BROWN

SUMMER RESEARCH SYMPOSIUM

2017

Sayles Hall
11:00 am – 1:00 pm

Thursday, August 3
Life Sciences and Humanities

&

Friday, August 4
Physical and Social Sciences and
Student Teams

PRESENTED BY
The Office of the Dean of the College

SUMMER RESEARCH SYMPOSIUM

Sayles Hall
Main Green

Thursday, August 3
Life Sciences and Humanities Posters

11:00 – 11:05 am	Welcome Associate Dean Oludurotimi Adetunji
11:05 – 11:10 am	Brief remarks Provost Richard Locke
11:10 – 11:20 am	Presenting the Mentoring Award Dean Maud Mandel
11:00 am – 1:00 pm	Research Poster Presentations

Friday, August 4
Physical and Social Sciences and Team Posters

11:00 – 11:10 am	Welcome Associate Dean Oludurotimi Adetunji
11:10 – 11:20 am	Brief remarks Dean Maud Mandel
11:00 am – 1:00 pm	Research Poster Presentations

~ A light lunch will be provided both days ~

Descriptions of each poster session include a poster number indicating the poster's placement in Sayles. To locate a poster, refer to the layout maps at the end of this pamphlet.

SUMMER RESEARCH SYMPOSIUM POSTERS
Thursday, August 3
Humanities & Life Sciences

Humanities

Ellen S. Cola — Poster #A1

Home Institution: Brown University

Summer Research Program: Undergraduate Teaching and Research Awards (UTRA)

Faculty Mentor: Dr. Emily A. Owens, Department of History

Motivating the Movement: The Connections Between Black Women in Slavery and #BlackGirlMagic

In recent decades, historians and contemporary scholars have begun to analyze the effects of U.S. slavery on black women, apprehend how intersectionality effects the lives of black women, and understand the significance of the #BlackGirlMagic movement. As a result of these scholars' phenomenal work, we now know a lot about each separate topic; however, we do not know how all these topics relate and intersect. This project will question whether the contemporary #BlackGirlMagic movement is really contemporary or if it truly has its roots in plantation slavery. By reading both primary and secondary sources about bondwomen in slavery and researching the true meaning of #BlackGirlMagic, I will debunk the true beginnings of #BlackGirlMagic and counter the argument that black women just recently became empowered.

Rubén Flores — Poster #A2

Home Institution: North Dakota State University

Summer Research Program: Leadership Alliance-Summer Research Early Identification Program (SR-EIP)

Faculty Mentor: Joshua Tucker, Department of Music

Chicanx Hip Hop and Models of Racial Discourse in the Red River Valley of the North

Hip Hop has historically prioritized the perspectives of marginalized communities. Therefore, Hip Hop is a direct reflection of marginalized communities' understandings. My project focuses on Chicanx Hip Hop's take on racial discourse. Through media analysis and ethnography, I link models of racial discourse in Chicanx Hip Hop to models of racial discourse in a Chicanx family's radio station, located in Fargo ND, and Moorhead MN. This racial discourse includes thoughts around whiteness and indigeneity. In my research, argue that racial discourse links the Chicanx community despite geographical differences. Ultimately, this gives a more nuanced understanding of racial discourse among Chicanx people and more nuanced understanding of American racial discourse, as a whole.

Mikayla Harden Poster #A3

Home Institution: The University of Texas at Austin

Summer Research Program: Leadership Alliance-Summer Research Early Identification Program (SR-EIP)

Faculty Mentor: Emily Owens, Department of History and Africana

Eleanor Eldrige: A 19th Century Black Business Woman

After a trip to the archives searching for age of consent civil suits, I found a unique case of a woman who lost her property after leaving Rhode Island. Her name is Elleanor Eldridge. Like most New Englanders, she labored for her wages. However, her being a black woman interfered with her business.

My Research question asks: What does it mean to be a black business woman? How did that intersect with being formerly enslaved? How does intersectionality play a role in her treatment? How did the courts treat her? Did she get representation in court? Furthermore, What experience did she have in her life? How does her experience compare to the experiences of other former enslaved people?

To further implore my questions, I will use the Rhode Island Judicial Records and their records of the civil suit against the person who sold her property. Then, I will use her memoir published in 1838 as a primary document from Eldridge. Lastly, I will use secondary documents to investigate whether her treatment in the Rhode Island courts connects to a larger picture of being a formerly enslaved black woman in Rhode Island.

Anya Hong Poster #A4

Home Institution: Brown University

Summer Research Program: Undergraduate Teaching and Research Awards (UTRA)

Faculty Mentor: John Bodel, Department of Classics

US Epigraphy Project

I work with Latin and Greek inscriptions; I enter them into the online database that is the United States Epigraphy Project website. I check that the metadata of - the language, origin, type, and material - entered for each inscription is correct. If material is lacking or untrue, I search for accurate information by researching the location of the artifact (eg, museum or private collection); once I discover its location, I would contact the museum curator or owner of the artifact in order to collect the necessary information concerning the epigraph. I enter the necessary data into the site using XML coding. This basic code allows site users to search for epigraphs from particular locations or time periods, or for epigraphs with specific words. I also help translate each piece and classify each word of the inscription according to its case or use in the sentence itself using the code. This enables users to search the inscriptions with greater specificity.

Jessica Jiang Poster #A5

Home Institution: Brown University

Summer Research Program: Undergraduate Teaching and Research Awards (UTRA)

Faculty Mentor: Evelyn Hu-DeHart, Department of Ethnic Studies

Sites of Encounter: Unsettling the Chinese Diaspora

This digital exhibit traces histories of interaction and intimacy between Chinese migrants and Indigenous peoples in Australia, Aotearoa/New Zealand, Hawai'i, and North America, from first encounters to contemporary relations. For both Indigenous peoples and racialized migrants such as the Chinese, discussions of oppression have typically sought to locate their subordinate statuses in relation to whiteness. In contrast, this project asks what relationships and responsibilities settlers of color have to the Indigenous peoples whose lands they live on. What might these encounters tell us about how settler colonialism works, and what possibilities for decolonization might we glimpse in their passing? In relationships between Chinese and Indigenous peoples across time and space, we find both structures of complicity, and openings for solidarity.

Caroline Jones Poster #A6

Home Institution: Brown University

Summer Research Program: IBES Internships

Faculty Mentor: Dawn King, Department of Environmental Studies

Pollinators and Pesticide Regulations

My

Summer research project with the Audubon Society of Rhode Island has focused around the protection of pollinators. I have researched policies in place in other states to protect pollinators through the conservation and creation of habitat, and I have researched potential avenues for improvement to Rhode Island's existing pesticide regulations.

Jennifer Mojica Santana Poster #A7

Home Institution: University of Puerto Rico, Mayaguez Campus

Summer Research Program: Leadership Alliance-Summer Research Early Identification Program (SR-EIP)

Faculty Mentor: Matthew Guterl, Departments of Africana Studies, American Studies, and Ethnic Studies

Yo Soy AmeRícan: Exploring Identity in Both the Mainland and Homeland in Tato Laviera's Poetry

Since the 1960s, Puerto Ricans have left their homeland for the United States, specifically New York. As a result, the Puerto Rican diaspora produced a new culture—the Nuyorican movement. Nuyoricans expressed their personal experiences dealing with culture clash, and discrimination from Americans and Puerto Ricans—leading to the struggle of finding their own identity. Years later, New York lost its place as the center of diasporic culture, migrants spreading around the whole United States. The poem "AmeRícan," by Tato Laviera, highlights the nationalization of diasporic

identity. The poem expresses the speaker's identity—what it is like and what it means to belong to both the United States and the Puerto Rican diaspora. This presentation explores identity to unveil a new sense of identity and a new generation of Puerto Ricans along the United States—the AmerRícans.

Fernando Norat Poster #A8

Home Institution: University of Puerto Rico

Summer Research Program: Leadership Alliance-Summer Research Early Identification Program (SR-EIP), Mellon Mays Undergraduate Fellowship

Faculty Mentor: Jennifer Lambe, Department of History & Sandra Pujals, Department of History-University of Puerto Rico

More than Sputniks in Havana: Soviet Culture in Cuba (1957-1961)

The purpose of this research is to examine the influence of Soviet culture in Cuba before and after the Cuban Revolution. The project how the Soviet Union engaged with Cuban culture, and what symbolic function the Cuban Revolution had on the Soviet media. Current scholarship on the period between 1959-1970 focuses on the political, economic, and military aspects of the countries' complicated relationship, and overlooked the rich cultural interactions that occurred. Cultural connections, as a founding stone for human interaction, are especially important in the beginning of an exchange as significant as the Cuban-Soviet. The project aims to discuss questions such as: What did the Cuban institutions understood of the Soviet Union culturally? Which position did Cuba occupy culturally in a rapidly changing Soviet Union? This aspect of the relation between the Soviet Union and Cuba has been study to some extent by social scientists and cultural scholars, but has not been broadly studied by historians. The project aims to develop these questions by using content analysis of primary sources as the methodology.

Charlotte Posever Poster #A9

Home Institution: Brown University

Summer Research Program: Undergraduate Teaching and Research Awards (UTRA)

Faculty Mentor: Jeremy Mumford, Department of History

Painting Identity: Portraiture in Colonial Peru

One of the many ways that colonial officials in the Viceroyalty of Peru promoted a message of complete political, social, and religious dominance was through artwork. My research will focus on material culture in colonial Peru, between the seventeenth and eighteenth centuries, with particular attention to portraiture. Actively incorporating European stylistic techniques and mediums, colonial portraits of the social elite are far more complex than they appear. Illustrating the intersections of indigenous and Spanish iconography, portraits weave distinct political, social, and religious themes together, commemorating a colonial society that struggled with questions of identity.

Research for my project will investigate representations of indigeneity in these portraits, examining the role colonial officials played in society and how they validated that position through portraiture. Central questions include: what are the iconographic links found between these different works and/or material objects? How does the iconography in portraits from this time period reflect the social changes taking place? What ways did portraiture silence and/or promote indigenous

narratives/identity among the social elite? How was this identity preserved? And lastly, do these works of art showcase agency and/or passivity to a new political, social, and religious order? Social tensions were fraught, yet artwork, including portraits and religious paintings, seemed to project an attitude of coexistence between Spanish and indigenous cultures. Why this was the case will be the baseline of my research.

Caroline Ribet Poster #A10

Home Institution: Brown University

Summer Research Program: Undergraduate Teaching and Research Awards (UTRA)

Faculty Mentor: Howard Chudacoff, Department of History

How Walter Byers Influenced the History of College Sports

In this project, Professor Chudacoff and I are examining the roll of the NCAA's executive director from 1951-1987, Walter Byers, in the commercialization of intercollegiate athletics. His combination of eccentric personality and significant tenure proved crucial in the negotiation of influential television contracts, for example.

Luiza Silva Poster #A11

Home Institution: Brown University

Summer Research Program: Royce Fellows

Faculty Mentor: Laurel Bestock, Department of Egyptology

A Forgotten Collection: Re-introducing the Egyptian Artifacts in Brazil's National Museum to Egyptology

The Egyptian collection in Brazil's National Museum is the largest and most important assemblage of its kind in South America. Despite this, it is not well-known in the Egyptological community, since the only means of studying the artifacts remotely are an outdated catalogue and a Portuguese-only website. In order to make the collection more accessible to international Egyptologists, I will update the museum website by translating current object descriptions and adding new information and images. Additionally, I will develop a new exhibit plan for a substantial part of the collection to attract not only foreign academics, but also local visitors.

Life Sciences

Layla Abdulla Poster #A12

Home Institution: Brown University

Summer Research Program: Undergraduate Teaching and Research Awards (UTRA)

Faculty Mentor: Betty Vohr, Department of Pediatrics

Perceptions of Discharge Readiness by Maternal Immigrant Status in NICU Mothers

Immigrant families face a variety of obstacles when it comes to healthcare due to social disadvantages, language barriers and fewer support systems. The aim of our project is to evaluate the

effect of maternal immigrant status on perceptions of discharge readiness in mothers of preterm infants. We hypothesize that immigrant mothers would perceive less discharge readiness in comparison to native mothers. The Fragile Infant Parent Readiness Evaluation (FIPRE) will be utilized to measure emotional preparedness. The maternal and infant characteristics as well as the FIPRE scores of our two groups will be compared. Based on our findings and the literature, a series of regression models will be run to estimate the effect of maternal immigrant status on the FIPRE scores.

Santiago Acero Bedoya Poster #A13

Home Institution: Columbus State Community College

Summer Research Program: Leadership Alliance-Summer Research Early Identification Program (SR-EIP)

Faculty Mentors: Michelle Dawson, Department of Molecular Pharmacology, Physiology, and Biotechnology & Deepraj Ghosh, Department of Molecular Pharmacology, Physiology, and Biotechnology

Mechanosensitivity Analysis of Breast Cancer Tumor Cells from Needle Biopsy

Tumor stiffness has been associated with malignancy and increased risk for metastasis. Extensive research has been done investigating breast cancer cell lines' responsiveness to surfaces of varying rigidities as well as examining the biophysical properties of breast cancer tumor samples. However, there is a critical gap regarding the relationship between cells' mechanosensitivity in conjunction to biophysical properties of their extracellular matrix environment. To explore this relationship, we will analyze single-cell mechanosensitivity in comparison to tumor rigidity via shearwave ultrasound elastogrophy (SWE). Given the putative affiliation, we hypothesize that cells expressing invasive mechanosensitivity profiles will correlate with stiffer tumor regions. In order to test this, we are developing novel techniques that will allow us to examine single-cell mechanosensitivity via tissue proxies.

Jose Almanzar Poster #A14

Home Institution: Brown University

Summer Research Program: Rhode Island Hospital

Summer Research Intern

Faculty Mentor: Craig Lefort, Department of Surgical Research

Development and Analysis of Candida Phagocytosis by Neutrophils

My Summer research has involved screening and testing differentiated neutrophils. An activated neutrophil has tens of thousands of mutations that can then be analyzed to see which neutrophil functions are either enhanced or diminished due to the function of the CRISPR/Cas9 editing system. These neutrophil functions will be analyzed using specific assays that will test the phagocytic, degranulation, and extravasation capabilities of these fully mature immune cells. Using the cells that are of interest, we will sort them individually using flow cytometry, and their unique sequence will be discerned using single-cell PCR or by next generation sequencing. The discovery of which sequence leads to which function will allow us to more fully understand the protein units on the surface of the cell.

Joshua Amaya Poster #A15

Home Institution: Brown University

Summer Research Program: Undergraduate Teaching and Research Awards (UTRA)

Faculty Mentor: Nicolas Fawzi, Department of Molecular Pharmacology, Physiology and Biotechnology

Fyn Kinase SH3 domain induces liquid-liquid phase separation of ALS-associated protein hnRNP A2 into in vitro models of transport granules

The myelination of axons is important for increasing the conduction velocity of action potentials in the nervous system. Myelin Basic Protein (MBP) translation is localized at specific sites in oligodendrocytes and activated-Fyn regulates MBP translation. MBP mRNA is transported to specific sites by hnRNP A2 in RNA granules in neurons which may be stabilized by liquid-liquid phase separation of constituent proteins and mRNAs. Fyn-Kinase activation triggers hnRNP A2 phosphorylation and other granule components resulting in the dissociation of the granule and removal of translational repression. Missense mutations in the LC of hnRNP A2 drive the formation of cytoplasmic inclusions that form in Amyotrophic Lateral Sclerosis (ALS) patients. Here we show that the SH3 domain causes the hnRNP A2 LC to condense into liquid droplets.

Yokabed Ashenafi Poster #A16

Home Institution: Brown University

Summer Research Program: Undergraduate Teaching and Research Awards (UTRA)

Faculty Mentor: Adam Levine, Department of Emergency Medicine

The use of mHealth to improve the WHO algorithm

This project aims to determine the reliability and usability of the two dehydration assessment tools and examine how assessment is enhanced with the use of mHealth technology. It is based on a prospective sample of patients presenting with acute diarrhea in Bangladesh. Local nurses measured patients' dehydration status and answered questions regarding the usability of each tool. All data analysis was conducted on STATA. Patients' baseline measurements were summarized, and the inter-rater reliability of each tool was calculated using Cohen's kappa statistic. We also assessed the usability of each diagnostic tool. This project is of great significance in reducing the global burden of diarrheal diseases as reliable dehydration assessment in resource limited settings is critical to offset scarce health resources.

Douglas Barber Poster # B1

Home Institution: Brown University

Summer Research Program: Undergraduate Teaching and Research Awards (UTRA)

Faculty Mentor: Dioscaris Garcia, Department of Orthopedics

Rapid Visualization and Characterization of Bacterial Biofilm on Orthopedic Materials

Biofilm formation on Orthopedic Trauma implants remains a major challenge for the field. In the United States, over two million fracture-fixation devices are inserted each year. Of those, between .5-2% become infected. In the case of open fractures, the rate of infection is as high as 30%. As

bacteria adhere to and proliferate on a surface, they produce a protective exopolymeric matrix composed of carbohydrates, proteins and exogenous DNA. This matrix hinders collection of microbial cells, leading to unreliable results with PCR- and culture-based methods of detection. I will develop a model of bacterial biofilm formation on Polyether Ether Ketone, an orthopedic material commonly used in spinal implants. This model will include a novel method of visualization and classification of biofilms that employs matrix-component fluorescent staining and confocal laser scanning microscopy.

Daniela Barbosa Poster #B2

Home Institution: The University of Texas Rio Grande Valley

Summer Research Program: Leadership Alliance-Summer Research Early Identification Program (SR-EIP)

Faculty Mentor: Robbert Creton, Department of Molecular Biology, Cell Biology, and Biochemistry

Effect of Choroideremia Inhibition on Zebrafish Vision

Choroideremia is an X-linked recessive disorder due to a mutation in the CHM gene resulting in blindness. To study this condition we use a morpholino knockdown of CHM protein in zebrafish. The morpholino functions by preventing translation of mRNA to protein. Preliminary data of 4 dpf CHM MO zebrafish had a constant low swim speed and a limited response to the visual stimulus compared to wild type, suggesting blindness induced by CHM knockdown. At 5 and 6 dpf their response to the visual stimuli is similar to the wild type. These results suggest that temporary CHM knockdown can induce blindness and recovery can be tracked, making them a great model to study choroidoremia disease and develop potential treatments.

David Bautista Poster #B3

Home Institution: Texas A&M University - Kingsville

Summer Research Program: Leadership Alliance-Summer Research Early Identification Program (SR-EIP)

Faculty Mentor: Nicolas Fawzi, Department of Molecular Pharmacology, Physiology and Biotechnology

Determining the Structure of the N – Terminal and C – Terminal Domains in SMN1 Protein In Association With Neurodegenerative Diseases

Survival of motor neuron (SMN) is a protein which has been linked to spinal muscular atrophy (SMA), a neurodegenerative disease. The mechanistic link between SMN and SMA is unclear due to the fact that SMN1 has no confirmed structure in the N-terminal domain (NTD) or the C - terminal domain (CTD). It is possible that the NTD and CTD are intrinsically disordered domain (IDDs), meaning there is no defined structure present in the domain. In order to have a full understanding of the biological mechanisms linking SMN and SMA, we must first define the structure or lack of structure in the NTD and CTD of SMN.

Quincy Beck Poster #B4

Home Institution: Brown University

Summer Research Program: Undergraduate Teaching and Research Awards (UTRA)

Faculty Mentor: Andrea Simmons, Department of Cognitive, Linguistic and Psychological Sciences & James Simmons, Department of Neuroscience

Neural processing of FM sweeps in echolocating bats

Echolocating bats emit ultrasonic FM sweeps and use information in the returning echoes to navigate and locate target objects. However, there are few studies on how these sweeps are represented neurophysiologically. In this study, auditory brainstem responses (ABRs) to single harmonic FM sweeps similar to a bat's sonar broadcast were recorded from the inferior colliculus of live sedated Eptesicus fuscus and Carollia perspicillata. The response waveform, amplitude, and latency were analyzed for trials of varying stimulus intensities. Early findings suggest that threshold for 120 kHz to 40 kHz sweeps is approximately 20 dB SPL, and this may be affected by the bats' body temperature and/or broadband noise exposure.

Marilyn Bravo Poster #B5

Home Institution: Brown University

Summer Research Program: Undergraduate Research Assistant

Faculty Mentor: Kevin Bath, Department of Neuroscience

Development of the Neural Circuit of Anxiety in Adolescent Mice

Anxiety disorders pose a huge problem for today's youth. The present study aims at understanding the developmental trajectory of neural circuitry and anxiety development during adolescence. Our findings in mice suggest that anxiety may be reduced during early adolescence, when compared to pre-adolescence and late-adolescence. This decrease in anxiety may explain previously published work detailing a deficit in the ability to express a conditioned contextual fear memory during early-adolescence. Here, we expand on our work by assessing the developmental trajectory of structures that project to the Basolateral Amygdala, a key structure in both the anxiety and fear circuits. Through this work we assess the link between circuit development and behavioral phenotypes.

Yueming Cao Poster #B6

Home Institution: Brown University

Summer Research Program: Undergraduate Teaching and Research Awards (UTRA)

Faculty Mentor: Gideon Koren, Department of Medicine, Division of Cardiology

The Role of Senescence in Arrhythmogenesis in the Infarcted Aged Heart

Aging is associated with a 10-20 fold increase in the incidence of sudden cardiac death. Our hypothesis is that age-related senescence response of cardiac myofibroblasts contributes to impaired wound healing which underlies the pathogenesis of malignant arrhythmias. These arrhythmias are sustained by the fibrotic, aged heart. We used Masons Trichrome staining to assess fibrosis and senescence-associated beta galactosidase (SA-βGal) staining to quantify senescent myofibroblasts in the infarct zone (IZ), infarct border zone (IBZ), and remote zone. Our data shows that 3-weeks

post-MI the aged IBZ has more interstitial fibrosis than young IBZ. In addition, there are more senescent myofibroblasts in the aged IZ than the young IZ. Aged heart is more fibrotic despite the persistent presence of senescent myofibroblast.

Brigett Carvajal Poster #B7

Home Institution: CUNY Hunter College

Summer Research Program: Leadership Alliance-Summer Research Early Identification Program (SR-EIP)

Faculty Mentor: Alexander Jaworski, Department of Neuroscience

Genetic Fate Mapping of Commissural Neurons in the Spinal Cord

Commissural neurons are a heterogenous population of spinal interneurons that project axons across the spinal cord ventral midline and relay somatosensory input from the periphery to the brain. However, the developmental origin and precise function of commissural neurons are not well understood. Here, we use mice that express Cre recombinase selectively in all commissural neurons together with a Cre-dependent reporter line to elucidate which progenitor domains within the embryonic spinal cord give rise to different subtypes of commissural neurons. We combine genetic labeling of commissural neurons with immunohistochemistry to visualize various classes of embryonic spinal cord neurons. Our studies provide important insights into commissural neuron development and serve as a starting point for understanding their contribution to somatosensory information processing.

Alexander Catoya Poster #B8

Home Institution: Brown University

Summer Research Program:

Summer Undergrad Research Intended for Senior Thesis in Neuroscience

Faculty Mentor: Leigh Hochberg, School of Engineering & David Brandman, Department of Neuroscience

Neuro-Identifiability

Intracortical brain computer interfaces (iBCIs) can enable individuals with tetraplegia to communicate and control external devices. The BrainGate2 clinical trial has previously described the long-term viability of implanted intracortical electrodes in several people. It is unknown whether a person's neural signals can be treated as a "finger print" that can be used to uniquely identify that user within a database of users. This project addresses the very practical concern about the extent of confidentiality required for recorded intracortical brain signals. Preliminary results from multi-task, two-participant comparisons demonstrate iBCI user identity is readily classifiable with standard techniques on this scale, and simultaneous user and task classification is possible. Additional participant and task data will demonstrate the extent to which this holds.

Stephanie Chan Poster #D4

Home Institution: Brown University

Summer Research Program: PLME Summer Research Assistantships in Biomedical Sciences

Faculty Mentor: Wael Asaad, Department of Neurosurgery

Quantifying Parkinson's Motor Behavior through a Motor Tracking Task for Closed-Loop Deep Brain Stimulation

To treat symptoms of Parkinson's disease, closed-loop deep brain stimulation (aDBS) quantifies the short-term variation of motor symptoms to identify optimal biomarkers for when to stimulate. An existing task assesses the motor symptoms by tracking a target that moves at a constant velocity and follows a set pattern. However, Parkinson's disease leads to deficits in habitual movement. The current task is limited and needs to sample a more dynamic range to more accurately assess the severity of Parkinson's symptoms in a short-time scale. Therefore, my project aims to create a tracking task that will better measure Parkinson's disease motor symptoms by programming the tracker to move in a semi-random path with varying velocity. This task will be implemented in the clinic and the data collected from this task will be compared to past data. Analysis of this data is essential to development of aDBS.

