



## **UNDERGRADUATE SUMMER RESEARCH PROGRAM 2016**



*2016 Undergraduate Summer Research Program Participants*

# Stanford Bio-X Undergraduate Summer Research Program



2015 USRP participant Kazuomori Lewis completed his summer research training in Dr. Sarah Heilshorn's lab

The Stanford Bio-X Undergraduate Summer Research Program (Stanford Bio-X USRP) is now 12 years old and has partnered with 222 Stanford faculty mentors in order to provide a ten-week summer research opportunity to 436 students.

The program aims to foster the interdisciplinary spirit of Stanford Bio-X in a new generation of up-and-coming scientists by exposing Stanford undergraduates to **ten weeks of hands-on laboratory research experience**. In addition to the ten weeks of laboratory research, students attend **weekly faculty talks** by thirty Bio-X faculty affiliates to introduce them to the cutting-edge research taking place in laboratories across campus. The program concludes with a **scientific poster session** alongside graduate students, faculty, and Stanford Bio-X community members from across campus and beyond.

Funding for the support of our program was provided by generous contributions from The Rose Hills Foundation, Vice Provost for Undergraduate Education, Burroughs Wellcome Fund, Ted & Colleen Friedel, Victoria Reed, William J. and Jill H. Shepherd, Vicky Rogers, Brian & Karen Mariscal, Stanford University Dean of Research Office, Mr. Vipool M. Patel and Mrs. Sharon L. Patel, Bio-X, and Anonymous Donors.

This year, 65 students participated in the program.



2015 Undergraduate Summer Research Program Participants

# 2016 STANFORD BIO-X UNDERGRADUATE RESEARCH TALKS BY STANFORD FACULTY:



## June 22

**Wolf Frommer** "Interfering with a major threat: Plant pathogens"  
**Paul Wang** "How to form your career around medical device innovation"  
**Melanie Hayden-Gephart** "Malignant brain tumor surgery and science"

## June 29

**Liqun Luo** "How do neurons connect with each other?"  
**Sean Mackey** "The strain in pain lies mainly in the brain: Lessons learned from neuroimaging of pain"  
**Zhen Cheng** "Lighting up diseases with dark materials"

## July 6

**Michael Snyder** "Precision medicine: Managing health and disease using genomics and big data"  
**E.J. Chichilnisky** "Electrical stimulation of the retina for design of retinal prosthesis"  
**Tom Clandinin** "Dissecting motion processing pathways in fruit flies"

## July 13

**Thomas Südhof** "How to construct a synapse"  
**Joseph Lipsick** "Using *Drosophila* to understand cancer: The DREAM complex"

## July 20

**Paul Khavari** "Stem cell differentiation and cancer"  
**Jonathan Pollack** "Ameloblastoma: Oncogenesis recapitulates odontogenesis"  
**Lei Stanley Qi** "CRISPR genome engineering for therapeutics"

## July 27

**Tony Wyss-Coray** "Young blood for old brains"  
**John Oghalai** "How hearing works"  
**Justin Gardner** "Human systems neuroscience"

## August 3

**Noah Rosenberg** "Theory of gene trees and species trees"  
**H. Craig Heller** "Roles of sleep and circadian rhythms in learning and memory"  
**Erin Mordecai** "Effect of temperature on Dengue, Chikungunya, and Zika transmission"

## August 10

**William Talbot** "Using the zebrafish to investigate the vertebrate nervous system"  
**Manu Prakash** "Simple science: Toys and Toy systems in biology, global health and science education"  
**Eric Gross** "Peptide modulators to break specific calcineurin protein-protein interactions"

## August 17

**John Boothroyd** "What makes *Toxoplasma* such a successful parasite/commensal?"  
**Kathleen Sakamoto** "Targeting CREB for leukemia therapy"  
**David Relman** "Better living through microbes"

## August 24

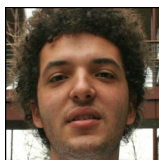
**Michelle Monje-Deisseroth** "Myelin plasticity in health and disease"  
**Ada Poon** "Bioelectronics"  
**Anthony Ricci** "How hearing happens?"

# 2016 Program Participants:

**Gunes Ates Akgun, Biology**

**Supported by: Stanford University Dean of Research Office**

**Mentor: Zhen Cheng, Radiology**



Super enhancers are regions on the mammalian genome which affect the expression of more than 20 genes. Ates hypothesizes that a region of the human genome is a candidate super enhancer sequence for cardiac development that turns on multiple genes to differentiate heart progenitor cells into cardiomyocytes. Ates will implement the CRISPR-Cas 9 system to create mutant embryonic stem (ES) cell lines by knocking out this target super enhancer. By comparing the mutant cell lines to wild type, or non-mutant, ES cell lines, Ates aims to shed light on the role of this target genetic region on cardiomyocyte differentiation efficiency.

**Daniel Alber, undeclared**

**Supported by: Stanford University Dean of Research Office**

**Mentor: Anthony Oro, Dermatology**



Basal cell carcinoma (BCC) is the most common cancer and is derived from inappropriate signaling of the hedgehog pathway. The exceptionally high rate of mutation of advanced BCCs anoints them as an excellent model system to study mechanisms of drug resistance. Daniel is studying the role of atypical protein kinase C (aPKC) in altering the genetic sequence selectivity of Gli1, which mediates hedgehog target gene transcription.

**Alan Aw, Mathematical & Computational Science**

**Supported by: Stanford University Dean of Research Office**

**Mentor: Noah Rosenberg, Biology**

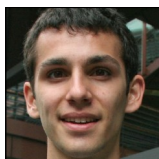


Alan's research focuses on improving methods for making inferences about evolutionary trees—which appear in many areas of biology, from tracing epidemics to understanding cell lineages in tumors. Specifically, Alan is utilizing probabilistic models and mathematical structures and tools to provide novel insights into the genealogical histories of lineages sampled across closely related species.

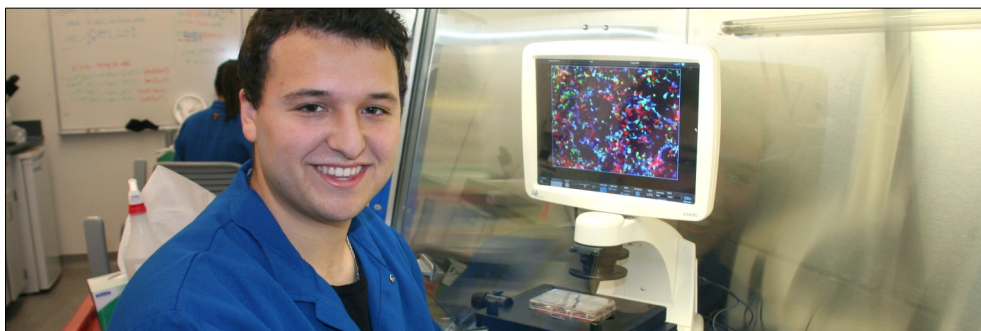
**Dylan Cable, Mathematics**

**Supported by: Vicky Rogers**

**Mentor: Justin Gardner, Psychology**



Imagine you are at a baseball game: you hear the crack of the bat and the crowd cheer, and you catch a glimpse of the ball moving out of the park. You would be able to report high confidence of the ball moving out of the park, and this confidence would be well rooted not in your visual evidence of the ball moving, but rather in a strong prior expectation that when balls are hit, they move out of the park. Dylan's project aims to dissect these two sources of confidence (prior expectations and sensory evidence) using a behavioral experiment in which a subject's perception is biased by their priors.



2016 USRP participant Aris Kare completed his summer research training in Dr. Stanley Qi's lab



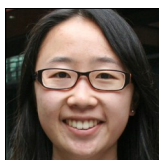


**Taylor Chavez, Bioengineering**

**Supported by: Anonymous Donor**

**Mentor: Wolf Frommer, Biology**

Taylor is developing a sugar sensor to measure sugar transporter activity in plant cells. The sensor designed will consist of a fusion between fluorescence proteins and a sugar transporter. The application of the sensor in glucose metabolism can advance the understanding of how sugar is used by different tissues during plant development, an essential knowledge required for the improvement of crops yields.

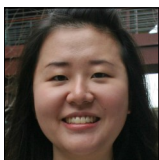


**Annabel Chen, Biology**

**Supported by: Anonymous Donor**

**Mentor: Eric Gross, Anesthesia**

Annabel is studying a receptor called the “chili pepper receptor”, or transient receptor potential vanilloid 1, that is responsible for pain sensation. She is researching the effects of modifying this receptor in order to develop pain therapeutics that are non-narcotic and cardiac-safe.

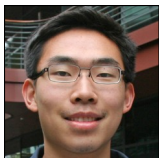


**Kelly Chen, Biology**

**Supported by: Vicky Rogers**

**Mentor: Tony Wyss-Coray, Neurology**

Kelly is investigating the mechanism by which seizures impair hippocampal function. Seizures increase secretion of vascular endothelial growth factor (VEGF) in the adult hippocampus, and a significant amount of adult hippocampal VEGF comes from neural stem and progenitor cells (NSPCs). Kelly uses the Novel Object Location task in mice to test if NSPC-VEGF is protective against hippocampal-dependent spatial-memory loss after seizure.

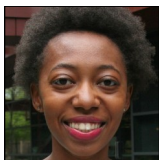


**Michael Chen, Chemistry**

**Supported by: Anonymous Donor**

**Mentor: Karl Deisseroth, Bioengineering and Psychiatry & Behavioral Science**

Michael is investigating the neural basis of stress to gain a better understanding of the neural mechanisms controlling the stress response, which is critical to developing effective treatments for diseases caused by stress such as depression and PTSD. To begin answering this question, he is identifying patterns of neural activity that are linked to stressful behaviors using fiber photometry, a technique that enables optical recording of the activity of genetically targeted populations of neurons.

