain, confirming previous findings that interictal spiking is associated with the EZ. Furthermore, post-surgically seizure-free patients trended toward lower spiking outside the RZ. Average control centrality of RZ electrodes was also significantly higher than control centrality outside the RZ, suggesting that the EZ might be desynchronizing in the interictal network. A k-means clustering algorithm was used to determine whether both features could be used together to better identify RZ electrodes. It displayed high specificity but low sensitivity and suggested that interictal spikes are a better predictor of the EZ than control centrality.

Nash, Jamie and Bala Thenappan; "*Trends in Executive Branch Power****"***
Our project tracked trends in Executive Power through an analysis of views letters, letters sent to Congress by the Department of Justice to communicate the President's views on proposed legislation. We found that the content and purpose of the letters, from the late 1940s to the present, changed substantially over time, reflecting changes in the power of

the presidency. With time, letters focused more on constitutional issues, specifically the separation of powers between the executive and legislative branches, and less on policy concerns. We also found that view letters are generally ineffective in influencing the legislative process and serve more as a catalog of the Executive Branch's views towards certain policy and constitutional issues.

Nguyen, Duc; "*HIV Integrase Catalytic Core Domain Structure****"***
HIV is a virus that has caused over 2 million deaths per year. A protein that is vital for the functioning of this virus facilitates the fusion of the HIV genomic data into the human genome, which would allow its gene to be transcribed and translated. This 32-kDa protein integrase has 3 domains, the C-terminal, the catalytic core, and the N-terminal domain. The catalytic core domain (CCD) is necessary for the main catalytic activity, and HIV integrase inhibitors target this site for protein dimerization and inactivation. We investigate the structure of the CCD interaction with different drugs using X-ray crystallography, a technique that involves shining X-ray beam into ordered protein crystals. From the results, we could see that the drugs are located near the amino acid tryptophan located on the surface of the protein, presumably through □-to-□ interaction. In the future, we are looking forward to comparing the dissociation constant and the functional group of each drug, and from there deduce its mechanism of binding.

Nieto, Vanessa; "*Code-Switching: Interpretations in Spanish-English Bilingualism****"***
Code-switching describes the alternation of two or more language varieties or multiple languages within a single conversation. Many multilinguals code-switch in their everyday lives when speaking to other individuals, especially friends and family members, who hold similar levels of fluency as themselves. Previous studies and observations have shown how grammatical constraints exist in intrasentential, intersentential, and extrasentential forms of Spanish-English code-switched sentences. As such, without being explicitly taught what is right from wrong in code-switched varieties, speakers usually carry an intuition in how to switch between languages, and when another speaker is "properly" code-switching too. In this way, the following study explores the possible differences between individuals' prescriptive ideas about Spanish-English code-switching, whether these ideas follow the grammatical constraints found in previous studies, and whether multilinguals actually follow such rules in a descriptive manner. Furthermore, this project also explores whether these grammatical constraints held by Spanish-English speakers are also applied by individuals across other languages. For example, after learning an alien language and having to communicate with other individuals using such novel language would speakers be more likely to follow their previous intuition about code-switching, or rather create their own rules while using this alien language?

Norton, Ryan; "*Investigating How Well Emotion Translates Over Text Messages****"***
This summer I worked as a research assistant for Dr. Gareth Roberts in the Cultural Evolution of Language Lab. Under his supervision and guidance, I codeveloped an experiment that asked the following question: How accurately does emotion via visual cues and verbal expression translate over texting between a sender and receiver? In the experiment, two participants (the sender and receiver) are seated in front of computers in separate cubicles. The sender is shown a video of an actor saying a sentence while expressing one of six basic emotions. The sender then relays the spoken message to the receiver using a texting interface. Both participants identify and rate the emotion being expressed and the disparity between the two ratings is compared. Three different conditions are used for comparison: one with the use of emoji, one without the use of emoji, and one where the sender can represent the video's sentence in their own words. These different conditions shed light on whether the transfer of emotion is significantly affected by emoji

usage and extended descriptions. After officially running the experiment during the upcoming year, it is predicted that more emotion will be "lost in translation" over texts that do not feature emoji than over texts that do feature emoji. Additionally, it is predicted that letting the sender represent the video sentence in their own words will help ensure better transfer of emotion over text.

Nouriyelian, Joshua; "*Vowel Categorization in a Conversational Corpus****"***
Children learn languages "from scratch", without formal instruction, in a process that starts when they are babies. How do babies do it? To understand what infants get out of language, we need to look carefully at the speech they hear. This project is all about characterizing language that infants could hear. Using the data from four women aged 20-30 from Buckeye Corpus data, I obtained two sets of f1 and f2 formant measurements for each vowel taken at 5 points in time through the vowel. One set of measurements assumed four formants, and the other using five formants. Through the use of python, I also merged phone data and word data so that I was able to tell which word each vowel token came from. After loading the data into R, I determined which set of measurements better represented the actual speech, finding that the midpoint four formant measurements was the best. Further analyzing the data, I determined which data points were incorrect/poor measurements and rescued them using a combination of a linear regression as well as referring to the other set of measurements to find a suitable replacement. I then restricted the dataset to only vowels that appeared somewhat frequently and used clustering algorithms to see what categories could be determined.

Okonkwo, Chinaza Ruth, Aseal Saed, and Biruktawit Tibebe; "*Project: Tracking Social Change in Philadelphia and Africa****"***
"Re/Member Black Philadelphia" and "Tracking a New Generation of Leaders" are two distinct research projects. The "Re/member Black Philadelphia" project investigates the fraught past, present, and future of Black Philadelphia and the increasingly "endangered spaces" of Black social and cultural practice against the backdrop of the systematic displacement of longtime Black residents. The project consisted of working together with a team of ethnographers, media makers, educators, and historians to delve into the history of Black Philadelphia. The investigation combined interviewing members of Black Philadelphia's community, filmmaking, oral history techniques, as well as learning how to use geospatial and 3D immersive technologies all to delve into exploring the significant social and cultural sites around Philadelphia, as well as hear the stories of those who inhabit it. The project is currently ongoing and will continue to study and research the rich history that Black Philadelphia possesses and to help teach the lived realities of marginalized populations and spaces. "Tracking A New Generation of Leaders" is a multinational qualitative project that explores the role of educational development in the production of a new political leadership class in Africa. The leadership programs targeting African youth that are the focus of this study have an explicit mission of developing the capacity of African youth to play a leadership role in their societies and provide some form of academic and professional training or support and we seek to understand the leadership experiences of trajectories of African youth who identify as rising leaders.

Orner, Paige; "*Influence of reported structure on multiple dots recall****"***
How does the perceived spatial context of a stimulus bias the stimulus' relative location during recall? For this exploratory study, this question was simplified to: Does the spatial context of two dots embedded in a dot image systematically bias their recall? It was predicted that dots identified as belonging within the same cluster would be placed closer together during recall (exhibiting attractive bias), while those across clusters would be placed further apart (repulsive bias). A psychophysical task of 160 experimental trials was

developed in which subjects, following the brief presentation of a dot image, recalled the locations of the dots on the screen. In the last 80 trials, between stimulus presentation and recall, subjects also reported their understanding of the structure of the dot image by identifying clusters of dots. By matching recalled dots with a subject's identified clusters, analysis shows that trials in which subjects were asked to identify a stimulus' structure show significantly stronger repulsion during recall of dots that are across clusters than within.

Ortega, John; "*Nun Left: The Disappearing Angels of Mercy****"***
This study explores the reasons and forces that led to a shift within Catholic hospital staffs in the United States from nuns to laypersons post-1960s, which was around the time of the Second Vatican Council. It will analyze the changing identity of these institutions and how they embody the tenets of the Catholic faith. In addition, this study aims to find how Catholic sisters are involved in the U.S. health care landscape in the present day. Using interview-based research, I mainly interacted with nuns who worked at Catholic health care facilities.

Orth, Rachel, Tracy Tran, and Xiaotong Zhu; "*Relationship Between Canine Insulin-like Growth Factor 1 (IGF-1) Expression and Immunosuppressive Activities****"***
Insulin-like growth factor 1 (IGF-1) circulates in the bloodstream of mammals to direct growth and development. In dogs, the level of IGF-1 circulating in the bloodstream has been shown to be a major contributor to the uniquely wide range of sizes among different breeds. Additionally, the literature suggests that the level of IGF-1 in dog serum correlates inversely with longevity and possibly susceptibility to diseases. The connection between IGF-1 and the canine immune system has not yet been clearly characterized, thus we hypothesized that IGF-1 expression is related to immunosuppression. Preliminary data from last summer indicated that distinct subsets of low-density myeloid cells express the IGF-1 receptor and raised the intriguing possibility that these subpopulations included immunosuppressive cells. The 2019 CANINE summer team continued attempting to identify these cells in canine blood. To characterize IGF-1 responsive cell types, the team split up to examine cell signaling and gene expression in parallel. One group used flow cytometry and cell surface markers to help identify specific populations of cells and discover their relationship to IGF-1R. Another group extracted RNA and analyzed gene expression in the same cell types to confirm the expression of IGF-1R genes. In coordination with the Oliver Garden lab, we used flow cytometry to measure the production of reactive oxygen species (ROS) by different cells in response to stimulation with E. coli. This form of oxidative burst is a known bacterial killing strategy, and we hypothesized that it may also be involved in immunosuppressive functions.

Orth, Rachel; "*Measuring Oxidative Burst Following Bacterial Stimulation of Canine Polymorphonuclear Cells****"***
Neutrophils, or polymorphonuclear leukocytes (PMNs), are an important subset of white blood cells involved in protecting the host against invading pathogens such as bacteria, protozoa, and fungi. Granulocytic myeloid-derived suppressor cells (PMN-MDSCs) characterized as an immature version of these phagocytic cells. However, these PMN-MDSCs have their own immunosuppressive functions and have been shown to increase in proportion during bacterial infections as well as other pathological states. Previous research focused on identifying and characterizing these PMN-MDSCs in canines has shown that they are present in higher frequencies in the peripheral blood of dogs with cancerous tumors compared to healthy controls. These cells release reactive oxygen species (ROS) among other cytokines as a mechanism for killing bacteria and performing their immunosuppressive functions. Based on this information and previous research suggesting

a relationship between the ability of MDSCs to respond to bacterial infection and their immunosuppressive activities, the present project set out to measure the production of ROS (also called oxidative burst) by canine PMNs and PMN-MDSCs in response to stimulation with the Gram-negative bacteria E. coli using flow cytometry. These results were also compared between cell types as well as between healthy patients and patients with cancer in order to analyze whether the pathological state of the patient had an effect on their cells' ability to respond to pathogens.

Paleologos, Nicholas; "*Activation of Microglia After Closed-Head Diffuse Traumatic Brain Injury in Swine****"***
Every year in the United States, over 2.4 million people are victims of mild traumatic brain injury (mTBI), otherwise known as concussion. It has been established that concussion can produce diffuse axonal injury, and we have recently shown that areas of the hippocampus and corpus callosum (CC) may also be particularly vulnerable to neuropathology. Microglia, as the resident immune cells of the CNS, play a pivotal role in maintaining homeostasis after TBI. Activated microglia are morphologically and biochemically distinct from their resting state.These cells can activate in response to local signals and migrate to areas affected by injury. The activation is believed to depend on the release of damage-associated molecular patterns (DAMPs) by injured neurons and the recognition of these molecules by microglial cell-surface receptors. The secretion of DAMPs is believed to promote a pro-inflammatory state in microglia which can cause harmful cytotoxic effects in healthy cells nearby if the neuroinflammatory response becomes dysregulated. Some of the factors secreted by pro-inflammatory microglia have been shown to promote neuronal death at chronic time-points and prolonged intervention has been linked to epilepsy and neurodegeneration.

In the current study, we aim to elucidate the functional phenotypes associated with chronic neuroinflammation in the hippocampus and CC using a porcine model of closed-head rotational acceleration-induced diffuse TBI that mimics the biomechanical etiology of concussion in humans. Based on human and rodent TBI studies, we hypothesize that microglial activation and function vary in a temporally sensitive manner and is associated with axonal injury after diffuse TBI.

Paolicelli, Michelle; "*Human Factors Engineering Approach to Address Nurse Workload and Alarm Fatigue****"***
Alarm fatigue is defined as the desensitization to alarms after a period of repeated exposure. In the hospital setting, alarm fatigue is most often experienced by unit nurses and poses a serious safety risk for patients. A lack of standardized guidelines and over-caution have led to over-monitoring of patients and in turn, an overabundance of false alarms. Overtime, nurses begin to discern which alarms are most vital to respond to based on their knowledge of their patients as well as their overall experience. Due to the limited time and resources possessed by nurses, alarm fatigue has led to important alarms being inadvertently unattended to, putting patient well-being at risk.

The Patient Safety Learning Lab at CHOP aims to re-engineer the system of monitoring hospitalized children on acute care wards, with a focus on reducing non-informative alarms and accelerating nurse responses to critical events. The first step in this process is to measure subjective nursing workload and measure its association with the number of alarms received by the nurse. Using the validated, multi-dimensional NASA Task Load Index (TLX) questionnaire, we quantitatively measured six aspects of nurses' workload: physical demand, mental demand, temporal demand, performance, effort, and frustration. A similar study found that with each 5-point increase in a nurse's TLX score during a shift,

there is a 34% increase in the likelihood of nursing error, confirming our early statistical analysis that has shown perceived workload is generally high (above 50) for all aspects indicates a need for change in nursing workflow.