Juanetziel Charneco Poster #B9

Home Institution: University of Puerto Rico in Aguadilla

Summer Research Program: Leadership Alliance-Summer Research Early Identification Program (SR-EIP)

Faculty Mentor: Gaurav Choudhary, Department of Medicine

Exploring mechanism of increased acetylcholine in the right ventricle in Pulmonary Arterial Hypertension

Pulmonary arterial hypertension (PH) is a serious disease in which vasoconstriction and vascular remodeling lead to a progressive increase in pulmonary vascular resistance resulting in right ventricular dysfunction and failure. Preliminary studies from our lab have shown that animals with PH have high levels of □ 7 nicotinic acetylcholine receptors and its ligand, acetylcholine, which result in increased RV dysfunction. I'll be working with on characterizing proteins that are involved in synthesis of acetylcholine, using immunoblotting. The membrane will be stripped and reprobed for actin to ensure equal loading. I'll be using RV and left ventricle (LV) rat tissue homogenates from control rats and rats with PH to examine the expression of acetylcholine synthesis pathway proteins in the ventricular tissue.

Jocelyn Cheng Poster #B10

Home Institution: Brown University

Summer Research Program: Undergraduate Teaching and Research Awards (UTRA)

Faculty Mentor: Jonghwan Lee, Department of Biomedical Engineering

Advanced Methods of Retinal Imaging for Early Detection of Alzheimer's Disease

Using HIPAA guidelines, we will create an automated image extraction program to bundle and remove stacks of raw image files, from Dr. Snyder's Optical Coherence Tomography system (Optovue Angiovue OCTA system). This involves manipulating data compression routines used by Optovue's software to create a repeating sequence for stack extraction of 2 contiguous micron slices through the retina from each individual subject. All subjects participating in the study are anonymous and de-identified. The bundles of image stacks will then be transported to the PI's Lab at Brown University School of Engineering. We will then develop another software to measure the abovementioned retinal structural metrics from the supplied human data. The software will use the structure of image-processing procedures developed by the PI in earlier studies in mice but will be adjusted to reflect characteristics of human retina images. Target metrics include RNFL thickness, inclusion body area, optical scattering coefficient and capillary characteristics, such as density/branching/tortuosity. Image processing will be applied for each metric (e.g. edge detection-based semi-automated measurement of the layer thickness, and Hessian-matrix vessel vectorization). Potential pitfalls include the fact that image stacks obtained from most commercial OCT systems are normalized and contrast-adjusted so that they may not be suitable for the scattering coefficient measurement. Our approach to measure the scattering coefficient from 3D OCT data requires un-normalized raw OCT data. In this case, we will discuss with the vendor to customize the system to enable export of raw OCT data.

Evan Chernov Poster #B11

Home Institution: Brown University

Summer Research Program: Undergraduate Teaching and Research Awards (UTRA)

Faculty Mentors: Joseph Bliss, Department of Biomedical Pediatrics & Sunil Shaw, Department of Biomedical Pediatrics

Applying FACS Technology to Interrogate Interactions between Candida and Host Cells My project is to develop a method to further interrogate the internalization process by which yeast in the bloodstream enter endothelial cells and evade killing by phagocytic immune cells. We isolate neutrophils and peripheral blood mononuclear cells (PBMCs) from human blood and introduce fluorescently labeled Candida parapsilosis. We use fluorescently activated cell sorting (FACS) to distinguish host cells that have internalized the labeled yeast from cells that have not. Establishing a FACS-based assay for this process allows additional studies to interrogate the molecular interactions more carefully. Understanding these interactions enables a more effective understanding of Candida's virulence and can inform the design of new therapies.

Elizabeth Clifton Poster #B12

Home Institution: Brown University

Summer Research Program: Royce Fellows

Faculty Mentor: Michelle Dawson, Department of Molecular Pharmacology, Physiology, and Biotechnology

SASP-induced polyploidy and nuclear enlargement: a potential system of chemotherapeutic resistance

A major challenge in the treatment of cancer is drug resistance, which occurs when the drug is not effective at producing apoptosis. Unlike normal cells, cancer cells are characterized by rapid cell

division, and more broadly, an abnormal cell cycle. Consequently, many chemotherapies act by killing dividing cells. However, in response to damage, cells can become quiescent, which is a mechanism that temporarily halts cell division to protect progeny from acquired damage, and can thus be tumor-suppressive. But cell cycle arrest can also be tumor-progressive in that it inhibits the ability of chemotherapies to target cancer cells. In fact, such quiescence has been shown to be correlated with chemotherapeutic resistance. Investigating the potential role of cellular quiescence in chemotherapeutic resistance can offer a potential target for future chemotherapeutics.

Heidi Cobarrubias Poster #B13

Home Institution: East Tennessee State University

Summer Research Program: Leadership Alliance-Summer Research Early Identification Program (SR-EIP)

Faculty Mentor: Shipra Vaishnava, Department of Molecular Microbiology and Immunology

Dynamics of Immunoglobulin A Binding on Gut Commensals Immunoglobulin A

(IgA), an antibody secreted into the gut in large quantities, has recently been identified as a prominent mediator of intestinal homeostasis. While IgA has been shown to limit effects of pathogens by immune exclusion, the role of IgA binding on benign commensals remains a major knowledge gap in the field. The focus of this study is to dissect the dynamics of IgA binding on bacteria over time, and specifically, to identify specific bacterial taxa bound by IgA at defined time points post-colonization. Future directions of this work will investigate direct functional effects of IgA on benign commensals, and the importance of IgA in maintaining bacterial populations in the gut.

Nina Diepenbrock Poster #B14

Home Institution: Brown University

Summer Research Program: Undergraduate Teaching and Research Awards (UTRA)

Faculty Mentor: Bertram Malle, Department of Cognitive, Linguistic, and Psychological Sciences

A Heart for Cooperation: Feeling Another Human's Heartbeat Promotes Prosocial and Cooperative Behaviors

Can feeling another human's beating heart enhance human cooperation? In the current study, participants held a novel device that vibrated rhythmically to imitate the human heartbeat while playing a series of behavioral economic games. Compared to those who believed that they were feeling their own heartbeat, those who believed feeling their partner's heartbeat behaved more altruistically, cooperatively, and honestly in the Dictator Game, the Trust Game, and the Deception Game (Gneezy, 2005), respectively. Enabled by recent technological advances, our research highlights how a simple belief of feeling another's heartbeat can have powerful and broad effects on prosocial and cooperative behaviors.

Kayla Dwyer Poster #B15

Home Institution: Brown University

Summer Research Program: Undergraduate Teaching and Research Awards (UTRA)

Faculty Mentor: Amanda Jamieson, Department of Molecular Microbiology and Immunology

Investigating the effects of commensal bacteria on IAV infection

This project aims to investigate how the lung microbiome and specifically commensal bacteria affect the immune response to infection with influenza A virus (IAV). The main objectives of this project are: 1) to determine if commensal bacteria play a role during viral pulmonary infection; 2) to identify commensal bacteria that reduce cell damage/death during IAV infection; and 3) to determine the mechanisms by which these bacteria act to alter the immune response. The results of this project may provide insight into how commensal bacteria can be used to reduce the detrimental effects of influenza infection.

Ibtihal Elfaki Poster #B16

Home Institution: Brown University

Summer Research Program: Undergraduate Teaching and Research Awards (UTRA)

Faculty Mentor: Anne Hart, Department of Neuroscience

What Brown University undergraduates and worms have in common: a look at the role of lst-2 gene in the sleep of C. elegans

Nobody knows for certain why we sleep. Everything sleeps, even the tiny, transparent nematode: C. elegans. A human study, consisting of 796 undergraduate students, was used to determine candidate genes associated with shorter and longer sleep durations, based on DNA methylation. Orthologous genes were then found in C. elegans. Reduced function alleles were used to analyze how these genes affect sleep in C. elegans. Out of the 5 genes identified, the lst-2 gene replicated in a separate human study. I will be using CRISPR-Cas9 system to create a complete loss-of-function allele of lst-2 and analyze the resulting sleep behavior. In this way, I will determine how lst-2 affects sleep and potentially bring us closer to understanding the mechanisms underlying sleep.

Kyle Evans Poster #C1

Home Institution: Brown University

Summer Research Program: Undergraduate Teaching and Research Awards (UTRA)

Faculty Mentors: Beatrice Lechner, Department of Pediatrics & Lori Underhill, Department of Pediatrics

Development of a fetal membrane cell culture to evaluate the role of decorin and biglycan in membrane rupture

Preterm-birth is the leading cause of death among newborns, 40% of which are caused by preterm premature rupture of fetal membranes (PPROM). Previous data in mice showed deficiencies in the homologous extracellular matrix proteoglycans, biglycan and decorin, are associated with premature delivery of pups with abnormal morphologies in fetal membranes (FM). The harvesting of FM involves harvesting day 17.5 of gestation, allows cell culturing to better understand the role of proteoglycans. Once 90% confluent, we tracked the progression of membrane growth via SCRATCH test. SCRATCH test inflicts a "wound" which allows measuring of regrowth. W determined that decorin-deficient FM contain significantly less cells ($p<0.001$) compared to biglycan-deficient and controls and that biglycan-deficient cells migrate at similar rate to control cells.

Mursal Gardezi Poster #C2

Home Institution: Brown University

Summer Research Program: Royce Fellows

Faculty Mentors: Christopher Born, Department of Orthopedics & Dioscaris Garcia, Department of Orthopedics

Fluorescent-Conjugated Antibodies as Markers of Bacterial Infection on Surgical Sites

Infection is the most pressing problem facing orthopedic surgeons. Currently, two methods are widely utilized in modern hospitals to identify microbial infections: Traditional Culturing and Polymerase Chain Reaction (PCR). These methods are marred by issues of time, and contamination leading to false negatives and false positives, rendering them unreliable. This study aims to further validate a rapid visualization assay for detecting gram-negative and gram-positive bacteria utilizing fluorescently conjugated antibodies and confocal laser scanning microscopy (CLSM). In-vitro experiments were carried against A. baumannii, P. aeruginosa and Methicillin-Sensitive S. aureus samples, which represent common etiologic agents in orthopedics. These experiments further supported previous findings that fluorescent-conjugated antibodies are viable options for rapid and reliable detection of infectious agents.

Valentina Grillo Alvarado Poster #C3

Home Institution: University of Puerto Rico, Rio Piedras Campus

Summer Research Program: Leadership Alliance-Summer Research Early Identification Program (SR-EIP)

Faculty Mentor: Ruhul Abid, Department of Surgery

Long-Term Exposure of NADPH Oxidase-Derived ROS on Murine Coronary Vessels after Myocardial Infarction

Reactive Oxygen Species (ROS) play an important role in cardiovascular physiology and pathophysiology. Increased levels of ROS have often been implicated in Cardiovascular Diseases (CVD), including Myocardial Infarction (MI), which is one of the leading causes of death worldwide. The survival of the ischemic myocardium depends on the speed with which coronary vessels achieve alternate circulation towards ischemic tissue through vasodilatation or angiogenic events. Paradoxically, such events are also ROS-sensitive. In recent studies, endothelial-specific NADPH oxidase- derived ROS have shown to be implicated in pro- survival kinase AMPK activation that in turn is involved in eNOS- mediated vasodilatation and regulation of several transcription factors and signaling molecules that stimulate endothelial cell (EC) proliferation. We aim to examine the effects of long term exposure of coronary endothelium to NADPH oxidase-derived ROS after a Myocardial Infarction (MI). Our lab is pioneer in the systematic study of temporal and source-specific subcellular ROS signaling in the coronary vascular endothelium. Understanding the factors that differentiate between normal signaling pathways and altered redox circuits may help develop ROS-modifying therapeutics to protect cardiac functions after MI.

Julia Gross Poster #C4

Home Institution: Brown University

Summer Research Program: Undergraduate Teaching and Research Awards (UTRA)

Faculty Mentor: Erica Larschan, Department of Molecular and Cell Biology and Biochemistry

Defining the Genetic Context of the D. Melanogaster Histone Locus Body

CLAMP is a transcription factor in flies that binds in different regions of the genome, producing dramatically different downstream effects depending on where it has bound. Specifically, when bound to the X-chromosome CLAMP recruits dosage compensation proteins, and when bound to the Histone Locus it recruits histone locus body factors. This Summer I have created multiple fly lines that have very small pieces of X-chromosome DNA substituted into the broader genomic context of the histone locus. We hope to use these flies to better understand how downstream responses to transcription factor binding are determined at the cellular level.

Mark Hays Poster #C5

Home Institution: Brown University

Summer Research Program: BrainGate Summer Program

Faculty Mentor: Leigh Hochberg, School of Engineering

Task-relevant changes in tuning of motor cortical neurons in people with tetraplegia using an intracortical brain-computer interface

The BrainGate team at Brown University researches the use of intracortical Brain-Computer Interfaces (iBCI) to decode neural activity recorded from electrodes implanted into the motor cortex of the brain and translate it into intended movement, enabling people with disabilities to control assistive devices. Neurons in motor cortex tend to have preferred directions (PD), meaning they will fire more for intended motion in one particular direction, which can be used to infer a person's movement intention. My project examines whether neurons try to optimize control in 2D vs 3D task-spaces by shifting their PDs to allow more information to be encoded in the relevant task-space. This is done by comparing PDs of neurons and the performances of decoders calibrated from each task.

Steven Hines Poster #C6

Home Institution: Brown University

Summer Research Program: Undergraduate Teaching and Research Awards (UTRA)

Faculty Mentor: Patrycja Dubielecka, Department of Division of Hematology/Oncology

Overexpression of Map3k8/Tpl2/COT1 is linking resistance to imatinib mesylate to overactive MEK-ERK and NF-kB signaling

In this study, we evaluated the activity of NF-kB and MEK-ERK signaling, as well as, the kinase linking the two pathways – Map3k8/Tpl2/COT1 in imatinib mesylate (IM) insensitive CML stem/progenitor cells as well as in IM resistant cells. Our data indicate that overexpression of Map3k8/Tpl2/COT1 was accompanied by increased activity of Src Family Kinases, MEK-ERK and NF-kB signaling in IM resistant cells. Combination of SFKs, MEK and NF-kB pathway inhibitors significantly potentiated apoptotic response of IM resistant cells and significantly reduced colony formation potential of IM insensitive CML stem/progenitor cells. Our results indicate that a combination of these inhibitors exhibits significant survival reducing effects in chemoresistant cells. This may present a new therapeutic option for overcoming imatinib resistance in CML patients.

Yanabah Jaques Poster #C7

Home Institution: Brown University

Summer Research Program: Undergraduate Teaching and Research Awards (UTRA)

Faculty Mentor: Karla Kaun, Department of Neuroscience

Scabrous Characterization in the Drosophila Melanogaster Central Brain

Drosophila show long-lasting memories for the appetitive properties of alcohol intoxication. We recently found a role for Scabrous, a secreted fibrinogen-related peptide that regulates Notch signaling in these memories using a forward genetics approach. Furthermore, we have shown that scabrous is necessary in the mushroom body, a learning and memory center in the Drosophila brain, for alcohol memory formation. I sought to characterize the expression pattern of Scabrous protein in the adult brain. I hypothesized that: 1) there would be different levels or localization of Scabrous protein in scabrous mutants (sca5-120, sca5-120/BP2) compared to wild-type flies, and 2) Scabrous levels or localization would change after ethanol exposure. I found that Scabrous was expressed at low levels in all mushroom body neurons, and that Scabrous levels were reduced in Scabrous mutants relative to wild-type animals. Additionally, (although experiments are still ongoing,) ethanol exposures may affect Scabrous levels. This work is an important characterization of Scabrous in adult Drosophila memory circuits.

Lucy Jia Poster #C8

Home Institution: Brown University

Summer Research Program: Undergraduate Teaching and Research Awards (UTRA)

Faculty Mentor: Jisu Li, Department of Medicine

Regulation of NTCP expression for efficient hepatitis B virus infection in vitro

Hepatitis B virus (HBV) is a small DNA virus and major cause of liver cirrhosis and hepatocellular carcinoma. Sodium taurocholate cotransporting polypeptide (NTCP) has been recently identified as HBV entry receptor, but the entry mechanisms remain elusive. In this study, we evaluated a new cell culture model where the NTCP expression can be induced by tetracycline (tet-on). We found that NTCP expression in HepG2 cells could be tightly regulated by doxycycline (Dox) in a dose-dependent manner. Accordingly, dose-dependent HBV infection was also observed. Efficient infection can be established by adding Dox at 1-2ug/ml. Switching off NTCP expression post-inoculation did not prevent HBV infection. This model will allow us to dissect the role of NTCP in HBV entry and post-entry steps.

Brittany Johnson Poster #C9

Home Institution: Tougaloo College

Summer Research Program: Leadership Alliance-Summer Research Early Identification Program (SR-EIP)

Faculty Mentor: Mark Johnson, Department of Molecular Biology, Cell Biology and Biochemistry

Understanding the Mechanism of HAP2, a Widespread Gamete Fusion Protein

In many organisms such as flowering plants and protists, a protein known as HAP2 aids in the fusion of gametes by undergoing a conformational change. HAP2 is known to be expressed on the male gamete, but my goal is to test the functionality of HAP2 on the female gamete. If HAP2 is found to not be functional on the female gamete alone, then I want to determine if HAP2 can work efficiently with the help of a HAP2 variant on the male gamete.

Isaac Kim Poster #C10

Home Institution: Brown University

Summer Research Program: Undergraduate Teaching and Research Awards (UTRA)

Faculty Mentor: Neil Sarkar, Department of Health Services, Policy and Practice

Investigating Disparities in Racial Representation of Genomic Sequencing Efforts

Recent studies have investigated and discovered alarming racial disparities in U.S. healthcare. For instance, black Americans have been found to suffer on nearly every measure of health in relation to white Americans . It is possible that these disparities are exacerbated by inadequate representation of racial minorities in genomic sequencing efforts such as The Cancer Genome Atlas (TCGA) . Here we show the disparities in racial representation of national datasets pertaining to clinical data, mortality rates, and genomic sequencing and accentuate the importance of targeted efforts to recruit more minorities into studies involving genomic sequencing.

Juliana Kim Poster #C11

Home Institution: Brown University

Summer Research Program: Undergraduate Teaching and Research Awards (UTRA)

Faculty Mentor: William Fairbrother, Department of Molecular Biology

Role of Small Molecules in Splicing Modulation

Small molecules have been shown to affect splicing by a number of mechanisms, and are promising therapeutics for splicing-related diseases. The purpose of this project is to discover all of the significantly alternatively-spliced sites for a small set of drugs already known to affect splicing in at least one gene, discover their mechanisms, and potentially apply that to correct abnormal splicing in mutated genes causing diseases.

Sarah Kim Poster #C12

Home Institution: Brown University

Summer Research Program: Research Assistant for the Department of Neuroscience (Hart Lab)

Faculty Mentor: Anne Hart, Department of Neuroscience & Thomas Serre, Department of Cognitive, Linguistic and Psychological Sciences

Examining locomotion in a C. elegans FUS ALS model

Amyotrophic lateral sclerosis (ALS), is a fatal neurodegenerative disease. Mutations in the human FUS protein cause some cases of familial ALS, and our work investigates this gene's C. elegans ortholog, fust-1. To see if there is a defect in behavior in worms with a patient allele fust-1 mutation we ran swimming assays. We did not see a difference in young adult animals using the published

software CeleST. However, a software program developed by the Serre lab did show a defect. In the future, we will repeat these studies using older animals to see if defects increase. Understanding more about the genetic and molecular basis of ALS facilitates finding therapies for this disease and further understanding of why neurons die.

Tracy Knight Poster #C13

Home Institution: Brown University

Summer Research Program: Undergraduate Teaching and Research Awards (UTRA)

Faculty Mentor: Kristi Wharton, Department of Molecular Biology, Cell Biology and Biochemistry

Glial-expressed BMP impacts motor neuron development

Bone morphogenetic proteins (BMPs) are signaling molecules that influence many developmental processes, including synaptic growth. The Drosophila BMP glass bottom boat (Gbb) was previously shown to send a retrograde signal from muscle to motor neurons, impacting their growth. We recently discovered gbb is also expressed in glial cells, neuronal support cells. My research is focused on determining how Gbb affects neuromuscular junction growth by varying levels and forms of Gbb expressed in glia. Specifically, I have analyzed the effect of Gbb knockdown, Gbb overexpression, and mutant forms of Gbb on phosphorylated Mad (pMad), the transcription factor immediately downstream of signaling that regulates gene targets that influence neuromuscular junction development.

Justin Lee Poster #C14

Home Institution: Brown University

Summer Research Program: Undergraduate Teaching and Research Awards (UTRA)

Faculty Mentor: Braden Fleming, Department of Orthopedics & Jill Beveridge, Department of Orthopedics

Quantitative Analysis of Collagen in the Anterior Cruciate Ligament

Collagen fiber organization in ligaments has been shown to be predictive of the structural properties (yield load, failure load, linear stiffness) of the ligament as a whole. Current methods of analyzing collagen fiber organization involve primarily 2D qualitative assessments. The goal of this project is to develop quantitative 3D methods using images acquired with second harmonic generation (SHG) microscopy. The specific aims are to measure the diameter, direction, and relative linearity of the fibers. Thus far, we have been able to quantify the principal direction and relative linearity of organized ligament. The next step will be to test this method on disorganized ligament to understand the relationship between qualitative and quantitative measures of collagen organization and ACL structural properties.

Mark Liang Poster #C15

Home Institution: Brown University

Summer Research Program: Undergraduate Teaching and Research Awards (UTRA)

Faculty Mentor: Nicolas Fawzi, Department of Molecular Pharmacology, Physiology and Biotechnology & Kim Mowry, Department of Molecular Biology, Cell Biology, and Biochemistry

In-Vitro Analysis of Granule-Associated Disordered Proteins in Xenopus laevis oocytes

Intrinsically disordered proteins (IDPs) are largely unstructured and dynamically regulate cellular activity across all organisms. In frog oocytes, these proteins are found in membrane-less granules in the developing cell, temporally and spatially controlling transcription and localization. Due to their transient nature, it is difficult to examine these proteins in the cell without understanding their fundamental properties. Using NMR spectroscopy and biophysical imaging methods in vitro, we can isolate individual IDPs for characterization, focusing on properties of inherent liquid-liquid phase separation that drives these structures' formation, activity, and dissociation. These structural discoveries have implications in development biology as well as pathology, as mutations in IDPs can have widespread clinical consequence (cancer, ALS, frontotemporal dementia).

Bailey Life Poster #C16

Home Institution: Brown University

Summer Research Program: Undergraduate Teaching and Research Awards (UTRA)

Faculty Mentor: Alexander Jaworski, Department of Neuroscience

Regulation of axon attraction and repulsion at the floor plate

During embryonic development, dorsal spinal cord commissural neurons project axons ventrally towards the floor plate (FP). FP contact induces a switch in protein expression on the axon, and previous work has shown that FP contact is both necessary and sufficient for this "midline switch". The molecule that induces the switch is not yet known. This project investigates the capacity of several candidate proteins that are enriched in the FP to induce the midline switch. This will be accomplished by treating commissural neurons with purified candidate proteins in vitro and observing expression of protein markers expressed pre-FP contact or post-contact by IHC.

Amy Lipman Poster #D1

Home Institution: Brown University

Summer Research Program: Undergraduate Teaching and Research Awards (UTRA)

Faculty Mentor: Alexander Brodsky, Rhode Island Hospital Department of Pathology

Investigating the Role of the Mevalonate Pathway in Ovarian Cancer Cell Resistance

The mevalonate pathway is an essential biochemical process for the production of cholesterol as well as other metabolic end products. Due to increased energetic requirements, cancer cells display significant cellular metabolic adaptations, including the reprogramming of lipid metabolism. In cancer cells, the dysregulated mevalonate pathway may play a role in conferring resistance to treatment. For this reason, statins, widely-used cholesterol-lowering drugs which target the mevalonate pathway, have been studied as possible anticancer agents, though there is much variation observed in response to treatment. The goal of this research is to use immunofluorescence imaging to visualize key proteins in the mevalonate pathway to investigate the role of the pathway in conferring resistance to treatment.