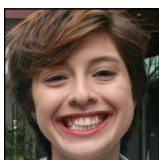


**Dominique Cooper, Biology**

**Supported by: Anonymous Donor**

**Mentor: Michelle Monje-Deisseroth, Neurology**

DIPG is a deadly brain tumor in children that currently has a 0% survival rate. Dominique will be investigating the mechanism through which DIPG spreads in the brain to hopefully aid in finding a way to prevent the tumor metastasis of DIPG. To do this, she will be pulling from various disciplines, namely neuroscience, stem cell research, and cancer research.

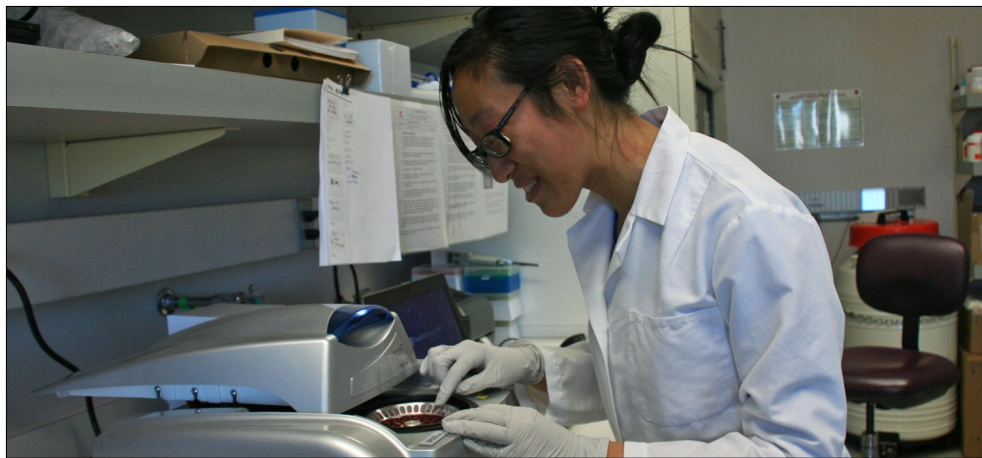


**Kristina Correa, undeclared**

**Supported by: Anonymous Donor**

**Mentor: Theo Palmer, Neurosurgery**

Genetic research has shown that Autism Spectrum Disorder (ASD) is associated with both environmental effects, such as an illness in the mother, and/or specific genetic conditions, such as the loss of one cMet allele. Using mice as a model organism, Kristina will use fluorescent tagging to investigate the concentration of specific neurons that have been associated with ASD in subjects who have only one cMet allele and/or whose mothers have been exposed to an infection. By studying the connection of genetics and infection of the mother to ASD, we can better understand the risk factors for, and potential causes of, ASD.



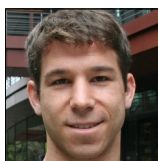
2016 USRP participant Annie Hu completed her summer research training in Dr. Samuel Yang's lab

### **Eric Cramer, Biomedical Computation**

**Supported by: Anonymous Donor**

**Mentor: Sean Mackey, Anesthesia**

Prescription opioid abuse has reached epidemic proportions in our country. Many problems with abuse start with exposure to opioids during the surgical period. Eric will be creating better models to predict which people will be more vulnerable to the addictive nature of opioids. This will be followed by helping these patients with safer approaches to pain management during their surgeries.



### **Tai Dinger, Biology**

**Supported by: Anonymous Donor**

**Mentor: Aaron Gitler, Genetics**

The neurodegenerative disease Amyotrophic Lateral Sclerosis (ALS) has recently been associated with a genetic mutation that causes the expression of very long nucleotide repeats that are then translated to aberrant proteins. Very little is known about how these aberrant proteins are produced, so Tai will be performing genetic screens on a yeast model to determine the proteins that enhance translation of the aberrant protein products. This knowledge will be important in devising strategies to combat not only ALS, but other diseases associated with long nucleotide repeats.



### **Julia Eberhard, undeclared**

**Supported by: Anonymous Donor**

**Mentor: Steven Artandi, Medicine (Hematology) and Biochemistry**

Julia is using a biochemical strategy to discover new proteins that are associated with a mutated protein, NPM1, specific to human leukemias. Identification of a novel pathway could lead to improvements in treatment for patients with NPM1 mutated leukemia.

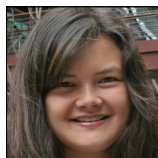


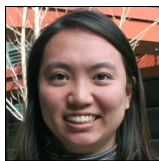
### **Juleh Eide, Biology**

**Supported by: Anonymous Donor**

**Mentor: Alan Cheng, Medicine (Otolaryngology)**

Juleh is studying inner ear progenitor cells that are capable of regenerating lost sensory cells, which are required for hearing and balance functions. By damaging sensory cells in transgenic mice and staining for various markers in these progenitors, Juleh plans on mapping the steps of sensory cell regeneration in mammals. Through this work, she hopes to build the foundation of finding a cure for hearing loss and balance dysfunction in humans.

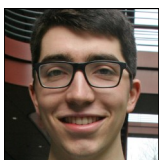


**Victoria Fan, Biology****Supported by: Vicky Rogers****Mentor: E.J. Chichilnisky, Ophthalmology and Neurosurgery**

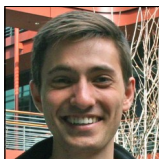
The goal of Victoria's research project is to contribute to the development of artificial retinas for treating blindness. Current devices stimulate retinal neurons to produce crude artificial vision; however, the unintended activation of many neurons of diverse types limits their usefulness for patients. Victoria's work is aimed at developing specific electrical stimulation patterns in the laboratory that can reduce this problem and eventually improve clinical outcomes.

**Johannah Farner, Biology****Supported by: The Rose Hills Foundation****Mentor: Erin Mordecai, Biology**

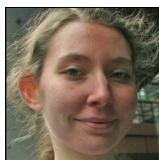
Serpentine soil is toxic to most plant species, but a select few native plant species have evolved to tolerate these generally poisonous growing conditions. Has this unique chemical environment led to the evolution of a similarly specific fungal species community in serpentine grasslands? Johannah hopes to answer this question, as it will provide insight into the role that fungal pathogens play in the ecosystem dynamics of California grasslands.

**Alex Feldman, Biology****Supported by: Burroughs Wellcome Fund****Mentor: Judith Frydman, Biology and Genetics**

Huntington's Disease (HD) is one of many neurological disorders caused by the aggregation of misfolded proteins. Specifically, HD results from the aggregation of the pathogenic protein Huntingtin (Htt). Alex will investigate the mechanisms by which a specific amino acid sequence (N17) on pathogenic Htt contributes to the formation of early-stage Huntingtin oligomers and how these oligomers affect HD's pathogenesis.

**Scott Fleming, Management Science & Engineering****Supported by: Vice Provost for Undergraduate Education****Mentor: William Talbot, Developmental Biology**

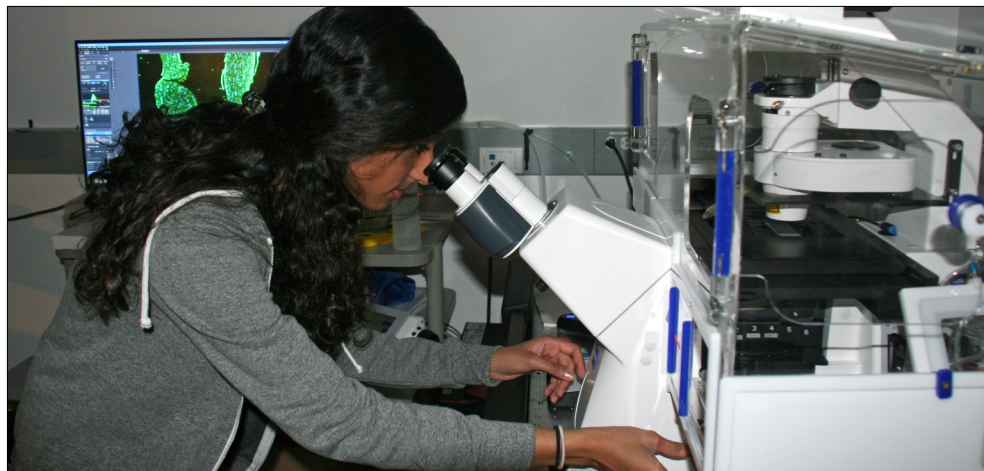
Microglia are specialized immune cells that regulate inflammation in the central nervous system (CNS) of vertebrates and defend the brain against foreign pathogens. Using targeted gene-editing techniques, Scott will investigate the mechanism by which a recently discovered protein in microglia, NLRC3-like, protects the CNS from inappropriate hyperinflammation. A better understanding of NLRC3-like and the inflammation pathway has important implications for diseases associated with neuroinflammation, such as Parkinson's disease and Alzheimer's disease.

**Isabel Goronzy, Chemistry****Supported by: Vice Provost for Undergraduate Education****Mentor: Steven Boxer, Chemistry**

To enter and infect human cells, the influenza virus must bind to molecules on host cell membranes. To identify factors that govern viral binding and determine means to interfere with viral infectivity, Isabel will examine the sterol composition and physical properties of host cell membranes.