Parchure, Shreya; "*Brain Derived Neurotrophic Factor Gene Polymorphism Predicts Response to Transcranial Magnetic Stimulation in Stroke Patients****"***
Continuous theta burst stimulation (cTBS) is a type of non-invasive brain stimulation that employs strong magnetic pulses to spur neuron firing. The high degree of inter- and intra-individual variability observed in response to cTBS thus represents an obstacle to its utilization as a treatment for neurological disorders. The brain-derived neurotropic factor (BDNF) gene may influence the capacity for neuroplastic changes that underlie the effects of cTBS. Healthy Val66Val carriers have been shown to respond to rTMS in the expected fashion, while healthy Val66Met carriers showed little or paradoxical effects of the stimulation.

This study examined the effects of BDNF polymorphism on the response to cTBS in patients with chronic Stroke. Val66Val carrier patients showed a significant decrease in excitability, while Val66Met showed a significant increase. Thus, BDNF genotype is a factor that differentially affects variability in cTBS response in patients. This is important as BDNF polymorphism genetic screening to stratify patients prior to use of cTBS as a neuromodulatory therapy may optimize response rates.

Park, Jang Jun; "*OMNIREP and Genetic Programming****"***
OMNIREP is a coevolutionary algorithm used to simultaneously find both a representation and an encoding for a particular evolutionary computation problem. In this paper, we implement OMNIREP to solve genetic programming problems using the DEAP (Distributed Evolutionary Algorithms in Python) library.

Park, Seeun; "*Effect of Sleep Deprivation on Hippocampus-Dependent Memory****"***
The idea that a good-night's sleep is critical to good memory is almost an axiom. Yet, the scientific proof behind this claim is still very amorphous. For a more specific observation on the association between sleep and memory, I have focused on sleep deprivation and its impact on contextual memory. Contextual memory commonly refers to the animal's spatial, social, emotional, and temporal memory associated with a particular event, and its retrieval is known to be dependent on hippocampal function. In order to observe the impact of sleep deprivation on contextual memory, I conducted a fear conditioning experiment and a simple object location memory paradigm using experimental mice. Experimental mice for both experiments underwent 5 hours of sleep deprivation immediately after being trained, and experiments were scheduled so that sleep deprivation could start at the beginning of the light phase. Test results when compared to the control animals that underwent a normal sleep cycle demonstrated a statistically significant level of contextual memory impairment. A modification of the fear conditioning experiment, in which I allotted five days of recovery time for the mice to return to its normal sleep cycle, further suggested that sleep deprivation impaired contextual fear retrieval. After the mice had recovered from the sleep deprivation, the experimental mice demonstrated a similar level of contextual fear memory to the control mice. In conclusion, I could demonstrate that sleep deprivation has the most impact on contextual memory retrieval, and that contextual memory can be rescued with enough recovery sleep.

Park, Suh Jung; "*The relationship between cognitive insight and symptoms in first episode psychosis****"***
A lot of research in the past has focused on clinical insight, which is associated with multiple dimensions of neuropsychological functioning in individuals on the psychosis spectrum. Cognitive insight, which entails the evaluation of distorted beliefs and appraisals, has been gaining more attention as a factor that may be able to predict psychopathology and treatment outcomes in this population. The Beck Cognitive Insight Scale (BCIS) includes two sub-scales, self-certainty and self-reflection, and has been used to measure certainty about convictions and resistance to correction. In my study, I took a look at the relationship between cognitive insight as measured by the BCIS and the positive, negative, disorganized, and general symptom domains of psychosis, as well as that between cognitive insight and functional outcomes.

Patel, Deep; "*Identifying neural substrates of resilience to stress****"***
Stress is a factor that affects nearly every type of animal in many different forms, leading to both short-term effects and long-term effects. Stress tends to affect every person differently, and therefore is important to attempt to understand the reasons for this variability in order to improve treatments. This project uses rodent models to examine resilience or vulnerability to repeated social stress, manipulates brain structures and substrates to determine the impact on behavior and physiology. Typically, the animal that is being socially defeated is studied to examine the effects, but in this case, the social defeater is being studied to study any changes in behavior, especially changes in maternal behavior towards their pups.

Payne, Sarah; "*Cognitively-motivated Models of Semantic Composition****"***
Natural Language Processing (NLP) is the branch of Computer Science dedicated to human-language-related tasks. In NLP, words are represented by fixed-length vectors called embeddings. Representing words as vectors allows us to apply vector operations to NLP problems. For example, we can measure the similarity of two words by taking the cosine of their embeddings, or finish analogies using addition and subtraction (e.g. the vector corresponding to "king"- "man" + "woman" is closest to the embedding for "queen").

We use co-occurrence to calculate embeddings because words that occur in similar contexts are likely to have similar meaning. For example, "cat" and "dog" might occur more with "pet" or "fur" than "apple" would. We can incorporate visual information into embeddings as well, creating multi-modal embeddings that approximately mimic the way humans store word meaning. However, we have yet to find a satisfactory method to construct embeddings for phrases. Simply using co-occurrence results in sparse vectors in this case because most phrases occur far less frequently than single words.

The meaning of a phrase can be viewed as a function of the meaning of its constituents – an idea called compositionality. Thus, phrase embeddings can be composed from word embeddings, which we know how to create. In this work, we compare the performance of cognitively-motivated multi-modal embeddings to text-only embeddings on existing composition functions. Subsequently, we introduce novel composition functions that employ syntax. We show that our embeddings and composition functions correlate better with human judgements than those in previous work.

Peck, Toni-Ann; "*Redesigning the Bilateral Assessment System****"***
The Bilateral Assessment System (BiAS) was designed to provide a means of quantitative assessment of the gross motor skills of people with stroke and was later adapted for use in

robot-assisted rehabilitation. To this end, BiAS is intended to be used to collect bio-kinematic data and improve interactions between robots and patients. The purpose of this project is to optimize BiAS for use in future studies. Its redesign consists of improvements to its circuitry and the development of a user interface for accompanying software. The listed adaptations of the system will allow BiAS to be more portable, affordable, and powerful.

Peng, Alina; "*Water Scarcity in Bhutan through the Gender Lens****"***
Over four billion people in the world currently face severe water scarcity, a fast-growing statistic that is exacerbated by the rising global population and worsening effects of climate change. Even though Bhutan releases little carbon emissions, it is a nation that is adversely impacted by climate change and ultimately, water scarcity. To focus on affected populations, we will visit the villages of Laptsakha in Punakha, Phangyul in Wangdue, and Pumar in Pemagatshel. In each village, qualitative research will be used to identify locally relevant experiences related to water scarcity, through 1:1 interviews and focus group discussions. Surveys with questions on demographics, gender dynamics, water adequacy, access, and adaptation will then be distributed to 30 people in each village to measure the impacts of the environmental change. This approach will provide both quantitative data and social dimensions to the issue of water scarcity. The onsite portion of the trip will occur in December of 2019.

Perez, Javier; "*Rap1 and Histone Interplay in the Toxic Effects of Rap1****"***
Rap1 (repressor-activator protein) is a chromatin protein conserved from yeast to man. In yeast, it plays two major roles. First, it binds the promoter DNA of ~10% of genes, particularly highly expressed genes such as those encoding ribosomal proteins. At such genes, Rap1 binding results in the displacement of nucleosomes from these promoters, thus facilitating gene activation. Second, it helps assemble transcriptional silencing complexes at silent mating loci and at telomeres. Our lab discovered that when telomeres are shortened due to genetic inactivation of telomerase, Rap1 relocates from shortened telomeres to the promoters of hundreds of new target genes, where it displaces nucleosomes and upregulates transcription. It also relocates to the promoters of the core histone-encoding genes and downregulates their expression. Overexpression of Rap1 has long been known to be toxic and my project attempts to understand if the previously mentioned functions of Rap1 can help in understanding the mechanisms of Rap1 toxicity. In particular, I hypothesized that Rap1 overexpression might interfere with normal histone functions. Indeed, I have found that Rap1 overexpression is synthetically toxic when histone levels are reduced experimentally. I have also found that a Rap1 point mutant (Rap1SHY), which prevents normal Rap1-histone contacts and diminishes nucleosome displacement by Rap1, may modulate this synthetic toxicity

Pfrommer, Samuel; "*Sample-Efficient Learning of Rigid Body Dynamics Models****"***
Current analytical physics models fail to fully capture rich contact dynamics, while purely learned models are sample inefficient and require prohibitively large amounts of data. Furthermore, state-dependent analytical formulations are difficult to train due to contact non differentiability causing large zero-gradient regions in parameter space. We introduce a dynamics error penalty to induce a tradeoff between satisfying model constraints and matching ground-truth state measurements. With an approximate contact model, this translates to embedding several differentiable, convex quadratic programs into a larger neural network for end-to-end training. We demonstrate that our approach expands non zero gradient regions for simulated scenarios and outline plans for testing this setup on a LBR iiwa arm.

Potter-Schwartz, Mira; "*Evaluating the Effect of Mexico's Prospera Program on Access to Education and School Choice****"***
My summer research project examined Mexico's Prospera Program. Prospera is a conditional cash transfer program and the main component aims to encourage consistent school enrollment. My research focused on access to education and school choice. Communities in Mexico have a wide range of access to Conafe (compensatory schools primarily targeted at marginalized, rural, and indigenous populations), General, Private, and Indigenous primary schools, and General, Private, Technical, and Telesundaria secondary schools. I created maps, plotting primary and secondary schools based on varying characteristics including average school Math and Spanish test scores, poverty level, Prospera ratio, school type, and school size. I also built a probit model, which estimates a student's probability of dropping out of school between grades 6 and 7 conditional on the students' Prospera status, parent education level, Math and Spanish test scores, type of grade 6 school attended, family income, and distance to the nearest grade 7 school, among other attributes. Finally, I studied data relating to school choice, with the goal of understanding the number of school choices students have when transitioning from grade 6 (primary school) to grade 7 (secondary school). This research includes identifying the number (and types) of secondary schools within a three-kilometer radius of each student's primary school and analyzing how these numbers differ between different states and regions in Mexico. I plan to use this information to understand the impact of school access on school enrollment and how families decide which secondary school (if any) to send their child.

Purcell, Adriana; "*An Evaluation of the Maternal Infant Program of Hospitalito Atitlan for High-Risk Indigenous Mothers in Rural Guatemala****"***
The Maternal Infant Sponsorship Program of Hospitalito Atitlan, located in Santiago Atitlan, Guatemala, was created to support the highest risk mothers of the indigenous Santiago community. Evaluations of risk are based on socioeconomic status, age, number of pregnancies, lack of social support, and previous health history of pregnant mothers. Historically, comadronas, or traditional birth attendants, attend births in the home. With home births, there are no solutions regarding pregnancy complications. There is a high risk for complications during pregnancy in indigenous women due to high rates of diabetes, a lack of formal education, and language barriers. Due to these risk factors, prenatal care and hospital births were made mandatory in the program. The program was evaluated for overall effectiveness in providing education to mothers and aiding in healthy infant development.

The Program provides participants with prenatal care, delivery services, postnatal care, and monthly health education meetings led by a social worker and pediatrician. One component of this program is every enrolled child is provided with free medical care access. Participants are financially dependent on international donor sponsorship of $30 a month for five years. Socioeconomic status of participants is assessed by variables such as monthly income per household member, the existence of a separate kitchen, running water and electricity, and number of dependents under 13 earning income to assess price reduction. Prices are discounted up to 90% of the label price. To study the impact of free medical care on care utilization, a study cohort was created using the Maternal Infant program.

Qin, Yuhong; "*Design Optimization for Truss Robot****"***

Qiu, Selinda; ***"****Reducing Mental Health Stigma Among Healthcare Providers in Rural China****"***
Chinese society severely stigmatizes people with mental illnesses (PMI), creating many obstacles to seeking and providing care for PMI. This pilot study focused on developing and evaluating a one-day training program for front-line mental healthcare providers (HCP) in Xinjin county, located in Sichuan province, China.

Based on qualitative reports from a focus group study, the intervention targeted stigma reduction through encouraging empathy for PMI and their families among HCP. Twenty HCP participated and filled out the study instrument three times: prior to the training (T0), immediately after the training (T1), and during 6-month follow-up (T2). The study instrument evaluated participants' levels of mental health knowledge, stigmatizing attitudes and behavior, and empathy for PMI using five scales: Mental Health Knowledge (MAKS), Mental Illness: Clinician Attitudes (MICA), Reported and Intended Behaviors (RIBS), Social Distance (SDS) and Jefferson Scale of Empathy.

After the training, the participants' average MICA, SDS, and Jefferson Empathy scores improved. During the 6-month follow-up, all average scores returned to baseline except for the Jefferson Empathy scale, which indicated lower levels of empathy than baseline. From the study data, the one-day training program appears to have had some positive, immediate effects, if not lasting changes. Future work will focus on expanding the intervention to a four-week program and recruiting a larger, more diverse sample of HCP for more accurate, reliable, and generalizable evaluations.

Ramesh, Sireesh; ***"****Evaluating the Economic Impact of a Proposed Surgical Center in Moshi, Tanzania****"***
5 billion people lack access to safe and affordable surgery. Most of these people are concentrated in low and middle income countries. Tanzania, with a population of 50 million has only 35 orthopaedic surgeons for their entire population. Accessing these limited orthopaedic surgeons also comes with geographic and financial barriers. Current solutions to the surgical deficit in LMICs have included surgical mission trips which produce relatively high complicaton rates and undercut local healthcare workers in the region.