Alexander Lo Poster #D2

Home Institution: Brown University

Summer Research Program: BrainGate Research Program

Faculty Mentor: John Simeral, School of Engineering & Marco Vilela, School of Engineering

Automated Spike Sorting and Processing

The BrainGate 2 clinical trial is engaged to create intracortical Brain-Computer Interfaces for people with motor disabilities to regain interaction with their environment by allowing them device control. Neural signals collected by multi-electrode arrays implanted into the brain's motor cortex determine device control. Each electrode may collect the electrical activity from multiple neurons. However, neurons can be manually distinguished based on their spike characteristics—known as spike sorting. Here we propose a computational infrastructure for spike sorting BrainGate data that scans the BrainGate database of experiments and automatically dispatches a spike sorting algorithm when a new research session is detected. Once sorted, the data is parsed to match the current data structure and additional analysis is then computed.

Animesh Mahapatra Poster #D3

Home Institution: Brown University

Summer Research Program: Undergraduate Teaching and Research Awards (UTRA)

Faculty Mentor: Anne Hart, Department of Neuroscience

Identifying a Suppressor of an ALS Gene

Amyotrophic Lateral Sclerosis (ALS) is a progressive motor neuron disease in which patients suffer muscle atrophy and die within a few years. We are characterizing genes that suppress ALS-associated defects in C. elegans caused by mutations in the gene SOD1. We are using markers to map potential suppressor mutations to precise locations on the C. elegans genome. Then, we will isolate the specific gene, investigate its impact on other ALS-associated defects, and identify relevant pathways. Insights into the suppressor's role in ALS pathogenesis will facilitate the design of effective treatments for patients.

Andrés Martínez-Muñiz Poster #D5

Home Institution: University of Puerto Rico, Mayagüez Campus

Summer Research Program: Leadership Alliance-Summer Research Early Identification Program (SR-EIP)

Faculty Mentor: Jonathan Kurtis, Department of Pathology

Expression of PfGARP in Recombinant P. pastoris for Malaria Vaccine Development

Malaria infections are common occurrences and one of the leading causes of death in developing countries. Current approaches for treating malaria mostly include drugs that are administered as remedies and not as preventive strategies. Biological breakthroughs have allowed for the discovery of different antigens that can boost an individual's immune system and help fight an infection. By comparing antibodies found in resistant and susceptible individuals, different antigens have been discovered. Plasmodium falciparum Glutamic Acid-Rich Protein (PfGARP) is one antigen that stops

development of the parasite in the trophozoite stage, ultimately reducing the spread of parasites to new individuals. The PfGARP gene was inserted in P. pastoris for protein expression in order to produce small amounts for purification and further testing.

Jessica Masur Poster #D6

Home Institution: Brown University

Summer Research Program: Undergraduate Teaching and Research Awards (UTRA)

Faculty Mentor: Willoughby Britton, Department of Psychiatry and Human Behavior & Kristina Eichel, Department of Psychiatry and Human Behavior

Relating Conscientiousness and Mindfulness

Mindfulness-Based Interventions (MBIs) are increasing in popularity in both clinical and research spheres. Determining individuals who experience greater benefits, as well as individuals who experience minimal or negative effects, helps individualize treatment to the patient. Using the five factor model of personality, these analyses focus on the personality dimension of conscientiousness. Conscientious individuals are dependable, responsible, achievement-oriented, and deliberate. In previous research, conscientiousness has been negatively correlated with depression. Giluk (2009) found conscientiousness to be positively correlated with mindfulness. Investigating the relationship between conscientiousness, mindfulness, and depression may provide important information to clinicians treating depressed populations. The following hypotheses are tested: (1) depressed patients will show lower levels of conscientiousness than the norm population, and (2) conscientiousness and mindfulness are positively correlated.

Anthony Mei Poster #D7

Home Institution: Brown University

Summer Research Program: Undergraduate Teaching and Research Awards (UTRA)

Faculty Mentor: Eric Loucks, Department of Epidemiology/Public Health

Childhood Access to Green Spaces and Its Relationship to Adult Blood Pressure

Hypertension continues to be a problem for many Americans. Studies have linked one's neighborhood to blood pressure. It would be important to analyze the relationship between childhood green spaces and later-life blood pressure. The goal of this project was to assess the association between early life access to green spaces and adult blood pressure. Using data from the Collaborative Perinatal Project and New England Family Study, we mapped a participant's access to green space within a buffer zone. Their childhood access to green spaces was then correlated to their adult blood pressure. This study is important for understanding area level determinants of health and its role across the lifecourse. We also anticipate important policy implications with the results.

Chelsea Miller Poster #D8

Home Institution: SUNY New Paltz

Summer Research Program: Leadership Alliance-Summer Research Early Identification Program (SR-EIP)

Faculty Mentor: Thomas Bartnikas, Department of Pathology and Laboratory Medicine

Studying the Role of SLC30A10

Excessive exposure of manganese can lead to the rare disorder manganism, a neurodegenerative disorder causing Parkinson's like symptoms. In 2012 a recessive mutation in Slc30a10 was discovered to be the commonality amongst patients who suffered from hypermanganesemia, hepatic cirrhosis, motor deficits, and polycythemia. The role of Slc30a10 in Mn homeostasis was studied using mice as the model organism. We aimed to determine the RNA levels of Slc30a10 in various tissues of wild-type mouse pups utilizing qPCR and detect tissue abnormalities in Slc30a10 deficient mice using histological analysis. Studying SLC30A10 and manganese homeostasis allows us to better understand the basic mechanisms of manganese homeostasis, a balance every individual needs to maintain to survive.

Nicholas Mroz Poster #D9

Home Institution: Brown University

Summer Research Program: Royce Fellows

Faculty Mentor: Arthur Salomon, Department of Molecular Biology, Cell Biology and Biochemistry

Phosphoproteomic Analysis of Tyrosine Phosphatases Within T Cell Negative Feedback Networks

As crucial members of the adaptive immune system, T cells typically initiate and orchestrate the clearance of infectious agents; however, inappropriate activation or regulation of T cells can result in numerous autoimmune diseases. Holistic proteomic analysis of the intracellular T cell activation cascade is required in order to fully understand its regulatory mechanisms and to design new therapies that inhibit misregulated T cells. This project seeks to identify the tyrosine phosphatase that mediates a recently discovered negative feedback pathway within the T cell signaling network, which may be important in determining the intensity and efficacy of a T cell's response.

Maria Muhammad Poster #D10

Home Institution: Tougaloo College

Summer Research Program: Leadership Alliance-Summer Research Early Identification Program (SR-EIP)

Faculty Mentor: Kareen Coulombe, School of Engineering & Travis Wallace, Department of Biomedical Engineering

Investigating the Relationship between Fibroblasts and Cardiomyocytes: Mechanical, Electrical, and Spatial Orientation

Cardiovascular Disease is one of the leading causes of death worldwide. Due to the inability of heart muscle cells to self-regenerate, surgical a regenerative approaches are necessary to treat heart wounds. The relationship between two heart cell types, fibroblasts, structural tissue and scar tissue in the heart, and cardiomyocytes, muscle tissue that allows the heart to pump blood, will be investigated to find if there is an ideal ratio of the two necessary for a heart to function. If so, the tissues will be stained, imaged, and tested for functionality i.e. their ability to conduct electricity, generate force, and contract under stimulation. This work will allow for heart repair to become more feasible in patients who suffer from advanced cardiovascular disease.

Naryan Murthy Poster #D11

Home Institution: Brown University

Summer Research Program: Undergraduate Teaching and Research Awards (UTRA)

Faculty Mentor: Leigh Hochberg, School of Engineering

Characterization of grasp sensory feedback using Brain-Computer Interface and JACO2 robot arm

When patients suffer spinal cord injuries or certain neurodegenerative diseases (such as ALS), motor function can be lost while brain function remains intact. The signals conveying motor output information can be recorded via a microarray of 100 electrodes implanted into motor cortex, and the BrainGate2 clinical trial utilizes such technology to develop a Brain-Computer Interface (BCI) enabling patients of locked-in syndromes to communicate with the world around them. One restorative neurotechnology under development is a neural-controlled robot prosthetic arm with fingertip pressure sensors. Grasping objects of varying fragility requires fine regulation so as to neither drop nor crush them. This project seeks to enhance the current system by adding a somatosensory feedback component to the currently solitary visual feedback loop.

Jade Neverson Poster #D12

Home Institution: University of Scranton

Summer Research Program: Leadership Alliance-Summer Research Early Identification Program (SR-EIP)

Faculty Mentor: Alan Morrison, Department of Internal Medicine

Quantification of Serum Interleukin 1-beta as a Biomarker for Calcific Atherosclerosis

Our laboratory has identified IL-1β to be a critical mechanistic component to signaling that promotes atherosclerotic calcification. Thus, we are interested in quantifying serum IL-1β for use as a biomarker of disease. An enzyme-linked immunosorbent assay (ELISA) has been developed to detect IL-1β. We seek to define the sensitivity and variance of this assay. There is evidence that for some proteins PCR-linked immunosorbent assay will increase sensitivity and decrease variances relative to standard ELISA. This study will define the best approach for quantifying IL-1β in order to develop a new more reliable method for quantifying IL-1β concentrations in human serum.

Erica Nguyen Poster #D13

Home Institution: Brown University

Summer Research Program: Undergraduate Teaching and Research Awards (UTRA)

Faculty Mentor: Erica Larschan, Department of Biology

Developmental Implications of Tissue-specific CLAMP Knockdown in Drosophila melanogaster

CLAMP, or Chromatin-Linking Adaptor for MSL Protein, is a key protein in Drosophila melanogaster dosage compensation. Though we know complete knockdown of CLAMP is lethal in males, a tissue-specific knockdown is not lethal but may lead to various degrees of developmental changes. The larval brain, the most highly dosage compensated organ in the fly, is a clear first step

for studying CLAMP knockdown. Through lifespan assays and length measurement tests, we were able to conclude the effects of this important protein on larval and adult flies.

Christopher Noyes Poster #D14

Home Institution: Brown University

Summer Research Program: Undergraduate Teaching and Research Awards (UTRA)

Faculty Mentor: Christine Biron, Department of Molecular Microbiology and Immunology

Analysis of Intrinsic Changes of NK Cells During the Cell Cycle

Our project's main aim is to determine which proteins are triggered by proliferation in natural killer cells that allows for the expression of Interleukin 10, something that has been previously shown to be expressed in significant amounts only after a natural killer cell has experienced several cell divisions. We hope to identify these proteins, which consist of both histone demethylases and histone methyltransferases, and from there, determine how the cell cycle triggers them to "open up" the Interleukin 10 gene, allowing the natural killer cells to express this cytokine.

Jamie Odzer Poster #D15

Home Institution: Brown University

Summer Research Program: Rhode Island Hospital Summer Intern

Faculty Mentor: Craig Lefort, Department of Surgical Research

The Effect of CRISPR-Cas9 Gene Editing on Neutrophil Phagocytosis of Pseudomonas aeruginosa and Staphylococcus aureus

Neutrophil phagocytosis is the process where neutrophils eliminate harmful bacteria and fungi by engulfing and internalizing the pathogens. With the rise of drug resistant bacteria strains such as Pseudomonas aeruginosa and Staphylococcus aureus, understanding the process of how neutrophils internalize these pathogens is more important than ever. This study attempts to assess the genetic mechanisms responsible for neutrophil phagocytosis of bacteria in order to identify potential targets for modulating the phagocytic capacity of neutrophils and potentially enhance their ability to eradicate pathogens. The hypothesis that there are distinct genetic mechanisms regulating the phagocytosis of two different bacterial pathogens, Pseudomonas aeruginosa and Staphylococcus aureus, will be evaluated by a CRISPR-Cas9 genetic screen of neutrophils to analyze phagocytic response to the bacteria. This will be achieved through flow cytometry analyses of exposed neutrophils and bacteria-killing assays where bacteria colony growth will be measured after exposure to altered and knockout neutrophils.

Michelle Petersen Poster #E1

Home Institution: Brown University

Summer Research Program: IBES

Faculty Mentor: Dawn King, Department of Environmental studies

City of Providence Office of Sustainability

My work at the Office of Sustainability has led me to wear a diverse range of hats, but they are all related to better understanding and meeting the needs of Providence residents. My work projects have included communicating survey data on the sustainability priorities of residents of color, assisting in measurement of Narragansett Bay's microplastic pollution, aggregating advice from other cities on how Providence should approach creating a Zero Waste plan, and developing marketing campaigns around the City's sustainability projects.

Taylor Pullinger Poster #E2

Home Institution: Brown University

Summer Research Program: Undergraduate Teaching and Research Awards (UTRA)

Faculty Mentor: Diane Hoffman-Kim, Department of Biology

Developing a three-dimensional tissue engineered stroke model

Stroke is one of the leading causes of death in the United States, and leaves many more people disabled. Traditional 2D tissue culture models are insufficient for showing true cell behavior, so our lab is working on developing a 3D model for stroke. Using established protocols I made 3D neural spheroids, which I deprived of oxygen and glucose to simulate stroke conditions. Stroke affects women and men differently, so in several experiments, spheroids contained cells from only male or only female rats. After simulating stroke conditions, I performed tests to measure cell death and used immunostaining techniques before imaging the spheroids. This research builds upon work done by recently graduated students in the lab, Samantha Zambuto and Liana Kramer.

Tanaya Puranik Poster #E17

Home Institution: Brown University

Summer Research Program: Undergraduate Teaching and Research Awards (UTRA)

Faculty Mentor: Christina Bailey, School of Engineering

Investigating cholera toxin infection during pregnancy using an in vitro placental model

Cholera, a bacterial disease caused by the bacterium Vibrio cholerae, is found in the small intestine and carried by infected water and food. In a study performed by Medicins San Frotieres in Haiti, 16% of pregnancies, 141 out of 900, complicated with cholera resulted in fetal loss. (Shillberg, 2016). The placenta contains molecular components that the cholera toxin, a virulent protein secreted by cholera during infection, has a high affinity for. Thus, we hypothesize that the cholera toxin will destructively interact with the placenta during pregnancy, leading to fetal loss. The goal of this work is to use our developed in vitro mimic of the placenta in order to investigate and mitigate the interaction of the cholera toxin.

Yanixa Quiñones Aviles Poster #E3

Home Institution: University of Puerto Rico- Aguadilla

Summer Research Program: Leadership Alliance-Summer Research Early Identification Program (SR-EIP)

Faculty Mentor: Alison DeLong, Department of Department of Molecular Biology, Cell Biology and Biochemistry

Can CRISPR-Mediated Mutagenesis Overcome Genetic Redundancy Between Tightly Linked Protein Phosphatase Regulatory Subunits?

Protein phosphatase 2A (PP2A) is a Ser/Thr phosphatase composed of three subunits (A, B, and C) that acts as a regulator of many metabolic pathways through reversible protein phosphorylation. PP2A B regulatory subunits provide substrate specificity and are encoded by three diverse gene families B55, B56, and B72. In Arabidopsis, the B72 gene family consists of 6 members (B12 – B17) that encode Ca+2-binding proteins. The B16 and B17 genes are only 50kb apart and their predicted protein products are almost identical. Previous work with mutants that overexpress B16 suggested that PP2A complexes containing B16 may positively regulate production of the gaseous hormone ethylene as well as the activity of 3-hydroxy-3-methylglutaryl CoA reductase (HMGR), a key enzyme in the mevalonate pathway. However, loss of function b16 and b17 single mutants do not show phenotypes, suggesting that these genes are genetically redundant. Tight linkage precludes construction of a double mutant via Mendelian genetics. The high sequence similarity of B16 and B17 allowed the use of a single CRISPR construct to mutagenize both genes, facilitating analysis of their role in ethylene biosynthesis. We isolated seedlings that were homozygous for b16 and b17 +1 frameshift alleles. The +1 frameshift is predicted to affect function of the protein product by producing premature stop codons and deleting conserved sequences. We used qPCR to define the abundance of B16 and B17 mRNAs in b16+1 b17+1 seedlings and found a two-fold decrease in mutant plants. Because ethylene inhibits cell elongation in dark-grown seedlings, we used growth assays to assess effects on ethylene production; previous experiments showed that a b16 gain-of-function mutation results in shorter hypocotyls. We found that b16+1 b17+1 seedlings exhibited longer hypocotyls (relative to the wild-type control), consistent with a decrease in ethylene biosynthesis. We are also assaying for altered regulation of HMGR activity to provide an independent test of the effect of the double mutant on B72-containing PP2A activity. If the b16 and b17 mutations affect PP2A regulatory activity in HMGR, then mutant seedlings treated with statins will show a higher sensitivity compared to the wild type. Our data suggest B16 and B17 share functions as regulators of ethylene production and HMGR activity. CRISPR-mediated site mutations provide the specificity required to study redundant genes and define new functions for PP2A subunits.

Nicholas Renton Poster #E4

Home Institution: Brown University

Summer Research Program: Undergraduate Teaching and Research Awards (UTRA)

Faculty Mentor: Amanda Jamieson, Department of Molecular Microbiology and Immunology

E-Cigarettes and Pulmonary Innate Immunity: An In Vivo and In Vitro Exploration

E-cigarettes convey nicotine to a user through inhalation of vaporized "e-liquid" containing propylene glycol, vegetable glycerin, nicotine, and various flavoring additives. While e-cigarettes were developed as a supposedly less harmful alternative to conventional cigarettes, their overall impact on human health merits further research. Our health is profoundly influenced by the activity of the innate immune system. In the lung, innate immune cells called macrophages serve as the principal 'sentinel cells' charged with initiating the fight against pathogens. This summer, I studied the effects

of e-cigarette vapor on macrophage function. Additionally, I used a mouse model to evaluate the impact of e-cigarette exposure on the innate immune system in vivo.

Daniel Roque Poster #E5

Home Institution: Brown University

Summer Research Program: Undergraduate Teaching and Research Awards (UTRA)

Faculty Mentors: Christopher Born, Department of Orthopedics & Dioscaris Garcia, Department of Orthopedics

Imparting Antibiotic-Independent Antimicrobial Properties to Surgical Sutures and Prosthetic Liners

Our goal was to transition from using hexane to using heptane as a component in our silver-doped antimicrobial coating. We began by generating dose-response curves with differing ratios of heptane to find the optimal concentration that maintained the efficacy of the original chemistry. Once the promising heptane conditions were chosen, we then utilized a Kirby-Bauer Assay with both surgical sutures and commercially available prosthetic liners, measuring the zones of inhibition against Staphylococcus aureus at the 24, 48, and 72-hour time points. The plated heptane conditions were further subdivided into several conditions of differing silver concentrations. Graphite Furnace Atomic Absorption Spectroscopy (GFAAS) will be used to measure the elution of silver over time in the new heptane conditions.

Ian Sabula Poster #E6

Home Institution: Brown University

Summer Research Program: Undergraduate Teaching and Research Awards (UTRA)

Faculty Mentor: Jill Kreiling, Department of Molecular Biology, Cell Biology and Biochemistry

Characterizing Changes in Heterochromatin with Age

This project investigates alterations in chromatin structure, related to changes in microRNA expression, throughout the lives of mice. Specifically studied is a region of the X-chromosome containing an 18 miRNA cluster which is de-repressed with age, and predicted to target pathways altered in aging. Cells are sampled from young (5 month) and old (24 month) mice, using three mice from each group. After lysing and sonication to create 200-500bp DNA fragments, immunoprecipitation is performed using antibodies against trimethylation of histone H3 at lysine 9 and H4 at lysine 20. Quantitative-Reverse Transcription-Polymerase Chain Reaction (qRT-PCR) determines whether the amount of constitutive heterochromatin in this region lessens with age, potentially increasing miRNA production.

Thomas Skipper Poster #E7

Home Institution: Brown University

Summer Research Program: Undergraduate Teaching and Research Awards (UTRA)

Faculty Mentors: Michelle Dawson, Department of Molecular Physiology, Pharmacology, and Biotechnology & Deepraj Ghosh, Department of Molecular Physiology, Pharmacology, and Biotechnology

Alginate hydrogels for 3-D cancer cell culture applications

Cancer cell culture in three dimensions has become a research priority due to its closer representation of in vivo conditions. Understanding the microenvironment interactions in a more realistic in vitro setting is an important aim of this project. Alginate is a naturally-occurring anionic, biocompatible, biodegradable polymer obtained from Brown University seaweed. By cross-linking 1% and 2% alginate with CaCl2 in a controlled manner, we obtained homogeneous gels at a range of stiffness and porosity. Subsequent cell culture in sterile conditions allowed us to study their comparative morphology, motility, and viability in the gels, and to draw conclusions about the cells' metastatic tendencies in different microenvironments.

Sophia Song Poster #E8

Home Institution: Brown University

Summer Research Program: Summer Research Assistantship in Biomedical Sciences

Faculty Mentor: Karla Kaun, Department of Neuroscience

Machine learning paradigms to assess alcohol-mediated behaviors in Drosophila melanogaster

Alcohol use disorder is a major problem affecting much of the world, but detailed mechanisms underlying alcohol-related memory formation are not well understood. The Kaun Lab has developed an operant runway model of reward self-administration for Drosophila melanogaster as a proxy for motivation to obtain alcohol. I used computer vision software to track flies during the assay, quantify alcohol-mediated behaviors using machine-learning, and develop analysis tools to visualize differences in fly behavior. These techniques show quantifiable differences, particularly in the time that flies take to traverse the runway for an alcohol reward. My efforts provide a computational foundation upon which to further analyze neural circuitry underlying alcohol reward response and memory.

Kylen Soriano Poster #E9

Home Institution: Brown University

Summer Research Program: Undergraduate Teaching and Research Awards (UTRA)

Faculty Mentors: Michelle Dawson, Department of Molecular Pharmacology, Physiology, and Biotechnology & Deepraj Ghosh, Department of Molecular Pharmacology, Physiology, and Biotechnology

Biophysical Models for Studying Chemoresistant Cancer

Ovarian cancer is a leading cause of cancer-related deaths in women; primarily due to late stage diagnosis after metastasis from the primary tumor site. Here we seek to determine how properties of the tumor microenvironment, including matrix rigidity and recruited stromal cells, influence the properties of ovarian cancer cells. To investigate this, we used an agarose co-culture model to mimic the 3D microenvironment. Cancer cells were cultured on the surface of the agarose with normal or TGF-b activated stromal cells embedded at varying concentrations within the agarose. After 48

hours, the cancer cells were transferred to collagen-coated polyacrylamide substrates for analysis of morphology, adhesion, and viability. With this approach we can determine how the microenvironment conditions cancer cells for metastasis.

Louise Stolz Poster #E10

Home Institution: Brown University

Summer Research Program: Undergraduate Teaching and Research Awards (UTRA)

Faculty Mentors: David Badre, Department of Cognitive, Linguistic and Psychological Sciences & Ceyda Sayali, Department of Cognitive, Linguistic and Psychological Sciences

Comparing Demand Avoidance of Cognitive and Physical Effort

Cognitive and physical effort are present in decision-making in our everyday life. While there is research on each cost of effort individually, there is a gap in studying how the two are integrated. My project uses an established demand selection paradigm to test the voluntary selection of effort across domains. Participants were required to choose between virtual decks that yield low or high cognitive and physical effort without explicitly being instructed about differences between decks. The first study showed that when effort domains were integrated, participants made their decisions based only on the physical domain. Results could be interpreted that physical effort is costlier than cognitive however, there could be greater perceptual salience between physical than cognitive effort levels. To ensure that the differences are equated in terms of their salience, an additional study was conducted to find a point of convergence in difficulty through explicit rating of effort. I will present behavioral demand avoidance rates across physical and cognitive domains and see how the cost of both efforts compare.

Yasmine Suliman Poster #E11

Home Institution: Brown University

Summer Research Program: INBRE-SURF (IDeA Network of Biomedical Research Excellence - Summer Undergraduate Research Fellowship)

Faculty Mentors: Dioscaris Garcia, Department of Orthopedics & Christopher Born, Department of Orthopedics

Comparative Analysis of a Novel Microbial Detection System and Gram Staining Utilizing Synovial Fluid

The ability to quickly and effectively diagnose infections in the operating room remains a pressing challenge for modern surgeons. 0.5-2% of post-surgical sites and up to 28% in open wounds end up in infected. These infections result in healthcare costs, extended hospital stays, and reductions in quality of life. Current methods utilized in hospitals include traditional culturing and PCR, which continue to encounter issues of efficiency and accuracy. This challenge has been the focus of a novel fluorescent-antibody based assay, which aims to create a quicker, more reliable way to visually detect infections. The assay aims to be able to accelerate current diagnostic methods, improve orthopedic interventions, and overall facilitate patient treatment.