2016 USRP participant Preethi Raghavan completed her summer research training in Dr. Michelle Monje-Deisseroth's lab

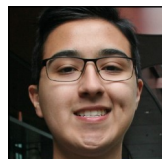


**Katie Gu, Biology**

**Supported by: Bio-X**

**Mentor: Paul Khavari, Dermatology**

Skin diseases ranging from eczema to skin cancer affect millions of Americans each year. Using a variety of groundbreaking techniques in the Khavari lab, Katie will focus on identifying new biomolecules, termed noncoding RNAs, that control many aspects of skin development and differentiation.

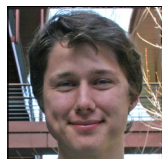


**Ricardo Guajardo, undeclared**

**Supported by: Vice Provost for Undergraduate Education**

**Mentor: Liqun Luo, Biology**

Ricardo is studying methods by which neurons are wired during development. Using fruit flies as a model organism, he aims to identify the molecular partners of Toll-like receptors (a class of proteins), which mediate a specific pathway of neural targeting. Identifying these molecules will allow for a better understanding of the molecular mechanisms behind this particular pathway and will shed light on how a structure as intricate as the brain is wired to such a degree of exactitude.



**Daniel Hart, Bioengineering**

**Supported by: Bio-X**

**Mentors: Calvin Kuo, Medicine (Hematology); and Stanley Qi, Bioengineering and Chemical & Systems Biology**

To advance the development of cancer treatments, The Cancer Genome Atlas (TCGA) has carried out genome scale DNA sequencing efforts of a variety of cancers to identify novel druggable targets; however, these data require functional validation in a biological system. Daniel Hart will use the CRISPR/Cas9 system for genetic screens in primary organoid culture to identify key drug targets in esophageal cancer by conducting loss of function and gain of function screens.



**Valerie Hau, Computer Science**

**Supported by: Vice Provost for Undergraduate Education**

**Mentor: Oussama Khatib, Computer Science**

The primary objective of Valerie's research is to pinpoint and map the areas of the brain responsible for coordinated, bimanual motor movement. By using the Haptic fMRI Interface (HFI-6) in conjunction with functional magnetic resonance imaging, she hopes to determine which areas control independent arm movement and whether these align with those that control coordinated arm movement.



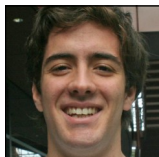
*"I felt like I gained some valuable lab experience that isn't necessarily exposed in a class-lab setting or in my previous research through the Bio department. Working on a distinct project that was my own (and not just working on running experiments for a mentor's project) relies on a lot of skills beside experimentation and technique."*

—USRP Participant Lana Ho

**Nicolas Herrera, Biology**

**Supported by: Bio-X**

**Mentor: Yanmin Yang, Neurology**

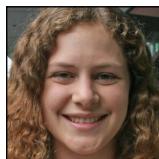


Using the hypothesis that neurodegeneration in Huntington's disease (HD) is exacerbated by a transport failure in neurons, Nicolas's project involves designing and implementing microfluidic chambers to organize cell cultures and study intracellular trafficking. Through these chambers, drugs and viruses that support neurons can be tested for future HD therapies.

**Kathleen Howell, Biology**

**Supported by: Bio-X**

**Mentor: Joe Lipsick, Pathology and Genetics**



Kathleen's research uses fruit flies as a genetic model to help understand the roles specific genes play in the cell cycle. By turning on and off these genes at various points in development, she is working to determine the relationships between these genes, how these genes are critical to normal cell cycle proceedings, and how problems with these genes can ultimately lead to cancer.

**Annie Hu, Biology**

**Supported by: The Rose Hills Foundation**

**Mentor: Samuel Yang, Emergency Medicine**

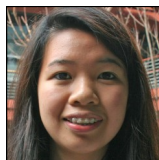


Sepsis is the primary cause of infection-related death in the world and accounts for 60-80% of all deaths in developing countries; however, current diagnostics for the condition are time-consuming and often lead to false-negative results, making them insufficient for proper patient treatment. Annie is developing a rapid test for sepsis using high-resolution melt and machine learning to identify pathogens directly from clinical samples while simultaneously profiling their antibiotic susceptibility. This project will improve not only patient outcomes in a clinical setting, but also the state of pathogen profiling in the scientific community.

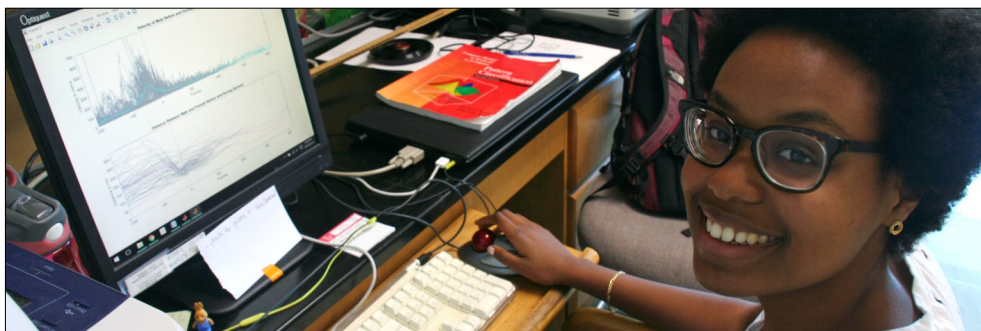
**Karen Huynh, Electrical Engineering**

**Supported by: Bio-X**

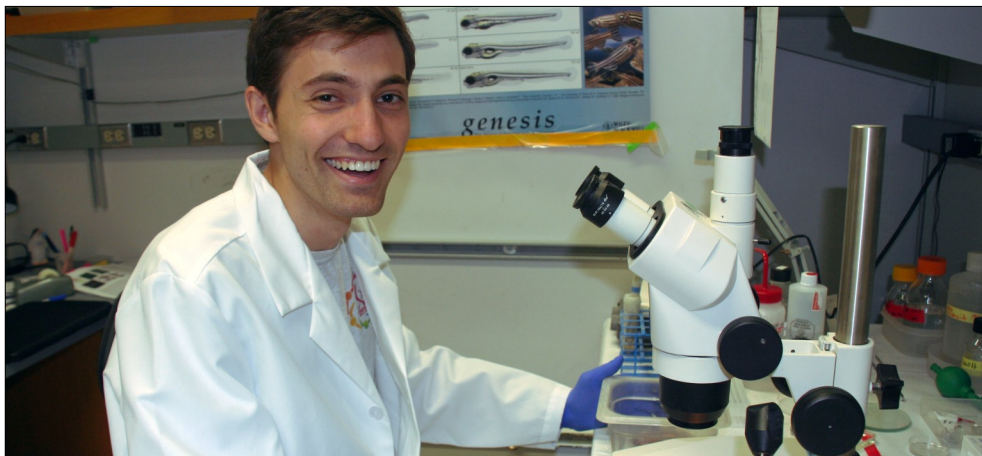
**Mentor: Ada Poon, Electrical Engineering**



Karen's research project works to extend the use of optogenetic tools to cardiac applications. This includes designing and building soft, stretchable, implantable wireless devices to deliver light to cells in the heart. The development of these new tools will contribute greatly to the use of cardiac optogenetics to understand heart functions in health and disease.



2016 USRP participant Luladay Price completed her summer research training in Dr. Russell Fernald's lab



2016 USRP participant Scott Fleming completed his summer research training in Dr. William Talbot's lab



**Anna Jaffe, Bioengineering**

**Supported by: Ted & Colleen Friedel**

**Mentor: Karl Deisseroth, Bioengineering and Psychiatry & Behavioral Sciences**

Anna's project focuses on screening a maximally diverse population of mice during behavioral tests to discover genetic determinants of specific psychiatric disorders. She will also be mapping the corresponding structural deficits by visualizing morphological changes in the brain.



**Zina Jawadi, undeclared**

**Supported by: Ted & Colleen Friedel**

**Mentor: John Oghalai, Otolaryngology**

Zina is examining the role of efferent activity, which sends signals from the brain to the cochlea (the auditory portion of the inner ear), on frequency discrimination. Behavioral training will be performed to help measure frequency discrimination, which is the minimum frequency difference between two tones a mouse can differentiate. Previous experiments on anesthetized mice have found that background noise modulates efferent activity, altering how the cochlea detects sound and impacting speech perception with background noise. This experiment will lead to a better understanding of auditory efferent function, which is impaired in mice with hearing loss.

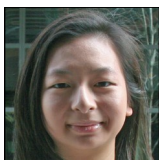


**Ariana Johnson, Symbolic Systems**

**Supported by: Ted & Colleen Friedel**

**Mentor: Vinod Menon, Psychiatry & Behavioral Sciences**

Ariana is investigating how children with autism process different types of memories by examining brain region activity and connectivity during the completion of memory tasks. Her project will be focused on compiling and analyzing neuropsychological, cognitive, affective, structural, and functional brain imaging data collected from children with autism.

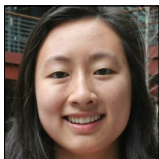


**Sharon Kam, Biology**

**Supported by: Burroughs Wellcome Fund**

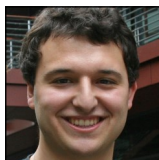
**Mentor: Kathleen Sakamoto, Pediatrics**

Hematopoietic stem cells (HSCs) are used to treat hematologic diseases and cancer in patients who receive stem cell transplantation. HSCs are difficult to sustain and cultivate *in vitro* and can be challenging to obtain from patients receiving their own stem cells due to damage from chemotherapy or radiation therapy. Sharon will optimize conditions that will allow HSCs to proliferate in culture and create various types of co-cultures that mimic the bone marrow niche using mesenchymal stem cells, which reside in the bone marrow, and growth factors in both human and murine models.