A proposed orthopaedic surgical center working in conjunction with Kimilmanjaro Christian Medical Center (a tertiary referral hospial with a catchment area of 12 million) could provide some relief to Tanzania's surgical deficit. With road traffic accident deaths on the rise (and a majority of deaths being concentrated in LMICs), an orthopaedic surgical center of excellence in the region could ameliorate the surgical deficit while combatting a rising burden of disease.

This proiect evaluated the potential economic impact of this center by using a novel method that tracked disability-adjusted-life-years for orthopaedic injuries in the region. This DALY number was then given an economic value and scaled to a the healthcare system of model countries. By varying the model countries used in the calculation, the economic value had a sensitivity analysis that would account for confounding variables outside of healthcare quality.

Raphael, Dana; ***"****Microglia in mouse brain tissue: Optimization of immunohistochemical staining using brightfield, epifluorescent, and dual epifl****"***
Microglia, the primary cells of the innate immune system in the CNS become activated to clear cellular debris and contribute to tissue repair following traumatic brain injury (TBI).

Previous research has demonstrated increased microglial activation in response to moderate/severe TBI. This project explores the microglial response to mild TBI, which has not been extensively studied yet. Additional studies report that following injury, microglia can express the protein DCX, a marker of immature neurons, in addition to the microglial marker Iba1. Whether this also occurs in the non-injured brain is unknown. The primary goals of this project included determining optimal staining parameters for Iba1 and DCX, and evaluating DCX antibody specificity by assessing whether microglial cells label with a DCX antibody in naïve (non-injured) tissue. To optimize staining parameters, single label immunohistochemistry (IHC) for Iba1 and DCX was performed in naïve mouse brain tissue using decreasing concentrations of the primary antibodies rabbit anti-Iba1 and goat anti-DCX. To determine whether DCX is a specific neuronal marker for immature neurons or also expressed by microglia, double label Iba1/DCX IHC was also performed. Tissue sections were visualized on Olympus Microscope BX51 at 200x and 400x magnifications using brightfield, epifluorescent, and dual epifluorescent microscopy. Optimal primary antibody concentrations of rabbit anti-Iba1 and goat anti-DCX were determined to be 1:10,000 and 1:16,000, respectively. Double label Iba1/DCX IHC revealed colocalization of Iba1 and DCX. However, to ensure specificity of DCX in double label IHC, additional staining needs to be performed.

Ravendran, Alysha; "*Racialised Narrative Structures in Malaysia: Looking at May 13th Through the Eyes of Millenials****"***
This research project aims to examine how urban millennials within the Klang Valley in Malaysia come to perceive the racial riots of 1969 through the intergenerational transmission of knowledge from elder members of their community. This research looks at how these oral accounts of history are differentiated and racialised in the absence of a transparent narrative from the state. These oral accounts are analysed in tandem with information regarding the research subject's home environment and educational background to assess how racialised narratives might impact interaction between races. This analysis hopes to provide insight on the future of race relations in Malaysia.

Reddy, Anya; "*Machine Learning Explainability for Sepsis Prediction Modelsc****"***
Over the summer, I worked with Dr. Masino and his group on researching current machine learning explainability methods. Dr. Masino's team has several projects that uses machine learning in the medical domain, however, before physicians can begin to trust the prediction models generated by these algorithms they must be more easily interpretable to the user. For this reason, I spent several weeks researching explainability methods and also executed one for a sepsis prediction project.

The project that I spent the bulk of my time working on was meant to predict sepsis in infants. Datasets that consisted of a variety of lab test results and medical history features were used to create the prediction models. I first learned how to not only clean and visualize the dataset provided to me but also how to create prediction models using various machine learning algorithms, like logistic regression, random forest, and support-vector machine. I used python and scikit-learn to create these prediction models. I then began to more closely research LIME (Local Interpretable Model-Agnostic Explanation), a machine learning explainability method. LIME is used to explain individual predictions made by any machine learning model. It works by first approximating the model locally and generating its own dataset of permuted samples of the original model. LIME then uses this dataset to train an interpretable model that it later uses to output an explanation for the prediction. This explanation consists of the contributions of the top features that the model used in its prediction.

Regan, Christopher; "*Evaluating Time-Dependent Expansion Models for Galactic Potentials Using Simulated Galaxies****"***
Understanding the structure of the Milky Way's gravitational potential is crucial to predicting the positions and velocities of stars at different points in time. Currently, many researchers model the Milky Way's potential analytically. However, this project attempts to evaluate the effectiveness of a different kind of model, which uses Multipole and Cylspline expansions to represent the dark and baryonic matter components of the potential, respectively. Using a simulation of a Milky Way-like galaxy m12i (where the density is known at all snapshots in time), expansion potential models were made for times throughout a time period of approximately 3.8 Gyr.

The orbits of select stars are integrated over time in the model potential (starting 3.8 Gyr ago), and different physical properties of these stars (phase space positions, energy, etc.) are compared to the true values from the present day snapshot. This helps decide on the accuracy of this potential model in the simulation, which would be instructive for using this kind of model for the actual Milky Way

Repsold França, Luiza; "*Material Commodity x Art Object: The Hybrid Status of 20th Century Artist's Textiles****"***
As an introductory step to my Thesis in History of Art, I am researching the hybrid role of twentieth century artist-designed textiles as both fine art objects and decorative and material commodities. I will be particularly looking at interdisciplinary artists working in the first half of the twentieth century, who began to move away from hand-sewn, embroidered and craft-oriented works, and towards mass-produced printed textiles by partnering with companies, fashion houses and department stores. The industrialized process of production in many ways is seen as a form of commodification of design, distancing it from the discipline of fine art. Nonetheless, many of the artists working on textiles continued to sustain their artistic practice in other mediums, with the two forms of production in many ways complementing each other. I am interested in this the breaking of the barrier between the traditionally institutionalized, one-of-a-kind work or art or "masterpiece" and its rendition onto a mass-produced material that expanded its audience and possibilities of interaction with the viewer.

Rinaldi, Antonio; "*Considering Possibilities of Urban Expansion in the Galapagos****"***
This project focuses on the unmitigated and rapid population growth and urban expansion of the Galapagos Islands off the coast of Ecuador, specifically in the coastal towns of Puerto Baquerizo Moreno and Puerto Ayora. Using various research methods including available census data, local testimony, and visual analysis of drone photography, the team was able to predict that the population Puerto Baquerizo Moreno on the island of San Cristobal would double and outgrow the currently established urban boundary within the next ten to twenty years. This type of expansion poses many problems to both human and ecological health when not factored into the pattern or method of new development and construction. The team endeavored to propose various design scenarios that could be implemented by the municipal government in making informed decisions regarding future urban development on the islands. The result was five basic schemes that allow for an increase in population density as well as an increase in safety for the environment and for its inhabitants.

Robnett, Maya; "*Targeting Sox-2 as an Antigen for Multiple Myeloma****"***
Multiple myeloma (MM) is a plasma cell cancer that can result in elevated calcium levels, renal failure, anemia, and bone lesions. High relapse rates and poor survival for MM present a need for novel therapies to combat the disease. MM cells uniquely express a

transcription factor called Sex determining region Y - box 2 (Sox-2) that is important for clonal expansion. Existing research has shown that Sox-2 immunity correlates with better patient prognosis, yet it remains unknown what regions of the Sox-2 protein are immunogenic. This study identifies Sox-2 peptide epitopes that generate Sox-2 specific T-Cell immunity in order to specifically target and eradicate MM cells. MM cell lines were generated in order to test Sox-2 specific T-Cells on tumor cells.

Rockhead, Charles; "*Machine Learning and it's application to EEG data analysis and seizure detection****"***
This poster explores the branches of machine learning and it's application to EEG data analysis in both a statistical nature and the seizure detection. This application revolutionizes epilepsy treatment and can be applied to other neurological disorders as seizures are common amongst them.

Rodriguez, Anyara; "*Drosophila Model Of ALS & FTD****"***
Recent work suggests a bidirectional relationship between sleep disturbances and neurodegeneration. Indeed, several studies have suggested sleep disturbance increases the accumulation of proteins in neurodegenerative disorders. For example, in Alzheimer's Disease, the accumulation of Beta Amyloid worsens sleep, while poor sleep enhances this accumulation. Studies suggest sleep as a modifiable risk factor in the progression of these diseases. The Kayser Lab, which uses fruit flies to study sleep and neurodegeneration, has recently developed a behavioral paradigm called Sleep Restriction Therapy (SRT). This paradigm has shown that restricting sleep opportunity leads to more consolidated and efficient sleep. I will use the fruit fly to study how TDP-43, the major pathological protein in amyotrophic lateral sclerosis (ALS) and frontotemporal dementia (FTD) affects sleep and is affected by sleep at a cellular level.
Rosario, Evan; "*Patient Satisfaction with the Use of Sedation in Transcatheter Aortic Valve Replacement****"***
The use of monitored anesthesia care (MAC) in transfemoral (TF) transcatheter aortic valve replacement (TAVR) has increased in recent years and has surpassed general anesthesia (GA) as the anesthetic of choice for these cases. Advantages of MAC include quicker recovery times, shorter lengths of stay, and perhaps improved outcomes. While much of the focus has been on clinical outcomes, patient satisfaction with this anesthetic approach has not been investigated. In this study, we aimed to assess and record feedback from patients concerning their experience with the anesthetic care they receive both before and during their TAVR.

Following IRB approval, a prospective survey study was conducted in patients undergoing TF TAVR under MAC. Patients undergoing TAVR via an alternate approach and those undergoing planned general anesthesia were excluded. After patient consent, a questionnaire about the anesthetic experience was completed with each patient on post-TAVR day #1.

All data will be compiled from eligible patients over a 10-week period and will be reported using descriptive statistics. The information gathered from this study will allow the TAVR team to modify practices when approaching patients for anesthesia consent to meet patient expectations for their procedure.

Rubio, Aidan; "*Learning Curves****"***

Saunders, Bradley; "*The Ejido: Agrarian Reform and Revolution in 20th Century Mexico****"***

Schell, Tiffany; "*Developing and Validating the Lab Electronic Aggression Paradigm (LEAP)****"***
This article presents a newly developed task, the Lab Electronic Aggression Paradigm (LEAP), which assesses for aggressive inclinations. LEAP allows participants to stick pins into a virtual doll representing a person who has been mean to them or who has caused them harm. This research includes three versions of the LEAP task. In the first condition, participants typed an integer between 0-51 to indicate the number of pins they wished to insert into the doll. The second condition allowed participants to insert 0-30 pins by clicking anywhere on the doll, with a pin graphic appearing at the coordinate clicked. The third condition mirrored that of the second condition, except each click resulted in a bloodstain graphic appearing along with the pin graphic. The results showed that higher aggression levels were correlated with more pins inserted into the doll. However, this relationship was fully mediated by sadism.

Sethi, Ashna; "*Bacteriophage lysin supplementation of Microbiome Therapy in the treatment of C. difficile****"***

Shah, Reeti; "Interactions Between Bacteria and Archaea***"***
Enteric fermentation in ruminants is the source of 27% of all methane emissions in the US in 2017. Also, ruminants use 2-8% of their dietary energy in methane production, which could instead be used to increase their efficiency. Thus, a way to mitigate methane production by ruminants while making sure that animal productivity is not negatively affected must be found. Directly inhibiting methanogens will not necessarily increase the efficiency of ruminants, as methanogenesis provides directionality to the fermentation of the feed in the rumen by bacteria and other microbes. If methanogens are inhibited and there is no alternative pathway to direct the hydrogen produced in fermentation, the concentration of hydrogen in the rumen will eventually inhibit fermentation. The objective of this project is to better understand the interactions between bacteria and archaea and the types of bacteria and archaea in the rumen for mitigating methane production from ruminants, without adversely impacting fermentation. DNA was extracted from rumen samples, amplified by PCR, quantified, pooled, bead-purified and sent for 16S sequencing on Illumina platform. Also, certain known interactions were targeted by primers—found by using NCBI BLAST—in real-time PCR (qPCR). Another future application of these interactions is in anaerobic digesters, which produce biogas. Biogas (contains methane) is valuable as it is a source of renewable and clean energy. If the interactions between bacteria and archaea are known, they can be manipulated such that methane production in ruminants is decreased and production of biogas (methane) in anaerobic digesters is increased.

Shaked, Jordan; "*Function and Identity of Essential YTHDC2 Binding Domain for Mammalian Meiotic Development****"***
MEIOC and YTHDC2 protein interaction during meiosis has been shown essential for mammalian development. While MEIOC and its functions have been extensively mapped, the mechanisms surrounding YTHDC2 remain poorly understood. Here, we will identify the region of YTHDC2 that binds to the MEIOC C-terminus domain. In addition, we will create YTHDC2 conditional knockout mice using a tamoxifen injection regimen. Once these conditional knockout mice are made, we will study the effect of YTHDC2 deletion on the mouse germ cells. Analyzing the structure and function of YTHDC2 allows us to better understand the mechanisms underlying meiosis. In addition, distinguishing the MEIOC binding domain of YTHDC2 may help in identifying a drug that may inhibit this interaction for application as a male contraceptive.

Shen, Zhifei; "*Analyzing Cassie Simulations****"***
My PURM summer project involved using mathematical methods to assess the accuracy of existing simulation models of the bipedal Cassie robot. Using manipulator and constraint equations, I was able to cross-check spring constants and accelerations with their expected values and thus come to the conclusion that although the models captured the behaviors of the springs rather well, the solved accelerations were often unreliable due to their sensitivity in the matrix equations. Additionally, I compared three different simulations of the Cassie robot and found that two (Drake and Gazebo) matched very well, though the third (Mujoco) differed significantly due to errors in the code and possibly different methods of generating the state of the robot via inputs.