Karishma Swarup Poster #E12

Home Institution: Brown University

Summer Research Program: Undergraduate Teaching and Research Awards (UTRA)

Faculty Mentor: Andrew Leslie, Department of Ecology and Evolutionary Biology

Cones and wildfires: exploring the evolution of specialized seed dispersal mechanisms in conifers

Serotiny, or the retention of seeds on a parent plant, is a dispersal strategy seen across many groups of plants. Serotiny may be correlated with the evolution of other reproductive traits, such as robust woody cones or fruits that protect these long-held seeds, but this has rarely been analyzed in an explicit phylogenetic framework. We tested whether serotinous plants produce larger, more robust reproductive structures using the Cupressaceae clade of conifers. Using cone size measurements of cones from 83 species housed in herbarium collections, we found that serotinous lineages repeatedly evolve larger and more robust cones, consistent with the idea that these structures do protect seeds. This study illustrates how seed dispersal ecology, particularly serotiny, can strongly influence the evolution of plant reproductive structures.

Alexander Tepper Poster #E13

Home Institution: Brown University

Summer Research Program: Undergraduate Teaching and Research Awards (UTRA)

Faculty Mentor: Patrycja Dubielecka, Department of Hematology/Oncology

Beyond JAK/STAT: Signaling Pathways Contributing to the Pathogenesis of Myeloproliferative Neoplasms

Constitutive activation of the JAK-STAT pathway is essential to the pathogenesis of primary myelofibrosis (PMF); yet, the use of JAK inhibitors is not curative, raising the possibility that other targetable mechanisms contribute to the pathogenesis of MPNs. Our current research shows that CD34+ hematopoietic progenitors and granulocytes from patients with PMF show decreased expression of the tumor suppressor, Abelson interactor -1 (ABI1). Furthermore, the ablation of ABI1 in mice (in vivo) and human cell lines (in vitro) leads to a phenotype resembling human PMF and increased Src Family Kinase (SFKs), STAT3 and NF-κB-dependent signaling. Our studies indicate that loss of Abi-1 function induces a myelofibrosis phenotype, and Abi-1 cross-talk with SFKs-STAT3-NF-κB signaling may represent a novel target for MPN treatment.

Jessica Tolbert Poster #E14

Home Institution: Claflin University

Summer Research Program: Leadership Alliance-Summer Research Early Identification Program (SR-EIP)

Faculty Mentors: Alfred Ayala, Department of Surgical Research & Bethany Girard, Department of Surgical Research

Understanding VISTA Expression During Sepsis

Sepsis is a life-threatening condition that affects many critically ill patients that is typified by a dysfunctional immune response to infection culminating in multiple organ failure. Current treatments are largely supportive in nature and yield poor outcomes. VISTA is an immune checkpoint protein on immune cells that suppresses T cell mediated immune responses, like proliferation and cytokine production, making it a novel checkpoint protein not only for consideration in the immunotherapy of cancer but immune suppressive conditions like traumatic injury/sepsis. However, VISTA has not been formally studied within sepsis. Thus, we propose that VISTA plays a central role in the induction of T cell dysfunction and immunosuppression that develops during the response to experimental septic challenge in mice.

Shirin Tooloee Poster #E15

Home Institution: Brown University

Summer Research Program: Braingate Summer Research Program

Faculty Mentor: Leigh Hochberg, School of Engineering

Real-time decoding of neural signals for actualizing kinematics in 3D movement with varying grasp sizes and capabilities

Through the understanding of neural signals and the implementation of decoding algorithms that can actualize kinematics through machinery we can provide those disabled with ALS or spinal cord injury the ability to interact with their environment. In order to utilize the JACO2 arm in 3D space with the added control over grasp aperture sizes, first we must observe and record neural activity when the patient imagines using the arm for different grasp sizes and speeds. Once we are able to correlate the neural activity with the feedback provided from the JACO2 arm, we can create a real-time decoder for optimized use and control of the JACO2 arm grasping feature.

Katerina Tori Poster #E16

Home Institution: Brown University

Summer Research Program: Undergraduate Teaching and Research Awards (UTRA)

Faculty Mentor: Eleftherios Mylonakis, Department of Infectious Diseases

Repurposing anthelmintic drugs for treatment of methicillin-resistant Staphylococcus aureus

Bacteria escape antibiotics by entering into non-growing dormant state without acquiring resistance mutations. These bacteria, known as persisters, exhibit minimized biosynthetic processes, such as DNA, protein, and cell wall synthesis, which are the major targets for most antibiotics currently prescribed. Evidence reports that persisters are responsible for antibiotic-tolerance of biofilms and recalcitrance of chronic infections, which are hard to cure via conventional antibiotics. Therefore, discovery of new antimicrobials effective against bacterial persisters is of clinical importance. We identify a clinically approved anthelmintic drug, bithionol, that kills methicillin-resistant S. aureus persisters by inducing rapid membrane permeabilization. Bithionol kills both growing and persistent MRSA cells with low toxicity profiles. Our results suggest the potential usage of bithionol for treating MRSA chronic infections.

Juliana Trach Poster #F1

Home Institution: Brown University

Summer Research Program: Undergraduate Teaching and Research Awards (UTRA)

Faculty Mentor: Theresa Desrochers, Department of Neuroscience

Testing the Effect of Practice and Motor Learning on Abstract Sequence Execution

Actions sequences in daily life, such as making a sandwich, are comprised of both simple motor movements (spreading peanut butter) and abstract planning (open jar, spread peanut butter) for executing their order. We extended previous research on each sequence type in isolation by studying practice effects on abstract sequences with and without implicit motor sequences. Over two sessions, participants practiced abstract judgment (color, shape, texture) sequences that either contained an underlying sequence of motor responses, or did not. In the second session, they performed novel abstract sequences for comparison. We predict that reaction times will decrease when abstract sequences are practiced, and decrease further with embedded motor sequences. Our study examines the intersection of abstract and motor sequential control.

Harrison Tran Poster #F2

Home Institution: Brown University

Summer Research Program: Undergraduate Teaching and Research Awards (UTRA)

Faculty Mentor: Carolina Haass-Koffler, Center for Alcohol and Addiction Studies

Analysis of Endogenous Hormones post-Baclofen Administration in Alcoholic Smokers

There is no approved treatment for dual alcohol/nicotine dependencies. A preliminary double-blind, placebo-controlled, randomized clinical study with 30 alcoholic smokers taking γ-Aminobutyric Acid (GABA B) receptor agonist, baclofen (80 mg/day), or placebo demonstrated the possible role of baclofen in treatment of alcoholic smokers. Blood samples were collected at Weeks 0-4- 8-2 to analyze a series of hormone levels in 20 patients. The medication exposure was calculated as the area-under- the-curve (AUC) and an independent samples t-test was used to detect statistical difference. Patients taking baclofen reported lower levels of □ -endorphin compared to placebo. [t(18)=2.175, p=.043]. No differences were detected in other hormones tested. This study provides preliminary evidence suggesting a possible role of baclofen in the treatment of alcoholic smokers via hormone modulation.

Joshaya Trotman Poster #F3

Home Institution: Brown University

Summer Research Program: Undergraduate Teaching and Research Awards (UTRA)

Faculty Mentor: Peter Belenky, Department of Pathology

The Impact of Environmental Stress on Horizontal Gene Transfer in Vibrio Bacteria

Transformation is a mechanism of horizontal gene transfer in which bacterial cells take up dsDNA floating in the environment and recombine it into their genomes. Not all bacteria species are transformation competent and one of the goals of the Belenky lab is to identify novel competent

bacteria utilizing next generation sequencing technology. The Belenky lab is also studying the impacts of environmental stress on transformation in competent Vibrio bacteria.

Andrew Verdesca Poster #F4

Home Institution: Brown University

Summer Research Program: Undergraduate Teaching and Research Awards (UTRA)

Faculty Mentor: John Sedivy, Department of Molecular Biology, Cell Biology and Biochemistry

Mechanisms that Regulate the Maintenance of Bone Health in Old Age

The protein MYC is an oncogenic transcription factor that regulates approximately 15% of our genome. The Sedivy lab has found that mice heterozygous for Myc have a 15% increase in lifespan and are resistant to osteoporosis. Decreased serum levels of insulin-like growth factor 1 (IGF1) are associated with osteoporosis in both mice and humans. Myc heterozygous mice have decreased serum and liver IGF1 levels, thus their resistance to osteoporosis is surprising. I am working to test the hypothesis that MYC regulates IGF1 in a tissue-specific manner by looking at bone levels of IGF1 mRNA and protein in Myc heterozygous mice, as well as downstream markers of bone health to determine the mechanism by which Myc heterozygous mice evade osteoporosis.

Brianna Walley Poster #F5

Home Institution: Tougaloo College

Summer Research Program: Leadership Alliance-Summer Research Early Identification Program (SR-EIP)

Faculty Mentor: Alison Delong, Department of Molecular Biology, Cell Biology and Biochemistry

Molecular Characterization of a Novel Ethylene Response Gene in Arabidopsis thaliana

In addition to being the "ripening hormone", ethylene gas is known to play critical roles in the regulation of processes such as seed germination, cell elongation, and defense against pathogens. While screening a collection of insertion (T-DNA tagged) mutants for ethylene-related phenotypes, we identified a mutant line exhibiting increased response to treatment with the ethylene precursor 1-aminocycloprpane 1-carboxylate (ACC). Additional experiments showed that ethylene signaling was weakly activated in the absence of added ethylene and when ethylene perception was blocked. Genetic analysis showed that the T-DNA insertion was not linked to the ACC hypersensitive phenotype, and suggested that the mutated gene might encode a novel ethylene response factor. We named the locus ACC hypersensitive hypocotyl (AHH1) based on the phenotype of the parental T-DNA line, which was seen to have short hypocotyls even in the absence of ACC. To allow molecular identification of the AHH1 gene, we are using single nucleotide polymorphism mediated mapping (SNP-mediated mapping) through bulk segregant analysis. The wild-type parental genomes of parental Columbia and Landsberg accessions are fully sequenced, with a well-defined set of SNPs known. In order to generate a mapping population, ahh1 in a Columbia background was crossed to another ecotype Landsberg. The F1 generation was then allowed to self-pollinate and the F2 seedlings were tested for ACC hypersensitivity to identify individuals homozygous for the ahh1 mutation. While these individuals would be randomly segregating Landsberg and Columbia SNPs, the expectation for the F2 is the homozygosity of Columbia SNPs surrounding the ahh1 locus. To verify that the F2 individuals were homozygous for the ahh1 mutation, F3 progeny families were re-

tested on normal and ACC- containing agar plates. After the verification of homozygosity, we will perform whole genome sequence analysis on pooled F2 DNA samples and ahh1 parental DNA. The concluding objective of this research is through the molecular characterization of the ahh1 mutation we hope to discover a new element within the ethylene signaling pathway, or to development a more profound understanding of the existing elements within the signaling pathway.

Amy Wang Poster #F6

Home Institution: Brown University

Summer Research Program: Undergraduate Teaching and Research Awards (UTRA)

Faculty Mentor: Richard Freiman, Department of Molecular Biology, Cell Biology, and Biochemistry

The Role of Notch 3 in Ovarian Cancer Progression

Ovarian high-grade serous carcinoma (HGSC) has the lowest survival rates of the different subtypes of ovarian cancer. The goal of my project is to elucidate the cellular and molecular effects of Notch 3 in HGSC. More specifically, I will look at the potential correlation between Notch 3 expression, p53 status, and BRCA2 status. I will utilize a novel ID8 cell line derivative that contains gene deletions of p53 (Trp53-/-) and BRCA2 (BRCA2-/-), which is more representative of actual ovarian HGSC than the parental ID8 cells are. Through utilizing siRNA to decrease Notch 3 expression levels and growing the cells under 3D conditions, I hope to assess how Notch 3 affects cell growth and adhesion.

Alexander Weingart Poster #F7

Home Institution: University of Vermont

Summer Research Program: Leadership Alliance-Summer Research Early Identification Program (SR-EIP)

Faculty Mentors: Sharon Rounds, Department of Medicine & Qing Lu, Department of Medicine

Effects of Acrolein and Cigarette Smoke on Inflammasome Signaling in Lung and in Cultured Endothelial Cells

Previous work from the Rounds Laboratory has demonstrated that acrolein, a highly reactive aldehyde present in cigarette smoke, increases lung vascular endothelial permeability in vivo in mouse lungs and in cultured endothelial cells (Rounds, 2017). In mouse models, intra-tracheal acrolein causes lung edema and inflammation, increasing the severity of acute lung injury (ALI). In cultured lung endothelial cells, acrolein increased monolayer permeability and decreased adherens junction formation, as assessed by □-catenin expression. In coronary artery endothelial cells, others have demonstrated that inflammasome activation is associated with loss of inter-cellular junction proteins and increased monolayer permeability (Borgas et al., 2016). The underlying mechanisms are poorly understood. Activation of the lung inflammatory signaling mechanisms regulated by the inflammasome Nlrp3, initiate a signaling cascade. The Nlrp3 protein forms a complex cleaving pro-caspase-1 to its active form, caspase-1, which proteolytically processes interleukin 1 beta (IL-1□), a potent pro-inflammatory cytokine. IL-1□ is an important mediator of the inflammatory response and is involved in a variety of cellular activities, including cell proliferation, differentiation, and apoptosis. In this study we assessed the effects of cigarette smoke extract and acrolein on lung tissue and cultured endothelial cell expression of Nlrp3, caspase-1, and IL-1□. Our results suggest that

lung inflammasome signaling cytokines may be involved in acrolein-induced endothelial barrier dysfunction and lung injury. Inhibition of inflammatory changes in response to acrolein may be a novel approach to prevent and treat acrolein-associated lung injury.

Adrianna Wenz Poster #F8

Home Institution: Brown University

Summer Research Program: Undergraduate Teaching and Research Awards (UTRA)

Faculty Mentors: Leigh Hochberg, School of Engineering & Marco Vilela, School of Engineering

Development of a Java Script Game Engine for Brain-Computer Interface applications

For many with paralysis or ALS, the ability to perform motor actions has disappeared while the desire to move remains. The mission of BrainGate2 is to bridge the gap between intention and action by developing brain-computer interfaces (BCIs) that help disabled individuals control a cursor or a robotic arm. The long term goal of this research is to develop a device for home use that could be used both to access the internet and perform tasks such as drinking a cup of coffee. We have worked to develop an internet-accessible application that can receive commands from the BrainGate2 system to control a cursor, with the hope that it will help those with paralysis achieve technological independence.

Caroline Wolek Poster #F9

Home Institution: Brown University

Summer Research Program: Undergraduate Teaching and Research Awards (UTRA)

Faculty Mentors: Thomas Roberts, Department of Ecology and Evolutionary Biology & David Sleboda, Department of Ecology and Evolutionary Biology

The Role of Connective Tissue in Muscle Fibers involved in Various Functions

This project consists of identifying and quantifying unique properties in muscle fiber connective tissue and comparing variances in these properties across muscles of various functions within a single species. The procedure includes isolating muscles of interest, preparing the muscle sections for SEM imaging, and then utilizing the acquired images for quantitative and qualitative analysis.

Anthonia Wray Poster #F10

Home Institution: University of Connecticut

Summer Research Program: Leadership Alliance-Summer Research Early Identification Program (SR-EIP)

Faculty Mentor: Jessica Plavicki, Department of Pathology and Laboratory Medicine

Understanding the Emergence of Hemorrhaging through AHR activation in the Liver Cells

One of the most toxic dioxin congeners, 2, 3, 7, 8-tetrachloro-dibenzio-para-dioxin (Dioxin or TCDD) can exert its toxicity through binding with aryl hydrocarbon receptor (AHR), a ligand activated transcription factor. By using zebrafish models, we are able to observe the effects environmental toxins in vertebrates, due to the short generation period zebrafish have. AHR activation in the liver and endothelial cells can promote the cause of hemorrhaging through changes

in the vascular endothelium and clotting factors of liver cells. In this project, we will be using constitutively active AHR (caAHR), a genetic construct that is ligand independent, to activate AHR in target cells. We expect to see hemorrhaging within the brain and around the liver of the zebrafish.

Dorothy Yam Poster #F11

Home Institution: Brown University

Summer Research Program: Undergraduate Teaching and Research Awards (UTRA)

Faculty Mentor: Willoughby Britton, Department of Psychiatry

Emotion Regulation and Age in the Context of Meditation Treatment Outcomes for Depression

Known as the "aging paradox," despite the biological and cognitive decline related to aging, facets of emotional wellbeing have been shown across studies to generally improve with age (with people with dementia as an exception). The Clinical and Affective Neuroscience Lab directed mildly to severely depression participants age 18-65 through an 8-week mindfulness meditation course to ameliorate their depression and negative emotional affect, and through this data set there is growing evidence of the benefits of meditation--specifically through the mechanisms of emotion regulation--amongst different age subgroups of depressed populations.

Michelle Zabat Poster #F12

Home Institution: Brown University

Summer Research Program: Undergraduate Teaching and Research Awards (UTRA)

Faculty Mentor: Peter Belenky, Department of Molecular Microbiology and Immunology

The Microbiome of Kimchi and Sauerkraut

The process of vegetable fermentation by lactic acid bacteria has important implications for both industry and food safety. In this project, we seek to assess the impact of the raw ingredients and the fermentation environment on the microbial communities present in kimchi and sauerkraut. We predict that the cabbage used in both fermented foods will most prominently impact the bacterial content of the final products, and that the environments in which these foods are fermented will contain more lactic acid bacteria than they otherwise would. Here, we present our methodology, pipeline, and initial data, based on samples collected from Rhode Island-based kimchi and sauerkraut fermentation companies.

Xiaoshu Zheng Poster #F13

Home Institution: Brown University

Summer Research Program: Undergraduate Teaching and Research Awards (UTRA)

Faculty Mentor: Phyllis Dennery, Department of Cell Biology, Molecular Biology and Biochemistry

Hyperoxia increases glucose transport proteins in fetal lung epithelial cells

Premature babies are born with underdeveloped lungs, requiring supplemental oxygen treatment (hyperoxia) for survival. The hyperoxic conditions lead to dysfunction and/or death of pulmonary epithelial cells. Hyperoxia increases glucose uptake and glycolysis; however, whether this impacts

neonatal lung injury is undetermined. Therefore, we evaluated the glucose transporters GLUT1-4 in fetal mouse lung epithelial cells (MLE-12) exposed to hyperoxia (95% O2, 5% CO2) for 24 hours. Controls were exposed to air/5% CO2. In MLE-12, only GLUT3 protein, whereas both GLUT3 and GLUT4 mRNA levels, significantly increased after hyperoxic exposure. We conclude that hyperoxia increases glucose transport through GLUT proteins. Evaluating cell viability and proliferation after silencing GLUT3 will confirm the importance of this protein in hyperoxic lung injury.

Margaux Zimmerman Poster #F14

Home Institution: Brown University

Summer Research Program: Undergraduate Teaching and Research Awards (UTRA)

Faculty Mentors: Bing Ma, Department of Molecular Microbiology and Immunology & Chun Lee, Department of Molecular Microbiology and Immunology

Chi3l1 mediates phosphorylation of Stat3 and the expression of immune checkpoint molecules in the pathogenesis of lung cancer

Chi3l1, a prototypic chitinase-like protein, binds but does not degrade chitin. PD-1, a receptor expressed on immune cells, can interact with the ligand PD-L1 on tumor cells to cause inhibition of T-cell activation and cytokine production. PD-1/PD-L1 interactions work as immune checkpoints for cancer cell immune evasion. Our lab has shown that Chi3l1 induces PD1/PD-L1 interactions, most notably T-cells and macrophages, facilitating in primary and metastatic lung cancer. This research project is trying to determine if signal transducer and activator transcription 3 (Stat3) works downstream of the Chi3l1 pathway as a main mediator in activation of PD1/PD-L1 interactions and cancer evasion. Use of Stat3 inhibitor in genetically modified mice will allow for the determination of level of expression of PD1/PD-L1 at varying controlled interactions of Chi3l1 and Stat3.

SUMMER RESEARCH SYMPOSIUM POSTERS
Friday, August 4
Physical and Social Sciences & Student Teams

Social Sciences

Liz Cory Poster #A1

Home Institution: Brown University

Summer Research Program: Undergraduate Teaching and Research Awards (UTRA)

Faculty Mentor: Amitai Shenhav, Department of Cognitive, Linguistic, and Psychological Sciences

The influence of perceived efficacy and reward on control allocation

How does a person's perception of the control they have over achieving an outcome (i.e., the "perceived efficacy" of their action) influence the amount of effort they invest in achieving it? How might offering different levels of reward for achieving that outcome also influence their effort allocation? We measure participants' cognitive effort allocation via their reaction times and accuracy on a Stroop task while varying efficacy and reward levels on each trial. Our preliminary results suggest that people make correct responses significantly faster when perceived efficacy is high and when reward level is high. Furthermore, we have found the effects of perceived efficacy and reward on performance to be independent of one another.

Micah Holness Poster #A2

Home Institution: Xavier University of Louisiana

Summer Research Program: Leadership Alliance-

Summer Research Early Identification Program (SR-EIP)

Faculty Mentors: Joo-Hyun Song, Department of Cognitive, Linguistic and Psychological Sciences & Dan McCarthy Department of Cognitive, Linguistic and Psychological Sciences

Recall of Emotional Scenes Following Eye Movements

We continuously move our eyes (i.e., make saccades) to detect changes in our environment; however, memory errors can occur between these rapid saccades. Boundaries for negative emotional scenes are rated as smaller than the original image (tunnel memory) while those for positive or neutral scenes are remembered as being larger (boundary extension). We investigated scene memory for positive, negative, and neutral emotional images by allowing participants to adjust image boundaries following saccades. Images shown at test were cropped to be smaller, larger, or the same size as the original image. Results indicate that participants experienced boundary extension independent of the emotional content and cropping level of the images, indicating that scene memory is not precise even following brief transsaccadic intervals.

Margaret Hu Poster #A3

Home Institution: Brown University

Summer Research Program: Undergraduate Teaching and Research Awards (UTRA)

Faculty Mentor: Oriel Feldman Hall, Department of Cognitive, Linguistic and Psychological Sciences

Acquired Equivalence: How We Learn to Categorize People

Humans have a well-developed ability to group different objects together based on common perceptual features (i.e. fruit, or modes of transportation). Being able to categorize enables a learning process called acquired equivalence, whereby learning the value of one stimulus can transfer to another stimulus without additional direct learning. While this effect has been demonstrated in the nonsocial domain, it remains unclear whether acquired equivalence is used in complex social interaction. This research seeks to investigate how we learn to categorize individuals, and whether categorization allows for the acquired equivalence of social traits such as generosity.

Lina Lalwani Poster #A4

Home Institution: Brown University

Summer Research Program: Undergraduate Teaching and Research Awards (UTRA)

Faculty Mentor: Zhenchao Qian, Department of Sociology

Invisible Intersections: Multiethnic Asian Families and the US Census

Multiethnic Asian Americans—individuals that identify with more than one Asian ethnicity—are a significant but understudied population in the Unites States. Using the American Community Survey Public Use Microdata Samples from 2008 to 2015, this project provides a preliminary quantitative analysis of multiethnic Asian families, examining demographic characteristics including parent's educational attainment, geographic distribution, nativity and citizenship status. Additionally, this report examines the convoluted nature of racial identification—evident in the ethnic classification of multiethnic Asian children—which conceals the true number of multiethnic individuals present in the population. Census limitations and aggregated ethnic categories also hinder the quality of data available. The implications of these results as well as recommendations for future policy and research are discussed.

Miles Martinez Poster #A5

Home Institution: Brown University

Summer Research Program: Undergraduate Teaching and Research Awards (UTRA)

Faculty Mentor: Joo-Hyun Song, Department of Cognitive, Linguistic and Psychological Sciences

Observation coupled with physical practice leads to improved generalization over physical practice alone

In daily life, people are tasked with learning complex motor actions. Mastery of learning involves performing such actions in environments different to that of the original learning. For example, highly proficient drivers are able to handle different vehicles in different terrains. Existing research has thoroughly investigated the psychological mechanisms of learning through physical practice.