**Joyce Kang, Computer Science**  
**Supported by: Burroughs Wellcome Fund**  
**Mentor: Ami Bhatt, Medicine (Hematology) and Genetics**

Joyce is investigating the role of the human gut microbiome, the collective genomes of all the microorganisms in the intestine, in immunocompromised patients undergoing bone marrow transplantation (BMT), a treatment that aims to cure certain blood-related cancers. Specifically, Joyce plans to use a combination of wet lab techniques, next-generation DNA sequencing, and genetic analyses of genomic data to examine the link between changes in the microbiome and graft-versus-host disease, a common and debilitating complication of BMT in which the donor stem cells attack the recipient.



**Aris Kare, Bioengineering**  
**Supported by: The Rose Hills Foundation**  
**Mentor: Stanley Qi, Bioengineering and Chemical & Systems Biology**

Aris is using a novel CRISPRi system to study pathological neuron cells afflicted by Huntington's disease. He is particularly interested in down-regulating the "CAG" repeat sequence of the *HTT* gene that leads to the development of mutant Huntingtin protein. Ultimately, he aims to suppress the defective protein enough to halt the onset of Huntington's disease, allowing for insight as to how mutant Huntingtin affects neuron cell physiology.



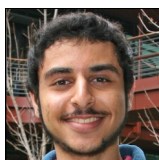
**Sawa Keymeulen, Biology**  
**Supported by: The Rose Hills Foundation**  
**Mentor: Stefan Heller, Otolaryngology**

Sawa is working to address the current limitations of inner-ear stem cell research by using a specific genetic marker to sort and select certain otic (relating to the ear) lineage cells. With these cells, she hopes to be able to understand their optimal conditions and bioengineer sensory epithelia for the inner ear. This research will help to better understand inner ear development and regeneration to help affected patients.



**Lina Khoeur, Human Biology**  
**Supported by: Bio-X**  
**Mentor: Melanie Hayden-Gephart, Neurosurgery**

Lina is testing the use of cerebro-spinal fluid (CSF) to detect mutations in the BCR-ABL1 gene, found in about 20-30% of Acute Lymphoblastic Leukemia (ALL) patients. In cases of brain metastases, the CSF is a better method of tracking mutation than the blood, since it is difficult to bypass the blood-brain barrier. If mutations can be tracked in the CSF, it could provide a much less painful and invasive way to monitor mutation and determine the most effective treatments.



**Joseph Kirollos, Biology**  
**Supported by: Bio-X**  
**Mentor: Giles Plant, Neurosurgery**

Joseph's project will be exploring the changes that take place in a model of cervical spinal cord injury after transplanting human stem cells. These specialized cells have been changed to respond to light stimulation; it is hoped that once transplanted, they will be able to cause changes or even repair the circuits of the brain and spinal cord.



**Nira Krasnow, Human Biology**  
**Supported by: Bio-X**  
**Mentor: Ron Kopito, Biology**

Nira is studying the molecular basis of Huntington's Disease, a neurodegenerative disease strongly associated with the misfolding and subsequent aggregation of mutant huntingtin protein. Specifically, she is testing the hypothesis that mutant huntingtin aggregation causes the destabilization of diverse, unrelated proteins within the proteome which may have deleterious cellular effects associated with Huntington's Disease pathogenesis. This work will enhance our understanding of the functional relationship between protein aggregation and neurodegenerative disease pathogenesis.



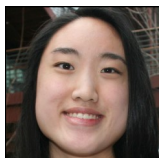


2016 USRP participant Alan Aw completed his summer research training in Dr. Noah Rosenberg's lab

**Anna Lai, Mechanical Engineering**

**Supported by: Bio-X**

**Mentor: Manu Prakash, Bioengineering**



Chemotaxis is the movement of an organism in response to a chemical stimulus. Anna is studying a non-biological analog of chemotaxis systems—implemented in a recently discovered dynamics of two component droplets, pioneered by the Prakash Lab. These simple systems demonstrate autonomous behavior of chemotaxis (sensing and motility) and provide the first example of complex behavior of chemotaxis implemented in non-living materials. Anna will be further exploring the physical dynamics of this system, specially looking at multi-droplet systems and exploring relationships of these ideas to condensed matter physics (spin glass systems).

**Andrew Lee, Bioengineering**

**Supported by: Bio-X**

**Mentor: Paul Wang, Medicine (Cardiovascular)**



Catheter ablation is an invasive procedure that has been the gold standard for treating atrial fibrillation (AF), a heart disease that affects more than two million patients in the U.S.; however, the success rate among patients with enlarged atria is less than 30% due to incomplete lesions that do not span the entire thickness of the heart tissue. To tackle this, Andrew is designing and testing a magnetic monorail ablation device that will benefit many patients who suffer from persistent AF and cannot undergo traditional catheter ablation therapy.

**Angela Li, Biomedical Computation**

**Supported by: Bio-X**

**Mentor: Michael Snyder, Genetics**



Mutations that lead to misregulated translation have significant consequences for human disease. In this project, Angela will develop a mathematical model that relates mutations to regulation of translation. Eventually, she hopes to validate this mathematical model using experimental methods. This project will have a major positive impact by enhancing our understanding of the genetic basis of translation regulation in disease.

**Lillian Liao, Biology**

**Supported by: The Rose Hills Foundation**

**Mentor: Calvin Kuo, Medicine (Hematology)**



*In vitro* cancer modeling is challenging due to the complex architecture of tumors and various tumor interactions with parenchymal and stromal compartments. Using tissue culture methods developed by the Kuo lab, Lillian will be characterizing immune cell populations and optimizing their preservation. The development and characterization of this system holds promise for studying tumor immunity and developing diagnostic assays for personalized cancer therapies.



**Alexander Lopez, Human Biology**

**Supported by: Anonymous Donor**

**Mentor: Theo Palmer, Neurosurgery**

Mutations in genes implicated in fetal development in combination with maternal immune challenges have the potential for increased fetal vulnerability and worsened neurological outcomes in mice. Alexander's project investigates cell proliferation in the brains of fetuses from immune challenged mothers, with or without a genetic alteration. Investigating problems in the neurological development of the fetal brain is critical to be able to address rising diagnoses of autism spectrum disorders.



**Daniel Lowet, Human Biology**

**Supported by: Anonymous Donor**

**Mentor: Ian Gotlib, Psychology**

Daniel proposes to analyze the association between suicidal behaviors, including suicidal ideation and attempts, and white matter integrity in the brain in 11- to 14-year-old adolescents. To investigate this relation, he will analyze brain scans, model the brain's white matter tracts with a method called tractography, and examine data from self-report measures. These analyses will increase our understanding of the brain basis of suicidality in youth.



**Eric Marceau, Biology**

**Supported by: Anonymous Donor**

**Mentor: Joseph Wu, Medicine (Cardiovascular) and Radiology**

Eric is interested in studying autophagy, a biological process by which cells in the face of stress, such as during starvation, degrade their internal parts to recycle remains as nutrients needed for survival. This process is implicated in many important diseases such as heart attack, heart failure, stroke, cancer, and diabetes. Because currently there is not a way to investigate autophagy in mice without sacrificing them, Eric is developing a novel imaging tool that would enable the long-term monitoring of this process in living mice.



**Aidan McCarty, undeclared**

**Supported by: Bio-X**

**Mentor: Richard Zare, Chemistry**

Aidan is investigating the use of a polymer called polypyrrole to facilitate insulin administration for diabetes. Polypyrrole is a conductive polymer that can sustainably hold the drug and release it only in response to an electric stimulus. Understanding and optimizing this process could vastly improve drug administration in diabetic patients, and the method could be applied more broadly to ailments as disparate as the common migraine and malignant cancers.



**Thi Nguyen, Biology**

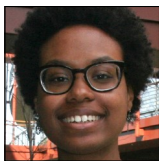
**Supported by: Bio-X**

**Mentor: Calvin Kuo, Medicine (Hematology)**

The brain possesses a highly specialized vasculature to meet its extremely active metabolic demand. Thi will be working to elucidate one of the various pathways that brain angiogenesis regulates during embryonic development. The ability to manipulate these pathways will become critical to mitigating and curing diseases like stroke and cancer.

*"I realized that to a very large degree, science is a collaborative effort. My interactions with my lab members helped me understand how strongly we rely on one another for technical advice and constructive criticism. As a microcosm of the scientific community, I felt that my lab experience helped me understand that lab work is as much about the science as it is about the interpersonal relationship that one builds in the process of collaboration and learning. Furthermore, I appreciated that the Bio-X talks gave me a survey of the fruits of scientific collaboration."*

—USRP Participant Jeffrey Kwong

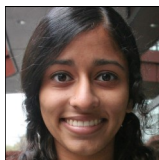


### **Luladay Price, Symbolic Systems**

**Supported by: Vice Provost for Undergraduate Education**

**Mentor: Russell Fernald, Biology**

Using gene knockout technology, Luladay will be studying the effect of the hormone arginine vasopressin in regulating social behavior in a fish model system (*Astatotilapia burtoni*). As dominance hierarchies are conserved between humans and the model system, investigating the effects of this hormone will shed light on how aggression is regulated and how social status is maintained.



### **Preethi Raghavan, Bioengineering**

**Supported by: Anonymous Donor**

**Mentor: Michelle Monje-Deisseroth, Neurology**

Preethi is researching the mechanisms underlying cognitive impairments in patients with Neurofibromatosis type I. She is analyzing structural changes of white matter in Nf1 mice and tracking the cell lineage involved in myelination, which is essential for the functioning of the nervous system. Through this, she hopes to obtain an understanding at the cellular level of how white matter is altered in these patients and how this could cause cognitive defects.