Sherwood Caballero, Enrique Henry; "*Tepoztlán Institute for the Transnational History of the Americas****"***
This summer, I worked as the undergraduate assistant for the Tepoztlán Institute under my mentor, and this year's director of the institute, Dr. David Kazanjian. Him and I met weekly for about eight weeks prior to discuss assigned theory readings that I reviewed for the given week. As the conference approached, we met in Tepoztlán to prepare logistically for the arrival of about 70 participants and their families. Paired with a graduate assistant from the English department, Nick Milligan, we carried out numerous tasks including making signs, putting up posters around Tepoztlán, and arranging nametags. When the conference began, I participated in daily discussions among academics and graduate students about assigned readings and the theme of the conference.

This year's theme was "Bodies of Water: Flows, Wars, Floods, Wakes." As such, most of the conversations centered around the power of water as both a driver of peace and prosperity as well as one of destruction and colonialism. As a conference intended to expand dialogue between academics around the Americas, there was room for experts from various disciplines, such as English, history, or anthropology, to contribute with the perspectives they garnered from their research. I enjoyed the experience of participating in a setting where experts in their field came together to discuss (and at times respectfully disagree) on heavy topics, both past and present. I cherish the conversations I held with the academics who attended, and am grateful to have been introduced to the world of academia in this manner.

Shi, Jackie; "*Periodical Research on Religious Denominations and the American Public's Opinions of the Jewish Holocaust****"***
This project analyzes how the American press shaped the beliefs and opinions of the American public during the Holocaust and posits that America's actions and inactions during WWII were largely a result of the coverage of the American press. Moreover, the way the press told the story of Nazi antisemitism– the space allocated for the news, the location of the news in the paper, and the editorial opinions—shaped the American reaction. Large American newspapers (i.e. New York Times, New York Herald Tribune, Baltimore Sun, Philadelphia Inquirer, Christian Science Monitor, Washington Post, Miami Herald, etc.) and religious periodicals were examined to determine what information was readily available to the public during WWII.

Shi, Sherry; "*Training a Language-to-Vision Mapping with Contextualized BERT Vectors to Construct Multimodal Embeddings****"***
Past research show that using multimodal embeddings created by combining textual and visual information to represent language results in better performance on semantic tasks than the traditional method of using unimodal word embeddings. The human brain naturally associates visual to semantic information in both memory formation and retrieval.

Thus, this research seeks to train a cognitively-grounded model, which learns a cross-modal mapping from language to vision, to then use imagined image output vectors to create multimodal embeddings. All existing research on multimodal embeddings, including Collell et al. 2017, which first presented the method above, use word embeddings that assign each word to a single vector, such as word2vec or GloVe, as the textual information. This is illogical in the context of training a cross-modal mapping model, since in the training data, different word senses of a polysemous word, likely associated with vastly different images, will all be represented by the same word vector. Therefore, we present a training dataset of contextualized word vectors extracted from Google's pre-trained BERT (in the context of Pinterest captions) corresponding to associated image vectors. Words and appropriate images are selected, with a focus on polysemous words, from a dataset of 40 million Pinterest photos and their most popular captions. In addition to training our model, future applications of our dataset include the problem of word sense disambiguation. (*project still in progress)

Shringari, Sumant; ***"****Computational Prediction of Thioamide Substitution on Proteolysis Rates****"***
Peptides, short sequence of amino acids, are appealing scaffolds for various therapeutics, but as natural product, they suffer from metabolic instability, which can be mitigated by single atom substitution from an oxygen to sulfur in the peptide backbone. However, the utility of this substitution has been limited by the uncertainty in placing the substitution. Previous work has failed to address of how to predict the effect of thioamide through simulation, allowing for design. Through the Rosetta Modelling Suite, we can simulate the thioamide to extract relevant parameters that will predict proteolysis rates, thereby metabolic instability. In doing so, we can add the thioamide to medicinal chemistry toolkit and increase the viability of peptide therapeutics by improving their metabolic stability.

Shultz, Michael; ***"****American Corporate Collusion with Franco's Nationalists During the Spanish Civil War****"***
The main goal of this project is to determine the level of support Americans (both individual persons and corporate entities) rendered to Francisco Franco and his Nationalist Forces during the Spanish Civil War. Direct support would have been in violation of both Roosevelt's "moral embargo" issued in 1936, and the Neutrality Act of 1937. Evidence suggests there were many more companies dealing with Franco than commonly known. The secondary goal of this project is to compile as many of the main actors involved with supporting Franco in one place, while also trying to gain a deeper understanding into their motivations.

Siciliano, Erin; ***"****Characterizing Conjugation of Primary Amines to Diamond Nanoparticles****"***
Nitrogen-vacancy (NV) centers in diamond are a promising platform for quantum sensing technologies. These atom-like systems hosted in the diamond crystal can be optically addressed to detect changes in magnetic field, electrochemical potential, and temperature. Furthermore, nanodiamonds (NDs) have low cytotoxicity, enabling their use in biological media. This motivates the development of a method to conjugate reporter molecules directly to the nanodiamond surface to enable site-specific quantum sensing. Here, we confirm presence and activation of nanodiamonds' surface carboxyl groups while testing appropriate buffer systems for amine-group conjugation.

Sidhu, Uday; ***"****Radiological Analysis of Lung Injury Progression in Large Animal Model****"***
Acute Respiratory Distress Syndrome (ARDS) is a disease associated with inflammation and increased permeability of the alveolar walls, resulting in hypoxemic conditions.

Usually induced by the high pressure or volumes of the ventilator, ARDS creates many problems in ICU patients, including pulmonary capillary hypertension and overdistension. After the initial injury, patients are sent into the ICU, where they are put on a ventilator. The ventilator settings may propagate the primary insult and lead to ARDS. Although the large tidal volumes or high PEEP is necessary for the proper aeration of the patient, it can worsen the condition of the lung itself. There are no established biomarkers for ARDS, so its diagnosis is reliant on the ratio of arterial oxygen pressure and percent oxygen of the ventilator. However, ventilating in the prone position, instead of the supine position, does present some benefits. Our quantitative analysis of lung computed tomography (CT) shows some trends which help in the homogeneity of lung injury and overall better aeration. Through CT images, the homogeneity of the injury is clearly seen in the prone position whereas the supine position tends to damage the dorsal regions. Furthermore, using a lower PEEP prevents injury related to atelectasis. However, a lower PEEP prevents the recruitment, or the re-opening of alveoli, lowering the perfusion-ventilation ratio. Using the right scans and mapping the disease is pivotal in the management of ARDS, as it indicates whether to use a more aggressive or conservative ventilator approach.

Sislo, Alex; "*The Effects of Prefrontal Cortex Stimulation on the Likelihood to Commit Antisocial Behavior****"***

Abnormalities and impairments in the prefrontal cortex (PFC) are thought to underline serious antisocial behaviors such as psychopathy and violence. Less is known about whether PFC abnormalities are associated with more minor forms of antisocial behavior. Additionally, much of the existing literature is based upon correlational analyses or group differences. These types of analyses limit the understanding of the PFC's casual role in antisocial behaviors. In this study, the role of the PFC in changing the likelihood to commit minor forms of antisocial behavior-, specifically, - cheating on an exam or engaging in piracy – is examined. Transcranial direct current stimulation (tDCS), a neuromodulation technique allowing researchers to manipulate the likelihood of neuronal firing in a desired region, was used to upregulate firing in the PFC. This upregulation of PFC activity was hypothesized to reduce the likelihood of minor forms of antisocial behavior. In this double-blind, randomized, sham-controlled study, 94 student participants were randomly assigned to either receive 20 minutes of tDCS (n=51) or a sham condition which involved approximately 30 seconds of stimulation (n=43). Results showed no significant differences ($p>.05$) in the likelihood of cheating on an exam nor engaging in piracy between active and sham groups, before and after controlling for covariates. The results provide evidence from an experimental setting that PFC neuromodulation does not have a significant effect on the likelihood of individuals to commit minor forms of antisocial behaviors. The findings provide insight into the scope of the PFC's casual role in minor forms of antisocial behavior.

Smalls, Morgan; "*The Clash Between Rights and Punishment****"***

Felon disenfranchisement is the practice of removing one's right to vote after a felony conviction. Felon disenfranchisement is practiced in forty-eight of the fifty states across the US. Felon disenfranchisement emulates the strange relationship between the national proclamation of securing the rights of all citizens and the exercise of these rights, while cruelly disregarding the citizenship of those within the prison system. My research will explain how felon disenfranchisement is an unjust form of punishment that places a dark shadow upon our democratic legitimacy and casts doubt upon the ideals we proclaim. Citizenship is permanent within our jurisdiction. Voting is essential to our conception of citizenship and is heavily tied to this status. Yet, felons are restrained from having a voice in the practices of our government. The aim of my research is to show that our current use

of felon disenfranchisement is a form of punishment that does not correspond with the principles that our nation was founded upon.

This research project is within the field of political philosophy. My research will contribute to the philosophical literature by providing a new argument that has been underdeveloped regarding the criminal justice system. Social and legal techniques are continuously used to place imprisoned people in a subordinate class of our society. I hope that my unique contribution to this field will bring light to the important role the lack of felon suffrage plays in our society that we have ignored. More specifically, I hope my research compels others to reconsider the use of felon disenfranchisement during a time where the importance of voting and having a voice in our democracy is most profoundly expressed.

Solomon, Emily; "*Comparing the e-cigarette control advertisements made by the vendors vs public health institutions****"***
The Surgeon General of the United States declared the rates of electronic cigarette (or "e-cigarette") use among youth to be of "epidemic proportions." Therefore, both public health institutions and e-cigarette vendors have been producing advertisements that are trying to control youth e-cigarette use. The goal of this project was to compile advertisements from both sources, analyze what themes were the most common, and to compare the arguments that were being made by both entities. From the data collected, it was evident that both public health institutions and e-cigarette vendors acknowledge the nicotine content in e-cigarettes, the addictiveness of such a substance, and the desire for youth to never start using these products. Yet, the public health institutions focused on the preponderance of negative health consequences resulting from e-cigarette use, while the e-cigarette vendors dwelled on advocating for policies to raise the legal buying age of e-cigarettes to 21. This discrepancy has the potential to alter views of source credibility and is a crucial launching point for further research.

Soos, Gregory; "*The effect of the Andromeda galaxy on the stellar halo of the Milky Way****"***
Though the Milky Way (MW) is the galaxy which we call home, our understanding of its outskirts is still, at best, approximate, as is our understanding of the effect of the nearby Andromeda (M31) galaxy. In the next 5-10 years, future astronomical surveys will provide the data to map the intermediate region between our Galaxy and its nearest neighbor, and thus more thoroughly flesh out our understanding of the dynamics of the MW-M31 system. We analyze the Feedback in Realistic Environments (FIRE-2) suite of simulated paired and unpaired MW-mass galaxies to: 1) predict what the edge of the MW will look like once observed by next-generation survey telescopes, and 2) study the effect of M31 on the outer regions of the MW.

Spherically averaged measurements of the stellar and dark matter (DM) mass density and velocity anisotropy tended to agree with observations made thus far, but did not present any readily apparent differences to distinguish paired from isolated galaxies. However, by comparing the density in the direction from one galaxy toward versus away from the other, we found a systematic lopsidedness in the mass distribution, with higher density towards the companion galaxy. This "bulge" toward a companion was also observable in the equipotential contours of the galaxy pairs. We also found that one galaxy in each pair would consistently exhibit a large stellar stream near its outskirts (around 200-300 kpc), pointed toward its companion, much like the large stream observed in M31.

Spicola, Erin; "*Exhibiting Mounds in the Wilkinson County Museum: Exploring Familiar Landscapes****"***

Sproch, John; ***"****Reducing power consumption of Nitrogen Vacancy spin control circuits****"***
Nitrogen Vacancy centers are defects found within diamonds. These centers can be controlled as quantum bits using microwave frequencies. These have the opportunity to be controlled at regular temperatures and without very high power consumption. The goal of this project is to reduce the impedance of the circuit to allow for a qubit that can be controlled with relatively low power usage.

Squillaro, Joseph; ***"****Verifying the Two-Step Verification Protocol: A Feasibility and Efficacy Study of Cybersecurity and Cyberlaw at Penn and Beyond****"***
This project is a feasibility study of cybersecurity protocols, like Two-Step Verification, at universities such as Penn and the world at large. Two-Step Verification is being branded as an easy to use added layer of computer security that guards against phishing attacks as well as unauthorized logins to Penn resources. But why are we doing this, is this the best way to secure our data and what legal implications do new security protocols thwart against? The main question this project sets out to answer is do they increase our security at the expense of our convenience or is there a better alternative to be adopted. This project will also look at the legal side of increasing cybersecurity measures and what the legal consequences are, if any, when systems are breached and personal data is exposed. Parallels will be drawn to Penn in this regard, which arguably has highly sensitive data such as student transcript, health and financial records stored using the same PennKey security system. What would it mean for Penn legally if our systems were breached and what precedent would it set if universities, the Guardians of Information, are unable to guard its data. This project hopes to discern whether Two-Step Verification is the solution to Penn's cybersecurity threats, how the law is responding to these threats and whether or not we can ever truly be safe in this age of technological acceleration.

