



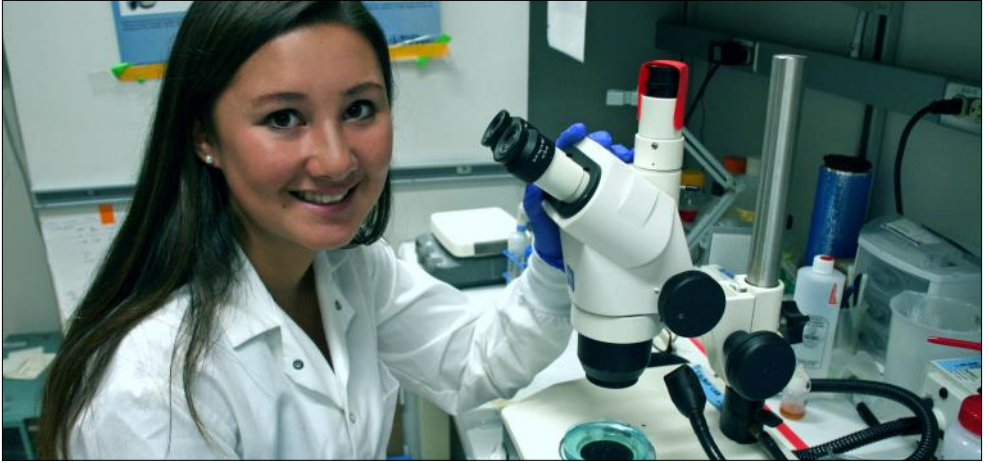
**STANFORD
BIO-X**

**UNDERGRADUATE
SUMMER RESEARCH
PROGRAM 2017**



2017 Undergraduate Summer Research Program (USRP) Participants

STANFORD BIO-X UNDERGRADUATE SUMMER RESEARCH PROGRAM



Hannah Lorin, 2017 cohort, completed her Stanford Bio-X summer research training in Dr. William Talbot's lab

The Stanford Bio-X Undergraduate Summer Research Program (Stanford Bio-X USRP) is now 13 years old and has partnered with 246 Stanford faculty mentors in order to provide a ten-week summer research opportunity to 501 students to date.

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.

In 2017, 65 students participated in the program.



2017 STANFORD BIO-X UNDERGRADUATE RESEARCH PROGRAM TALKS BY STANFORD FACULTY:



June 28

Carla Shatz (Biology and Neurobiology), “Saving the Synapse”

Paul Nuyujukian (Bioengineering and Neurosurgery), “Brain-Machine Interfaces”

Melanie Hayden-Gephart (Neurosurgery), “Malignant brain tumor surgery and science”

July 5

Sandy Napel (Radiology), “Images are not just pictures; they are data: Applications to Radiology & Medicine”

Alistair Boettiger (Developmental Biology), “Single molecule imaging of gene expression and genome structure”

Alison Marsden (Pediatrics and Bioengineering), “Computational Methods for Personalized Medicine in Cardiovascular Disease”

July 12

Thomas Südhof (Molecular & Cellular Physiology), “How to wire a neural circuit: Initial approaches to a difficult problem”

Karen Parker (Psychiatry & Behavioral Sciences), “Novel approaches for detecting and treating autism”

Anson Lee (Cardiothoracic Surgery), “Multidisciplinary Approach to Treating Arrhythmia”

July 19

Edward Graves (Radiation Oncology), “Migration of Tumor and Immune Cells”

Maria Barna (Genetics and Developmental Biology), “Specialized Ribosomes: A New Frontier in Gene Regulation, Organismal Biology, & Evolution”

Liqun Luo (Biology), “TRAPing active neurons”

July 26

Creed Stary (Anesthesiology, Perioperative & Pain Medicine), “MicroRNAs in Cerebral Ischemia”

Carolyn Bertozzi (Chemistry), “Tuberculosis diagnostics powered by chemistry”

Helen Bronte-Stewart (Neurology & Neurological Sciences), “Brain and movement in Parkinson's disease melding a background in Dance and Neuroscience”

August 2

Joseph Woo (Cardiothoracic Surgery), “The Fusion of Biology, Engineering, and Surgery in Treating Cardiovascular Disease”

Helen Blau (Microbiology & Immunology), “Building muscles by juvenating muscle stem cell function”

Peter Jackson (Microbiology & Immunology), “Before neurons: sensory and metabolic signaling in primary cilia”

August 9

Anthony Oro (Dermatology), “Cells as Drugs for Incurable Diseases”

Marc Levenston (Mechanical Engineering), “See it Squish: Using Medical Imaging to Study Cartilage Deformation *In Vivo*”

Ian Gotlib (Psychology), “Understanding and Reducing Risk for Depression”

August 16

Ivan Soltesz (Neurosurgery), “Organization and Control of Hippocampal Networks”

Stephen Quake (Bioengineering and Applied Physics), “Single Cell Genomics”

Karl Deisseroth (Bioengineering and Psychiatry & Behavioral Sciences), “Nature's gift: how the discovery of structural principles in a microbial protein helped illuminate the pathophysiology of psychiatry”

August 23

Gerlinde Wernig (Pathology), “The unifying mechanism of fibrotic diseases”

Tanya Stoyanova (Radiology), “Defining new biomarkers and therapies for prostate cancer”

Kim Butts Pauly (Radiology), “Blood Brain Barrier Opening with MRI Guided Focused Ultrasound”

August 30

Lucy O'Brien (Molecular & Cellular Physiology), “Gutting to the truth of the matter: Life and death in the *Drosophila* intestine”

Anne Brunet (Genetics), “Understanding and modeling aging”

Justin Annes (Medicine—Endocrinology), “Developing a regenerative therapeutic for diabetes”

Stanford Bio-X Undergraduate Summer Research Program Alumni:

Alumni of the program are extremely successful. They have gone on to pursue doctorates and medical degrees all over the world, published in high-impact journals, and accepted exciting positions in industry and beyond.