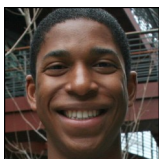


### **Christina Ren, Biology**

**Supported by: Anonymous Donor**

**Mentor: David Relman, Medicine (Infectious Diseases)**

It has been shown that the gut microbiota has significant consequences on human health; however, much of the research to date has focused on bacteria. For this project, Christina plans to critically examine the role of fungi, especially the interactions between fungi, bacteria, and the host that could contribute to predicting gut microbiota stability and resistance to disturbances. Towards this end, she will collect and analyze samples from human participants with and without introduction of certain perturbations such as antibiotics, diet modification, and colonic cleansing.

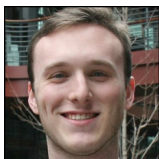


### **Walter Roper, Bioengineering**

**Supported by: Victoria Reed**

**Mentor: Eugene Butcher, Pathology**

Walter is studying the gut region and the leukocyte interactions within mice. Through this model, he hopes to identify the factors involved in the specification of peyer patches (small masses of lymphatic tissue found within the small intestine) and the spleen. This research could impact medical procedures and testing for diseases that target the stomach, including some types of cancer.

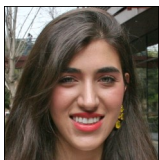


### **Zachary Rosenthal, Chemistry**

**Supported by: Victoria Reed**

**Mentor: James Chen, Chemical & Systems Biology and Developmental Biology**

Zachary will be investigating the Hedgehog signaling pathway, a pathway which, when defective, can be responsible for extreme cell proliferation. Aberrant Hedgehog-activated cellular growth can ultimately result in a number of cancers, including basal cell carcinoma, medulloblastoma, and meningioma. Zachary will be responsible for the development of potent inhibitors of the pathway and the characterization of their mechanisms of action.



### **Persiana Saffari, Electrical Engineering**

**Supported by: Victoria Reed**

**Mentor: Jonathan Pollack, Pathology**

Ameloblastomas are tooth bud tumors rare in humans but remarkably common in dogs. Persiana proposes to evaluate the similarities of human and canine ameloblastomas at the genetic level. If similarities can be demonstrated, then both humans and our canine companions will benefit from one another, through the collective knowledge and therapy studies done.



**Megha Srivastava, Computer Science**

**Supported by: Mr. Vipool M. Patel & Mrs. Sharon L. Patel**

**Mentor: Kalanit Grill-Spector, Psychology**

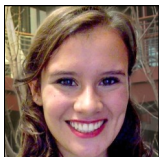


Megha will seek to use computational models to explain the biological foundation of facial perception. Based on fMRI data, she hypothesizes that the size of receptive fields corresponds to our ability to distinguish human faces. By training convolutional neural networks on images of human faces, she plans to study how reducing the receptive fields in the networks affects the ability to successfully distinguish faces.

**Gabriela Steiner, Human Biology**

**Supported by: William J. & Jill H. Shepherd**

**Mentor: Anthony Ricci, Medicine (Otolaryngology)**

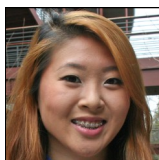


Gaby is studying the cytoarchitecture of the Organ of Corti (a structure in the cochlea of the inner ear) in gerbils to better understand how mechanical interactions between cells within the Organ of Corti amplify sound waves and give the mammalian cochlea tremendous sensitivity and frequency selectivity. She aims to obtain 3D quantitative data to generate a mechanical model of the gerbil cochlea with details about the arrangement and behavior of different Organ of Corti cells. Mechanical models of the cochlea allow for functional characterization of changes arising from pathologies, genetic alterations, and future interventions, such as implantations and the regeneration of cochlear substructures using stem cells.

**Grace Tam, Biology**

**Supported by: William J. & Jill H. Shepherd**

**Mentor: Allan Reiss, Psychiatry & Behavioral Sciences and Radiology**



Grace will be analyzing how posture plays a role in the changes of oxygenated and deoxygenated hemoglobin levels in the brain as measured with fMRI. It has been proposed that posture within the magnet can vary cognitive functioning. In order to test the hypothesis that different lying positions affect neural activity, she will be analyzing the brain scans of healthy adults. Ultimately, this research aims to provide new understandings of neuroimaging to the field of medicine.

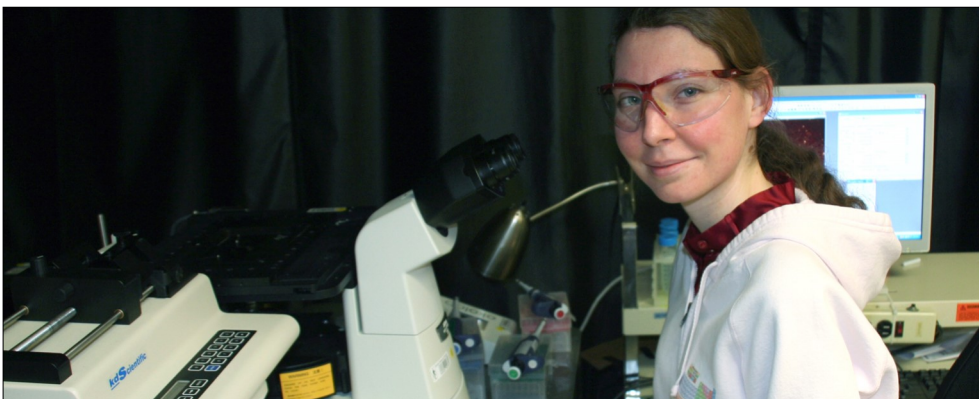
**Sonia Targ, Mathematical & Computational Science**

**Supported by: William J. & Jill H. Shepherd**

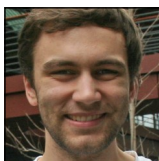
**Mentor: Josef Parvizi, Neurology**



Sonia's research explores the dynamics of information exchange between brain regions when we complete computations such as  $2 + 2 = 4$ . Specifically, she is analyzing electrocorticographical (ECoG) data to investigate interconnectivity between the visual numeral area and the intraparietal sulcus of the human brain, elucidating the process of numerical abstraction.



2016 USRP Participant Isabel Goronzy completed her summer research training in Dr. Steven Boxer's lab



**Benjamin Thomson, Chemistry**  
**Supported by: Brian & Karen Mariscal**  
**Mentor: Steven Boxer, Chemistry**

Benjamin is using a model protein to test hypotheses about the nature of hydrogen bonds in protein structure and function. Hydrogen bonds are responsible for protein folding, assembly, and drug binding, and they play key roles in enzyme catalysis. This work is directed towards a more fundamental understanding of these non-covalent interactions which could have broad implications in protein and drug design.



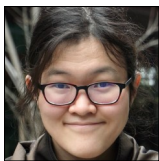
**Paul Tran, Biology**  
**Supported by: Brian & Karen Mariscal**  
**Mentor: Russell Fernald, Biology**

Paul is studying how animals make the most important decision of their lives: who to mate with. Studying the mate preferences of hybrid cichlid fish will provide insights into how species differ in their preferences, the mechanisms they use for deciding, and ultimately the genetic and neural processes governing mate choice.



**Rebecca Triplett, Human Biology**  
**Supported by: Bio-X**  
**Mentor: Thomas Südhof, Molecular & Cellular Physiology**

The mechanisms responsible for dynamic structural and functional changes in the synapses of neurons, which are necessary for the transmission, storage, and retrieval of information in the brain, are still poorly understood. Rebecca's proposed work addresses this important knowledge gap through employing new tools to track synaptic molecules through time and space.



**Mashbayer Tugsbayer, Biology**  
**Supported by: Bio-X**  
**Mentor: H. Craig Heller, Biology**

Smith Magenis syndrome is a developmental disorder whose most prominent features include an inverted circadian rhythm and moderate learning disability. Mashbayer will be analyzing the mouse model of Smith Magenis syndrome not only to gain further understanding of this difficult yet under-researched disease, but also to explore the link between circadian rhythm disturbances and learning deficits. Learning deficits present in many other diseases such as Down syndrome and Alzheimer's disease are hypothesized to be caused by misfiring circadian neurons; comprehensive understanding of Smith Magenis syndrome and its mechanism may help us learn how to restore not only a regular circadian rhythm but also learning and memory in patients with such diseases.



**Aileen Wang, undeclared**  
**Supported by: The Rose Hills Foundation**  
**Mentor: Edward Graves, Radiation Oncology**

Aileen is developing methods to treat small animal models of disease with clinically relevant radiotherapy. Her project will engineer treatment planning approaches for the X-RAD SmART system to determine the optimal set of radiation beams to produce a radiation dose to treat a specific target while sparing other tissues. The software she will develop will allow researchers to study radiotherapies matching those given to human patients.

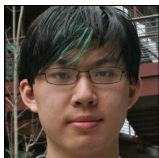
*"The most important lesson that I learned was how to critically think about research to develop appropriate questions. Then from the questions I learned how to design experiments that would hopefully address the question... Finally I learned how to implement the experiments I have designed and interpret the results."*

—USRP Participant Tally Buckstaff

### **Brian Wei, Science, Technology & Society**

**Supported by: Bio-X**

**Mentor: John Boothroyd, Microbiology & Immunology**



Brian's project aims to understand how the important human parasite, *Toxoplasma gondii*, can invade almost any cell it encounters. He will do this using a modern version of a classical genetic approach, isolating mutants that are defective in this ability and then sequencing the DNA of those mutants to identify the genes involved. This work will impact our understanding of not only *Toxoplasma* but also its cousin parasite, *Plasmodium falciparum*, that invades similarly and is the pathogen responsible for human malaria.