Sriram, Adithya; ***"****Aptamer Based Detection of Alpha-Synuclein****"***
Alpha synuclein is widely believed to aggregate in oligomeric inclusions within the brain causing dementia in a variety of neurodegenerative diseases. There exists a pressing need to detect these inclusions and characterize them rapidly before irreversible neurological damage occurs. We demonstrate the use of a library of engineered oligonucleotide aptamers designed to bind to various strains of alpha-synulcein preformed fibrils. Using a library of >20 aptamers we performed a barcoding test to heatmap the signals received by each of the aptamers against each strain of alpha-synuclein fibrils. This heat mapping would allow one to use high-dimensional analysis techniques to more accurately characterize fibril strains. We additionally tested their efficacy as a tissue-staining agent and as a chemical probe for use in a graphene based nanoelectronic biosensor. These preliminary results indicate that these aptamers could be used as a viable replacement for antibodies as a probe and given the ease of functionalization of these aptamers, they could additionally be used as a drug delivery agent. The studies done here are a proofs of concepts of the aforementioned applications.

Stanton, Liam; ***"****A LMNA variant disrupts nuclear organization to result in tissue-specific lineage instability****"***
The Jain lab seeks to decipher the rules governing spatial positioning of the genome and the impact on organogenesis. The nuclear lamina is an intermediate filament network of proteins that provides structure and organization to the nucleus. Despite being germline mutations, it remains unclear how variants in LMNA, which encodes for Lamin A/C, result in specific disease phenotypes in a tissue specific manner, such as dilated cardiomyopathy. Moreover, it remains unknown how genome organization at the nuclear lamina is impacted in cell types that develop disease versus those that are not affected clinically. We determined that cardiac myocytes from patients with dilated cardiomyopathy and LMNA

variants had abnormal nuclear morphology compared to failing controls. Modeled after a patient who presented with congestive heart failure, we knocked a missense point mutation (LMNA T10I) into control human induced pluripotent stem cells. Mutant cardiac myocytes (iPSC-CMs) demonstrated a loss of nuclear morphology, disrupted genome organization at the nuclear lamina, and overall lineage instability. Strikingly, we found that mutant iPSC-derived hepatocytes retained relatively normal nuclear morphology and architecture, indicating the effects of this mutation are tissue specific. Taken together, our studies suggest a critical role for lamina-chromatin interactions is to maintain normal lineage stability during development. Finally, our studies demonstrate how genome organization changes in a cell-specific fashion to regulate a specific subset of lamina-associated domains to result in tissue-specific phenotypes observed in LMNA mutant tissues.

Steele, Christina; "*A Real World Study of the Contact Hypothesis at Penn****"***
The goal of this study is to assess implicit and explicit biases in intergroup relationships. More specifically, the study will investigate how intergroup contact and descriptive data can influence individual perceptions of others. The first part of the study will take place on Amazon's Mechanical Turk (MTurk) and will involve self-report measures and computerized tasks. The second part of the study will involve an additional behavioral component that will take place within the context of BIBB-160, an Academically Based Community Service (ABCS) course at Penn. The overarching goals of the study will be to assess the dynamic nature of intergroup perceptions.

Stein, Samantha; "*Reconciling Risk: The Logics and Practices of Community Engagement in Exception from Informed Consent Research****"***
In 1996 the U.S. adopted 21 CFR 50.24 which permits exception from informed consent (EFIC) research in emergency medicine given that particular criteria are met. The criteria include two prerequisites for EFIC intervention deployment: 1) community consultation (a process by which communities at-risk for clinical trial enrollment offer feedback about the proposed study) and 2) public disclosure (in which at-risk communities are informed about the study). These community engagement practices challenge clinician scientists to negotiate tensions between public health ethics, biomedical research ethics, and clinical ethics. To explicate these negotiations, I conducted nearly 30 interviews with EFIC research clinical coordinators and principal investigators from major U.S. academic hospitals. I inquired about the methods they used to conduct community consultation (CC) and public disclosure (PD) as well as their attitudes towards CC and PD. I compared and contrasted their attitudes towards CC and PD to their attitudes towards more traditional biomedical research consent processes detailed in speech (i.e., interviews) and text (i.e., clinical journals). The data elucidates contradictions in how clinician scientists explicitly discuss consent and what they convey about consent indexically. Participants reconciled a historical consciousness multi-modally with the difficulty obtaining consent from the vulnerable populations who frequent urban emergency rooms by equating community consultation and public disclosure with informed consent and utilizing shifters to avoid laminating risk location onto patient demographics. To draw conclusions about risk, participants grappled with moral economies which juxtapose obligation to the individual and obligation to society, anticipatory and therapeutic ethics, and scientific and clinical priorities.

Stevens, Edward; "*History of Mexican and Latin American Immigration to the United States****"***
In the current political climate, conversations about immigration are unavoidable - but, the most important aspect of any discussion on this topic is that all parties involved are well

informed on the issue and are able to understand historical nuances and potential implications. This project sought to compile an annotated bibliography to design a comprehensive, diverse syllabus for a semester long course on immigration in the Department of History, here at the University of Pennsylvania. The final product emerges from a summer of intensive research consisting of reading books detailing the stories of immigrants who migrated across the border on foot, watching thought-provoking documentaries on life in migrant detainment facilities, analyzing significant Supreme Court cases dealing with immigration, among other learning experiences. Additionally, this project highlights current events within the realm of immigration including current and pending legislation, individual narratives, and political analysis.

Suarez, Maria; "*Diabetes and the TIPE Family of Proteins****"***
The goal of my project was to understand how the suppression of TNFAIP8 family of proteins affects the incidence of Streptozotocin-Induced Diabetes. It is known that the TNFAIP8 family of proteins is crucial for the regulation of tumorigenesis and inflammation. Nevertheless, its role on the incidence of diabetes is not fully understood. After treating different strains of mice with streptozotocin (STZ) to induce diabetes, their pancreases were removed. I then counted the remaining beta islets and compared the results between TIPE1 knockout, TIPE2 knockout, TIPE 1 and TIPE2 knockout, TIPE3 knockout, and the wild type mice exhibiting all TIPES. I also used a quantitative PCR to quantify the amounts of TIPEs in normal beta islets.

Suri, Pranshu; "*Evaluation of Bias Across Multiple Machine Learners in Epidemiological Case-Control Studies of Pancreatic Cancer****"***
Cohort studies collect risk factor and biospecimen data at baseline, prior to disease development and prospectively follow participants over time for outcomes. Although cohorts can serve as a rich resource for computational studies, few machine learning studies have been conducted in cancer cohorts, likely due to the perception of the "black box" nature of machine learners and how they respond to study biases, such as confounding. This study utilized an existing cohort and generated 3 case-control sample sets with differing control selection criteria and varying levels of bias. A machine learning analysis pipeline was then constructed comprising 8 different machine learning models. The models were evaluated based on how they performed across the 3 datasets on a variety of classification metrics. Specifically, balanced predictive accuracy, feature importance scores, and reproducibility of study findings across the different machine learners were compared. Furthermore, the datasets' various biases were analyzed for how each of their specific features may inform the classification of patients in future large-scale cohort analyses.

Tanaka, Melissa; "*Dissolved Organic Carbon in Pennsylvania Anthracite Soils****"***
Due to the history of extensive anthracite coal mining in eastern Pennsylvania, alluvial and floodplain soils in the Lehigh and Schuylkill River valleys have been shown to contain high concentrations of anthracite coal. The incorporation of coal in these soils has unknown effects on the carbon cycle, in particular, the cycling of dissolved organic carbon (DOC) within this ecosystem. For this project, we analyzed the concentration of DOC in samples that varied laterally with distance from the river and vertically with soil depth. To characterize and quantify the labile DOC in our soil samples, we conducted a hot water extraction. The extracts were then analyzed for total organic carbon content and percent aromaticity using persulfate digestion and UV-vis spectroscopy analysis. We hypothesized that both the DOC and the percent aromaticity would decrease with lateral distance from the river and as coal deposition decreased. While there was high variability in the water soluble organic carbon and percent aromaticity, for surface soils, there was an increase in

water soluble organic carbon with distance from the river while the aromaticity of DOC was highest in the middle of the transect.

Teshome, Hiab; "*Understanding IMPDH2 Aggregates and Their Role in Neurodegeneration****"***
This project is focused on understanding the genetic underlings of Pontocerebellar Hypoplasia Type 9 (PCH-9). Patients with PCH-9 display neurodevelopmental deficits as well as neurodegeneration. It has been found that mutations in Adenosine Monophosphate Deaminase 2 (AMPD2) gene which regulates the conversion of adenosine monophosphate (AMP) to inosine monophosphate (IMP) during nucleotide metabolism pathway is important for proper brain development. The mutations in AMPD2 gene affect the levels of Inosine Monophosphate Dehydrogenase 2 (IMPDH2) and induces its polymerization into micron-length aggregates with rod and ring structures. The goal of this project is to investigate how aggregation of IMPDH2 resulted in changes to brain structure, survival and weight loss in a mouse model of PCH-9. For this, we have generated mice that carry a non-polymerizing form of IMPDH2, generated by the substitution of the tyrosine in position 12 to an alanine (IMPDH2-Y12A). This project will focus on the characterization of the IMPDH-Y12A homozygous mice and AMPD2 mutated mice which may lead to uncovering the role of IMPDH2 rod and ring aggregates in neurodegeneration.

Tieu, Tiffany; "*Expanding Mental Health Resources to Asian Communities in Pennsylvania and New Jersey****"***
Many people are not aware of the relatively low numbers of minorities who access mental health care. With my interest in minority mental health, I researched efforts to expand mental health resources to Asians in Pennsylvania and New Jersey, but focused on the Philadelphia area. I examined how five different organizations and centers have addressed the mental health needs of Asians. I collected data at the Jaisohn Mental Health Services of the Philip Jaisohn Memorial Foundation, KITHS Integrated and Targeted Human Services (KITHS), Center for Asian Health (CAH) at the Lewis Katz School of Medicine of Temple University, an anonymous mental health center in Philadelphia, and the Chinese American Mental Health Outreach Program in New Jersey (CAMHOP-NJ). I chose these locations because of their efforts to attract a larger number of Asians to care for their mental health. I selected and established solid connections with eight professionals who were interested in improving the mental health of Asians. While interviewing mental health professionals, I noticed the large number of group sessions and events available and their effectiveness. In the future, I plan to study how group meetings may be more culturally acceptable to Asians. I also was informed of the importance of providing resources that are cost-effective and available in Asian languages. Upon further research, I hope to help eradicate the reluctance and stigma towards seeking mental help in the Asian community.

Torres, Omaya; "*PhillyRespond: Promoting Narcan Acquisition and Carrying Among Philadelphians****"***
Opioid overdose rates are increasing rapidly in the United States. A number of those overdose deaths could have been prevented by the administration of Naloxone (Narcan), the overdose reversal drug. The goal of PhillyRespond is to reduce the risk of overdose deaths in Philadelphia through the promotion of Naloxone acquisition and carrying. By gathering perspectives from a diverse set of individuals across the city, we hope to better understand the motivators behind Naloxone acquisition and carrying. We also hope to create a platform to share real life stories of how these individuals have been impacted by the opioid epidemic, which will also serve as a way of promoting Naloxone acquisition and carrying. We conducted over forty interviews across Philadelphia, asking residents about their experience with the epidemic, their understanding of Naloxone, and their feelings

about carrying Naloxone themselves. We compiled those responses to create the story-sharing platform, which is almost ready to be published and accessible to everyone. Progress can be seen here: https://phillyrespond.cloudshopstudios.com/.

Tseng, Pei Hsuan (Sherry); "*Introducing Resettled Refugees to Philadelphia Through Virtual Reality****"***
Virtual reality (VR) has found many applications in exposure therapy, using the digital environment to reduce shock responses and acclimate users to new surroundings. The goal of this project is to do the same for resettled refugees, as many, upon arrival, face an overwhelming amount of new information. In doing so, the project is creating an interactive VR toolkit to navigate resettled refugees around Philadelphia. Working in collaboration with HIAS PA, an NGO for immigrants and refugees, the toolkit introduces users to transportation, housing, employment, American customs and etiquette, and Philly neighborhoods. Ultimately, this project is meant to lay the foundations for an ongoing effort to facilitate and ease the experiences of resettled refugees and asylees coming to Philadelphia.

Tso, Huen-Yee; "*Consequences of Astrocyte Stretch on Oxidative Stress and Cytoskeleton****"***
The primary aim for this project is to cause oxidative stress in human optic nerve head astrocytes and examine the cytoskeleton of astrocytes in elevated oxidative stress. This oxidative stress is applied through placing astrocytes under 10% static stress on Flexcell FX5K Tension for 16 hours. After the 10% mechanical static strain is applied, oxidative stress is measured using CellROX Green Reagent and images of the astrocytes are taken using a fluorescence microscope. The cytoskeleton of the stretched astrocytes are also examined by using NucBlue Live Cell Stain ReadyProbes reagent, ActinGreen 488 ReadyProbes reagent, and DNase 1 Alexa Fluor 594.