2013 cohort Helena Scutt sailing with her partner, Paris Henkel, during the 2016 Olympics

Nick Davis, 2010 and 2012 cohort (pictured at right), will be completing a PhD in Biological Engineering at MIT in the fall of 2017. Nick also leads a consulting group that serves pre-IPO and growth-stage biotech and life science companies in Boston, New York and San Francisco. So far, this group has helped over three dozen teams solidify their IP estates, access equity financing, and foster productive commercial partnerships.



Jenelle Wallace, 2011 cohort (left, photo courtesy Harvard MCB Graphics), is now a 4th year PhD student at Harvard in the Molecules, Cells, and Organisms program. Jenelle recently received an NIH F31 NRSA fellowship to fund her last two years of graduate school.

Zahra Harati Taji, 2012 and 2013 cohort (right), graduated with a M.Sc. in Chemistry from the University of Zurich. Next, she started working in business development at a pharmaceutical company specializing in vaccines. Her chemistry research background greatly enhances her ability to represent the company, as an important part of her position is communicating about science and research.



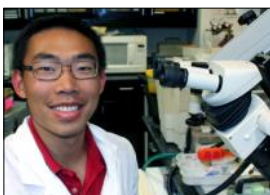
Helena Scutt, 2013 cohort, and her sailing partner qualified for the Rio 2016 Olympics, finishing 10th overall. Helena then returned to Stanford to finish her Master's in Mechanical Engineering and will soon be training to prepare for the 2020 Olympics. Helena now sails a type of boat which hydrofoils—the technical development and engineering involved unite Helena's passions for sailing and science.



Eric Lopez, USRP 2014 cohort (pictured at left), is currently in the MD program at UCSF School of Medicine, planning to eventually specialize in neurology. Eric is also working on a historical investigation of mental health policy in California, and an ethnography of patients with amnesia secondary to autoimmune encephalitis. Next, Eric aims to start clinical research in neuroimmunology.



Bora Erden, 2015 cohort (pictured at right with Dr. William Newsome), was selected as a winner of the Firestone Medal for Excellence in Undergraduate Research for his thesis in Dr. Newsome's lab, which was based on his Stanford Bio-X USRP research.



Michael Chen, 2016 cohort (pictured at left), is currently a junior at Stanford studying Chemistry and is planning to pursue an MD-PhD. Michael recently received the Goldwater Scholarship, and a paper from his Bio-X USRP research was published in *Neuron* in May of 2017. Michael says the Bio-X USRP played a major role in his decision to pursue a career in medical research.

2017 Stanford Bio-X Undergraduate Summer Research Program Participants:

Michelle Bach, Science, Technology, & Society

Supported by: Bio-X

Mentor: Paul Bollyky, Medicine (Infectious Diseases) and Microbiology & Immunology



Chronic endobronchial infection with *Pseudomonas aeruginosa* (Pa) is present in the majority of patients with cystic fibrosis (CF) and is associated with decreasing lung function and increased morbidity and mortality. Through the Bio-X USRP, Michelle will help investigate the links between the levels of a virus that infects Pa and clinical outcomes in CF. The results of this work will inform potential efforts to use virus levels as predictors for pulmonary exacerbation and to guide antibiotic choices in Pa infection in high-risk patients with CF.

Ankit Baghel, Computer Science

Supported by: Bio-X

Mentor: Philip Beachy, Developmental Biology and Biochemistry



The Sonic hedgehog (Shh) signaling protein expressed in brainstem neurons has an unexpected but critical role in maintenance and regeneration of taste receptor cells in taste buds on the tongue. Ankit's project will explore how Shh from brain stem neurons controls taste receptor cell regeneration by using a tagged version of Shh to track its long-range movement along axons to the taste receptor cells on the tongue.

Rishi Bedi, Computer Science

Supported by: Bio-X

Mentor: Ron Dror, Computer Science



An important question to address in drug development is how to accurately predict the three-dimensional conformation that proteins will adopt when forming a complex with each other. A protein's importance is conferred by its ability to interact with other molecules (especially other proteins), and understanding the exact interaction conformation is a prerequisite to rationally designing drugs. Rishi will leverage recent machine learning advances in deep neural networks to "learn" the features of likely protein interactions from a large publicly available dataset, the Protein Data Bank.

Sarah Bell, Human Biology

Supported by: Bio-X

Mentor: Allan Reiss, Psychiatry & Behavioral Sciences and Radiology



Sarah's research will involve the evaluation of a novel intervention to improve executive function (EF) in children with Attention Deficit Hyperactivity Disorder (ADHD). There are many school-aged children in the US with ADHD—some reports estimate as many as 1 in 10—and it is therefore a costly burden on the US health-care system. Through the Bio-X USRP, Sarah will be working to evaluate the effect of a targeted intervention (involving cognitive rehabilitation and neurofeedback) that enhances the neural networks subserving executive functions in ADHD in order to treat the underlying disorder.