### **Eileen Williams, Psychology**

**Supported by: Bio-X**

**Mentor: Ian Gotlib, Psychology**

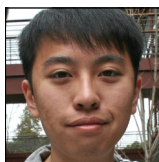


Eileen's research project is designed to investigate neurological correlates and potential predictors of suicidal ideation and attempts in depressed youth. Using FSL, a comprehensive library of analysis tools for brain imaging data, Eileen will contrast differences in structural and functional connectivity in depressed adolescents with a history of suicidal ideation compared to those with no such history. Ultimately, such knowledge could contribute to early identification of at-risk individuals and possible avenues of treatment.

### **Timothy Wu, Biology and Symbolic Systems**

**Supported by: Anonymous Donor**

**Mentor: Peter Kao, Medicine (Pulmonary & Critical Care Medicine)**

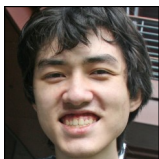


Timothy is studying mechanisms by which cancers inactivate normal immune surveillance including activating the programmed cell death receptor pathway (PD-1). Timothy will use CRISPR/Cas9 technology to disrupt specific nuclear proteins, NF45 and NF90, that control PD-1 expression. The strategic goal is to restore immune responses against endogenous cancers.

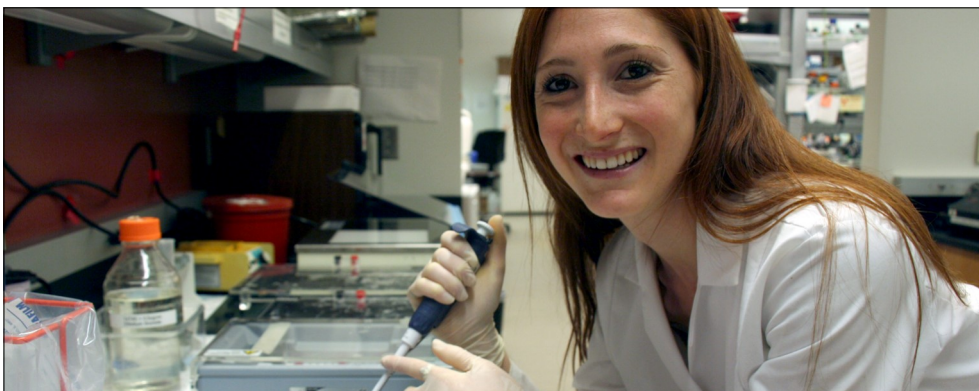
### **David Zimmerman, Physics**

**Supported by: The Rose Hills Foundation**

**Mentor: Tom Clandinin, Neurobiology**



Every cell packs a meter-long molecule of DNA into a micron scale nucleus by carefully folding it up, while dynamically accessing the critical genes it needs to express. However, at present, no existing technology can describe this complicated folding pattern in individual cells. David is developing a new technology that will make it possible to probe this architecture with unprecedented spatial and temporal resolution.



2016 USRP participant Nira Krasnow completed her summer research training in Dr. Ron Kopito's lab



# 2016 Poster Titles - presented August 24, 2016

## “Investigating Possible Super Enhancer Sequences for Cardiac Development”

Gunes Ates Akgun<sup>1</sup>, Jaechol Lee<sup>2</sup>, Ningyi Shao<sup>2</sup>, Joseph Wu<sup>2,3</sup>, Zhen Cheng<sup>3</sup>  
Departments of Biology<sup>1</sup>, Cardiology<sup>2</sup>, and Radiology<sup>3</sup>, Stanford University

## “Visualizing the Role of Cell Cycle in Epithelial Differentiation”

Daniel Alber<sup>1</sup>, Samantha Piekos<sup>1</sup>, Sandra Melo<sup>1</sup>, Jessica Torkelson<sup>1</sup>, Lingjie Li<sup>1</sup>, Gautam Shankar<sup>1</sup>, Anthony Oro<sup>1</sup>  
Department of Dermatology<sup>1</sup>, Stanford University

## “Bounds on the Number of Loci Required for All Splits of a Species Tree to Appear in a Set of Gene Trees”

Alan J. Aw<sup>1</sup>, Rohan S. Mehta<sup>2</sup>, Lawrence H. Uricchio<sup>2</sup>, David Bryant<sup>3</sup>, Noah A. Rosenberg<sup>2</sup>  
Departments of Mathematical & Computational Science<sup>1</sup> and Biology<sup>2</sup>, Stanford University; Department of Mathematics & Statistics<sup>3</sup>, University of Otago, New Zealand

## “Inferring Orientation Tuning from fMRI Data with the Forward Encoding Model Suffers from Biased Estimation”

Dylan Cable<sup>1</sup>, Taosheng Liu<sup>2</sup>, Justin L. Gardner<sup>1</sup>  
Department of Psychology<sup>1</sup>, Stanford University; Department of Psychology<sup>2</sup>, Michigan State University

## “Fluorescent Biosensors for Sugar Transport”

Taylor M. Chavez<sup>1</sup>, Lily S. Cheung<sup>2</sup>, Wolf B. Frommer<sup>1,2</sup>  
Department of Biology<sup>1</sup>, Stanford University; Department of Plant Biology<sup>2</sup>, Carnegie Institution for Science

## “Regulation of TRPV1 and TRPV4 Membrane Trafficking”

Annabel Chen<sup>1</sup>, Carl Hurt<sup>1</sup>, Eric Gross<sup>1</sup>  
Department of Anesthesia<sup>1</sup>, Stanford University

## “Effects of Kainic Acid and NSPC-Derived VEGF on Immature Neuron Activation”

Kelly Chen<sup>1</sup>, Elizabeth Kirby<sup>1</sup>, Tony Wyss-Coray<sup>1</sup>  
Department of Neurology<sup>1</sup>, Stanford University

## “Mapping Connectivity and Function of the Neural Circuits Underlying Thirst”

Michael Z. Chen<sup>1</sup>, William E. Allen<sup>2</sup>, Liquan Luo<sup>3</sup>, Karl Deisseroth<sup>1,4</sup>  
Departments of Bioengineering<sup>1</sup>, Biology<sup>3</sup>, and Psychiatry & Behavioral Sciences<sup>4</sup> and Neurosciences Interdepartmental Program<sup>2</sup>, Stanford University

## “The Role of SPARC and Its Binding Partners in Diffuse Intrinsic Pontine Glioma Invasion to the SVZ”

Dominique Cooper<sup>3</sup>, Elizabeth Qin<sup>1</sup>, Michelle Monje<sup>2</sup>  
Departments of Neuroscience<sup>1</sup>, Neurology<sup>2</sup>, and Biology<sup>3</sup>, Stanford University

## “Synergistic Effects of Maternal Immune Activation and cMet Deletion on Embryonic Neuronal Subtype Distribution”

Kristina Correa<sup>1,2</sup>, Alex Lopez<sup>1,2</sup>, Aditi Narayan<sup>1,2</sup>, Brooke Babineau<sup>1,2</sup>, Theo Palmer<sup>1,2</sup>  
Department of Neurosurgery<sup>1</sup> and Institute for Stem Cell Biology & Regenerative Medicine<sup>2</sup>, Stanford University

## “Predicting Remote Pain and Opioid Use Cessation Using Early Trajectory Clustering”

Eric Cramer<sup>1</sup>, Sean Mackey<sup>1</sup>, Ian Carroll<sup>1</sup>, Jennifer Hah<sup>1</sup>  
Department of Anesthesiology (Division of Pain Management)<sup>1</sup>, Stanford University

## “Designing Reporters for Repeat Associated Non-ATG (RAN) Translation in HEK 293T”

Tai Dinger<sup>1</sup>, Shizuka Yamada<sup>1</sup>, Aaron Gitler<sup>1</sup>  
Department of Genetics<sup>1</sup>, Stanford University

**“Biochemical Purification of Protein Complexes Associated with Mutant Nucleophosmin (NPM1)”**

Julia Eberhard<sup>2</sup>, Marisa Juntilla<sup>1,2</sup>, Caitlin Roake<sup>2</sup>, Natalie Ortiz<sup>2</sup>, Steven Artandi<sup>2</sup>  
Departments of Pathology<sup>1</sup> and Hematology<sup>2</sup>, Stanford University

**“In Vivo Characterization of Murine Inner Ear Hair Cell Progenitors”**

Juleh Eide<sup>1</sup>, Patrick J. Atkinson<sup>1</sup>, Alan G. Cheng<sup>1</sup>  
Department of Otolaryngology – Head & Neck Surgery<sup>1</sup>, Stanford University

**“Optimizing Single-Cell Activation in Epiretinal Prostheses to Restore Vision in People Blinded by Photoreceptor Diseases”**

Victoria H. Fan<sup>1,2</sup>, Lauren E. Grosberg<sup>1,2</sup>, E.J. Chichilnisky<sup>1,2</sup>  
Department of Neurosurgery<sup>1</sup> and Hansen Experimental Physics Laboratory<sup>2</sup>, Stanford University

**“Effects of Soil Chemistry on Plant Pathogen Communities”**

Johannah Farner<sup>1</sup>, Erin R. Spear<sup>1</sup>, Caroline Daws<sup>1</sup>, Erin A. Mordecai<sup>1</sup>  
Department of Biology<sup>1</sup>, Stanford University