Tu, Maria; "*Debloating Software Programs****"***
Without the need to account for limited processing capacity due to technological advances, software programs now can easily include a lot of code, some of which is often rarely used. As a consequence of this and other common software engineering practices such as software reuse, many programs suffer from performance degradation, difficulties with maintainability, and security vulnerabilities, all due to this software bloating. This summer I was given the great opportunity of working with Professor Naik's lab to research solutions for software debloating. His lab was in the midst of finding solutions for debloating and had developed a software debloating system called Chisel, which reduces a program by removing unnecessary functionality. Currently, Chisel has 10 benchmark programs to test its functionality for further research. I both manually reduced some of these thousand-lined programs and used Chisel to look into the accuracy and behavior of Chisel when it comes to debloating programs. By doing so, I was evaluating what Chisel did right or did wrong. The project has now shifted focus to debloating for package-management systems for a computer's operating system. I looked into different types of package-management systems, package dependencies and other debloating solutions for different sides of software. Overall, this project has opened my eyes to a new side of computer programming, one that constantly prioritizes efficiency, especially for long-established software.

Uehara, Hannah; "*Screens & Their Effects on the Developing Mind****"***
As scientists continue to untangle the underlying pathophysiology of both substance and behavioral addictions, it remains unclear which of the two categories "screen addictions," or compulsive behaviors surrounding screen use should fall under. Despite attempts to assign such addictive behaviors an accurate model or mechanism, this task proves

particularly difficult considering the lack of empirical, neurobiological data supporting similarities between screen addictions and either category. While many studies note that certain problematic screen behaviors meet accepted addiction criteria, they are largely based on self-reported, cross-sectional data. It has become alarmingly clear that there is a need for empirical and causal findings into the specific brain regions affected by the average American consumer's screen use. This poster aims to summarize a summer's worth of individual research into the statistically warranted need for longitudinal, FMRi studies that may confirm negative social phenomena, which remain merely correlated with various problematic behaviors today. Specifically, this focuses on long-term or significant effects of such phenomena on our most valuable and malleable brains: those that are still developing until the age of roughly 25. Finally, I will take a leap of faith and posit attainable solutions to the modern consumer's worries of such "zombification," or automated screen habits.

Ukeomah, Kristen; "*UPHS HR Policy Analyses****"***
The University of Pennsylvania Health System (UPHS) is a large network of hospitals, including the Hospital of the University of Pennsylvania, Penn Presbyterian Medical Center, and Pennsylvania Hospital, to name a few. UPHS has a central Human Resources entity, though each hospital may have slightly different policies. A few years ago, a survey was conducted asking UPHS and Penn employees, students, and affiliates about their experiences with the institution and the ways they have felt particularly welcome or unwelcome, and their overall opinion of the institution. From those responses, those that were coded as having HR policy implications were isolated. In this project, narratives specific to UPHS were isolated, coded, and analyzed based on the identified problem, the individual's response to the issue, and the potential HR policy the narrative would fall under, then cross-referencing to see if UPHS has existing policies addressing the issues addressed. In my research, I found that many issues reported dealt with harassment, an issue that UPHS HR does not have adequate policies for, inappropriate language, and implicit biases, which UPHS HR does not mandate trainings for. This is important because the wellness of UPHS employees impacts productivity, which impacts the patients they see and the overall care that they provide.

Ulysse, Sciaska; "*Physiological stress response and role of neuroactive steroid hormones in Premenstrual Dysphoric Disorder (PMDD)****"***
Premenstrual Dysphoric Disorder (PMDD) is a cyclic mood disorder that affects approximately 3-5% of women, translating to millions worldwide. PMDD has been compared to severe premenstrual syndrome (PMS), although its symptoms are similar to those of major depression (e.g. irritability, low mood, anxiety). In PMDD, these mood symptoms only occur in the premenstrual phase of the menstrual cycle. This clinical study seeks to understand the role of neuroactive steroid hormones that fluctuate across the menstrual cycle, such as progesterone and its metabolites, in PMDD. The overall goal is to shed light on how hormones interact with the central nervous system (CNS) to influence mood and stress response. This study uses a laboratory stressor to measure stress response (e.g. cortisol, acoustic startle response) in women with and without PMDD at different points in the menstrual cycle.

Unger, Olivia; "*Euler and Out-of-plane Buckling of Elastic Beams****"***
Elastic truss-like geometries have been seen to exhibit not only Euler column buckling but also kink buckling, an out-of-plane twist that occurs after initial buckling and has not been studied in rectangular beams. In order to characterize kink buckling in more complex geometries, the bending and twisting of rectangular elastic beams must be understood. In this project, I developed a methodology to investigate the relationship between geometric

parameters and critical stress and strain at which sequential buckling events happen in PDMS beams. Stress-strain curves were obtained from uniaxial compression testing of beams with varying aspect ratios and cross sectional area to length ratios. I compared the results for initial beam buckling against Euler's criterion, but theory for the kink is yet to be developed. Only some beams experienced a kink and those that did depicted a decrease in stress at the time of the kink, which can be used to define the critical stress and strain at which the kink occurs. Further research can determine an explanation for kink occurrence in relation to beam parameters, as well as a way to control when or if it occurs. Kink buckling is a complex motion that comes from a simple input, which has applications in fields such as locomotion, soft actuation, and responsive materials.

Vargas, Eliud; "*The proportion dominance effect in moral evaluation****"***
People often make decisions that affect others. For instance, government officials decide on which laws to pass and school board members decide on the budget for the district. In these contexts, people's decisions are subject to what is known as the proportion dominance effect. Specifically, it appears that people's decisions about which course of action to pursue depends not on the absolute number of people, but rather on the proportion of people affected, which can produce inconsistencies in decision-making. For example, people might prefer to harm more people if that number is a smaller proportion of a reference group, even if the reference group is arbitrary. Here, we examined to what extent the proportion dominance effect arises in evaluations of other people's behavior. 223 participants read four scenarios where people were harmed at either a high proportion or a low proportion. They were then asked a few questions in which they assessed the harm of the scenarios by rating the magnitude of the harm and making a resource allocation decision. Although we found no significant difference in people's evaluations of harm between the low and the high proportion conditions, the difference in valence of harm between scenarios might have skewed our results; two scenarios involved harm in the form of death while the other two involved harm without death. Regardless of condition, death scenarios were viewed as more harmful than the non-death scenarios. Therefore, it could be the case that scenarios involving death over and above affect people's judgments, making the proportion dominance effect dormant.

Wang, Kathleen; "*Spectrum of Loss of Methylation at Imprinting Control Region 2 in Beckwith-Wiedemann Syndrome****"***
Beckwith-Wiedemann syndrome (BWS) is the most common epigenetic growth disorder and occurs in about 1 in 10,300 births. BWS is characterized by a wide spectrum of clinical features including macroglossia, overgrowth, and embryonal tumors. It is associated with genetic and epigenetic changes on the chromosome 11p15 region, most commonly loss of methylation at imprinting control region 2 (IC2 LOM). . About a third of IC2 LOM patients have been reported to have a multilocus imprinting disturbance (MLID) with aberrant methylation at multiple imprinting regions across the genome. However, the clinical significance of MLID is uncertain. This project examines imprinting regions outside of the BWS region to create a methylation signature for BWS patients and to identify additional markers for cancer.

Wang, Yiyue; "*Plasma nuclear and mitochondrial DNA are associated with post-traumatic acute kidney injury****"***
Background: Acute kidney injury (AKI) is an abrupt decline in kidney function which may lead to fluid buildup, permanent kidney damage, and death. Nuclear and mitochondrial DNA (nDNA, mtDNA) are released from damaged tissues after trauma and may contribute to AKI, but studies in in trauma patients are limited. We hypothesized that both plasma nDNA and mtDNA would be associated with post-traumatic AKI.

Methods: We enrolled trauma patients with Injury Severity Score (ISS) >15 presenting to Penn's Level I Trauma Center. Plasma was collected at presentation and 6, 12, 24, and 48 hours, with mtDNA and nDNA levels tested using qPCR. We defined AKI using consensus criteria. We constructed mixed effects models, adjusting for trauma mechanism, ISS, transfusions, and shock, to test associations of mtDNA and nDNA levels from presentation to 48h with AKI.

Results: AKI developed in 17/55 (31%) patients. Plasma nDNA levels were significantly higher throughout the first 48 hours in the patients with AKI than those without (=1.49, 95% CI 0.87-2.10 log copies/μL, p<0.001) without effect modification by timepoint. Presentation nDNA was associated with AKI independent of ISS (OR 2.55 per log copies/μL, 95% CI 1.36-4.78 log copies/μL, p=0.003). In contrast, plasma mtDNA levels were associated with AKI only at 24h (=0.90, 95% CI 0.21-1.58 log copies/μL, p=0.010) and 48h (=0.71, 95% CI 0.01-1.41 log copies/μL, p=0.047).

Conclusions: In trauma patients, plasma nDNA levels were strongly associated with AKI over the first 48 hours while plasma mtDNA levels exhibited such a relationship only between 24h and 48h.

Wang, Zhuoyang; "*Development and Validation of a Liquid Biopsy Assay for Detection of C797S Mutation in cell-free DNA of NSCLC Patients****"***
Lung cancer is a major cause of cancer deaths worldwide, and 85% of all lung cancer cases are classified as non-small cell lung cancer (NSCLC). Mutations in epidermal growth factor receptor (EGFR) develop in 10-30% of NSCLC patients (Testa, 2018). Many EGFR mutant tumors are sensitive to third generation EGFR tyrosine kinase inhibitor (TKI) treatment, however a C797S mutation has been associated with resistance to this class of drug (Wang et al., 2016). Clinically, solid tumor samples are often inaccessible for cancer genotyping, posing difficulty for timely and noninvasive identification of the C797S mutation. This project aims to develop a highly sensitive liquid biopsy assay that noninvasively detects C797S mutation in plasma cell-free DNA (cfDNA) to facilitate clinical decision making and cancer management.

Watson, Adam; "*Continuity or Aggression? Russian Foreign Policy Since 1990****"***
The view that Russian foreign policy goals have become increasingly confrontational under the premiership of Vladimir Putin is widespread throughout Western media publications and the bipartisan Washington political elite. Underpinning this narrative is the view that, with the breakup of the Soviet Union in 1991, the friendly relations between Boris Yeltsin and then President Clinton presented a real opportunity for the Russian Federation to become a democratic, pro-Western state. On the other hand, under Putin's leadership, the mainstream Western narrative argues that Russian foreign policy goals have become increasingly confrontational and anti-Western. Throughout my research project, analysis of scholarly articles, foreign policy, key speeches and publications has revealed that Russia's major foreign policy goals have remained continuous since the early part of Yeltsin's tenure as the Russian President.

Watt, Caleb; "*Data Analysis of Proton Collisions at the CERN LHC****"***
Supersymmetry is an extension of the Standard Model. Supersymmetric particles have not been detected. As a result, they can only be observed by the particles that they decay into. Analysis of supersymmetric particle-detecting algorithms begins on the truth level with collisions generated by simulations. Different regions have been established based on parameters of the collision. The regions are implemented by testing the parameters and

filtering the resulting events into the proper region. Diboson events were also filtered or reconstructed and analyzed and parsed into the established regions.

Weiss, William; "*Trag Leyden Geduldiklich: Medieval Notions of Suffering During the German Mysticism Movement****"***
The German Mysticism Movement of the 14th century had a profound and lasting impact upon the religion and culture of Germany. Among the many revolutionary ideas put forth by the movement's leaders, none would be so interesting and seemingly contradictary than its approach towards suffering, Spiritual leaders of the movement like Henry Suso championed the idea of a willful, obdient, and almost joyful embrace of suffering yet openly admitted to struggling at actually practicing what he preached. Despite this admission of not living up to the ideal form of suffering as well as describing the difficulty of doing so, the works promoting this idea became some of the most widely distributed and read literature in the 150 years following the movement. My research attempts to delve into this conundrum of popular reception. It seeks to answer why so many people became interested into an ideal form of suffering that even those preaching its virtue struggled to practice. How and why did the idea of a patient embrace of suffering strike a chord with so many medieval Christians?

Weitzman, Micah; "*Analysis of the Mechanical Properties of Electro-deposited Thin Nickel Films****"***
Attempting to further research regarding the healing of metals at room temperature, a series of tensile strength tests were conducted on electrodeposited thin nickel films (~10um) plated on ITO substrates. The nickel electrolyte was varied to find the solution that produced the highest yield strength as well as improved engineering toughness. A series of additional tests were conducted using additives based on the current literature to further improve the mechanical properties of the nickel films. The results suggest that a combination of Nickel Sulfamate and Nickel Golden Eye II produce the highest yield strength. However, further research is needed to confirm the correct ratio of the mixture and to discover possible techniques and additives to produce an even higher tensile strength.

Wen, Yuxin; "*Of Two Minds: A Critical Study of the Relationship Between Jean-Paul Sartre and Simone de Beauvoir****"***
The intellectual history project examines the intricate relationships between two eminent thinkers of the twentieth-century: Jean-Paul Sartre and Simone de Beauvoir. To de-mystify the romanticized story created by public and popular imaginations, the research critically studies the courtship, familial rapport, and intellectual ties between the couple, through the lens of existential philosophy. With a focus on the newly published letters from de Beauvoir to Sartre and existent letters from Sartre to de Beauvoir, the research further delves into the letters between de Beauvoir and other lovers, including Claude Lanzmann. With a combination of literary, philosophical, biographical and manuscript study approaches, the project investigates the complexity, consistency and contradictions of the relationships between the couple and proposes a critical model of modern love that transcends traditional categories.