Ian Hull, 2015 cohort, completed his Stanford Bio-X summer research training in Dr. Tom Südhof's lab

Alisha Birk, Bioengineering
Supported by: Anonymous Donor
Mentor: Sharon Pitteri, Radiology



Alisha is investigating small molecule drugs that are potent against breast cancer cell lines using quantitative proteomics technology. She will compare treated and untreated cells to identify which proteins have altered levels in the treated cells. The experiment is being conducted to gain a deeper understanding of what proteins and pathways these drugs are targeting, in order to design more potent analogs that will ultimately be more successful in killing breast cancer cells.

Alexandra Bourdillon, Computer Science
Supported by: Bio-X



Mentor: Joseph Woo, Cardiothoracic Surgery

On the path to building completely autonomous surgical robots, Alexandra's Bio-X USRP project will explore the challenge of building a simulated surgical environment using computer visualization and graphics. In this virtual environment, she will test motion planning algorithms to execute surgical tasks.

Ryan Buchanan, Biomechanical Engineering
Supported by: Anonymous Donor



Mentor: Creed Stary, Anesthesia, Perioperative & Pain Medicine

Astrocytes protect the brain against injury. Ryan will be comparing astrocytes from two regions of the brain—one that is resistant to low blood flow, and one that is vulnerable—to develop new treatments to protect the brain from injury.

Tucker Burnett, Chemistry
Supported by: Anonymous Donor



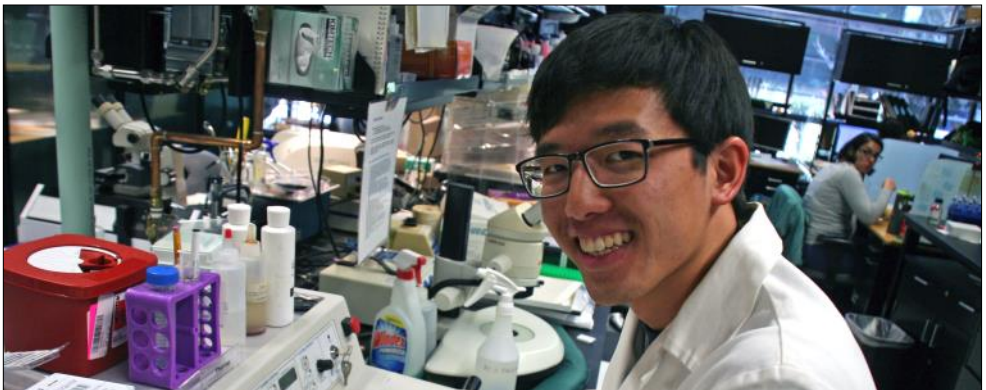
Mentor: Ronald Davis, Biochemistry and Genetics

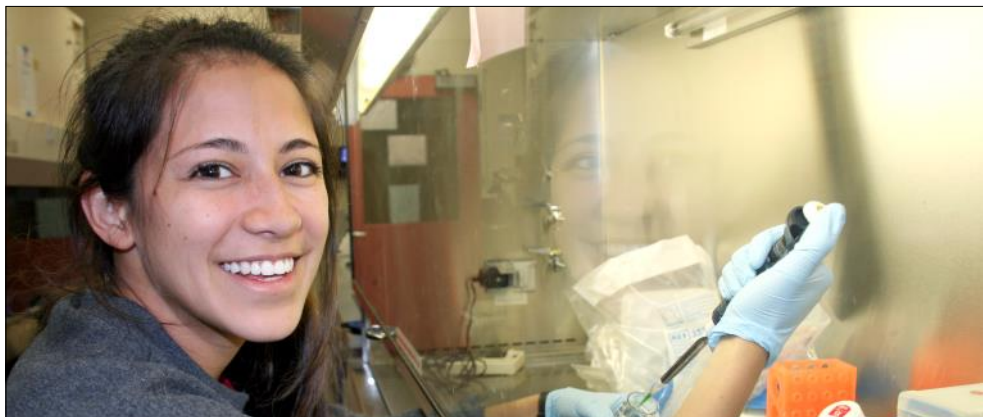
With the development of CRISPR-Cas9 mediated gene editing technology, the world of scientific and medical research has been given an incredibly powerful tool. Tucker will be optimizing a new high throughput editing system for improved efficiency and mismatch tolerance using high fidelity CRISPR systems. Higher fidelity genetic engineering will ensure the safety and reproducibility of these editing systems as they are employed at ever larger scales. An understanding of the fidelity of these CRISPR systems will help ensure that only the intended genomic changes are made.

Tae-León Butler, Human Biology
Supported by: Anonymous Donor
Mentor: Kathleen Sakamoto, Pediatrics



Tae's research explores the dynamics of cell signaling pathways involved in induction or production of leukemias. Specifically, she will be analyzing biological assays and real-time reverse transcriptase PCR to investigate how cellular transcription factor CREB-inhibiting small molecules can be utilized in an effective, less toxic therapy for Acute Myeloid Leukemia.





Alexandra Bourdillon, 2017 cohort, completed her Stanford Bio-X summer research training in Dr. Joseph Woo's lab

Sharon Chen, Biology

Supported by: Anonymous Donor

Mentor: Anne Brunet, Genetics



Frontotemporal Lobar Degeneration (FTLD) is a protein aggregation-associated neurodegenerative disease. The probability of developing FTLD increases with age. Sharon's project focuses on examining the regulation of lysosomal transmembrane protein TMEM106B, a gene identified in a genome-wide association study to have protective effects against FTLD. Sharon will investigate the role of TMEM106B in proteostasis and healthy cognitive aging by studying TMEM106B in the brain of the newly pioneered model organism African Turquoise Killifish.