**“The Role of N17 in Huntingtin Pathogenesis”**

Alex Feldman<sup>1</sup>, Koning Shen<sup>1</sup>, Judith Frydman<sup>1</sup>  
Department of Biology<sup>1</sup>, Stanford University

**“Mechanistic Investigation of Inflammation Regulation by Novel Protein NLRC3-like”**

Scott L. Fleming<sup>1</sup>, Ana Meireles Sousa<sup>1</sup>, William S. Talbot<sup>1</sup>  
Department of Developmental Biology<sup>1</sup>, Stanford University

**“Sterol-Dependent Membrane Dynamics Regulate Influenza Virus Binding”**

Isabel Goronzy<sup>1</sup>, Robert Rawle<sup>2</sup>, Peter Kasson<sup>2</sup>, Steven Boxer<sup>1</sup>  
Department of Chemistry<sup>1</sup>, Stanford University; Department of Molecular Physiology & Biological Physics<sup>2</sup>, University of Virginia

**“Characterizing C/D Box Small Nucleolar RNA Interactions with GTPases in Keratinocyte Differentiation”**

Katie Gu<sup>1</sup>, Eon Rios<sup>1</sup>, Paul Khavari<sup>1</sup>  
Department of Epithelial Biology<sup>1</sup>, Stanford University

**“Identification of the Molecular Partners of Toll-6 and Toll-7 in the Developing Antennal Lobe”**

Ricardo Guajardo<sup>1</sup>, Jiefu Li<sup>1</sup>, Liqun Luo<sup>1</sup>  
Department of Biology<sup>1</sup>, Stanford University

**“Engineering Screening Approaches to Validate Cancer Driver Genes”**

Daniel Hart<sup>1</sup>, Sean de la O<sup>1</sup>, Antonia Dominguez<sup>2</sup>, Ameen Salahudeen<sup>1</sup>, Stanley Qi<sup>2</sup>, Calvin Kuo<sup>1</sup>  
Departments of Medicine (Division of Hematology)<sup>1</sup> and Bioengineering<sup>2</sup>, Stanford University



2012 Undergraduate Summer Research Program Participants

**“Utilizing Haptic Interfaces to Understand Motor Control”**

Valerie Hau<sup>1</sup>, Alok Subbarao<sup>3</sup>, Jananan Mithrakumar<sup>2</sup>, Samir Menon<sup>1</sup>, Oussama Khatib<sup>1</sup>  
Departments of Computer Science<sup>1</sup> and Electrical Engineering<sup>2</sup>, Stanford University; Department of Biomedical Engineering<sup>3</sup>, San Jose State University

**“Steps Toward Huntington’s Disease Therapeutics: ProBDNF Treatment and the Microfluidic Co-Culture System”**

Nicolas Herrera<sup>1</sup>, Wei Wang<sup>1</sup>, Yanmin Yang<sup>1</sup>  
Department of Neurology & Neurological Sciences<sup>1</sup>, Stanford University

**“Myb-RFP Expression and Regulation of a Polo-GFP Transgene in Larval Wing Disc Development of *Drosophila*”**

Kathleen Howell<sup>1,2</sup>, Joseph Lipsick<sup>1,2</sup>  
Departments of Pathology<sup>1</sup> and Genetics<sup>2</sup>, Stanford University

**“Replacing Blood Culture: Combined Broad-Range Microbial ID and AST Directly from Whole Blood”**

Annie Hu<sup>1</sup>, Nadya Andini<sup>1</sup>, Samuel Yang<sup>1</sup>  
Department of Emergency Medicine<sup>1</sup>, Stanford University

**“Variable Topography Antenna for Single-Element Beam-Steering”**

Karen Huynh<sup>1</sup>, Chris Vassos<sup>1</sup>, Yuji Tanabe<sup>1</sup>, Ada Poon<sup>1</sup>  
Department of Electrical Engineering<sup>1</sup>, Stanford University

**“Characterization of Single-Guide RNAs in CRISPR/Cas9 Knockin Mice for Understanding Disease Phenotypes in Genome-Wide Association Studies”**

Anna Jaffe<sup>1</sup>, Priya Rajasethupathy<sup>1</sup>, Karl Deisseroth<sup>1,2</sup>  
Departments of Bioengineering<sup>1</sup> and Psychiatry & Behavioral Sciences<sup>2</sup>, Stanford University

**“Behavioral Assessment of Frequency Discrimination in Mice”**

Zina Jawadi<sup>1</sup>, Jinkyung Kim<sup>1</sup>, Homer Abaya<sup>1</sup>, John Oghalai<sup>1</sup>  
Department of Otolaryngology – Head & Neck Surgery<sup>1</sup>, Stanford University

**“Dynamic Functional Connectivity Using Resting-State fMRI in Children with Autism”**

Ariana Johnson<sup>1</sup>, Shaozheng Qin<sup>2</sup>, Tiawen Chen<sup>2</sup>, Rachel Rehert<sup>2</sup>, Vinod Menon<sup>1,2,3,4</sup>  
Symbolic Systems Program<sup>1</sup>, Departments of Psychiatry & Behavioral Sciences<sup>2</sup> and Neurology & Neurological Sciences<sup>3</sup>, and Stanford Neurosciences Institute<sup>4</sup>, Stanford University

**“Mimicking the Human Bone Marrow: Developing a 3D Co-Culture System to Increase Hematopoietic Stem Cell Proliferation”**

Sharon Kam<sup>1</sup>, Minyoung Youn<sup>2</sup>, Anupama Narla<sup>2</sup>, Joy Y. Wu<sup>3</sup>, Fan Yang<sup>4</sup>, Kathleen M. Sakamoto<sup>2</sup>  
Departments of Biology<sup>1</sup>, Pediatrics<sup>2</sup>, Endocrinology<sup>3</sup>, and Bioengineering<sup>4</sup>, Stanford University

**“Identifying Microbiome Signatures of Steroid-Refractory Graft-vs-Host Disease in HSCT Patients”**

Joyce Kang<sup>1</sup>, Tessa Andermann<sup>2</sup>, Jessica Ribado<sup>1</sup>, Katia Tkachenko<sup>1,3</sup>, Eli Moss<sup>1</sup>, Ami Bhatt<sup>1,3</sup>  
Departments of Genetics<sup>1</sup> and Medicine (Divisions of Infectious Diseases<sup>2</sup> and Hematology<sup>3</sup>), Stanford University

**“Hunting for New Therapeutic Approaches: Using CRISPR Systems to Treat Huntington’s Chorea”**

Aris John Kare<sup>1</sup>, Dehua Zhao<sup>1</sup>, Lei Stanley Qi<sup>1,2,3</sup>  
Departments of Bioengineering<sup>1</sup> and Chemical & Systems Biology<sup>2</sup> and ChEM-H<sup>3</sup>, Stanford University

**“Selecting Otic Sensory Lineage Cells from Mouse ECS with the Fbxo2 Marker and Optimizing Conditions for Sensory Epithelia”**

Sawa Keymeuen<sup>1</sup>, Byron Hartman<sup>1</sup>, Stefan Heller<sup>1</sup>  
Department of Otolaryngology<sup>1</sup>, Stanford University



2016 URSP participant Nicolas Herrera completed his summer research training in Dr. Yanmin Yang's lab

**“Using Cell-Free RNA to Monitor BCR-ABL1 Mutations in Brain-Metastatic Leukemia”**

Lina Khoeur<sup>1</sup>, Yingmei Li<sup>1</sup>, Melanie Hayden-Gephart<sup>1</sup>

Department of Neurosurgery<sup>1</sup>, Stanford University

**“Optogenetic Stimulation of iPSC-Derived Corticospinal Motor Neurons for Spinal Cord Injury”**

Joseph Kirolos<sup>1</sup>, James Weiman<sup>2</sup>, Giles Plant<sup>2</sup>

Departments of Biology<sup>1</sup> and Neurosurgery<sup>2</sup>, Stanford University

**“Development of Cellular Models to Assess the Effects of Mutant Huntingtin Protein Aggregation on Global Proteome Stability”**

Nira Krasnow<sup>1</sup>, Airlia Thompson<sup>1</sup>, Ron Kopito<sup>1</sup>

Department of Biology<sup>1</sup>, Stanford University

**“Lattice Systems of Vapor-Mediated Droplets”**

Anna Lai<sup>1</sup>, Stefan Karpitschka<sup>2</sup>, Manu Prakash<sup>2</sup>

Departments of Mechanical Engineering<sup>1</sup> and Bioengineering<sup>2</sup>, Stanford University

**“Developing a Novel Bipolar Catheter Ablation System for Treating Ventricular Tachycardia”**

Andrew Lee<sup>1</sup>, Meghedi Babakhanian<sup>2</sup>, Paul J. Wang<sup>1,2</sup>

Departments of Bioengineering<sup>1</sup> and Cardiovascular Medicine<sup>2</sup>, Stanford University

**“Development of a Pipeline for Determining Allele Specific Translation”**

Angela Li<sup>1,2</sup>, Can Cenik<sup>1</sup>, Jason Reuter<sup>1</sup>, Maheetha Bharadwaj<sup>1</sup>, Michael Snyder<sup>1</sup>

Department of Genetics<sup>1</sup> and Program in Biomedical Computation<sup>2</sup>, Stanford University

**“Characterizing and Maintaining Immune Cell Populations within Tumor Organoid Cultures”**

Lillian Liao<sup>1</sup>, James T. Neal<sup>1</sup>, Iris Liu<sup>1</sup>, Calvin Kuo<sup>1</sup>