Although observing others' actions provides important information for motor learning, researchers have thus far neglected the mechanisms supporting learning by observation. In the current study, participants made reaching movements toward a visual target, adapting their movement to offset a rotation between visual feedback and movement. We examined whether observation of adaptation prior to physical practice improved the transfer of motor learning to untrained locations.

Maya Singh Poster #A6

Home Institution: Brown University

Summer Research Program: Brown University CLPS funded research

Faculty Mentors: Rebecca Burwell, Department of Cognitive, Linguistic and Psychological Sciences & Victoria Heimer-McGinn Cognitive, Linguistic and Psychological Sciences

Representation of Context in the Postrhinal Cortex

Memory for context of events is a critical element of episodic memory, as well as perception and decision-making. But how and where is context represented in the brain? Early research suggests that object information reaches the hippocampus (HC) through the perirhinal cortex (PER) and contextual information reaches the HC through the postrhinal cortex (POR). The PER and POR each project directly to the HC and indirectly through the lateral and medial entorhinal areas (LEA and MEA), respectively. We predict that the POR represents the local spatial context including the spatial layout of objects, patterns, and features of the environment. The POR also monitors these cues for changes and updates its representation when changes occur. In order to isolate neuronal correlates of complex conjunctions of stimuli, a biconditional discrimination task and electrophysiology recordings were performed on rats. By recording individual cells and local field potentials in the POR this work can help determine how the POR represent contexts and how these representations are used in the HC for episodic memory and associative learning. Given that parahippocampal structures are implicated in memory decline associated with epilepsy and mild cognitive impairment, it is of great benefit to continue exploring this area of interest in the hopes of developing novel targeted treatment.

Chayla Vazquez Poster #A7

Home Institution: Emory University

Summer Research Program: Leadership Alliance-Summer Research Early Identification Program (SR-EIP)

Faculty Mentors: Dima Amso, Department of Cognitive, Linguistic and Psychological Sciences & Kevin Bath, Department of Cognitive, Linguistic and Psychological Science

The Effect of Early Life Enrichment on Cognitive Development

The socioeconomic status (SES) gap in the U.S. correlates with the achievement gap for children, which is concerning for families at or below the poverty line. One possibility is that higher SES children have more enrichment in their home and school environments. Cognitive control is a mediating variable between SES and achievement. We tested whether early life enrichment (ELE) impacts cognitive control using parallel human and mouse models. Animal models had corticosteroid and biological markers of brain maturation measured, as well as cognitive

assessments. These experiments will be able to help define the importance of our environment during early development and ELE on cognitive advancement.

Betsy Waisel Poster #A8

Home Institution: Brown University

Summer Research Program: Undergraduate Teaching and Research Awards (UTRA)

Faculty Mentors: Abigail Harrison, Department of Public Health & Jennie Pellowski, Department of Public Health

Fertility and the Transition to Adulthood in South Africa: 'Unintended' Pregnancy, Lifecourse Strategy, or Somewhere in Between?

Pregnancy marks the transition to adulthood for many South African women, though literature has traditionally viewed teenage pregnancy as a pathology to be fixed. Recently, however, attention to the role of familial and social factors, as well as women's agency, has challenged this perspective. In the absence of marriage and in environments with few economic and occupational resources, pregnancy can be a means by which young women "prove fertility" and thus construct their futures. It is important to examine early childbearing not simply as a foundation for future disadvantage, but also as a purposeful life course strategy. By joining public health and anthropological perspectives, this systematic review aims to examine existing literature on teenage pregnancy in South Africa to define gaps in the research, questions for future research, and to offer a foundation to build on existing theories.

Erin West Poster #A9

Home Institution: Brown University

Summer Research Program: Royce Fellows

Faculty Mentors: Vazira Zamindar, Department of History & Patsy Lewis, Department of Development Studies

Violence Without Borders: The U.S. Immigration Regime and the Violence to which it Responds, yet Reproduces

Although many pathways to immigration are subject to closure in the next few years, some have remained unchallenged and may, in fact, expand: documentation status for victims of violence. Erin's research this summer explores the exceptional status given to immigrants, mostly women, who experience domestic violence, human trafficking, or other forms of intimate harm. This summer, Erin takes an "on-the-ground" perspective by conducting ethnographic field work under the Immigration Advocacy Director at Sojourner House, a domestic violence organization in Providence. Erin's analysis takes a critical perspective on the legal categories of gender, violence, power, and vulnerability that are inscribed and differently valued through state documentation processes.

Student Teams

Stephanie Adaniya, Jessica Cao, & Amy Landi Poster #A10 & A11

Home Institution: Brown University

Summer Research Program: Undergraduate Teaching and Research Awards (UTRA)

Faculty Mentors: Jin O-Uchi, Cardiovascular Research Center & Bong Sook Jhun, Cardiovascular Research Center

PKD-dependent phosphorylation of DLP1 regulates mitochondrial morphology and function in cardiomyocytes

This project focuses on the role of post-translational modifications of mitochondrial fission/fusion proteins in the heart. Our lab recently found that the fission protein, dynamin-like protein 1 (DLP1) is capable of undergoing phosphorylation mediated by protein kinase D (PKD), a downstream target of GqPCR signaling and key signaling molecule for cardiac function. Currently, our working hypothesis is that PKD-dependent DLP1 phosphorylation induces mitochondrial fragmentation and dysfunction under GqPCR stimulation. Here, we present recent data obtained from the cell lines and primary cardiomyocytes and discuss the role of this signaling pathway in mediating pathological changes in the heart such as during heart failure.

Role of tyrosine phosphorylation of mitochondrial Ca2+ uniporter (MCU) in mitochondrial Ca2+ homeostasis regulation

Mitochondrial Ca2+ (mtCa2+) uptake via the mtCa2+ uniporter (MCU) is a critical factor in determining cell survival or death. Basal tyrosine phosphorylation (P-Y) of MCU has been reported via mass spectroscopy data, and our lab has found that proline-rich tyrosine kinase 2 (Pyk2) activated by alpha1-adrenoceptor signaling increases P-Y of MCU and mtCa2+ uptake. However, the identity of Pyk2-specific phosphorylation sites in MCU and how such post-translational modifications modulate channel properties as well as mitochondrial and cellular function are still unknown. Thus, this project seeks to (1) biochemically determine Pyk2-specific phosphorylation sites in MCU in situ and (2) to assess the functional impact of Pyk2-dependent P-Y of MCU at each site using cell biological and physiological assays.

Yazen Alani, Spencer Boyum, Eric Kong, Vincent Kubala, Kaushik Nimmagadda, & Morgan Talbot Poster #A12, A13 & A14

Home Institution: Brown University

Summer Research Program: Undergraduate Teaching and Research Awards (UTRA)

Faculty Mentor: Michael Paradiso, Department of Neuroscience

An Intelligent Visual Prosthesis for the Blind

We are developing a wearable assistive device that will allow blind people to identify, locate, and interact with objects in their environment, avoid obstacles, and perform other visual tasks. A video camera and other sensors attached to a pair of spectacles will relay data to a wearable computer, where it will be processed in real time to extract high-level, easily communicable information such as the locations of important objects. The user will interact with the device through a voice-activated interface, and will receive live information about their surroundings through verbal and non-verbal

auditory cues. We hope that our device will ameliorate some of the practical inconveniences of blindness and allow users to more easily gain independence.

Ashley Aldridge & Mauricio Pinto Poster #F15

Home Institution: Brown University

Summer Research Program: Undergraduate Teaching and Research Awards (UTRA)

Faculty Mentor: Wael Asaad, Department of Neurosurgery

Relationships of Physiologic Factors to the Progression of Acute Traumatic Subdural Hemorrhage

Subdural hematoma (SDH) accounts for more than 12% of all cases of traumatic brain injury (TBI). SDH in isolation has also been implicated as a major determinant of poor short-term outcomes in TBI, relative to other TBI subtypes. Because acute SDH has been found to progress in particular patients, the goal of this study was to provide a more comprehensive understanding of the factors underlying SDH bleed expansion. Through a volumetric analysis of head computed tomography (HCT), the authors assessed the association of prehospital and in-hospital characteristics with progression of acute subdural hematoma (aSDH) in order to ascertain the most potent predictors of SDH bleed expansion and facilitate the identification of the most at-risk SDH patients.

*Presenting on Thursday, August 3

Kidest Assefa-McNeil, Alexandra Banks, Justin Ferenzi, & Tammy Jiang Poster #A15

Home Institution: Brown University

Summer Research Program: Solsbery Summer Research Fellowship

Faculty Mentor: Stephen Buka, Department of Epidemiology

Interactive effects of childhood, neighborhood, and individual characteristics on substance use and abuse patterns

The aim of this study was to examine cross-level interactions between childhood neighborhood- and individual- characteristics on lifetime risk of substance abuse disorders. Participants were members of a birth cohort established in 1959 and followed through adulthood in their early 40s. Participants' home addresses were geocoded and linked to census data. Census tracts were used as proxies for neighborhoods. We examined the interactive effects of participants' neighborhood socioeconomic status (SES) x individual SES, neighborhood racial composition x individual race, and neighborhood residential stability x individual residential mobility with lifetime risk of substance abuse disorders. Substance abuse disorder diagnoses were obtained using the Composite International Diagnostic Interview during the adult assessments.

Abby Atkinson & Caroline Buckholtz Poster #A16

Home Institution: Brown University

Summer Research Program: Undergraduate Teaching and Research Awards (UTRA)

Faculty Mentors: Bruno Pradier, Department of Molecular Pharmacology, Physiology and Biotechnology & Julie Kauer, Department of Molecular Pharmacology, Physiology and Biotechnology

Characterization of trigeminonuclear neurons with c-fos immunohistochemistry in a nitroglycerin-induced migraine model

Migraine is a long-term neurological disorder affecting 12% of the population worldwide. Recent research implicates activation of the trigeminovascular system in the processing of migraine pain. As part of this system, the spinal trigeminal nucleus receives second-order input, but has not yet been extensively investigated. The present study aims to characterize the location of neurons found in the trigeminal nucleus by comparing proportions of excitatory and inhibitory neurons within the trigeminal nuclear lamina. Using injection of nitroglycerin in mice as a model for migraine pain, a time course for c-fos expression (indicating activated neurons) was generated. Fixed tissue slices were then stained with various antibody markers to determine the ratio of excitatory and inhibitory neurons active during migraine.

Justin Bai, Maksymilian Dabkowski, Kalinda Pride, & Nicholas Tomlin Poster #A17

Home Institution: Brown University

Summer Research Program: Undergraduate Teaching and Research Awards (UTRA)

Faculty Mentor: Scott Anderbois, Department of Cognitive, Linguistic and Psychological Sciences

A'ingae Language Documentation

A'ingae is an under-documented language spoken in Ecuador and Colombia, with approximately 1500 speakers. This project involves working with native speakers to collect texts in A'ingae, perform linguistic analysis, and build web/mobile interfaces to display these texts.

Julia Bleier & Samantha Cohen Poster #D16

Home Institution: Brown University

Summer Research Program: Undergraduate Teaching and Research Awards (UTRA)

Faculty Mentor: Carlos Aizenman, Department of Neuroscience

The Effect of Experience on the Temporal Properties of Multisensory Integration In Xenopus Laevis Tadpoles

In order to make sense of the multisensory world in which we live, it is imperative that our brains process a wide variety of stimuli at once. Though certain neurons are specialized for processing of unimodal information, there is evidence of cells that exhibit multisensory integration. The Aizenman lab uses the Xenopus laevis tadpole as an ideal model for understanding development of multisensory integration, as prior research has mapped out virtually every stage of their neural development. Through methods such as electrophysiology and behavioral analysis, Julia Bleier and I hope to determine whether tadpoles prefer (respond best to) multisensory stimuli presented at

particular time intervals and moreover, whether conditioning during development may give rise to such behavioral and neurological responses.

*Presenting on Thursday, August 3

William Dawson, Jonathan Hagedorn, & Nathan Sorscher Poster #B5 & B6

Home Institution: Brown University

Summer Research Program: Undergraduate Teaching and Research Awards (UTRA)

Faculty Mentors: Mark Johnson, Department of Molecular Biology, Cell Biology and Biochemistry & Ben Rimon, Department of Molecular Biology, Cell Biology and Biochemistry

A Novel approach to Isolating the genetic elements involved in cellular signaling essential for plant reproduction

Fertilization and reproduction in flowering plants constitutes a lengthy and complex cellular journey. Although some research has been done to explore the genetic origin of the unique processes involved in angiosperm reproduction, the relationship between genetics and pollen-tube fertilization is mostly unknown. We have been conducting a forward genetic screen of Arabidopsis thaliana to identify and characterize gene families that regulate these pathways, including the mechanisms that ensure that one pollen tube enters the ovule, focusing on over-expressing genes in the pollen tube and female gametophyte. This has shown a much higher yield of mutant phenotypes than previous screens. By integrating different approaches of mutant characterization (genotyping, microscopy, and "classic genetics") we have described a battery of mutant lines that originated from our screen.

Interdisciplinary analysis of novel mutations disrupting cellular signaling essential for plant reproduction

Fertilization and reproduction in angiosperms consists of a plethora of mostly unknown, but certainly complex, cellular processes. Although many pathways are described and somewhat researched, many more remain to be discovered. After coordinating a forward genetic screen of Arabidopsis thaliana emphasizing the overexpression of genes in the pollen tube and female gametophyte, we have integrated different approaches of mutant characterization to explore the unique mechanisms of the identified genes that control plant reproduction. Microscopy and "classic genetics" provided data on the transmission and phenotypes of the screened mutants, while genotyping and bioinformatics unlocked the loci and shed light on the rationale of each mutation. Our findings suggest novel ways specific gene families facilitate and control the plant reproductive pathway.

Alexandra Ertman, William Greis, & Abigail Kohler Poster #F16

Home Institution: Brown University

Summer Research Program: Summer Research Assistantship in Biomedical Sciences

Faculty Mentors: James Simmons, Department of Neuroscience & Andrea Simmons, Department of Cognitive, Linguistic and Psychological Sciences

Biosonar performance of Eptesicus fuscus after high-intensity ultrasonic noise exposure

This experiment tested the hypothesis that biosonar performance of big Brown University bats (Eptesicus fuscus) is not degraded after exposure to long duration high intensity ultrasonic noise.

Bats were trained to fly through a narrow, straight corridor of vertical plastic chains. Its sonar broadcasts during these flights were recorded by microphones on the ceiling above and the wall at the end of the corridor. Recordings of each flight were cut to isolate the in-flight broadcasts. The inter-pulse intervals (IPI), amplitudes, and frequencies of each broadcast were extracted to assess the differences in sonar emissions before and after noise exposure.

*Presenting on Thursday, August 3

Matthew Finn & Julianna Liu Poster #B7

Home Institution: Brown University

Summer Research Program: Undergraduate Teaching and Research Awards (UTRA)

Faculty Mentors: Stephen Helfand, Department of Molecular and Cellular Biology & Jackson Taylor, Department of Molecular and Cellular Biology

Mechanisms of Lifespan Regulation by Sirt6 in Drosophila melanogaster

Sirtuins are a class of proteins that regulate a variety of cellular processes, and have been shown to play a role in aging, particularly SIRT1 and SIRT6. Our preliminary data shows that whole-body overexpression of the Drosophila melanogaster ortholog of SIRT6, dSirt6, extends lifespan in male and female flies. However, it is unclear whether this effect is specific to a certain tissue or group of tissues.The goal of this project was to determine the effects of altering dSirt6 expression in whole body, nervous system only, fat only, and muscle only. Here, we specifically overexpressed and knocked down dSirt6 in these tissues using the GAL4-UAS system, quantified level of dSirt6 overexpression by qPCR, and measured lifespan.

Margaret Follett, Dae Hyun Sam Kim, Lauren Montieth, & Wennie Zhang Poster #B8, B9 & B10

Home Institution: Brown University

Summer Research Program: Undergraduate Teaching and Research Awards (UTRA)

Faculty Mentor: Michael Satlow, Department of Judaic Studies

Inscriptions of Israel/Palestine

Under the direction of Dr. Michael Satlow, our interdisciplinary team is redesigning a web-based scholarly database of approximately 3,000 ancient inscriptions from the Israel/Palestine region. Our goal is for this database to engage both scholars and a general audience.

Alfonso Garcia & Karine Liu Poster #D17

Home Institution: Brown University

Summer Research Program: Undergraduate Teaching and Research Awards (UTRA)

Faculty Mentor: Carlos Aizenman, Department of Neuroscience

Effects of Early SSRI Exposure in Developing Nervous System

Recent research suggests a possible correlation that antidepressant use in pregnant women leads to autism in their children. Our research exposes the developing circuit of Xenopus Laevis tadpoles to SSRIs. Use of tadpoles as to model neurodevelopmental disorders has been an established tool in

the Aizenman lab due to electrophysiological and behavioral markers that could be detected if there are suspected characteristics pointing to a neurodevelopmental disorder(s). If tadpoles exhibit neurodevelopmental abnormalities due to exposure to SSRIs, it will underscore the importance serotonin regulation during prenatal development.

*Presenting on Thursday, August 3

Aryana Javaheri & Valerie Zhu Poster #B11

Home Institution: Brown University

Summer Research Program: Undergraduate Teaching and Research Awards (UTRA)

Faculty Mentors: Alexandra Deaconescu, Department of Molecular and Cellular Biology & Margaret Suhanovsky, Department of Molecular and Cellular Biology

Interaction of DNA polymerase IV (DinB) with transcription termination/anti-termination protein NusA and transcription repair coupling factor Mfd

DNA damage in the form of base modifications, DNA adducts, ss and dsDNA breaks is a major cause of genomic instability, and can interfere with essential cellular processes such as transcription and replication. Our goal is to better understand the interplay between these processes and DNA repair using the tools of biochemistry and structural biology. Here, we explore the interactions between three factors involved in three distinct processes: translesion DNA synthesis (the Y-family DNA polymerase DinB), transcriptional regulation (NusA) and transcription-coupled DNA repair (the Mfd ATPase). Our hypothesis is that these factors collaborate with each other to preserve genomic integrity in a variety of contexts, as suggested by previously reported genetics studies. Here we describe preliminary work aiming to study NusA/DinB and DinB/Mfd interactions in vitro and using X-ray crystallography.

Myungjin Jean Lee & Jonathan Vexler Poster #B12 & B13

Home Institution: Brown University

Summer Research Program: Undergraduate Teaching and Research Awards (UTRA)

Faculty Mentor: Sherief Reda, Department of Computer Engineering

A Cloud-Based System to Monitor and Control Performance and Power of Computing Infrastructure

The goal of this project is to build a cloud-based system that allows for the monitoring and control of large computing structures. We will create a system that would allow us to do the following: 1) Monitor and keep track of physical metrics such as temperature and power consumption. 2) Use machine learning techniques to predict and alert the administrators should any emergencies/potential problems arise. Our system will keep historic data of power consumption and implement a designed algorithm to predict any cases that would lead to failed equipment, and take preventative measures should any emergencies be detected. 3) Create a control dashboard that enables the system administrator to control the whole system to cap power and temperatures when needed.

Jeanine Noordam & Claudia Silva Poster #B14

Home Institution: Brown University

Summer Research Program: Undergraduate Teaching and Research Awards (UTRA)

Faculty Mentor: David Rangel, Department of Education

The Complex Logics of Parenting in the United States: The Case of Mexican Immigrant Families

The Complex Logics of Parenting in the United States: The Case of Mexican Immigrant Families" is a research focused on the parenting practices of Mexican-origin parents. The qualitative study looks at Mexican parents at two Southwestern cities in the US to figure out how they choose to be involved in their children's education. Parental involvement includes both within the home (eg helping with homework, teaching Spanish, planning family activities) and with the school (attending parent-teacher conferences, PTA meetings, extracurricular activities, etc.), as well as between parents in the neighborhood or school community.

Zack Pockrose & Dara Wais Poster #F17

Home Institution: Brown University

Summer Research Program: IBES

Faculty Mentor: Jeanne Loewenstein, Department of Environmental Sciences and Studies

Fish Habitat Enhancement and Broodstock Assessment in RI Waters

This summer, we have focused our efforts on three main projects. We have been monitoring the effect of oyster reef construction in Ninigret Pond and Quonochontaug Pond, surveying important marine habitat and species in the Providence River, and evaluating suitable oyster substrate and habitat in Narrow River and Green Hill Pond.

*Presenting on Thursday, August 3

Physical Sciences

Ishaan Agarwal Poster #B15

Home Institution: Brown University

Summer Research Program: Undergraduate Teaching and Research Awards (UTRA)

Faculty Mentor: Jeff Huang, Department of Computer Science

Causal Effects in Sleep

Through a partnership with a company that makes the most popular sleep tracking app on the market (with over 10 million installs), we have access to the largest set of sleep records in history. There are over 10 million nights of sleep from over 60,000 people across several years in this dataset. In general, observational data does not allow for causality claims, but recently there have been methods based on specific assumptions which provide a framework to reasonably verify

claims. They have been commonly used by companies like Google to analyze effects of ads based on observational data. In this project, we explore some of those methods and apply them to sleep data.

Joy Aso Poster #C1

Home Institution: Brown University

Summer Research Program: Undergraduate Teaching and Research Awards (UTRA)

Faculty Mentor: Kareen Coulombe, School of Engineering

Engineering Collagen Mircofibers for Cardiac Regeneration

Tissue scaffolds are important for the creation of viable cellular environments in tissue engineering. Collagen hydrogels are desirable tissue scaffolds due to their biocompatibility, but typically have low stiffness in comparison to native tissue. We hypothesize that this could be remedied through altering the molecular alignment of individual collagen fibers via stretch since this would allow us to influence the molecular assembly of the collagen. A collagen stretcher was designed to spin and stretch wet collagen fibers to up to 20% its original length for mechanical assessment. Fibers were then assessed to evaluate the influence of stretch conditioning on strength, elasticity, and Young's modulus computationally. Stretched fibers showcased greater stiffness than unstretched fibers suggesting that with the right mechanics and scaffold design, we could have the tools to be able to build a desired engineered tissue that mimics native tissue.

Elizabeth Bixler Poster #C2

Home Institution: Brown University

Summer Research Program: Undergraduate Teaching and Research Awards (UTRA)

Faculty Mentor: Eric Darling, Department of Molecular Pharmacology, Physiology and Biotechnology

Effect of Cell Cycle on ASC Surface Marker Expression

Adipose-derived stem cells (ASCs) are used in clinical settings for regenerative medicine, as they have the ability to differentiate into different cell types. Research on ASCs is relatively new, and ASC identification remains controversial because differences may exist in isolated ASCs based on various factors. Isolating ASCs using traditional methods is a time and labor-intensive process, which may be improved by including additional biomarkers for ASC identification. For instance, cell cycle phase may be a viable biomarker to identify ASCs from their original population. This study seeks to discover how surface marker expression changes with cell cycle, because perhaps cell cycle could serve as a significant biomarker when determining how to isolate and characterize ASCs.

Laura Blackstone Poster #C3

Home Institution: Brown University

Summer Research Program: Undergraduate Teaching and Research Awards (UTRA)

Faculty Mentor: Seny Kamara, Department of Computer Science

File-Injection Attacks on Searchable Oblivious RAM Database Storage

In an age where databases can be cheaply and easily stored on 'the cloud', clients should be able to easily access their data with the confidence that it is secure. The Oblivious RAM (ORAM) method for using keywords to search over encrypted data prevents devastating access-pattern leakage, which plagues more efficient mainstream methods. Because of this, the Searchable ORAM Model is often regarded as the gold standard of security for this problem, yet no formal crypt-analysis of it exists. This research presents file-injection attacks on the Searchable ORAM model for several database growth patterns. The attacks aim to identify the keyword(s) associated with single-word searches performed over an email database. The existence of successful attacks demonstrates that the models' leakage is non-trivial, and can be exploited to reveal sensitive information about clients' private files and search patterns. These findings suggest that the Searchable ORAM model is not as secure as the cryptography community perceives it to be.