Isaac Cinquini, Computer Science

Supported by: Anonymous Donor

Mentor: Alistair Boettiger, Developmental Biology



The expression state of a gene is determined by the interaction of regulatory sequences distributed along the chromosome. The packaging of the chromosome in the three-dimensional volume of the cell's nucleus places constraints on this communication, and thus understanding the spatial organization of the genome is key to understanding gene expression. Zack will extend existing super-resolution microscopy techniques to study these interactions in single cells with substantially finer spatial and genomic resolution than achievable with current technology.

Kendall Costello, undeclared

Supported by: Bio-X

Mentor: Liqun Luo, Biology



Memories are vital to our everyday existence, and yet little is known about their specific neuronal basis. Using a new technology in the Luo Lab, Kendall's research will investigate the relationship between the prefrontal cortical neuronal circuits active during fear-induced learning and those involved in memory recall weeks later. Then, through a combination of optogenetics and viral-genetic tracing, Kendall plans to develop a more precise mapping of the neuronal circuits underlying long-term fear memories, which will be useful for better understanding PTSD, anxiety, and other stress-related mental health disorders.

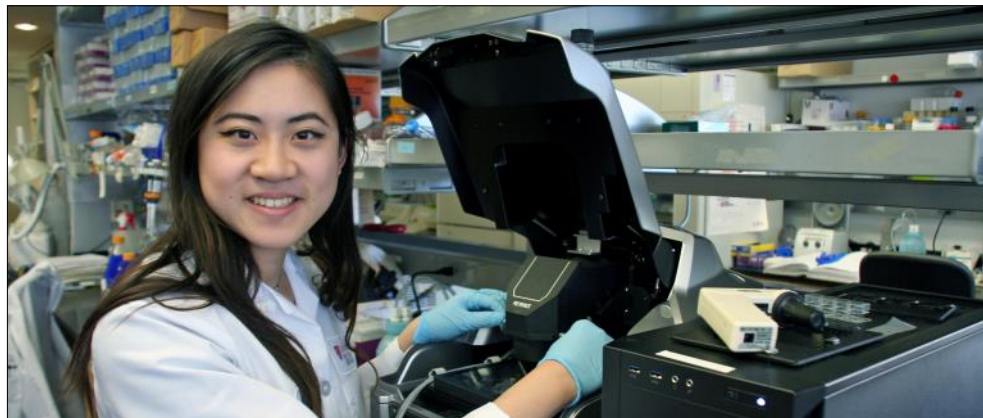
Cole Deisseroth, Computer Science

Supported by: Anonymous Donor

Mentor: Gill Bejerano, Developmental Biology, Computer Science, and Pediatrics



Currently, the Bejerano lab has an effective Mendelian-disease-diagnosing tool, but it still has room for improvement. Cole is working on improving the tool's knowledge base by finding a way to efficiently search the web for papers that discuss pathogenic Single Nucleotide Variants (SNVs), and loading them into the system to improve future diagnoses.



Helen Liu, 2017 cohort, completed her Stanford Bio-X summer research training in Dr. Helen Blau's lab

Jorge Delgado, Biology

Supported by: Anonymous Donor

Mentor: Anthony Norcia, Psychology



Transcranial Alternating Current Stimulation (TACS) may offer a novel approach to treating amblyopia, or lazy eye, through activation of mechanisms in the brain that underlie its ability to change. Jorge's project will examine the extent to which electrical stimulation of specific visual responses offers a potential treatment for lazy eye by first showing whether TACS can modulate visual responses in adults with normal vision.

Eleanor Frost, undeclared

Supported by: Vice Provost for Graduate Education

Mentor: Michelle Monje, Neurology



Eleanor is working in Dr. Michelle Monje's lab to investigate the effects of epileptic seizures on cognition. Epilepsy patients often show cognitive impairment, but the mechanisms are not well understood. Eleanor is investigating seizure-induced nerve damage in an epileptic rat model and exploring if optogenetically-induced seizures decrease myelin plasticity.

Scarlett Guo, Human Biology

Supported by: Vice Provost for Undergraduate Education

Mentor: Frederick Chin, Radiology



Fragile X syndrome is a neurodevelopmental disorder caused by a mutation in the FMR1 gene. The disorder is characterized by abnormal body features and sensitivity to stimuli as well as intellectual, emotional, and behavioral disabilities. Through a competitive binding experiment and combined PET and MRI imaging on an established fragile X syndrome mouse model, Scarlett aims to develop a non-invasive imaging method potentially transferrable to human imaging to investigate the developmental physiology of the GABAergic neurotransmitter system at a critical stage of neurodevelopment and the onset of fragile X syndrome.

David Hsu, Biology

Supported by: Anonymous Donor

Mentor: Euan Ashley, Medicine (Cardiovascular), Genetics, and Biomedical Data Science



A genome wide association study (GWAS) is a powerful tool to discover genetic variants responsible for a specific disease or heritable trait. For this project, a GWAS will be conducted on approximately 120,000 individuals who have undergone a submaximal exercise test to determine novel genetic loci that could be responsible for increased aerobic fitness. These loci could be utilized to prescribe exercise over medicine, create a drug that mimics the benefits of exercise, and elucidate the relationships between physical activity and other diseases.