Department of Medicine (Division of Hematology)<sup>1</sup>, Stanford University

**“The Combinatorial Effect of Genetic Risk Factors and Maternal Immune Challenges on Embryonic Brain Development”**

Alexander Lopez<sup>1</sup>, Kristina Correa<sup>1</sup>, Aditi Narayan<sup>1</sup>, Brooke Babineau<sup>1</sup>, Theo Palmer<sup>1</sup>

Department of Neurosurgery<sup>1</sup>, Stanford University

**“Sex Differences in White Matter Correlates of Suicidal Ideation in Adolescents: A Diffusion Tensor Imaging Study”**

Daniel Lowet<sup>1</sup>, Tiffany Ho<sup>1</sup>, Sarah Ordaz<sup>2</sup>, Ian Gotlib<sup>1</sup>

Departments of Psychology<sup>1</sup> and Psychiatry & Behavioral Sciences<sup>2</sup>, Stanford University

**“A Novel Bioluminescence Reporter-Based Sensor for Interrogating Drug-Induced Autophagy”**

Eric Marceau<sup>1</sup>, Ian Chen<sup>1</sup>, Joseph Wu<sup>1</sup>

Stanford Cardiovascular Institute<sup>1</sup>, Stanford University



**“Electroresponsive Polypyrrole Nanoparticles for Controlled Drug Delivery”**

Aidan McCarty<sup>1</sup>, Devleena Samanta<sup>1</sup>, Niloufar Hosseini-Nassab<sup>1</sup>, Richard N. Zare<sup>1</sup>  
Department of Chemistry<sup>1</sup>, Stanford University

**“Embryonic Brain Vascular Phenotypes of Endothelial-Specific Gpr124 KO Mice Versus Reck KO Mice”**

Ahi Nguyen<sup>1</sup>, Mario Vallon<sup>1</sup>, Junlei Chang<sup>1</sup>, Calvin Kuo<sup>1</sup>  
Department of Medicine (Division of Hematology)<sup>1</sup>, Stanford University

**“How to Get the Girl: Quantifying Courtship Behavior in Male Cichlids Using Automated Behavior Tracking”**

Luladay Price<sup>1</sup>, Scott Juntti<sup>1</sup>, Quentin Gaudry<sup>2</sup>, Russ Fernald<sup>1</sup>  
Department of Biology<sup>1</sup>, Stanford University; Department of Biology<sup>2</sup>, University of Maryland

**“Age- and Brain Region-Dependent Dysregulation of Oligodendrocyte Precursor Cell Population Dynamics in a Mouse Model of Neurofibromatosis Type I”**

Preethi Raghavan<sup>1</sup>, James Lennon<sup>2,3</sup>, Michelle Monje<sup>2,3</sup>  
Departments of Bioengineering<sup>1</sup> and Neurology<sup>3</sup> and Institute for Stem Cell Biology & Regenerative Medicine<sup>2</sup>, Stanford University

**“Mingling Microbes: Assessing Fungi-Bacteria Interactions in the Human Gut Microbiota”**

Christina Ren<sup>1</sup>, Les Dethlefsen<sup>1</sup>, Arati Patankar<sup>1</sup>, Amy Lorber<sup>1</sup>, David Relman<sup>1</sup>  
Department of Microbiology & Immunology<sup>1</sup>, Stanford University

**“Transcription Factors, COUP-TFII and Nkx2-3, Act in Concert to Modulate MAdCAM1 Expression”**

Walter Roper<sup>1</sup>, Thanh Theresa Dihn<sup>1</sup>, Nicole Salazar<sup>1</sup>, Julian Pan<sup>2</sup>, Milladur Rahman<sup>1</sup>, Eugene C. Butcher<sup>1,2</sup>  
Laboratory of Immunology & Vascular Biology (Department of Pathology)<sup>1</sup>, Stanford University; Center for Molecular Biology & Medicine<sup>2</sup>, VA Palo Alto Health Care System

**“Mechanistic Insights into a New Gli-Dependent Cancer Therapeutic”**

Zach Rosenthal<sup>1</sup>, Alison Ondrus<sup>1</sup>, Marisa Hom<sup>1</sup>, James Chen<sup>1,2,3</sup>  
Departments of Chemical & Systems Biology<sup>1</sup>, Developmental Biology<sup>2</sup>, and Chemistry<sup>3</sup>, Stanford University

**“Man’s Best Model: A Genomic Comparison of Ameloblastoma in Humans and Dogs”**

Persiana Saffari<sup>1</sup>, Boaz Arzi<sup>2</sup>, Robert West<sup>1</sup>, Frank Verstraete<sup>2</sup>, Jonathan Pollack<sup>1</sup>  
Department of Pathology<sup>1</sup>, Stanford University; Department of Surgical & Radiological Sciences<sup>2</sup>, University of California, Davis School of Veterinary Medicine

**“Teaching a Computer to Recognize Faces: Impact of Convolutional Neural Network Architecture and Image Variations”**

Megha Srivastava<sup>1</sup>, Kalanit Grill-Spector<sup>1</sup>  
Department of Psychology<sup>1</sup>, Stanford University

**“In-situ Two-Photon Imaging of the Gerbil Organ of Corti”**

Gabriela M. Steiner<sup>1,2</sup>, Sunil Puria<sup>1,2</sup>, Anthony J. Ricci<sup>1,2</sup>  
Department of Otolaryngology – Head & Neck Surgery<sup>1</sup> and Otobiomechanics Research Group<sup>2</sup>, Stanford University

**“Effects of Posture on Resting-State Functional Magnetic Resonance Imaging (rsfMRI)”**

Grace Tam<sup>1,2</sup>, Hadi Hosseini<sup>3</sup>, Allan Reiss<sup>3,4</sup>  
Departments of Biology<sup>1</sup>, Psychiatry & Behavioral Sciences<sup>3</sup>, and Radiology<sup>4</sup> and Center for Interdisciplinary Brain Sciences Research<sup>2</sup>, Stanford University

**“Hello Operator: Human Neuronal Population Activity During Mathematical Cognition”**

Sonia Targ<sup>1</sup>, Yuqing Zhu<sup>1</sup>, Amy Daitch<sup>1</sup>, Pedro Pinheiro-Chagas<sup>1</sup>, Josef Parvizi<sup>1</sup>  
Department of Neurology & Neurological Sciences<sup>1</sup>, Stanford University

**“Using Non-Canonical Amino Acids to Probe Short Hydrogen Bonds in Photoactive Yellow Protein”**

Ben Thomson<sup>1</sup>, Steven Boxer<sup>1</sup>

Department of Chemistry<sup>1</sup>, Stanford University

**“Investigating Female Mate Choice in Malawi Cichlids”**

Paul Tran<sup>1</sup>, Alina Nguyen<sup>2</sup>, Allie Byrne<sup>1</sup>, Ryan York<sup>1</sup>, Russell Fernald<sup>1</sup>

Department of Biology<sup>1</sup>, Stanford University; University of Notre Dame<sup>2</sup>

**“Systematic Identification of Synaptic Ligands that Bind Astrocytic Neurexin-1”**

Rebecca Triplett<sup>1</sup>, Justin Trotter<sup>1</sup>, Zhang Bo<sup>1</sup>, Shane Antony Liddelow<sup>2</sup>, Alexandra Munch<sup>2</sup>, Ben A. Barres<sup>2</sup>, Tom Südhof<sup>1</sup>

Departments of Molecular & Cellular Physiology<sup>1</sup> and Neurobiology<sup>2</sup>, Stanford University

**“Sleep and Learning in Mouse Model of Smith Magenis Syndrome”**

Mashbayar Tugsbayar<sup>1</sup>, Bayarsaikhan Chuluun<sup>1</sup>, H. Craig Heller<sup>1</sup>

Department of Biology<sup>1</sup>, Stanford University

**“Optimizing Dosage of Small Animal Radiotherapy Using the PXi X-Rad SmART System”**

Aileen Wang<sup>1</sup>, Stavros Melemenidis<sup>1</sup>, Edward Graves<sup>1</sup>

Department of Radiation Oncology<sup>1</sup>, Stanford University

**“*Toxoplasma gondii* MAF1b Binds the Host Cell MIB Complex to Mediate Mitochondrial Association”**

Felice D. Kelly<sup>1</sup>, Brian M. Wei<sup>1</sup>, Michelle L. Parker<sup>2</sup>, Martin J. Boulanger<sup>2</sup>, John C. Boothroyd<sup>1</sup>

Department of Microbiology & Immunology<sup>1</sup>, Stanford University; Department of Biochemistry & Microbiology<sup>2</sup>, University of Victoria

**“Neural Correlates of Suicidality in Depressed Adolescents”**

Eileen Williams<sup>1</sup>, Natalie Colich<sup>1</sup>, Ian Gotlib<sup>1</sup>

Department of Psychology<sup>1</sup>, Stanford University

**“Dynamic Binding of Novel Transcription Factors NF45 and NF90 to PD-1 Promoter upon T Cell Activation”**

Timothy Ting-Hsuan Wu<sup>1</sup>, LingFang Shi<sup>2</sup>, Peter N. Kao<sup>2</sup>

Departments of Biology<sup>1</sup> and Medicine (Division of Pulmonary & Critical Care Medicine)<sup>2</sup>, Stanford University

**“Profiling the Transcriptional Response to Activity in the *Drosophila* Brain”**

David Zimmerman<sup>1</sup>, Thomas Clandinin<sup>1</sup>

Department of Neurobiology<sup>1</sup>, Stanford University

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