Wenzinger, Meghan; "*Complete Eats: Implementation and Effectiveness of Four CHOP Sites as Points of Entry into the Summer Food Service Program****"***
Food insecurity is the state of being without reliable access to a sufficient quantity of affordable, nutritious food. Compared to the 12% national average, 20% of Philadelphians are currently facing food insecurity. Hunger is especially a problem for children, worsening in the summer in the absence of free school meals. The Summer Food Service Program

(SFSP) fills in this gap, serving meals at over 1,000 sites in Philadelphia. Yet, only 1/10 kids eligible for school meals participates in SFSP. This project's first aim is to implement and assess the acceptability and feasibility of SFSP at four CHOP locations. The second is to evaluate the effectiveness of how this intervention connects users to sites in their communities and impacts family-level food security and child health. The program took place from June 10th to August 23rd, serving meals from the Archdiocese of Philadelphia and Nutritional Developmental Services. Research assistants surveyed caregivers of program participants to assess experience, acceptability, intention to use the program in the future, and current states of family-level food security and child health. Follow-up surveys were conducted thirty days after participation to analyze changes. The results suggested that the intervention increases connections between families and community resources and positively impacts family-level food security and child health. The implementation of this intervention was accepted by patients, families, and clinical staff and had no interference with patient care. Subsequent follow-ups and analyses may be necessary to determine if lasting changes in child health and family-level food security are taking place.

Werner, Sarah; "*Algal Competition in Coral Bleaching Recovery****"***
Coral reefs cover less than 1% of earth's surface yet support more than 25% of marine organisms, giving rise to services valued at more than $350 billion dollars. Their calcium carbonate skeletons provide housing for an immense number of species and form the basis for one of the most diverse and productive ecosystems on earth. However, corals are dying and at risk for extinction because global warming is causing the breakdown of their symbiotic relationship with microalgae. These microscopic partners provide indispensable nutrition for corals and allow them to survive in nutrient-poor waters by converting sunlight into energy for the animal.

My preliminary in vivo experiments suggest that competition between algal species negatively impacts coral health in the process of recovery, which is exciting and significant since reef waters typically contain many species of microalgae. In addition to quantifying the host health throughout reinfection with multiple algal species, this project will report preliminary results in the development of a novel protocol for fluorescent in situ hybridization (FISH) for specific algal species. All studies of coral symbiosis rely on the ability to identify and count algae within the host, and this procedure will improve on existing methods for the quantification of individual species of algae within the animal.

This research is a fundamental interrogation of the mechanisms of recognition, regulation and competition in coral-algal symbiosis which will contribute to our understanding of how corals will respond to global warming in order to promote species-specific conservation efforts.

West, Ana; "*In Circulation: Modern Literature, Philosophy, Art, and the Medium of the Postcard****"***
Through PURM, I was matched with Professor Weissberg, whose current project is on the political, literary, and artistic significance and impact of postcards in the early 20th century. Over the course of my own research, while coordinating with Professor Weissberg in Germany, I traveled to various archives around Philadelphia, including the ones housed at the University of Pennsylvania (at Van Pelt's Kislak Center), the Free Library of Philadelphia, and the Rosenbach Library. I viewed and digitally photographed hundreds of original postcard holdings. Throughout this process, I made collections inquiries, consulted with librarians and archivists, and worked directly with the original materials. In my own research, I encountered a number of questions about the use of postcards as a method of correspondence, the puzzle presented by marginalia (often unrelated, and/or in different

languages), and cross-cultural similarities and significance in terms of art designs, publishers, etc. A particular challenge and point of interest was attempting to relate the material in Philadelphia-area archives - which comes from multiple time periods and consists mostly of Americana and mass-produced American cards - to the existing research and work (focused on a specific time period and specific places).

Wiklund, Josephine; "*The Impact of Sexual Health Perceptions on the Healthcare Provider- Patient Relationship for African American Women****"***
Despite evidence that increasing numbers of older adults remain sexually active after age 60, primary healthcare providers often don't discuss this topic with their patients. Therefore, there is a high prevalence of sexually transmitted infections among this population. The purpose of this study is to investigate the perceptions of sexual health among older African American women and how these perceptions impact their level of comfort talking to their primary care provider. Many women feel that the topic is no longer relevant or that it should simply be need-based education, however 35% of women interviewed stated that they are in a relationship that could involve sexual activity. If healthcare providers assume that older women are not sexually active, a significant percentage of the population is missing out on vital education. Furthermore, the level of comfort in the patient-provider relationship was a significant factor in determining whether a patient would feel able to self-advocate for her sexual health. This relationship was impacted by factors such as length of relationship with the healthcare provider, having a female doctor and the presence of a caregiver. Further research needs to be conducted in this area, especially as it is considered a "taboo" subject. By de-stigmatizing the sexual health of older adults in medicine, more research can be conducted and the prevalence of STIs in this population can decrease.

Wiredu, Daphne and Beatrice Zhang; "*The interplay between systemic metabolism and the brain****"***
The prevalence of Diabetes Mellitus is rapidly rising and is projected to increase by 54% to impact over 54.9 million Americans by the year 2030. Therefore, it is crucial that we gain a better understanding of this disease and its detrimental impact on the function of various organs. While the impact of diabetes on metabolic organs such as the pancreas and the kidneys is well studied, the mechanism by which it impacts brain function is less clear. Some studies have shown that hyperglycemia, a diabetes-associated condition involving elevated glucose levels, can cause cognitive impairment and increase risk for neurodegenerative diseases such as Alzheimer's disease. However, the mechanisms underlying the connection between diabetes and Alzheimer's disease remain largely unknown. This study is using a combination of animal models and in vivo physiology to elucidate the impact of systemic metabolic derangements accompanying diabetes on brain function.

Wiston, Eli; "*Pileup Uncertainties in the ATLAS Jet Calibration****"***
Proton-proton collisions at the Large Hadron Collider (LHC) produce complex streams of hadrons known as jets. Reconstructing these jets is essential for understanding the complex particle interactions that occur at the LHC. However, individual jet reconstruction faces interference from other jets, known as pileup. Proton-proton collisions occurring either at the same time or within a short period of the collision being investigated leave excess energy in the detector. In order to confront this issue, corrections are applied to try to eliminate the dependence of reconstructed jet transverse momentum on pileup. These corrections are based on truth jets in Monte Carlo simulation. My project for the summer was to validate their efficacy in real data, as well as calculate their uncertainty. To begin, I validated the pileup independence of two methods of calculating reconstructed jet

momentum. The first method employed track jets, which can accurately measure the momentum of charged particles. The second method balanced the reconstructed jet momentum against the momentum of a recoiling Z boson. The dependencies of reconstructed jet momentum on pileup were plotted against track jet and Z boson momentum in bins of η (a measure of the angle of the jet relative to the beam axis). These dependencies were found to be close to 0, validating the correction. Taking the difference of these dependencies between simulation and data, the systematic uncertainty could also be calculated for each η bin.

Wossenseged, Yanet; ***"****The Potential of Multiplexed Immunofluorescence Imaging in Fanconi Anemia Research and Treatment****"***
Fanconi Anemia (FA) is a recessive autosomal disease caused by mutations in FA genes. FA patients typically exhibit physical abnormalities and face early onset bone marrow failure. A prior study by Yoon et al. indicates that during fetal development, Fancd2 deficient murine samples exhibit a fetal liver mass and a hematopoietic stem cell deficit. Given such findings, my project was directed at in utero murine fetal livers to identify key distinctions in microenvironment between wildtype and Fancd2 knockout samples.

To image the samples, we utilized the tissue-based cyclic (t-CyCIF) immunofluorescence technique. t-CyCIF follows a cyclic procedure including nuclear staining, 4-channel imaging, bleaching, and antibody incubation which is then proceeded by a washing step and repeated to generate high resolution, multiplexed images. As opposed to traditional imaging methods, t-CyCIF allows for more than four antibodies to be investigated per sample while utilizing conventional laboratory instruments and reagents.

This technique was completed using CD-150, CD-31, and Dlk-1 antibodies which stain for stem, endothelial, and stromal cells, respectively. We hypothesized that there is a fundamental difference in architecture and microenvironment between wildtype and Fancd2 knockout murine fetal liver. Specifically, we expect there to be fewer stem, endothelial, and stromal cells in the knockout Fancd2 murine fetal liver which will be exhibited through a lower frequency of fluorescence signal for CD-150, CD-31, and Dlk-1 markers.

Wren, Steven; ***"****Effect of E3 ubiquitin ligase TRIM11 on TDP-43 aggregation****"***
A hallmark characteristic of amyotrophic lateral sclerosis (ALS), a neurodegenerative disease, is the accumulation of aggregated TDP-43 protein within motor neurons. Previously, the Yang lab has found that tripartite motif (TRIM) family proteins are involved in protein quality control and that the E3 ubiquitin ligase TRIM11 identifies and promotes the degradation of misfolded proteins, which may be valuable for protecting against neurodegeneration. In this project, the effect of TRIM11 on TDP-43 aggregation in in vivo models was tested. Transgenic mice of the TDP-43 Q331K strain were used, as they show phenotypic characteristics and pathology of ALS observed in humans. TRIM11_AAV9 was delivered to the cerebrospinal fluid via intracerebroventricular injections in mice to ensure global spread and propagation of TRIM11 in the central nervous system. Behavioral tests were then conducted to gauge the effect TRIM11 had on motor capabilities of mice versus the control mice, which were injected with GFP rather than TRIM11. Our initial results show no statistically significant changes between groups at five months of age in open field testing, and that the TRIM11 group performed worse in grip strength and motor coordination tests. Pilot studies using a 10-time lower dose has been shown to induce modest recovery in motor dysfunction. We conclude that TRIM11 most likely has a small therapeutic window; titers beyond this margin would likely cause

adverse effects in the TDP-43 Q331K mice. This work provides an understanding of how TRIM11 may be better used as a therapeutic treatment in the future.

Wu, Jason; "*The Biodiversity of Fish Species from the Late Paleozoic Ice Age****"***
For the past 33 million years, Earth has been facing a major period of glaciation, popularly known as an Ice Age. The sole presence of polar ice caps shows us that this period is ongoing. However, for most of Earth's history, there were no polar ice caps. The late Paleozoic Ice Age, which lasted from about 360-260 million years ago, was another one of the few periods in which ice caps existed. Current biodiversity was likely heavily influenced by these fluctuating glacial conditions. However, there are a very limited number of studies looking at the fish fossil record to the extent in which researchers do not know how many fish species lived 1 million years ago. In order to understand how living fish species have diversified to their current state as well as predict future evolutionary patterns, it is important to compile and analyze fish fossil records from these ice ages. This project specifically involved gathering fossil records from the late Paleozoic Ice Age. The fossil record data from various literature sources and museum collections was inputted into a large database. This database aims to be the most complete record of fish fossils from the late Paleozoic Ice Age. Using the database from this project, future studies can include surveying fish ecosystem structures or investigating the origination of new species and changes in temperature.

Wu, Tina; "*Effect of Omega-3 Fatty Acids Nutritional Intervention on Behavior and Sleep****"***
Omega-3 fatty acids, commonly found in fish oil, have been linked to long term neuro-developmental effects in children. Previous studies have shown that omega-3 fatty acids could be linked to improved sleep quality, fewer externalizing and internalizing behavioral problems, and less antisocial behavior in adults. However, it is unclear whether these initial findings in adults can be substantiated earlier in life. The current study aims to examine the effect of an omega-3 fatty acid nutritional intervention on sleep quality and behavior in mother-child pairs as well as the parenting style of mothers participating in the study. Thirteen mothers and sixteen children, aged 5-10 years, were recruited for the double-blind random control trial, resulting in thirteen mother-child pairs. Each pair was randomly assigned to the nutrition intervention or control group. Cognitive assessment tasks, child interview, and various surveys (including the Adult Self Report, Child Behavior Checklist, Reactive-Proactive Questionnaire, and Pittsburgh Sleep Quality Index) were utilized at the baseline, 45-day follow-up, and 90-day follow-up assessments. In the first 45-day period, all participants were instructed to consume one supplement drink, containing either the omega-3 or placebo, per day. Preliminary data analyses were conducted to examine the efficacy of the nutritional intervention on improving parenting, behavior, and sleep outcomes.

Wu, Tina; "*The Effect of Motivation to Move on Rehabilitation Outcomes in Children with Cerebral Palsy: Methods and Reliability****"***
Cerebral palsy (CP) is a neurological disorder, caused by brain damage either before or soon after birth, that results in lifelong motor disability. Early motor training interventions demonstrate the greatest efficacy in reducing motor impairment; however, rehabilitation outcomes show wide variabilities independent of treatment method. This current study aims to study one potential reason for this difference, namely the child's motivation to move, which could vary greatly between children. We hypothesize that children demonstrating greater motivation to move will also display greater improvement in motor function. Because this variable had never been studied or coded before by the research team, optimal protocol and interrater reliability were established. In this preliminary

exploration, a rigorous, reliable method for measuring motivation to move in young children with CP was developed using the Motivation to Move-a scale.

Xiao, Jason; "*1 World Connected****"***
1 World Connected is a research project of the Center for Technology, Innovation and Competition at the University of Pennsylvania. Governments, civil society organizations, and businesses around the world have initiated a wide range of efforts to improve broadband adoption around the world, but no systematic analysis of these myriad efforts currently exists. 1 World Connected represents a comprehensive effort to consolidate, systematically analyze and disseminate information about these efforts, as well as understand their effects on development outcomes in education, health, financial inclusion and gender development.

Xiong, Michelle; "*How Do Song Lyrics and Music Taste Change Over Time?****"***
Understanding how certain cultural items become popular provides insight into what influences human behavior. Using natural language processing, this project investigates how song lyrics and music taste have changed over time with two separate questions.