James Hu, Bioengineering

Supported by: Anonymous Donor

Mentor: Sean Wu, Medicine (Cardiovascular)

Clinical attempts at myocardial tissue grafting have shown limited success due to the insufficient vascularization and poor control on the scaffold structure. James is utilizing the 3D bioprinting of iPSC-derived cardiomyocytes, endothelial cells, and biomaterials to create and test various vascular network designs in order to address these challenges. The proposed research could establish design principles that lead to the creation of the first 3D bioprinted, patient-specific, vascular myocardium, which can be broadly applicable to other tissues and organs.



Akshay Jaggi, undeclared

Supported by: Bio-X

Mentor: Sandy Napel, Radiology

When will computer vision surpass human vision? It's happening right now: at Google, at Tesla, and right here at Stanford Bio-X. Using novel machine learning algorithms, Akshay is training computers to determine the malignancy of indeterminate lung tumors. Currently, radiologists cannot accurately classify these nodules, but, by going beyond human vision, these algorithms will aid doctors in making crucial clinical decisions.



Mika Jain, Physics and Computer Science

Supported by: Anonymous Donor

Mentor: Stephen Quake, Bioengineering and Applied Physics

Mika is interested in developing precision measurement tools for probing the dynamics of gene regulation at the single-molecule and single-cell level. To do so, he intends to leverage precision measurement techniques from applied physics. Such tools have the potential to answer questions in both fundamental biology and medicine.



Ketan Jain-Poster, Biology

Supported by: Anonymous Donor

Mentor: Steven Chang, Neurosurgery

Cerebral arteriovenous malformations (AVMs) are poorly understood, yet potentially devastating lesions of cerebral vasculature that can lead to high feeding artery pressures, venous drainage, and other hemodynamic abnormalities such as hemorrhages, migraines, or seizures. Using an endothelial cell tube-formation assay that is currently well-established in the lab for studying tube formation and vessel dilation during development, Ketan will work to quantify and describe the relationship between the microenvironment and abnormal vasculature development present in the progression of AVMs, as well as develop an *in vitro* model for studying the disease.



Jorge Delgado, 2017 cohort, completed his Stanford Bio-X summer research training in Dr. Anthony Norcia's lab

**Tiffany Jiang, Biology and Music****Supported by: Anonymous Donor****Mentor: Paul Khavari, Dermatology**

Mutations in proteins responsible for controlling signaling pathways drive cancer development. In particular, RAS GTPases are the most frequently mutated oncogene family in human cancer. By characterizing the role of novel interactors in RAS activation and their effect on signaling inhibition, Tiffany will identify potential new treatment targets in RAS-driven cancers.

**Yong-hun Kim, Computer Science****Supported by: Bio-X****Mentor: Gerlinde Wernig, Pathology**

Yong-hun is researching the pathways in idiopathic pulmonary fibrosis. Focusing on the gene c-Jun, which is required for fibrosis proliferation, he will study the activation status of signaling networks in dissociated mouse lungs over time in response to c-Jun expression and its subsequent deletion using CRISPR/Cas9. Understanding how the signaling network is activated will help in studies working to inactivate the network of pulmonary fibrosis.

**Hee Joo Ko, Human Biology****Supported by: Bio-X****Mentor: Josef Parvizi, Neurology**

Utilizing the superior temporal and spatial resolution of intracranial electrocorticography (ECoG) data and a unique three-task experimental paradigm, Hee Joo aims to gain a more comprehensive understanding of the effects of race on face processing. She will be measuring ECoG signals directly from the fusiform face area, a region in the human visual system that is specialized for facial recognition, as human subjects view own-race and other-race faces under different task conditions.

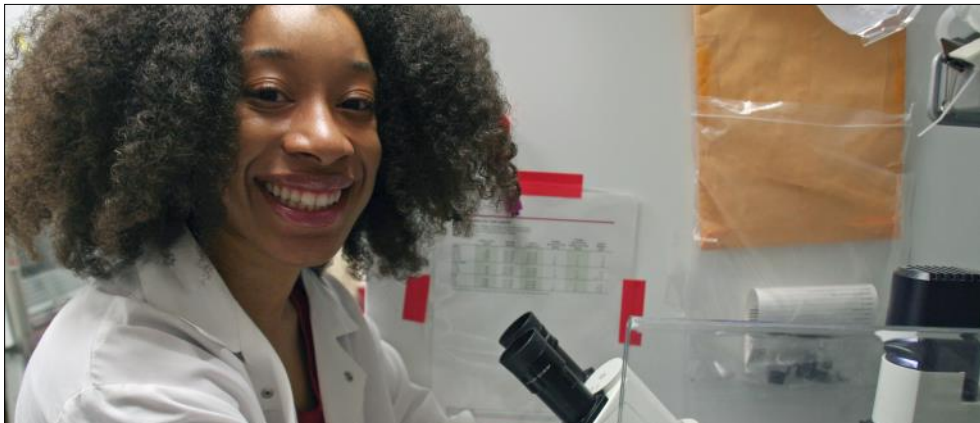
**Pallavi Krishnarao, Biology****Supported by: Bio-X****Mentor: Maria Barna, Genetics and Developmental Biology**

In order to effectively study translational regulation in the context of embryonic development *in vivo*, there is a need to develop a method to quickly and gently isolate small populations of cells. Pallavi will develop such a method by immunoprecipitating (immunopanning) cells marked by a versatile, exogenous cell-type specific surface marker.