Noah Burke Poster #C4

Home Institution: University of Rhode Island

Summer Research Program: Experimental Program to Stimulate Competitive Research (EPSCoR-NSF)

Faculty Mentor: Rashid Zia, School of Engineering

Using 3D Printing and Raspberry PI's to Automate an Optics Bench

To an untrained eye, an optics bench can seem complex, but the basic process of alignment is quite simple. A common tool in any optical setup is a pair of mirrors, which can align a laser beam along any path. Here, we design a low-cost setup that automates this alignment process. The design uses DC motors to turn manual knobs changing the position of each mirror, and 3D-printed couplers to bind the motors to the mounts. A Raspberry PI and quadrant photodiode sensors complete the system, and provide the system controls and feedback signal necessary for automation.

Elisa Bye Poster #C5

Home Institution: Brown University

Summer Research Program: Wong Lab Undergraduate Research

Faculty Mentor: Ian Wong, School of Engineering

High Content Imaging Platform for Cancer Cell Invasion

Metastasis, a process by which tumor cells migrate through the extracellular matrix (ECM), is responsible for over 90% of cancer deaths (Mehlen). Thus, methods of cancer cell migration through the ECM are relevant towards understanding tumor progression. This project utilizes fluorescent beads to label collagen matrices, enabling imagery of cell-ECM interactions. After considering multiple variables that may affect bead labeling, it was found that fetal bovine serum, a component of MBA-MD-231 cell culture media, was strongly correlated with effective bead labeling. True labeling integrity was tested by reproducing results from (Nguyen-Ngoc), analyzing the effect of temperature on collagen gel formation qualitatively. Gel incubation at 0°C before gelation caused qualitative differences in collagen formation, in agreement with (Nguyen-Ngoc). Finally, bead-matrix labeling was used with live cells to image cell-ECM interactions and migration over 48 hours. Beads did not inhibit migration of cells in 3D and matrix interactions during migration were visible.

Therefore, this imaging technique is a user-friendly way of viewing the collagen matrix and may be useful in migration research.

Michael Caplan Poster #C6

Home Institution: Brown University

Summer Research Program: Undergraduate Teaching and Research Awards (UTRA)

Faculty Mentor: Jacob Rosenstein, School of Engineering

Distributed Chemical Sensing Networks

In this project, we are prototyping a small chemical sensor network. The network consists of several sensor nodes built using Raspberry Pi embedded computing modules, running Python scripts which acquire signals from small metal-oxide gas sensors. Uniquely, we will be treating the chemical transport as a communications channel. Binary messages are encoded using an ultrasonic mister to spray isopropyl alcohol into the air, and a fan distributes the chemical across the sensor array. By analyzing the data returned from each sensor, we hope to build frameworks capable of recognizing the presence of arbitrary patterns encoded in chemical vapors. There are many potential uses for an apparatus that can identify and localize airborne chemical sources, including the detection of dangerous chemicals.

Grant Casey Poster #C7

Home Institution: Brown University

Summer Research Program: Undergraduate Teaching and Research Awards (UTRA)

Faculty Mentor: Brian Sheldon, Department of Materials Engineering

Image Analysis of Mechanical Degradation in Li-Ion Battery Cathodes

Solid electrolyte batteries are being investigated as safer alternatives to liquid electrolyte batteries. These batteries are prone to mechanical deformation that occurs through repeated discharge and recharge cycles. This project investigates this mechanical deformation. Images of solid electrolyte battery electrodes were analyzed with ImageJ software, and changes in particle size, electrode size and area ratios were tabulated. The goal of the project is to determine if the mechanical deformation can be statistically predictable.

Harry Chalfin Poster #B1

Home Institution: Brown University

Summer Research Program: Undergraduate Teaching and Research Awards (UTRA)

Faculty Mentor: Ian Dell'Antonio, Department of Physics

Dark Matter Mapping by Weak Gravitational Lensing

Dark matter is an exotic type of matter which is not yet well-understood. Our research team has been investigating dark matter using a phenomenon called weak gravitational lensing -- matter causes a curvature in space, so massive clumps of dark matter cause nearby light rays to bend, creating a lensing effect. We have been analyzing distant galaxy clusters, trying to detect the presence and abundance of dark matter in these regions of space by looking for these gravitational lenses.

Since this lensing effect is usually very weak, we have been using statistical methods to pinpoint the lenses and hence the dark matter. We hope our work can teach physicists something about the nature of dark matter.

Aaron Charous Poster #C8

Home Institution: Brown University

Summer Research Program: Undergraduate Teaching and Research Awards (UTRA)

Faculty Mentor: Daniel Mittleman, School of Engineering

Effect of Angle-Dependent Transmittance & Reflectance on Gaussian Beams

The transmittance and reflectance of an array of parallel-plate waveguides varies with the frequency and angle of the incident light. To solve for the transmittance and reflectance of the device, the two-dimensional wave equation is analyzed and treated as a Sturm-Liouville Eigenvalue problem. The incident light is modeled as a finite Gaussian beam; in contrast to a plane wave which only propagates in one direction, Gaussian beams' angular spectra have a non-zero bandwidth and thus propagate in multiple directions. So, when a Gaussian beam is shined upon a device with angle-dependent transmittance and reflectance, the transmitted and reflected beams have new, complex angular spectra, manifesting phenomena such as translation, dilation, and splitting.

Zihan Chen Poster #C9

Home Institution: Brown University

Summer Research Program: Undergraduate Teaching and Research Awards (UTRA)

Faculty Mentors: Sylvia Dee, Department of Earth, Environmental, and Planetary Sciences & James Russell, Department of Earth, Environmental, and Planetary Sciences

Modelling the response of tropical lake system to climate change since the Last Glacier Maximum

Reconstruction of temperature changes since the Last Glacier Maximum (LGM) have made fundamental contributions to our understanding of past, present and future climate. However, little is known about the sensitivity and mechanism governing tropical climate change, largely due to the insensitivity of tropical continental climate proxies to air temperature. To quantify uncertainties in the temperature record, we use the Hostetler and Bartlein lake model to investigate changes in two large tropical lacustrine systems, Lake Tanganyika and Lake Malawi, by evaluating the energy balance during the LGM, the mid-Holocene, and the pre-industrial period. By comparing the model simulation and the temperature proxies' reconstruction, our work provides new insights into the patterns, amplitude, sensitivity and mechanisms of African temperature change.

Jungho Daniel Choi Poster #B2

Home Institution: Brown University

Summer Research Program: Undergraduate Teaching and Research Awards (UTRA)

Faculty Mentor: Ian Dell'Antonio, Department of Physics

Dark Matter Interactions from Weak Lensing of Galaxy Clusters

In an attempt to better understand dark matter, this project focuses on the question: What interactions, if any, does dark matter have with itself? We use the technique of weak gravitational lensing, where a large foreground mass bends light coming from galaxies behind it, to measure the lensing signal from galaxy clusters. From this, we then determine the mass distribution of dark matter. When matter interacts with itself, it changes its motion, slowing the particles down. Thus, by comparing the peaks in dark matter distributions with those of galaxy distributions, which are not slowed down, we can draw conclusions about whether dark matter interacts with itself as much as the regular matter in galaxies does.

Ella Cohen Poster #C10

Home Institution: Brown University

Summer Research Program: Undergraduate Teaching and Research Awards (UTRA)

Faculty Mentor: Amit Basu, Department of Chemistry

What's in a name? The etymology of common organic compound names

This project is focused on discovering the etymology of the names of common organic compounds through the analysis of historical writings, including journals and books. The information from this research is synthesized into comprehensive stories delineating the historical roots of the development, discovery, and naming of important reagents. The goal is to engage people with organic chemistry from a different perspective, and to expose chemists to the historical origins of the compounds with which they interact on a daily basis.

Kayla Cole Poster #C11

Home Institution: Tougaloo College

Summer Research Program: Institute for Molecular and Nanoscale Innovation (IMNI)

Faculty Mentor: Angus Kingon, School of Engineering

Synthesis and characterization of CH3NH3Pbl3 (MAPbI3) single crystals

Solution-processed CH3NH3Pbl3 (MAPbI3) hybrid organic–inorganic perovskites have attracted great deal of interest for their photovoltaic properties. Interestingly for these applications, single crystal MAPbI3 has shown improved physical properties as compared to its polycrystalline counterpart. Here we synthesize large single crystals as well as polycrystalline MAPbI3 and study their charge-transport properties. We implement a recently proposed temperature—dependent pulsed voltage-current measurements under dark conditions to study electronic transport and the nature of migrating species (cation/anion) with grain sizes. Further, we investigate the growth of large grain MAPbI3 within confined containers. Such configurations could be extremely helpful in order to improve performance of detectors, and energy storage devices.

Nadia Colombi Poster #C12

Home Institution: University of California, Los Angeles

Summer Research Program: Leadership Alliance-Summer Research Early Identification Program (SR-EIP)

Faculty Mentors: Meredith Hastings, Department of Earth, Environmental, and Planetary Sciences & Wendell Walters, Department of Earth, Environmental, and Planetary Sciences

Characterizing the Stable Isotopic Composition of Ammonia Emitted Through Gasoline and Diesel Fuel Combustion in Providence, Rhode Island

Ammonia (NH3) is critical in the formation of particulate matter in its ability to react readily with acidic atmospheric constituents. Particulate matter contributes to poor air quality, can cause damage to human lung tissue and the heart, and even contributes to global climate change. However, there is disagreement regarding the amount of ammonia which industrial/combustion processes emit. Stable isotope analysis may provide an effective method for constraining the amount of NH3 emitted from combustion processes in urban environments. My research project aims to lower the uncertainty associated with tracking urban ammonia emissions by establishing the isotopic fingerprint of ammonia emitted by gasoline fueled engines. I hypothesize that the NH3 emission budget will be higher than the expected values reported by the National Emissions Inventory for Providence County, Rhode Island.

Ana Colón Poster #C13

Home Institution: Dartmouth College

Summer Research Program: Leadership Alliance-Summer Research Early Identification Program (SR-EIP)

Faculty Mentor: Ralph Milliken, Department of Earth, Environmental, and Planetary Sciences

Mapping Ancient Lakebeds on Mars and Implications for Future Exploration

While the past presence of water on Mars is generally accepted, many characteristics of this water and the geological context of the environments in which it was held remain unknown. This project aims to create a detailed map of the distribution of clay deposits in the Uzboi-Morava-Ladon System, thought to have been a series of lakes interconnected by channels, and understand how these hydrous minerals relate to topography, adjacent fluvial networks, and the overall stratigraphy of basin deposits. This is critical for understanding the global scale climate on early Mars and its climate evolution. The ULM is recognized as an important site for Mars exploration, and a detailed map would allow us to further specify landing sites for future rovers.

Diana Cordero Dumit Poster #C14

Home Institution: Barry University

Summer Research Program: Leadership Alliance-Summer Research Early Identification Program (SR-EIP)

Faculty Mentor: James Russell, Department of Earth, Environmental and Planetary Sciences

Long-chain diols as a paleoenvironmental proxy in lake sediments

As global climate changes, it is imperative to understand the history of our climate to comprehend future changes and what they entail. While we have reasonable confidence of future changes in temperature, little is known of the past and future fate of the hydrological cycle. My research investigates the potential use of long-chain diols (LCDs) as a biomarker for hydrological changes. Biomarkers, which are organic molecules produced by plants and algae, are an important proxy for studying past climates. Many biomarkers are well preserved in lacustrine and marine sediments, and

preserve chemical signals of past climate changes. The aim of the study is to calibrate the chemical and isotopic composition of diols to reconstruct past hydrologic changes in the tropics.

D'Nea Galbraith Poster #C15

Home Institution: Hunter College, The City University of New York

Summer Research Program: Leadership Alliance-Summer Research Early Identification Program (SR-EIP)

Faculty Mentor: Kevin Bath, Department of Cognitive, Linguistic and Psychological Sciences

The Effects of Early Life Stress on Medial Preoptic Area Development

Early life stress (ELS) increases the lifelong risk for pathology and can impact future parental care. Here, we used a mouse model of ELS in the form of restricted maternal bedding from P4-P11. We carried out comprehensive analysis of the effects of ELS on maternal behavior using continuous automated video tracking and hand scoring. Maternal behavior was assessed over the circadian cycle during postpartum days 3-12. We assessed the effects of ELS on neural development using RT-qPCR, focusing on the development of the medial preoptic area (MPOA) of the hypothalamus, a sexually dimorphic brain region that is crucial for the expression of parental behavior. Our hypothesis was that ELS would alter, maternal behavior, cellular development, and sexual differentiation of the MPOA.

*Coauthored by Megan Gallo, Mizan Gillard, and Marques Love

Johanna Garfinkel Poster #C16

Home Institution: Brown University

Summer Research Program: Undergraduate Teaching and Research Awards (UTRA)

Faculty Mentor: Yongsong Huang, Department of Earth, Environmental and Planetary Sciences

Analyzing Organic Material Preserved in Freshwater Lake Sediments to Reconstruct the North Atlantic Oscillation

The North Atlantic Oscillation (NAO) is a large-scale weather phenomenon in the Northern Hemisphere that is caused by differences in sea level pressure. As the NAO periodicity is not well understood, this project explores how it varies on different time-scales. Recent preliminary studies from Prof. Huang's group have shown that sediments from freshwater lakes in Iceland contain a class of molecules called alkenones that are produced by Group I haptophyte algae. In response to changes in temperature, these algae change the alkenones' chemical makeup and offer a temperature chronology preserved in sediment. Through chemical analysis of the alkenones, we can obtain a quantitative temperature record to better understand the NAO and potentially propose probable trends for the future.

Mebatsion Gebre Poster #D1

Home Institution: Wellesley College

Summer Research Program: NSF REU (contact Prof. Brian W. Sheldon for details)

Faculty Mentor: Brian Sheldon, Department of Materials Science and Engineering

Electrochemical Properties of Spinel LiMn2O4 (LMO) as a Lithium Ion Battery Cathode

Spinel LiMn2O4 (LMO) is a commonly studied cathode material for lithium ion batteries because of its high potential (~4 V), low cost, and limited environmental impacts. In this work, we study the electrochemical properties of thin-film spinel LMO cathodes in coin-cell batteries through galvanostatic cycling and electrochemical impedance spectroscopy (EIS). A sol-gel method is used to prepare stoichiometrically accurate ~100 nm thick LMO films onto a stainless-steel substrate coated with a 400 nm layer platinum current collector. The cathode films are characterized using X-ray diffraction (XRD) and Raman spectroscopy before and after cycling to monitor their phase purity. The EIS results are then used to evaluate changes that occur at the LMO / electrolyte interface during electrochemical cycling.

Yichen Geng Poster #D2

Home Institution: Brown University

Summer Research Program: Undergraduate Teaching and Research Awards (UTRA)

Faculty Mentor: Karen Fischer, Department of Earth, Environmental and Planetary Sciences

Seismic anisotropy and mantle deformation beneath the Hindu Kush-Pamir region

This research uses shear-wave splitting, a method to measure anisotropy in seismic wave velocities, to understand mantle mineral alignment and deformation beneath the Hindu Kush-Pamir region, the western edge of the India-Eurasia collision zone. I have made new local S splitting measurements at the six stations of the Tajik network for earthquakes recorded since 2010, building on prior analysis of local S and teleseismic SK(K)S phases recorded by this network. In addition, I have measured splitting in local S and teleseismic SK(K)S, pSKS and sSKS phases at a new station, KBL. All splitting measurements are plotted in map view and 3D. An olivine a-axis alignment model is proposed based on these plots, which reveals the pattern of mantle deformation beneath this region.

Jungho Gong Poster #D3

Home Institution: Brown University

Summer Research Program: Undergraduate Teaching and Research Awards (UTRA)

Faculty Mentor: Jason Sello, Department of Chemistry

Usage of solid phase synthesis to explore hydroxyzine analogues

Hydroxyzine was first synthesized in 1956 as an anti-histamine drug. However, ever since it was developed, there has not been any change to the chemistry used to synthesize the drug. To explore new chemical space around old drugs using new chemistry and implement rapid synthesis and screening of the compounds, solid phase synthesis is used in this project to synthesize hydroxyzine and its analogues.

Felix Guo Poster #D4

Home Institution: Brown University

Summer Research Program: Undergraduate Teaching and Research Awards (UTRA)

Faculty Mentor: Meredith Hastings, Departments of Earth, Environmental and Planetary Sciences & Environment and Society

Agricultural Nitrogen Oxides Emissions and Their Isotopic Ratio

Agricultural soils emit nitrogen oxides (NOx), which are a family of reactive nitrogen gases that act as potent oxidants in atmospheric chemistry. NOx is key to the formation of ozone, photochemical smog, and acid deposition, posing a threat to the environmental and human health of a region. Soil NOx emissions are varied spatially and temporally across different fertilization methods and meteorological conditions yet the existing measurements are limited. For this project, we measure soil NOx fluxes and their nitrogen isotope ratios across different dairy manure incorporation treatments — conventional broadcast tillage, no-till broadcast, and no-till injection — in a rained cornfield. These results provide understanding on the controlling factors attributed to Nix emissions, the importance of soil management, and emission source fingerprinting.

Kara Hartig Poster #D5

Home Institution: Brown University

Summer Research Program: Undergraduate Teaching and Research Awards (UTRA)

Faculty Mentor: Brad Marston, Department of Physics

Modeling Langmuir Turbulence in the Ocean Surface Boundary Layer with Dedalus

Langmuir turbulence, formed when steady winds blow over the ocean, helps to mix the ocean surface layer and regulates the exchange of heat and gas with the atmosphere. Due to their size and complexity, global climate models struggle to resolve turbulence on this scale, leading to persistent uncertainties in ocean surface temperatures and the mixed layer depth. As part of the effort to reduce climate model uncertainties and better understand ocean-atmosphere dynamics, this project built and analyzed a computational model of Langmuir turbulence. Two approximations, the quasi-linear and generalized quasi-linear, were compared to a fully non-linear simulation (the best representation of reality) to judge their ability to capture critical dynamics at minimal computational cost.

Megan Hauptman Poster #D6

Home Institution: Brown University

Summer Research Program: Independent Study

Faculty Mentors: Amit Basu, Department of Chemistry & Blaise Leeber, Department of Chemistry

Impact of ionic strength, electrostatic and hydrophobic interactions, and concentration on hNMR chemical shifts

Due to hydrogen bonding between solution and solvent in hNMR, a number of chemical shifts exhibit concentration dependence. This summer I have studied a variety of aromatic substances, sugars, and polyols to determine the correlation of concentration to hNMR chemical shift.

Jake Heinlein Poster #D7

Home Institution: Brown University

Summer Research Program: Undergraduate Teaching and Research Awards (UTRA)

Faculty Mentor: Matthew Zimmt, Department of Chemistry

Directed Assembly of Nanoparticles on Chemically Patterned Self-assembled Monolayers

The Zimmt's research group has done a lot of work in creating monolayers – large patterned sheets of molecules stacked together in geometrically compatible ways – similar to pieces of Tetris. These molecules have a reactive component of them that stick up perpendicularly from the monolayer, resulting in rows of reactive functional groups sticking up from the monolayer in very specific, regular patterns. In this project, I worked on finding optimal conditions for the easiest and cleanest ways to synthesize and characterize gold nanoparticles (AuNP) of specific sizes (about 2 nanometers in diameter) that have been functionalized to react with those reactive parts of the monolayer. This should result in neat rows of AuNP on the monolayer.

Gian Ignacio Poster #D8

Home Institution: Brown University

Summer Research Program: Undergraduate Teaching and Research Awards (UTRA)

Faculty Mentors: Kareen Coulombe, School of Engineering & Cassady Rupert, School of Engineering

Increasing Electrical and Mechanical Maturation in Cardiac Tissue through Carbon-Nanotube Hybrid Scaffolding

Conventional synthetic cardiac scaffolding models are not physiologically representative models of functional cardiac tissue, challenged by poor cell-to-cell electrical communication as well as poor cell retention, survival, and proliferation. We hypothesize carbon nanotubes (CNTs) will further enhance mechanical and electrical properties of synthetic scaffolds, producing conductive scaffolding with alignment for uniaxial electrical flow and development of micro-architecture mimicking the natural extracellular matrix for cardiomyocyte adhesion and regulate cellular behavior. Acellular constructs evaluating CNT groups suggested significant conductivity increases upon electrical stimulation in CNT-collagen hydrogels. Polarized Light Microscopy analysis confirms CNT alignment, suggesting a correlation between alignment and increasing conductivity of tissue constructs. CNTs are promising tools for developing cardiac scaffolds that will perform similarly to natural scaffolds mechanically and electrically.

Oliver Isik Poster #D9

Home Institution: Brown University

Summer Research Program: Undergraduate Teaching and Research Awards (UTRA)

Faculty Mentor: Derek Stein, Department of Physics

Detecting Spherical Virus Translocations through Solid-State Nanopores

We use nanotechnology to detect spherical viruses. Measuring electrical current across a nanopore is a common method of detecting DNA and filamentous virus translocations, the resistive molecules

decreasing current as they pass through the pore. However, detecting spherical viruses using this method has not been fully developed, despite how commonplace the process is in biological systems. Due to their smaller size, the particles pass through pores extremely quickly, making signals difficult to distinguish from noise. We optimize signal strength and duration by modifying nanopore material, length, and diameter, as well as solution pH, conductivity, and composition.

Elaine Jiang Poster #D10

Home Institution: Brown University

Summer Research Program: Center for Computation and Visualization

Faculty Mentor: Tom Sgouros, Center for Computation and Visualization

Volume Rendering Supernova Cassiopeia A in Virtual Reality

Given volumetric data from supernova Cassiopeia A collected from multiple satellites in space, this project produces a volume rendering of the supernova that is compatible with virtual reality software, particularly Brown University's YURT Virtual Reality Cave. This project uses the Visualization Tool Kit (VTK) as a bridge to convert raw data into a 3-dimensional model. The overarching goal is to build a generic volume-rendering program that is able to read in a wide range of data to display using virtual reality.

Carly Kabelac Poster #D11

Home Institution: Brown University

Summer Research Program: Undergraduate Teaching and Research Awards (UTRA)

Faculty Mentor: Fabiola Munarin, Department of Biomedical Engineering

Alginate Customization for Angiogenesis in Engineered Tissue

Engineered myocardial tissue offers the potential to restore functionality in hearts damaged by myocardial infarction. However, in order for the engineered tissue to integrate and survive in the host over time, it is essential that a network of vasculature is established. Encouraging angiogenesis by the host organism ensures that this network exists. Vascular endothelial growth factor (VEGF) is a potent angiogenic protein, with its function maximized by sustained release over 7 to 14 days. In this project, we are studying the release kinetics of immobilized VEGF in modified alginate microspheres, with the hopes of retarding release. The alginate modifications include covalently bound sulfate groups and heparin. These modifications were selected because of their known compatibility with binding factors on VEGF.

Louis Kang Poster #E14

Home Institution: Brown University

Summer Research Program: Undergraduate Teaching and Research Awards (UTRA)

Faculty Mentor: Qian Chen, Warren Alpert Medical School of Brown University & Hongchuan Yu, Department of Orthopedics

Synthesis of JAK: Novel RNAi delivery as an innovative treatment for joint diseases

RNA interference (RNAi) is a natural mechanism of gene silencing by targeting mRNA, implemented through small interference RNA (siRNA). To efficiently deliver siRNA into cells of articular cartilage, the JAK molecule (a Janus base with amine or lysine) was designed. The objective of this research project was to achieve high efficient chemical synthesis of JAK molecule AAT (6-amino fused adenine and thymine). This involved techniques such as column chromatography, filtration, extraction, TLC, NMR, and MS. Previous results show that AAT can be synthesized using commercially available chemicals with a total yield of 5.6%. In this study, we are working on improving the efficiency of total synthesis and testing RNA delivery into cartilage, which would provide a therapy for osteoarthritis.

Bharath Kayyar Poster #D12

Home Institution: Brown University

Summer Research Program: Undergraduate Teaching and Research Awards (UTRA)

Faculty Mentor: Harvey Silverman, School of Engineering

Real-time acoustic source localization using microphone arrays

This research project attempts to use multiple microphone arrays to locate sound sources, specifically talking humans, within a room or confined space. A total of thirty two microphones are arranged on four separate boards, and these boards are mounted on the walls and ceiling of a room. The boards are then calibrated to establish a relative coordinate system. Signal processing algorithms are then run in real time on a centralized computer to cancel noise in the inputs from the thirty two microphones and determine the source of the sound. Such a system has potential applications in conference rooms and live broadcast events. Research topics in this project include optimizing calibration methods, determining the best noise-cancelling algorithms and ensuring minimal latency in the functioning of the system.