First, lyrics over multiple periods were analyzed to see if songs with lyrics more differentiated from its genre become more popular. This claim was found to be true for recent songs between 2014-2016 in Are Atypical Things More Popular? By Jonah Berger and Grant Packard. Songs from 1989-2018 were tested to see if the trend holds for songs in a larger date range. Results indicated that while there is correlation between song differentiation and ranking for some periods further back in time, it is not as significant.
Secondly, lyrics over multiple periods were compared to see if new song lyrics imitate the lyrics of the most popular songs. The hypothesis was that mainstream song lyrics of one time period would be similar to the most popular song lyrics of the previous period. Initial results suggest the current topic model for the lyrics does not capture changes in topics over time well. Future adjustments are needed to improve the comparison between the most popular songs and mainstream songs.

Yancopoulos, Luka; "*Fabrication and Applications of Silicon Nitride Substrate Nanopores for Biomolecule Sensing****"***
The solid state nanopore allows for counting and sizing biomolecules and other particles suspended in different electrolyte solutions. When two electrolyte solutions are separated by a thin film with a small pore, a voltage bias can be applied across the film to generate a current of flowing salt ions through the pore. This current can be measured by putting electrodes into the electrolyte solution. Small charged biomolecules will move as a result of the voltage bias, flowing through the nanopore. While passing through the nanopore, these molecules block some electrolytic solution from flowing, causing the measured current to drop. The material used as the nanopore substrate, as well as the physical structure of the nanopore, impact electrical properties and allow for more accurate size and count readings. While working with Silicon Nitride substrate nanopores, the integrity of the structure of the pore is very dependent on the fabrication process, which involves lithography techniques, dry-etching, wet-etching, and Focused Electron Beam Drilling. By optimizing these fabrication techniques, it is possible to optimize the functionality of the nanopore for biomolecule analysis. Novel methods for DNA manipulation and tagging were also developed to greater understand naturally-occurring DNA fragments and DNA-pore interactions. Small oligonucleotides linked to proteins were hybridized to specific regions of longer naturally-occurring DNA sequences to act as deliberate markers along the DNA. Both the optimization of the nanopore and the manipulation of DNA provide important tools for analyzing DNA at high resolution, and are described for this project.

Yang, Alexander; "*CrowdMixer: Differentially Private Anonymous Communication****"***
The overall goal of this project is to build a system that meets the same standards as previous systems with the addition of 2 capabilities: increasing the number of users connected to the system and allowing messages to be stored for a set period of time. To achieve these goals, the project utilizes a heavily modified version of the Vuvuzela protocol with improved adaptive composition theorems that generate the noise necessary for the storage of messages over time.

The project also increases the number of users connected to the system through JavaScript code in a Chrome extension, creating involuntary "passive" users that are indistinguishable from real "active" users of the system. This thereby increases the anonymity set and makes the act of connecting to the system less suspicious. At the same time, we explore a more distributed server topography to spread out computational cost and significantly improve latency.

This system aims to meet standards of ε, δ differential privacy, with parameters for ε not exceeding ln(2) and parameters for δ not exceeding 1 x 10-4 over k rounds of communication. It is important to note that privacy guarantees are independent of the number of connected users.

Yang, Wenyao; "*Drop out From School in Mexico: An Empirical Analysis With Mixed Logit Model****"***
The Mexican conditional cash transfer (CCT) program, PROSPERA, began in 1997 to incentivize parents to enroll their children in school. Predicting the probability of a child dropping out of school plays an important role in the decision process for CCT. Using population and housing data from Instituto Nacional de Estadística y Geografía (INEGI), a mixed logit model is estimated to predict the probability for dropping out. Estimation findings indicated that socioeconomic factors such as employment status, years of education, home environment, family wealth are best modeled as fixed parameters while locality and household are best modeled as random parameters. Results from the quantitative analysis (N = 816406 families; 1345031 children, ages 12 - 19) were generally consistent with the qualitative analysis of potential factors for students dropping out. The results also show that the mixed logit model has a better performance than the normal logit model as a methodological tool in terms of the Bayesian information criterion.

Ye, Zhilin; "*An Analysis of On-road and VDT Data in Ohio****"***
The driver's licensing on-road exam (ORE) is often viewed as the gateway to independent driving. As drivers education is often not mandatory for individuals over 18 across all states, there is a substantial risk that novice drivers are taking the ORE despite being underprepared in their driving skills. Through a partnership between CHOP, Diagnostic Driving, and the Ohio Bureau of Motor Vehicles (OBMV) a virtual driving test (VDT) was developed, validated, and implemented in the state of Ohio's driver licensing workflow. Data from 4,643 first-time license applicants were collected between July 2017 and March 2018. This study aims to provide insights into the distributions of demographics among those taking the ORE in Ohio, as well as to predict a driver's on-road performance based on their VDT data. Our results showed that tutorial duration, which denotes the amount of time a driver spends on the tutorial portion of the simulation, is the single variable with the most predictive power in driver's performance. We found that the ORE rate of passage peaks when the driver is younger than 18, and is lowest when the driver is between 18 and 23 years old. We believe this is the result of the lack of driving training prior to the test, as driver's education is only required for those under 18. Our future work aims to uncover the

cause of the fluctuation of passage rates, with explicit examinations in relation to on-road training, driving skills as predicted by the virtual driving test, etc.

Yin, Changyue; "*Two Families, One Communist Dream: Oral History Accounts of Two Families of the Cultural Revolution of P.R.C."*
The goal of this research is to document the personal experience of my grandfather's siblings who migrated to different parts of China from Indonesia in the 1940s and 1950s. Though dispersed in different provinces, they maintained contact with each other, supported each other, and went through the turbulent first forty years of the People's Republic of China. This research aims to record the accounts of their experiences as immigrants to the early stage of PRC, and their impression of the PRC coming from a different cultural and ethnical background.

Young, Aidan; "*Unique Photoluminescent Patterns in CVD-Grown Tungsten Disulfide Monolayers"*
Two-dimensional materials, especially WS2, have generated excitement due to their optical and electronic properties as well as their direct bandgap. Chemical Vapor Deposition (CVD) is used to grow pristine, uniform monolayers of tungsten disulfide (WS2). These monolayers are placed under an optical microscope and excited with 405 nm light from a blue laser. The resulting photoluminescence, along with optical images, was captured using an imaging machine. The photoluminescent patterns of the monolayers were recorded and analyzed. Emission wavelength and intensity were measured from select areas inside the monolayers. In addition, an analysis was performed on the growth process as well.

Zaitseva, Daria; "*Seizure Observations in Adult CDD Mice and Righting Assay of CDG Pups"*
CDKL5 Deficiency Disorder and Congenital Disorders of Glycosylation cause infantile to early childhood epilepsy. The R59X mouse model of CDD used in the Zhou lab has shown seizures in aging female breeders. Generalized and myoclonic seizures were inconsistently seen on video and with EEG recordings. R59X mice also showed sleep twitches resembling seizure-like activity. The sleep twitches were accompanied by abnormal EEG activity. The frequencies of the seizures of 9 aging R59X breeders were monitored and recorded. Patients with congenital disorders of glycosylation have shown a variety of symptoms besides epilepsy, including delayed motor milestones and ataxia. The Zhou lab is working with GALNT2 conditional knockout mice to detect similar phenotypes. The righting assay performed on 5 to 13 day old mouse pups is used to detect delays in motor coordination. While sample size is not large enough, the current results do not show an obvious phenotype in full body or brain GALNT2 knockout mice. The GALNT2 conditional knockout mouse model has also not shown signs of epilepsy unlike human patients.

Zhang, Lilian; "*Investigating establishment of common ground through encoding linguistic expressions"*
Language enables people to talk about entities in the world. However, the same entity can be addressed with different linguistic expressions — and the choice is never arbitrary. For instance, people may refer to Jim Kenney, Philadelphia's current mayor, with his full name, "Jim Kenney," if they believe their addressee likely knows who the city's mayor is, and that this knowledge is mutually known, i.e., in their so-called "common ground." Other expressions, such as "Philadelphia's mayor", do not presuppose this specific mutual knowledge. The choice of expression also reflects the perspective the speaker adopts, illustrated by the differences between "the mayor," "my neighbor," or "Jim." Finally, such expressions can be definite, as exemplified above, or indefinite (e.g., "a man"). Definite

expressions may convey the presupposition that the entity can be uniquely identified by the addressee because of mutually shared knowledge (e.g., 'the mayor', 'Jim'). Conversely, the use of an indefinite expression indicates that the referent is not unique or not specific (yet).

The Dahan Lab aims to investigate the establishment of common ground. More specifically, we study how people decide which referring expression to use when discussing a specific entity for the first time with their addressee. We examine how people adopt different strategies and which, if any, demographic variables (e.g., age, sex, education level, personality traits, cognitive abilities) may predict people's behaviors. Participants recruited from the greater Philadelphia area are invited to play a matching game, and their linguistic choices are recorded and analyzed using a coding program called Praat.

Zhang, Robert; "*Developing an LCS Scikit-learn Package****"***
Learning Classifier Systems (LCSs) are a classification of Rule Based Machine Learning Algorithms that have been shown to perform well on problems involving high amounts of heterogeneity and epistasis. Well designed LCSs are also highly human interpretable. LCS variants have been shown to adeptly handle supervised and reinforced, classification and regression, online and offline learning problems, as well as missing or unbalanced data. These characteristics of versatility and interpretability give LCSs a wide range of potential applications, notably those in biomedicine. Over the past few decades, research in LCSs has been conducted within a relatively small community. Further exposure of LCS techniques will benefit the general ML community and allow for more rapid research. To this end, this paper presents a description of a newly developed Scikit-learn LCS package that implements a UCS variant: eLCS. Ultimately, this package aims to further bring LCS techniques into the ML zeitgeist, as well as provide an easier means for LCS models to be developed and tested by a larger community of researchers.

Zheng, Weichen; "*Defense Against the Adversarial Attacks****"***
I present a new method of training adversarial robust models that achieve high accuracy even under great disturbance. The method uses path-wise optimization by increasing the attack disturbance gradually and tune the model accordingly. The resulting model can successfully defend against the state of the art attack.

Zhou, Qingyang (Freya); "*Film Exchanges between East Germany and China during the Cold War****"***
This project examines filmic exchanges between two socialist comrade states, the German Democratic Republic (GDR, 1949-1990) and the People's Republic of China. It explores the political intentions that fostered the production of documentaries about China by the GDR's state-sponsored film studio, DEFA, in the 1950s and the 1980s. The project investigates how the Chinese were perceived by East German state officials and film audiences, how these attitudes were reflected in the films produced, as well as how these cinematic dialogues intertwined with GDR cultural and foreign policy.

Zhou, Rongxuan; "*Baroque Topologies****"***
The theme of this project is the defamiliarization of Baroque Architecture with the assistance of modern day technology. Baroque churches were scanned using a LiDAR scanner; meshes of the interior of the churches were then created with the point cloud data. These meshes, taken out of any context of the exterior, landscape, and culture, were perceived as objects and rendered in orthographic view with studio lighting instead of the human perspective with natural lighting in KeyShot. Rendered images were then brought

into Adobe Photoshop for post-processing (including color correction, merging original plan drawings with the renderings, etc.). Reflected ceiling plans with original plan drawings layered on top were brought into Rhino - the original plan drawings were traced and compared with the actual plan from the mesh of the interior and the point cloud plan cut of the exterior if the exterior scan existed. All of the images produced serve the goal of re-representation of Baroque architecture in the lens of object-oriented speculative realism.

Zhu, Chuning; "*Concise Bug Explanation Using SMT Solver****"***
Recent years have witnessed a growth in popularity and efficacy of online fuzzers such as OSS-Fuzz. These fuzzers test programs against generated inputs until a crashing input is encountered. However, error traces produced by fuzzers are in the form of stack trace, which is nonspecific and may fail to capture the source of the bug. Users thus spend a lot of time and effort to understand the bugs in their code. To address this problem, we present a hybrid algorithm which produces concise explanations of bugs found by fuzzers. We first extract the LLVM trace of the buggy execution and convert it to a formula in conjunctive normal form. Applying Microsoft Z3 solver, we reduce the formula to its minimal unsatisfiable core. Finally, we use an iterative algorithm to handle conditional statements omitted in the unsatisfiable core. We evaluate our algorithm on a suite of real null-dereference bugs. Results show that our algorithm can reduce the length of an error trace by several orders of magnitude while retaining the essence of the bug.

Zhu, Lucy; "*Developmental gating of social behaviors in Drosophila****"***
Early in life, animals initiate a broad repertoire of behaviors essential for survival, such as feeding, sleeping, and aggression. These innate behaviors can arise from immature underlying neural processes, show dramatic ontogenetic change, and be altered by experience, indicating that these circuits are highly dynamic and modifiable. Aberrant emergence of social behaviors in early life is a hallmark of human neurodevelopmental disorders, emphasizing the importance in gaining a mechanistic understanding of behavioral ontogeny. We have found that newly eclosed male flies do not exhibit aggressive behaviors for the first 24 hours of adult life. As flies age, aggression becomes increasingly robust. To discover novel regulators of aggression ontogeny, we have undertaken a thermogenetic screen to identify neurons and circuits that can drive aggression in juvenile flies. Activation of neurons defined by YF1 Gal4 line strongly promotes aggressive and courtship behaviors on the first day of adult life. Genetic intersection experiments reveal that the courtship-promoting activity within YF1 maps to sexually dimorphic dopaminergic PAM neurons. On-going work aims to determine how this neuronal population interacts with regulators of adult courtship to modulate the developmental gating of social behaviors in Drosophila.

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