**Jason Li, Computer Science and Biology****Supported by: Bio-X****Mentor: Thomas Südhof, Molecular & Cellular Physiology**

Astrocytes, a type of non-neuronal cell, are hypothesized to have a critical role in the formation, specification, and regulation of synapses. The goal of Jason's project is to identify novel proteins that mediate the interaction between astrocytes and the pre- and post-synapse, which will in turn elucidate the underlying mechanisms regarding the role of astrocytes in synapse development.





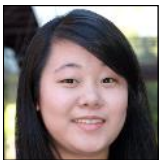
Kamina Wilkerson, 2017 cohort, completed her Stanford Bio-X summer research training in Dr. Carolyn Lee's lab

Cindy Liu, undeclared

Supported by: Bio-X

Mentor: Stephen Skirboll, Neurosurgery

Using a novel live cell array technology, nearly 300 cell surface markers have been screened to determine the 12 best candidate positive markers that may identify cancer stem cells in human glioblastoma (GBM). Cindy will use 2 classic *in vitro* validation studies to help determine which of these 12 top markers have higher propensity for forming tumors. Cindy will also use the assays to study combinations of the top 2-4 markers to determine which combination best identifies the critical cancer stem cell subpopulations in GBM.

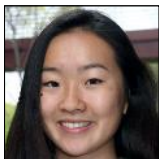


Elisa Liu, Bioengineering

Supported by: Bio-X

Mentor: Fan Yang, Orthopaedic Surgery and Bioengineering

Glioblastoma represents one of the most common brain cancers, yet effective therapies remain elusive as tumor cell phenotypes are poorly understood. Elisa is working on a platform that uses a 3D gradient hydrogel which can provide a high-throughput screening of how tumor microenvironment affects cell behavior. The platform offers the opportunity to study the physiological behavior of tumor cells and provide a system for studying potential novel treatments.



Helen Liu, undeclared

Supported by: Bio-X

Mentor: Helen Blau, Microbiology & Immunology

Many of the receptors that regulate cell fate and self-renewal are G-protein coupled receptors (GPCRs). Discovering drugs for muscle repair is challenging because it has been difficult to discover drugs for cell fate regulating GPCRs. To overcome this issue, Helen will develop an innovative new system to create a library of single variable chain antibodies (nanobodies) that will be able to target GPCR as agonists to the receptors and may also lead to other novel treatments.



Hannah Llorin, Human Biology

Supported by: Bio-X

Mentor: William Talbot, Developmental Biology

Oligodendrocytes and Schwann cells are supportive cells that produce the myelin sheath around axons in the nervous system. Cyclic adenosine monophosphate (cAMP) is a messenger that regulates differentiation of these cells, which affects proper development of axons. Using zebrafish as a model organism, Hannah will investigate the function of cAMP by using fluorescent tagging and observing myelin sheath development around the axon and gene expression at various stages of development. A better understanding of the disruption of myelin has important implications for diseases such as multiple sclerosis (MS) and peripheral neuropathy.



Alexander Lu, Biomedical Computation

Supported by: Bio-X

Mentor: Alison Marsden, Pediatrics and Bioengineering



Kawasaki disease is the leading cause of acquired heart disease during childhood in developed countries, with complications such as coronary artery aneurysms that present risk of heart attack and sudden death. While current determination of an individual's risk looks mainly at aneurysm size, it may be more informative to look at blood flow through the aneurysm. Alex will address this hypothesis by generating patient-specific blood flow models with a patient's imaging data that may then non-invasively guide clinical decisions. Simulation results will be compared with clinical outcome data.

Jonathan Mak, Electrical Engineering

Supported by: Vice Provost for Undergraduate Education

Mentor: Anson Lee, Cardiothoracic Surgery

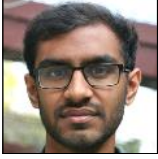


Jonathan is creating a portable medical device to study those who suffer from post-operative atrial fibrillation, an illness that is characterized by abnormal heart beats and can lead to stroke. Jonathan hopes to utilize the data from the device to properly learn how to treat this illness as well as to find out more about this uninvestigated area of medicine.

Anoop Manjunath, Biology and Economics

Supported by: Bio-X

Mentor: Irving Weissman, Developmental Biology, Pathology Stem Cell Institute



Prostate cancer metastasizes to the bone with the help of CDCPI, a surface protein shared by hematopoietic stem cells (HSC), which allows cancer cells to colonize the HSC niche. Anoop is investigating the effectiveness of a CDCPI antibody in preventing the growth and spread of metastatic prostate cancer. He also aims to understand the effect of the antibody on tumor-associated immune cells by applying novel RNA sequencing techniques to treated and untreated models.