Amelia Khoo Poster #D13

Home Institution: Brown University

Summer Research Program: Undergraduate Teaching and Research Awards (UTRA)

Faculty Mentor: Kareen Coulombe, Department of Biomedical Engineering

Vascularization and Endothelial Cell Migration in Engineered Tissue Scaffolds

Vascular tissue engineering seeks to fabricate functionally, therapeutically relevant tissues. The Coulombe lab focuses on engineering cardiac tissue for ischemia. One key barrier is that engineered tissue contains orders of magnitude fewer blood vessels than native cardiac tissue. One tactic to encourage the formation of new vessels is to release growth factors, signaling cells to form blood vessels. An indicator of this process is cell migration to form tubular structures that precede mature vessels. My project seeks to characterize in vivo migration of endothelial cells into scaffolds with channels running through them. To reach this goal, I trained in surgical skills, performed migration studies in vitro, and evaluated the effectiveness of growth factors in vivo for introduction into these scaffolds.

Julia Krogh Poster #D14

Home Institution: Brown University

Summer Research Program: Undergraduate Teaching and Research Awards (UTRA)

Faculty Mentor: Colleen Dalton, Department of Earth, Environmental, and Planetary Sciences

Evolution of the lithosphere in the Arctic Ocean basin from combined ambient noise and earthquake tomography

The concepts of rigid lithosphere and weak asthenosphere are fundamental to the theory of plate tectonics, yet the physical properties of the mantle that give rise to this layered system remain unclear. I used ambient noise tomography to study properties of lithosphere in the Arctic Ocean basin. Ambient seismic noise is independent of earthquake occurrence, thereby allowing the inclusion of seismic-wave paths not typically sampled by earthquake-station geometries. Using a method described by Ma and Dalton (2017), I cross-correlated noise between 57,782 pairs of seismic stations to measure Rayleigh wave travel times. I supplemented the data with travel times from earthquake data and generated maps of wave-speed variations at multiple frequencies, which provide sensitivity to the depth range 40-300 km.

Yong Hyun Kwon Poster #D15

Home Institution: Brown University

Summer Research Program: CCV

Faculty Mentor: Tom Sgouros, Department of Computer Science

Hololens Application in ER

Development of Hololens App in ER. Using SharingService, Tracking and Volume Rendering

Jessica Lai Poster #D16

Home Institution: Brown University

Summer Research Program: Undergraduate Teaching and Research Awards (UTRA)

Faculty Mentor: Harvey Silverman, School of Engineering

Developing a Recording and Analysis Device to Capture and Classify Pain vs. Non Pain Induced Infant Audio Cries

The work focuses on the development of a recording and analysis device to aid in the diagnosis of infants with Neonatal Abstinence Syndrome. The recording device will be used by researchers at Women and Infants Hospital to capture numerous babies' cries. That audio data will then be passed into an analysis software that employs signal processing to aid in the decision of whether or not an infant has NAS.

Anand Lalwani Poster #D17

Home Institution: Brown University

Summer Research Program: Institute for Molecular and Nanoscale Innovation (IMNI)

Faculty Mentor: Rashid Zia, Department of Physics & School of Engineering

Study of electric-field-assisted ion migration and phase segregation in mixed halide perovskites

Mixed halide organic-inorganic perovskites, such as CH3NH3Pbl1.5Br1.5, show promise for use bandgap tuneable opto-electronic devices, including tandem solar cells. However, under illumination, the two halide regions segregate and device efficiency is lowered greatly. Researchers have hypothesized that differential diffusion rates for electrons and holes may generate an electric field in the perovskite layer upon illumination, which in turn drives ion migration. Here, we present an experiment examining ion migration under the influence of an external field. Specifically we created a capacitor structure with the perovskite layer sandwiched between electrodes, and then measured the photoluminescent spectra and lifetime measurements to investigate the role of electric fields in ion migration.

Katia Matora Poster #E1

Home Institution: Brown University

Summer Research Program: Stein Lab Research Assistant

Faculty Mentor: Derek Stein, Department of Physics

Physics Toward A Fluorescent Hybridization Assay For Single DNA Molecules

Nanofluidic technology has the potential to streamline DNA analysis. This project utilizes nanofluidic chips to capture DNA fragments and allows for the running of various biological assays on a single DNA molecule in real time. This particular project will use YOYO, a GFP DNA stain, and lambda DNA. The lambda DNA is to be captured in the entropic traps located in the nanofluidic chip and YOYO will subsequently be flushed through the device. The successful adherence of YOYO to the DNA in the nanofluidics chip will give us a baseline for doing more complicated assays, such as PCR, within the confines of the entropic traps.

David Mayans Poster #E2

Home Institution: Brown University

Summer Research Program: Undergraduate Teaching and Research Awards (UTRA)

Faculty Mentor: Brenda Rubenstein, Department of Chemistry

Solving the Atom: Using Quantum Monte Carlo Simulations to Rapidly Compute the Hamiltonian

Solving the molecular Schrodinger Equation is a computationally intensive task. Exact solutions scale poorly with the number of electrons, and approximate methods produce poor results when the system being studied contains strongly interacting electrons. Lanthanides and actinides, with their large, highly correlated electronic structures, are particularly difficult to study using traditional techniques. Quantum Monte Carlo (QMC) methods, which solve the Schrodinger Equation using random numbers, aim to provide the best of both approaches. In this work, we take advantage of the computational efficiency of QMC methods to increase the number of basis orbitals used to construct Hamiltonians. This allows us to better predict ground state energies by incorporating a fuller picture of the electronic system.

Joshua McDuffie Poster #E3

Home Institution: North Carolina A&T State University

Summer Research Program: Leadership Alliance-Summer Research Early Identification Program (SR-EIP)

Faculty Mentor: Karen Fischer, Department of Earth, Environmental, and Planetary Sciences

Assessing Mantle Deformation in the Aleutian Island Subduction Zone Using Shear Wave Splitting Techniques

Shear wave splitting is a phenomenon used to study anisotropy in seismic wave speeds and to map out patterns of upper mantle mineral alignment and deformation. I used SKS phases to test previous models for mantle deformation in the Aleutian Island subduction zone through the newly stationed USArray seismometer network. Using SplitLab software, I cross correlated data using the Silver and Chan [1991] method to find the best fit for phi (Φ) and dt (δ). The Fast directions measured show patterns of trench parallel alignment with gradual clockwise rotations further inland. As the global population continues to expand upon earthquake-prone areas, knowledge about the underlying dynamic processes in these regions is an increasingly pertinent topic in seismology.

Michelle Miller Poster #E4

Home Institution: Brown University

Summer Research Program: Space Grant/NASA, Undergraduate Teaching and Research Awards (UTRA)

Faculty Mentor: Jonathan Pober, Department of Physics

The Early Universe: Testing Semi-analytical Code Simulating Reionization

After the Big Bang, the universe was filled with neutral hydrogen that began to cool and collapse into the first structures. These first stars and galaxies began to emit radiation that eventually ionized all of the neutral hydrogen in the universe. 21CMMC is a semi-numerical code that takes simulated boxes of this ionized universe from another code called 21cmFAST. Mock measurements are taken from the simulated boxes in 21cmFAST. Those measurements are thrown into 21CMMC and help us determine certain properties of this simulated universe. My project tests the robustness of 21CMMC on universe simulations other than 21cmFAST to see whether 21CMMC can properly reconstruct early universe parameters given a mock "measurement".

Catherine Miranda Poster #E5

Home Institution: Brown University

Summer Research Program: Undergraduate Teaching and Research Awards (UTRA)

Faculty Mentor: Ralph Milliken, Department of Geological Sciences

Evidence for an Ancient Water System on Mars

The Uzboi-Ladon-Morava region on Mars was once host to an ancient, through-flowing system of water. Several sites within this system, including possible ancient lakebeds, contain water-bearing minerals that make them major areas of interest for future Mars missions. In this project, I use remote sensing data to map out the geology and mineralogy of Ladon Valles, Holden Basin, and

Eberswalde Crater. This mapping provides a crucial framework for understanding the nature of these past aqueous environments and ultimately, for identifying potential locations of preserved organic materials.

Shivam Nadimpalli Poster #E6

Home Institution: Brown University

Summer Research Program: RTG Dynamics and Stochastics REU

Faculty Mentor: Benjamin Kunsberg, Department of Applied Mathematics

Combinatorial Vector Field Topology for 3D Shape Perception

The Morse-Smale (MS) complex is a topological structure that can be computed from a scalar field, e.g. an image. We investigate whether the MS complex of shaded images is related to a "part" decomposition of the underlying imaged surface. Here, we present the implementation of an approximation algorithm to compute the MS complex based on the gradient flow of an image, and generate a test-set of images to investigate the role of the MS complex of an image as a scaffold for the perception of three-dimensional shape.

Zachary Neronha Poster #E7

Home Institution: Brown University

Summer Research Program: Undergraduate Teaching and Research Awards (UTRA)

Faculty Mentor: Ian Wong, Department of Biomedical Engineering

Swarming Migration of Co-Attracting Epithelial Cells into Fractal-Like Clusters

Cellular swarming plays a critical role in biological processes including embryogenesis, wound healing, and tumor invasion. Such coordinated cell migration is challenging to observe in vitro, where the exogenous application of growth factors may dominate over cell-secreted factors governing cell-cell communication. Here, we demonstrate that mammary epithelial cells exhibit swarming in low serum and epidermal growth factor (EGF) negative culture conditions. We quantify this behavior using Ripey's H function, the correlation of neighboring cell velocity vectors, and fractal dimension of clusters. Interestingly, this clustering behavior can be described as a phase diagram of cell density, speed, and cluster fraction, which has thermodynamic analogies. Overall, these findings provide insight into coordinated cell behaviors under nutrient deprivation and may have implications for tumor biology.

Emily Ortiz Poster #E8

Home Institution: Saint Mary's University of Minnesota

Summer Research Program: Leadership Alliance-Summer Research Early Identification Program (SR-EIP)

Faculty Mentor: Lynae Brayboy, Department of Reproductive Endocrinology

Spontaneous loss of multidrug resistance transporter in ovaries

Multidrug resistance transporters (MDRs) are a part of a much larger group of transporters known as the ATP Binding Cassette (ABC). This group of transporters are transmembrane proteins located

within the phospholipid bilayer that aid in cellular detoxification. MDRs have been shown to serve as a protection mechanism in many organisms and is highly conserved. In the ovary, MDRs have been shown to protect against chemotoxicity by effluxing compounds out of the cell. This resistance is mediated by p-glycoprotein. Therefore, the primary objective of our study is to further understand the effect that a spontaneously mutated MDR ovary has on overall reproductive health. Here we used spontaneously mutated p-glycoprotein (Pgp) mice to perform ovarian histomorphometry (follicle staging and counting), metabolic profiling, hormonal profiling, eiconasoid testing, and transcriptomics. Preliminary data suggests that we will find indications of increased oxidative stress and reduced ovarian reserve.

Andrew Park Poster #E9

Home Institution: Brown University

Summer Research Program: Brown University Applied Math Department

Faculty Mentor: Benjamin Kunsberg, Department of Applied Mathematics

Recovering 3D Surface Orientations from Isotropic Textured Images

We use the texture of a two dimensional image in order to recover the original three-dimensional structure of an imaged surface. We observe the gradient distributions in a given window of the image, and by assuming the textures are isotropic on the surface, are able to find a linear transformation between the observed gradient distribution and an assumed isotropic (uniform) distribution. We show that there is a unique linear transformation that returns the best recovery of the original surface tangent plane. We then use Poisson reconstruction to "knit" the tangent planes together and find the best fit surface to the textured image.

Cadence Pearce Poster #E10

Home Institution: Brown University

Summer Research Program: Undergraduate Teaching and Research Awards (UTRA)

Faculty Mentor: Amit Basu, Department of Chemistry

Synthesizing Antimicrobials; Making and Modifying a Diamide Compound Using the Ugi Reaction, CAN Reaction, and Chan-Lam Coupling

Previously, the Basu lab has synthesized several diamide compounds with antimicrobial activity. The synthesis uses isocyanide compounds as a starting material. Many isocyanides are not easily available, limiting synthetic possibilities for the diamide compounds. Currently, we are working on an alternate synthetic route that modifies the functionality of an initial diamide compound, circumventing the limits of the original synthesis, and hopefully allowing for the synthesis of antimicrobials with a higher potency. The first step of the route involves making a starting diamide using the Ugi reaction. The second step reduces the section of the molecule derived from an isocyanide back to a primary amide. Finally, Chan-Lam coupling attaches a desired functionality to the amide.

Steven Pei Poster #E11

Home Institution: Brown University

Summer Research Program: Undergraduate Teaching and Research Awards (UTRA)

Faculty Mentor: Thomas Powers, Department of Physics & School of Engineering

Axisymmetric colloidal membranes

Colloidal membranes are highly replicable, microscopic structures with potential applications in drug delivery. Recent experiments reveal that these membranes can take on a catenoidal shape, similar to the shape of a soap film between two rings. We theoretically determine the shapes of these membranes by generalizing the soap-film model to include membrane bending stiffness. Our findings indicate the existence of stable shapes under the conditions of vanishing edge bending torque, vanishing edge forces, and fixed area, and that the physical constants introduced with these conditions can be varied to form shapes not achievable by the basic catenoid solution.

Kaitlyn Petitpas Poster #E12

Home Institution: Brown University

Summer Research Program: Undergraduate Teaching and Research Awards (UTRA)

Faculty Mentors: Joanne Lomas-Neira, Department of Surgical Research at Rhode Island Hospital & Chun-Shiang Chung, Department of Surgical Research at Rhode Island Hospital

Neutrophil Binding To ICAM-1 Expressed On Both Endothelial Cells & Pericytes Contributes to Pericyte Dissociation & Development of Indirect ARDS

Patients with extrapulmonary/indirect acute respiratory distress syndrome (iARDS) experience loss of pulmonary vascular endothelial cell (EC) barrier integrity. We showed that the Angiopoietin (Ang)/Tie pathway modulates EC activation, resulting in either an anti-inflammatory, pro-survival phenotype (Ang-1/Tie-2), or the inflammatory micro-vascular leakage of ARDS (Ang-2/Tie-2). In our murine iARDS model, neutrophil depletion decreases incidences of ARDS. Pericytes, the vascular cells forming a sheath around EC's to provide stability, interact with EC's through PDGF-β/PDGFR-β, and both interact with neutrophils. In isolated mouse cultures of EC's and pericytes, significant decreases in PDGF-β/PDGFR-β (respectively) are observed when interacting with neutrophils. This suggests that through ICAM-1 binding, hemorrhage-primed neutrophils contribute to loss of EC barrier function by decreasing Ang-1/Tie-2 binding, and stability from EC/pericyte interactions.

Sarah Pratt Poster #E13

Home Institution: Brown University

Summer Research Program: Undergraduate Teaching and Research Awards (UTRA)

Faculty Mentor: David Borton, Department of Biomedical Engineering

Automated Kinematics Tracking of Non-Human Primates using Region-based Convolutional Neural Networks

Understanding the relationship between neural signals and limb kinematics requires quick and intuitive tools for joint annotation. Currently, the joints of non-human primates are marked with UV

paint and software (SIMI) attempts to track these points, but this software is slow and performs poorly in many cases (e.g. occlusion). Using a region-based convolutional neural network (Faster-RCNN), these markers can be detected automatically. Once these markers are localized in each frame, they can be tracked over time with information about their previous locations and velocities. By integrating the tracked joints from multiple camera angles, the data can be converted into a 3D model of hindlimb gait without the need for time consuming manual annotation.

Hunter Quintal Poster #E15

Home Institution: Brown University

Summer Research Program: Undergraduate Teaching and Research Awards (UTRA)

Faculty Mentor: James Head, Department of Earth, Environmental, and Planetary Sciences

McMurdo Dry Valleys: Exploring Antarctica as a Mars Analog

I am exploring the climate variables required for the formation and development of martian valley network river systems on the Noachian Hesperian boundary. To do this I am characterizing the closest terrestrial analog of the Antarctic dry valley Onyx River using satellite imagery in order to find similar valley networks on Mars. I will then utilize meteorological data recorded in the dry valleys on Earth in order to find the likely climate parameters for these similar systems found on Mars. This research is critical because it will provide insights into martian climate history prior to significant climate change that occurred at this boundary of geologic time.

Ji Won Ryoo Poster #E16

Home Institution: Brown University

Summer Research Program: Undergraduate Teaching and Research Awards (UTRA)

Faculty Mentor: Tom Sgouros, Center for Computation and Visualization

Dinosaur Track Creation Visualization

We present the results of collaborative case study analyzing visualization requirements of paleontologists studying dinosaur track creation. The primary data they use is simulated particle flow, which lends itself to pathline visualization. We also present the results of a subjective but formal comparison of four path line seeding methods for this application. We propose the sparse closest point transform as a new method for solving the pathline seeding problem, inspired by MRI fiber bundle clustering. The compared methods for pathline seeding are poisson disk sampling, principal components analysis combined with hierarchical clustering (PCA), curve similarity signatures, and sparse closest point transform (SCPT).

Sophie Saskin Poster #E17

Home Institution: Brown University

Summer Research Program: Undergraduate Teaching and Research Awards (UTRA)

Faculty Mentor: Michael Littman, Department of Computer Science

COACHing Deep Networks

This project's goal is to use the COACH algorithm to train a robot with reinforcement signals. The algorithm has been successful in controlled circumstances with a perceptual system that is hand-coded to detect a predetermined color. To see if this algorithm can be more generally applied, we are experimenting with the use of a deep convolutional network to encode the robot's mapping from visual perception to behavior. We are experimenting with data collection in a virtual environment, connected to an augmented reality system to allow real people to interact with and train the virtual robot. This project would contribute to the field of reinforcement learning by validating an algorithm that will allow non-technical users to train a robot to effectively meet their needs.

RuiXi Seet Poster #B3

Home Institution: Brown University

Summer Research Program: Undergraduate Teaching and Research Awards (UTRA)

Faculty Mentor: Ian Dell'Antonio, Department of Physics

Comparative Analysis of Dark Matter in Clusters Using X-ray Observations

The research project combines data from X-ray observations of different clusters to investigate dark matter interaction and obtain measurements of the direct upper limit of dark matter collisional cross-section. Using X-ray data from the Chandra telescope, the distribution of gaseous components of clusters is determined as most of the gas emit in the X-ray region. Gravitational lensing signals reveal the gravitational force-sensitive distribution of dark matter and gas by showing multiple mass peaks. By comparing data from the observations and verifying if they agree, I will find the gas-dark matter offset: how different are the observed locations of gas bullets from their predicted locations.

Muyu Situ Poster #F1

Home Institution: CUNY Hunter College

Summer Research Program: Leadership Alliance-Summer Research Early Identification Program (SR-EIP)

Faculty Mentor: Anne Hart, Department of Neuroscience

Searching for Locomotion Defects in a C. elegans Model of Amyotrophic Lateral Sclerosis

Amyotrophic Lateral Sclerosis (ALS) is a fatal neurodegenerative disease that results in motor neuron loss within the spinal cord and motor cortex. Currently, ALS has no known cure and the mechanism by which motor neurons die has not been identified. Mutations of the DNA/RNA binding protein FUS (fused in sarcoma) result in familial ALS and mutations in FUS cause stress sensitivity. However, the pathway through which FUS mutations lead to neurodegeneration is not clearly understood. In this study, we use C. elegans to model FUS mutations in ALS to determine which genes act downstream of FUS; thus, this will provide insight into ALS pathways and a potential therapeutic target.

Abigail Skerker Poster #F2

Home Institution: Brown University

Summer Research Program: Undergraduate Teaching and Research Awards (UTRA)

Faculty Mentor: David Borton, Department of Biomedical Engineering

Investigating the Viability of Decoding Hind-limb Kinematics using Intracortical Local Field Potentials

Brain machine interfaces are a technology with the purpose of transforming central nervous system signals into action to allow paralyzed individuals to live more independent lives. In investigating local field potentials (LFPs) as inputs for a hind-limb BMI, a decodertakes LFPs as inputs and kinematics of hind-limb joints as outputs, comparing the output to actual kinematics to determine the efficacy of the decoder.

Arianne Spaulding Poster #F3

Home Institution: Brown University

Summer Research Program: Undergraduate Teaching and Research Awards (UTRA)

Faculty Mentor: Jennifer Franck, Department of Mechanical Engineering

Computational Fluid Dynamics for Marine Propulsion

Inspired by the movement of many marine animals, Oscillating Foil Propulsion (OFP) uses hydrofoils, which are underwater wings that resemble the cross section of a whale's tail, to generate thrust. OFP has many applications for a variety of marine vessels such as tugboats, ferryboats, fishing vessels and military applications. Kinematic properties that determine how the foils move, such as heave, pitch, and frequency and geometric considerations must be optimized for maximum efficiency of the system. This is done by utilizing Computational Fluid Dynamics, which are powerful computational methods used to model flow physics without building a physical prototype. The goal of my research is to determine the properties that yield the most thrust with the least amount of power input.

Yashil Sukurdeep Poster #F4

Home Institution: Brown University

Summer Research Program: Undergraduate Teaching and Research Awards (UTRA)

Faculty Mentor: Paul Dupuis, Department of Applied Mathematics

Applications of Randomized Algorithms to Counting Problems

We study the binary contingency table problem, where our goal is to count the number of n x m binary tables ({0,1}-valued matrices) that satisfy certain given row and column sums. We present a straightforward Markov Chain Monte Carlo (MCMC) algorithm that gives robust estimates for the number of binary contingency tables when the dimension of the matrices is relatively low. We then present the parallel tempering method, which makes use of coupled Markov Chains running at different "temperatures", for approximately counting the number of binary contingency tables. We then discuss the qualitative properties of the parallel tempering method and its advantages with regards to other randomized algorithms such as the splitting algorithm.

Abhey Sur Poster #F5

Home Institution: Brown University

Summer Research Program: Undergraduate Teaching and Research Awards (UTRA)

Faculty Mentor: Robbert Creton, Department of Molecular Biology, Cell Biology, and Biochemistry

The Effects of Dynactin 1A MO in Zebrafish Larvae

The Dynactin 1A morpholino is injected into zebrafish embryos to observe gene knockdown effects of Dynactin. At 4 days post fertilization a behavioral assay is conducted in which the larvae are visually stimulated with circulating red crosses in periods where the cross spins clockwise and counterclockwise to observe the ability for the injected zebrafish to respond in comparison to the control. The process is repeated at 5 and 6 days post fertilization to see any effect the morphonlino may have.

Neille-Ann Tan Poster #F6

Home Institution: Brown University

Summer Research Program: Undergraduate Teaching and Research Awards (UTRA)

Faculty Mentor: Jeff Huang, Department of Computer Science

Rewind: Automatically Generated Digital Memories from Mobile Geolocation Data

We introduce Rewind, a system that automatically recreates interactive scenes of past trips. Rewind uses historical geolocation data to generate egocentric sequences of images of earlier experiences from publicly available street-level images. Images used in Rewind are manipulated to incorporate time-of-day, seasonal, and weather information, thereby creating more faithful representation of the original experience to maximize the memory cues for the user. Together, the composed Rewind offers users a window into past travels.

Emma Tilley Poster #B4

Home Institution: Brown University

Summer Research Program: Undergraduate Teaching and Research Awards (UTRA)

Faculty Mentor: Ian Dell'Antonio, Department of Physics

Weighing the closest clusters

Weak gravitational lensing is the process by which light from distant sources is bent by the gravitational fields of objects (lenses) between the source and the observer, producing an image that is very slightly distorted. Lensing can be observed by statistical measurement of galactic ellipticities behind clusters: if orientations are intrinsically random, alignment patterns would indicate the presence of a massive lens such as dark matter. Our project examines weak lensing around 10 clusters much closer than those usually studied for this purpose ($z < 0.03$). This selection implies challenges in signal-noise ratio but the advantage of increased resolution. Newly available wide-field images permit a first test of these techniques at such short distances; here we report our first results.