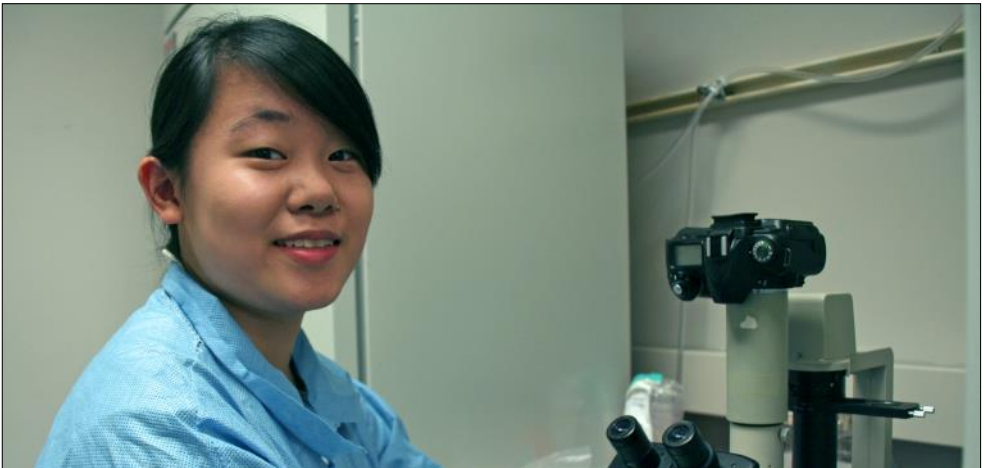
Michael Mariscal, Human Biology

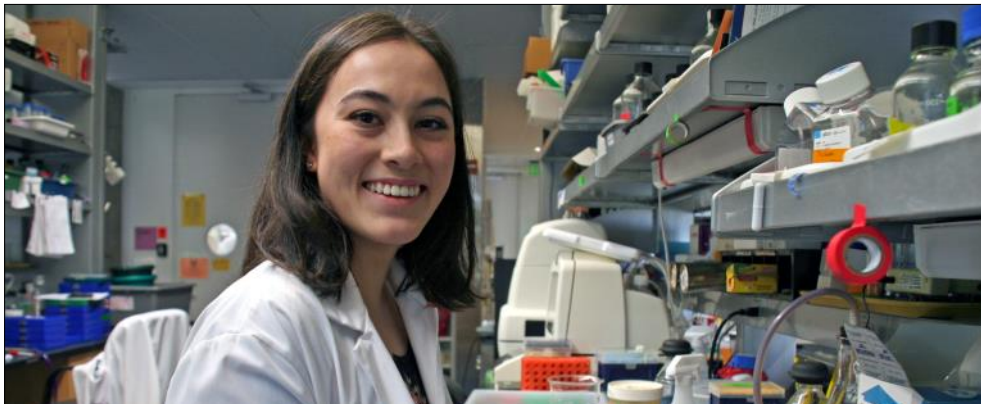
Supported by: Bio-X

Mentor: Karen Parker, Psychiatry & Behavioral Sciences



A part of the Parker Lab's research efforts is testing children with autism spectrum disorder (as well as typically developing children) for contagious yawning or laughter. Michael's research will test whether children with autism spectrum disorder exhibit diminished contagious yawning and laughter responses, and how social neuropeptides oxytocin and vasopressin affect these contagion responses.





Clare Moffatt, 2017 cohort, completed her Stanford Bio-X summer research training in Dr. Laura Attardi's lab

Sarah Matsunaga, Human Biology

Supported by: Bio-X

Mentor: Anthony Wagner, Psychology



Flexible planning for the future is critical for achieving beneficial health, educational, social, and financial outcomes; however, under acute stress, prospective thought is impaired. Sarah will examine whether these impairments are solely caused by glucocorticoid effects of stress acting on neural regions involved in memory and cognitive control, or by divided attention induced by the stressor. These insights will provide a neuroscientific framework for understanding the precise mechanisms underlying the profound impacts that stress can have on prospective planning and behavior.

Maxwell Melin, Biology

Supported by: Bio-X

Mentor: Thomas Südhof, Molecular & Cellular Physiology



Essential tremor is the most common movement disorder, but our understanding of this disease is still very primitive. Max's project seeks to locate the brain region(s) responsible for the tremor phenotype in mouse models lacking the synaptotagmin 2 protein. He is utilizing several neuroscience techniques, including rodent surgery, cryosection, microscopy, and behavioral testing.

Taylor Merkel, Biology

Supported by: Bio-X

Mentor: Tony Wyss-Coray, Neurology



While recent headlines have lauded young blood as the "fountain of youth," the ability of aged blood plasma to induce brain aging is an equally interesting phenomenon. Taylor hopes to further elucidate the exact mechanism by which aged blood plasma affects neuron formation in the hippocampus, focusing in particular on vascular cell adhesion molecule 1 (VCAM1) as a mediator of crosstalk between blood and brain tissues. This knowledge could be the key to mitigating the impact of memory loss, Alzheimer's disease, and other neurodegenerative diseases in an ever-growing elderly population.

Clare Moffatt, Biology

Supported by: Bio-X

Mentor: Laura Attardi, Radiation Oncology and Genetics



The transcription factor p53 is critical in suppressing tumorigenesis in humans and mice. The Attardi lab has used affinity purification and mass spectrometry to identify novel transcriptional co-repressors of mouse p53, and one of these is the protein Spen, which is known as a negative regulator of cancer signaling pathways. Clare will be validating the interactions between p53 and Spen using co-immunoprecipitation assays and then determining how Spen may function as a co-repressor of p53 target gene expression and in tumor suppression through Spen inhibition.

Grace Ng, Symbolic Systems

Supported by: Bio-X

Mentor: Ivan Soltesz, Neurosurgery

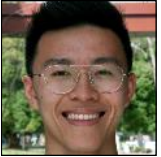


The dentate gyrus area of the hippocampus plays an important role in memory and behavior, and should be represented in computational models of the brain. Using the NEURON simulation environment, Grace's research project aims to construct a computational model of granule cells in the dentate that accurately represents the input-output transformations performed in the mammalian dentate gyrus. This model can then be integrated into a full network model of the dentate to study learning and memory in the hippocampus, as well as the cognitive deficits associated with diseases like epilepsy.