Mikayla Tinus Poster #F7

Home Institution: Brown University

Summer Research Program: Undergraduate Teaching and Research Awards (UTRA)

Faculty Mentor: Jonghwan Lee, Department of Biomedical Engineering

The Search for Early Biomarkers of Alzheimer's Disease

Through Retinal Imaging Alzheimer's Disease (AD) is a progressive neurodegeneterive disease characterized by cerebral Amyloid-Beta Plaque deposition and eventual neuron death. Current detection and diagnoses rely on invasive and labeled imaging and symptoms of cognitive decline. Label free and non-invasive imaging, Optical Coherence Tomography (OCT), has detected vascular structural and functional changes in the brain and retina of human patients and the animal model. Our study uses in vivo OCT technology for longitudinal observation of the AD mouse model to establish a spatiotemporal relationship of retinal changes and cognitive decline. Imaging for measurement of retinal thickness is presented and will expand to metrics of retinal layer segmentation, total retinal blood flow and blood vessel diameter to establish early retinal biomarkers of the disease.

Andrew Ton Poster #F8

Home Institution: Brown University

Summer Research Program: Undergraduate Teaching and Research Awards (UTRA)

Faculty Mentor: Richard Stratt, Department of Chemistry

Dynamics of a supercooled glassformer in two dimensions

A glass-former in its liquid state can be "supercooled" – cooled below its freezing point – without forming crystals. Once it is cooled enough, the glass-former undergoes a phase transition at which point it forms a glass. We are interested in the dynamics of supercooled liquids on a molecular level. Supercooled liquids tend to have very slow dynamics, taking a long time to diffuse from place to place. Our goal is to take an existing model of a glass-forming molecule called ortho-terphenyl and come up with a working simulation of supercooled liquid ortho-terphenyl in two dimensions. Once we have a working simulation of the supercooled liquid, we can begin to probe the system to learn what exactly makes a supercooled liquid's dynamics so slow.

Kevin Trinh Poster #F9

Home Institution: Bowdoin College

Summer Research Program: Leadership Alliance-Summer Research Early Identification Program (SR-EIP)

Faculty Mentors: Christian Huber, Department of Earth, Environmental, and Planetary Science & Tarsilo Girona, Department of Earth, Environmental, and Planetary Science

Understanding volcanic activity through water vapor emissions at Turrialba volcano, Costa Rica

We apply a novel, cost-effective remote sensing method on Turrialba volcano, Costa Rica, which relies on pixel brightness of digital images as a proxy for intensity of light scattered from water vapor emissions. Our data set consists of digital images of the Turrialba volcano crater and gas plume taken every second of the day for September and October, 2016. We found an unreported fire fountain eruption event during the night of September 19 2016, followed by the emergence of outgassing fluctuations over shorter periods than usual at around 100 seconds. The occurrence of shorter periods in the outgassing time series is consistent with magma ascent closer to the surface and could possibly be used as a precursor for some eruptions.

Ekaterina Tsotsos Poster #F10

Home Institution: Brown University

Summer Research Program: Undergraduate Teaching and Research Awards (UTRA)

Faculty Mentor: Jerome Robinson, Department of Chemistry

Development of Novel Heterobimetallic Rare Earth Compounds for Switchable Renewable Polymer Synthesis

Polymers are extremely versatile over the range of temperatures humans often experience, easily scaling the difference between brittle and liquid states between -100° and 100° Celsius. Perhaps their versatility explains the variety of uses people have devised for polymers. The variability of the order of different repeat units allows for the great variety of polymers' physical properties, such as elasticity and viscosity. My project this summer is the synthesis of a heterobimetallic rare earth compound to catalyze polymerization. This catalyst directly controls the order of units in a polymer chain, thus customizing the properties of the polymer. I aim to discover whether my catalyst will convert carbon dioxide into useful polymers as efficiently as the best current methods of polymerization.

Caleb Tulloss Poster #F11

Home Institution: Brown University

Summer Research Program: Neil B. Mitchell Systems Thinking Award

Faculty Mentor: David Borton, School of Engineering

A prototype for implantable wireless eye orientation tracking

I am developing an implantable wireless eye orientation tracker to be used in nonhuman primate neuroscience experiments. Current eye tracking methods require the subject to be head-fixed, limiting their use in experiments involving natural movement and vision. I have designed, built, and tested a benchtop prototype demonstrating a novel method of detecting eye orientation: measuring the inductive coupling coefficient between each of 3 fixed "primary" coils and a "resonator" coil in the sclera of the eye. The prototype consists of motors to rotate a marble (eyeball model), several coils, an analog processing PCB, and an Arduino board to control the system. Initial benchtop results and simulations indicate that this coupling-based detection method can be used to determine eye orientation.

Gabriela Usabal Poster #F12

Home Institution: Brown University

Summer Research Program: Undergraduate Teaching and Research Awards (UTRA)

Faculty Mentor: Stephen Parman, Department of Earth, Environmental and Planetary Sciences

Anorthosite Formation on the Earth and Moon

Much debate surrounds the origin and formation of anorthosite, an igneous rock formed deep below the Earth's crust. One leading hypothesis describes the process through basalt fractionation - where magma underneath the Earth's crust can accumulate and then separate into several layers. These layers are distinguished by the presence of different minerals due to combined differences in the buoyancy of these minerals and in the density of the surrounding remaining magma. The goal of this project is to address and verify this hypothesis using high-pressure experimentation. These experiments will investigate the conditions of pressure, temperature, and magma composition necessary for the formation of anorthosite.

Connor Watts Poster #F13

Home Institution: Brown University

Summer Research Programs: Experimental Program to Stimulate Competitive Research (EPSCoR-NSF), Institute for Molecular and Nanoscale Innovation (IMNI)

Faculty Mentor: Nitin Padture, School of Engineering

Solvent Engineering for One-Step Deposition of Hybrid Perovskite Thin Films

Thin-film hybrid-perovskite (HP) based solar cells show promise as an affordable green energy technology as they are amenable to solution processing, a production method with relatively low energy cost. However, the solvents commonly used to dissolve HP materials are not favorable for forming HP thin films with desired microstructures. In this research project, we have developed a new solvent system based on a mixture of 2-methoxyethanol and methylamine that produces HP thin films that are phase-pure, smooth, and have full coverage and controllable film thickness—qualities necessary for high-efficiency solar cells. We envision that further optimization of this solvent system may lead toward nearly complete control over the microstructure and properties of HP thin films.

Sungseob Whang Poster #F14

Home Institution: Brown University

Summer Research Program: Undergraduate Teaching and Research Awards (UTRA)

Faculty Mentor: Iris Bahar, School of Engineering

Evaluating Critical Bits in Arithmetic Operations due to Timing Violations

Various error models are being used in simulation of voltage-scaled arithmetic units to examine application-level tolerance of timing violations. The selection of an error model needs further consideration, as differences in error models drastically affect the performance of the application.

Specifically, floating point arithmetic units (FPUs) have architectural characteristics that characterize its behavior. We examine the architecture of FPUs and design a new error model, which we call Critical Bit. We run selected benchmark applications with Critical Bit and other widely used error injection models to demonstrate the differences.

Quinesha Williams Poster #F15

Home Institution: Tougaloo College

Summer Research Program: Institute for Molecular and Nanoscale Innovation (IMNI)

Faculty Mentor: Nitin Padture, School of Engineering

Quantification of Grain Growth Accompanying Phase Transformations in Perovskite Thin Films for Solar Cells

The grain size can significantly affect the properties of polycrystalline formamidinium lead triiodide (FAPbI3) perovskite thin films that are being used as the light absorbing layer in the emerging perovskite solar cells technology. Therefore, the accurate measurement of the average grain size in these films is very important. The line intercept method uses relationship between the length of the line and grain boundary intercepts to estimate the average grain size within a polycrystalline microstructure. Another method called ImageJ, which is an open access image analysis tool developed by the National Institutes of Health (NIH), uses threshold images and filtering to determine the grain size and its distribution. Both methods were used to quantify grain growth during the hexagonal to cubic phase transformation in FAPbI3 thin films subjected to different annealing treatments. The results from these two methods are compared, and their advantages and disadvantages are discussed.

Ethan Wright Poster #F16

Home Institution: Brown University

Summer Research Program: Undergraduate Teaching and Research Awards (UTRA)

Faculty Mentors: Andrea Simmons, Department of Cognitive, Linguistic, and Psychological Sciences & James Simmons, Department of Neuroscience

Auditory Perception: Musical Timbre

The objective of my Teaching UTRA is to reinvent the structure and focus of CLPS1510: Auditory Perception under the mentorship of its professor, Andrea Simmons. I am creating an original digital laboratory to allow students to delineate various components of timbre in musical sound (attack time, spectral centroid, and spectral flux). The laboratory will highlight cymbal, vocal, and stringed-instrument timbre. My work also involves adapting existing assignments to Adobe Audition, creating video tutorials, and rewriting demonstrations and keys. Overall, my work this summer will result in a more digitally-inclined and musically-minded course.

Sang Joon Yum Poster #F17

Home Institution: Brown University

Summer Research Program: Undergraduate Teaching and Research Awards (UTRA)

Faculty Mentor: James Simmons, Department of Neuroscience

3D modeling of Eptesicus fuscus brain structures with bright field microscopy

While the cochlea of the big Brown University bat (Eptesicus fuscus) has been made into a 3D model, many of the other brain structures have not been modeled due to the limitations of CT imaging: namely, that internal structures are not separated well enough to model specific parts. Thus, imaging other than CT scanning is needed. The Simmons lab had the brain of a big Brown University bat sliced into slides 5 microns thick for analysis under a microscope. After taking digital images of each slide with a bright field microscope, we can model the internal parts of the bat brain with the Fiji distribution of ImageJ, an open source software that has plugins used for 3D imaging.

SUMMER RESEARCH PROGRAMS AT BROWN

Generous support for the undergraduate summer research presented in this symposium has been provided by:

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- IDeA Network of Biomedical Research Excellence - Summer Undergraduate Research Fellowship (INBRE-SURF)
- Institute at Brown for Environment and Society
- Institute for Computational and Experimental Research in Mathematics (ICERM)
- Institute for Molecular and Nanoscale Innovation (IMNI)
- Leadership Alliance-Summer Research Early Identification Program (SR-EIP)
- LINK Awards
- Mellon Mays Undergraduate Fellowship
- National Science Foundation (NSF) Research Experience for Undergraduates (REU)
- Neil B. Mitchell Systems Thinking Award
- Research Training Group (RTG) on Integrating Dynamics and Stochastics (IDYaS)
- Royce Fellows
- Solsbery Fellowship
- Space Grant/NASA
- Summer Research Assistantship in Biomedical Sciences
- Summer Training in Academic Research and Scholarship (STARS) program, Brigham and Women's Hospital
- Undergraduate Teaching and Research Awards (UTRA)
- University of Georgia REU: Population Biology of Infectious Diseases
- Weiss-Sipprelle Summer Undergraduate Fellows

Thursday, August 3, 2017

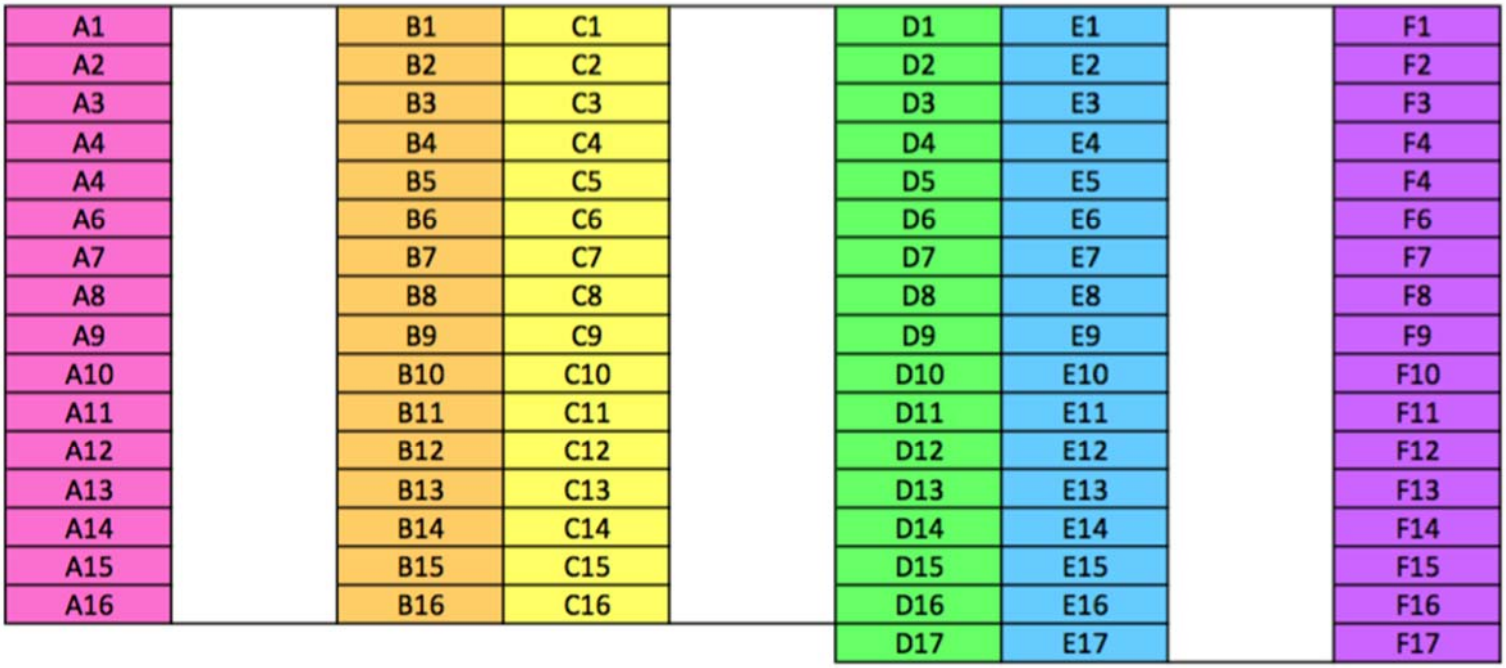
Name	Poster #	Name	Poster #	Name	Poster #
Ellen S. Cola	A1	Mark Hays	C5	Sophia Song	E8
Rubén Flores	A2	Steven Hines	C6	Kylen Soriano	E9
Mikayla Harden	A3	Yanabah Jaques	C7	Louise Stolz	E10
Anya Hong	A4	Lucy Jia	C8	Yasmine Suliman	E11
Jessica Jiang	A5	Brittany Johnson	C9	Karishma Swarup	E12
Caroline Jones	A6	Isaac Kim	C10	Alexander Tepper	E13
Jennifer Mojica Santana	A7	Juliana Kim	C11	Jessica Tolbert	E14
Fernando Norat	A8	Sarah Kim	C12	Shirin Tooloee	E15
Charlotte Posever	A9	Tracy Knight	C13	Katerina Tori	E16
Caroline Ribet	A10	Justin Lee	C14	Tanaya Puranik	E17
Luiza Silva	A11	Mark Liang	C15	Juliana Trach	F1
Layla Abdulla	A12	Bailey Life	C16	Harrison Tran	F2
Santiago Acero Bedoya	A13	Amy Lipman	D1	Joshaya Trotman	F3
Jose Almanzar	A14	Alexander Lo	D2	Andrew Verdesca	F4
Joshua Amaya	A15	Animesh Mahapatra	D3	Brianna Walley	F5
Yokabed Ashenafi	A16	Stephanie Chan	D4	Amy Wang	F6
Douglas Barber	B1	Andrés Martínez-Muñiz	D5	Alexander Weingart	F7
Daniela Barbosa	B2	Jessica Masur	D6	Adrianna Wenz	F8
David Bautista	B3	Anthony Mei	D7	Caroline Wolek	F9
Quincy Beck	B4	Chelsea Miller	D8	Anthonia Wray	F10
Marilyn Bravo	B5	Nicholas Mroz	D9	Dorothy Yam	F11
Yueming Cao	B6	Maria Muhammad	D10	Michelle Zabat	F12
Brigett Carvajal	B7	Naryan Murthy	D11	Xiaoshu Zheng	F13
Alexander Catoya	B8	Jade Neverson	D12	Margaux Zimmerman	F14
Juanetziel Charneco	B9	Erica Nguyen	D13	Ashley Aldridge & Mauricio Pinto	F15
Jocelyn Cheng	B10	Christopher Noyes	D14	Alexandra Ertman, William Greis, & Abigail Kohler	F16
Evan Chernov	B11	Jamie Odzer	D15	Zack Pockrose & Dara Wais	F17
Elizabeth Clifton	B12	Julia Bleier & Samantha Cohen	D16		
Heidi Cobarrubias	B13	Alfonso Garcia & Karine Liu	D17		
Nina Diepenbrock	B14	Michelle Petersen	E1		
Kayla Dwyer	B15	Taylor Pullinger	E2		
Ibtihal Elfaki	B16	Yanixa Quiñones Aviles	E3		
Kyle Evans	C1	Nicholas Renton	E4		
Mursal Gardezi	C2	Daniel Roque	E5		
Valentina Grillo Alvarado	C3	Ian Sabula	E6		
Julia Gross	C4	Thomas Skipper	E7		

Friday, August 4, 2017

Name	Poster #	Name	Poster #	Name	Poster #
Liz Cory	A1	Michael Caplan	C6	Michelle Miller	E4
Micah Holness	A2	Grant Casey	C7	Catherine Miranda	E5
Margaret Hu	A3	Aaron Charous	C8	Shivam Nadimpalli	E6
Lina Lalwani	A4	Zihan Chen	C9	Zachary Neronha	E7
Miles Martinez	A5	Ella Cohen	C10	Emily Ortiz	E8
Maya Singh	A6	Kayla Cole	C11	Andrew Park	E9
Chayla Vasquez	A7	Nadia Colombi	C12	Cadence Pearce	E10
Betsy Waisel	A8	Ana Colón	C13	Steven Pei	E11
Erin West	A9	Diana Cordero Dumit	C14	Kaitlyn Petitpas	E12
Stephanie Adaniya, Jessica Cao & Amy Landi	A10 & A11	D'Nea Galbraith	C15	Sarah Pratt	E13
Yazen Alani, Spencer Boyum, Eric Kong, Vincent Kubala, Kaushik Nimmagadda, & Morgan Talbot	A12, A13 & A14	Johanna Garfinkel	C16	Louis Kang	E14
Kidest Assefa-McNeil, Alexandra Banks, Justin Ferenzi, & Tammy Jiang	A15	Mebatsion Gebre	D1	Hunter Quintal	E15
Abby Atkinson & Caroline Buckholtz	A16	Yichen Geng	D2	Ji Won Ryoo	E16
Justin Bai, Maksymilian Dabkowski, Kalinda Pride, & Nicholas Tomlin	A17	Jungho Gong	D3	Sophie Saskin	E17
Harry Chalfin	B1	Felix Guo	D4	Muyu Situ	F1
Jungho Daniel Choi	B2	Kara Hartig	D5	Abigail Skerker	F2
RuiXi Seet	B3	Megan Hauptman	D6	Arianne Spaulding	F3
Emma Tilley	B4	Jake Heinlein	D7	Yashil Sukurdeep	F4
William Dawson, Jonathan Hagedorn, & Nathan Sorscher	B5 & B6	Gian Ignacio	D8	Abhey Sur	F5
Matthew Finn & Julianna Liu	B7	Oliver Isik	D9	Neille-Ann Tan	F6
Margaret Follett, Dae Hyun Sam Kim, Lauren Montieth, & Wennie Zhang	B8, B9 & B10	Elaine Jiang	D10	Mikayla Tinus	F7
Aryana Javaheri & Valerie Zhu	B11	Carly Kabelac	D11	Andrew Ton	F8
Myungjin Jean Lee & Jonathan Vexler	B12 & B13	Bharath Kayyar	D12	Kevin Trinh	F9
Jeanine Noordam & Claudia Silva	B14	Amelia Khoo	D13	Ekaterina Tsotsos	F10
Ishaan Agarwal	B15	Julia Krogh	D14	Caleb Tulloss	F11
Luke Noreña	B16	Yong Hyun Kwon	D15	Gabriela Usabal	F12
Joy Aso	C1	Jessica Lai	D16	Connor Watts	F13
Elizabeth Bixler	C2	Anand Lalwani	D17	Sungseob Whang	F14
Laura Blackstone	C3	Katia Matora	E1	Quinesha Williams	F15
Noah Burke	C4	David Mayans	E2	Ethan Wright	F16
Elisa Bye	C5	Joshua McDuffie	E3	Sang Joon Yum	F17

POSTER LAYOUT
Thursday, August 3
Humanities and Life Sciences

[STAGE]



[ENTRANCE]

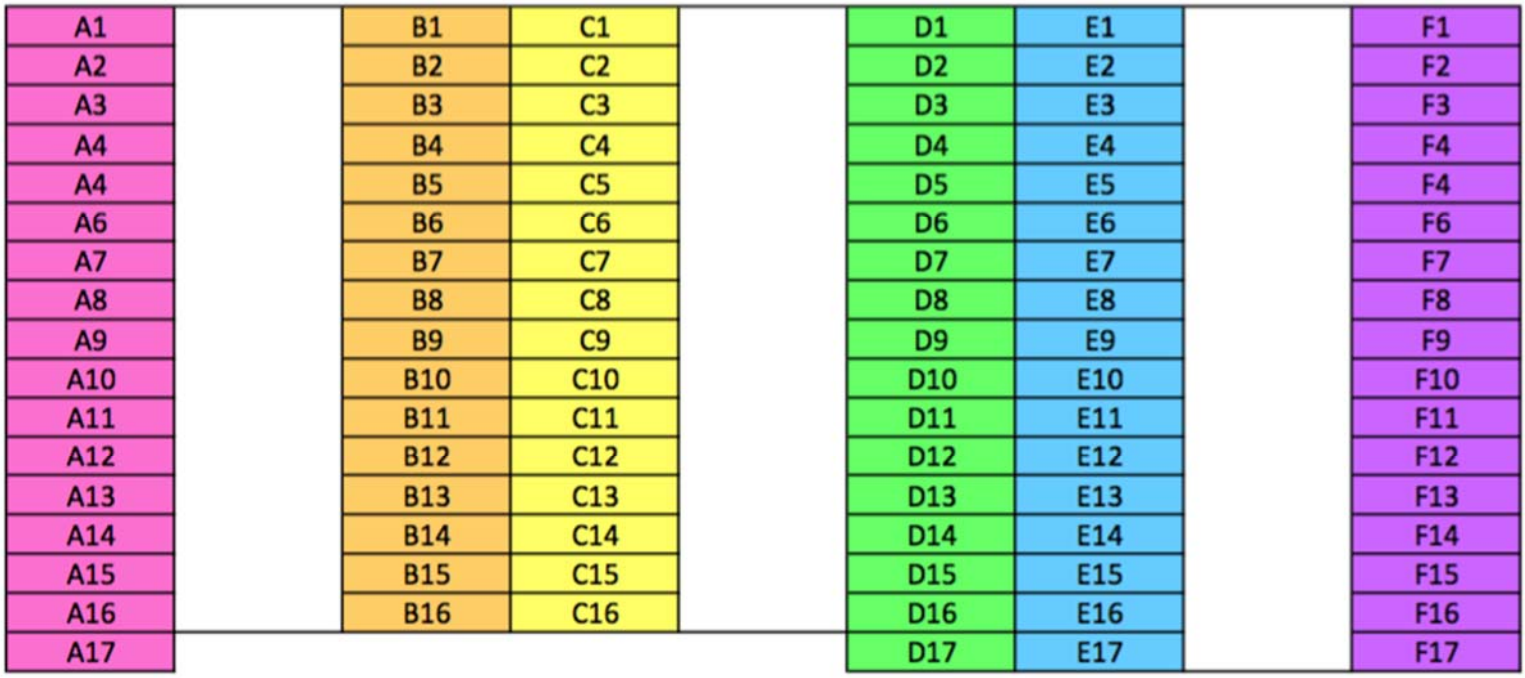
[LOBBY]

POSTER LAYOUT

Friday, August 4

Physical and Social Sciences & Student Teams

[STAGE]



[ENTRANCE]

[LOBBY]

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- Barry University
- Bowdoin College
- Brown University
- Claflin University
- Columbus State Community College
- CUNY Hunter College
- Dartmouth College
- East Tennessee State University
- Emory University
- North Carolina A&T State University
- North Dakota State University
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- Tougaloo College
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- University of Connecticut
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- University of Puerto Rico, Mayagüez Campus
- University of Puerto Rico, Rio Piedras Campus
- University of Rhode Island
- University of Scranton
- University of Vermont
- Wellesley College
- Xavier University of Louisiana

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