Sang Ngo, Biology

Supported by: Bio-X

Mentor: Lucy O'Brien, Molecular & Cellular Physiology



In healthy organs, a network of differentiated cells—collectively called the 'niche'—directs stem cells on when to properly divide. When stem cells become tumorigenic, they stop listening to directions given by their niche; currently, little is known about how this mechanism works. Using the fruit fly intestinal tract as a model, Sang is looking at how manipulating key factors in the cell division pathway influences tumor development.

Cindy Nguyen, Bioengineering

Supported by: Anonymous Donor

Mentor: Lei Stanley Qi, Bioengineering and Chemical & Systems Biology



Cindy is investigating the role that the three-dimensional organization of the human genome plays in regulating gene expression. She will be using CRISPR/dCas9 technology, a catalytically dead version of the CRISPR genomic editing system, to study the functional consequences of gene repositioning and the potential for developing a tool for long-term transcriptional control in human cells.

Kira Oskirko, Psychology

Supported by: Bio-X

Mentor: Ian Gotlib, Psychology



Puberty is a time of dramatic and important changes. Neurologically, puberty is marked by an increase in cortical thickness followed by a period of thinning, likely due to synaptic pruning. More aggressive pruning has been associated both with depressed children and with girls who are characterized by high levels of sex hormones during puberty; however, there has been little research examining the neural basis of suicidal ideation, a critical precursor of suicidal behaviors and attempts. Kira will examine trajectories of cortical thickness over puberty in a sample of girls characterized by high levels of suicidality and their low-suicidal peers.





Ashley Utz, 2017 cohort, completed her summer research training in Dr. Carolyn Bertozzi's lab



Enoch Park, Human Biology

Supported by: Vice Provost for Undergraduate Education

Mentor: Calvin Kuo, Medicine (Hematology)

Modeling cancer *in vitro* offers a strong tool to study pathways and identify and test new therapies in gastric cancer. Enoch will be developing novel methodologies through which the ErbB2 mutation in gastric cancers can be modeled in tissue cultures and explore how acquiring this mutation specifically alters normal gastric tissue.



Jennifer Parker, Biology

Supported by: Bio-X

Mentor: Anthony Oro, Dermatology

The overarching goal of this project is to understand chromatin dynamics in tissue engineering of skin for the scalable production of personalized, genetically corrected skin sheets for patients with the debilitating disease Epidermolysis bullosa. The lab has previously published the Therapeutic Reprogramming method, and, now, Jennifer aims to detail high-fidelity lineage commitment by detailing the transcription factor network and its interactions.

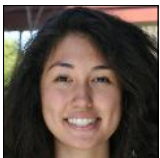


Jordan Parker, Psychology

Supported by: Bio-X

Mentor: Helen Bronte-Stewart, Neurology

Jordan will be investigating the role of augmented reality as a tool for teaching Parkinson's Disease patients to regain rhythmicity in their movement. This disease deteriorates one's capacity for coordinated, complex movements, and Jordan will be exploring how the augmented reality component in the Moving Through Glass program (developed for Google Glass in collaboration with Dance for PD and the Mark Morris Dance Group) could use external timing mechanisms to compensate for the loss of internal timing in PD patients.



Tess Rinaldo, undeclared

Supported by: Bio-X

Mentor: Theo Palmer, Neurosurgery

Mutations in genes implicated in Autism Spectrum Disorder (ASD) may be linked to changes in cortical thickness in ASD individuals. Tess's project investigates cell proliferation in fetal mouse brains that have one of two different gene mutations. Studying the neurological effects of certain gene mutations in embryonic mice models may offer critical insight into potential ASD pathways and their neurological effects.

Julia Schulz, Bioengineering

Supported by: Bio-X

Mentor: Lars Steinmetz, Genetics



Protein phosphorylation is essential for cellular process, and deregulation in phosphorylation networks is linked to the progression of cancer. Julia's project will utilize massively parallel genome editing, which uses CRISPR Cas9 to systematically mutate all phosphosites in the yeast proteome, and assess the phenotypic consequences in a variety of stress conditions. This will help us to understand the functional architecture of cell signaling networks and give insight into how deregulation results in cancer progression.

Maricela Sistos, Biology

Supported by: Bio-X

Mentor: Russell Fernald, Biology



Social rank is important in all social systems, and regulates reproduction. Gonadotropin releasing hormone is the main actor, and the neurons producing this peptide change as a function of status in the animals studied. Maricela will identify how and where these neurons change and how that is regulated at a molecular level.

Gia Soles, Science, Technology & Society

Supported by: Bio-X

Mentor: Rebecca Bernert, Psychiatry & Behavioral Sciences

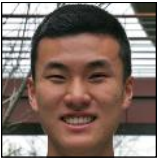


Gia's research investigates sleep as a low-risk intervention for suicide ideation via clinical trials through the study "iSleep: Insomnia Treatment for Improved Well-Being". The study is an open label suicide prevention clinical trial which aims to test the therapeutic impact of a brief behavioral insomnia treatment on suicidal behaviors.

Austin Su, undeclared

Supported by: Vice Provost for Undergraduate Education

Mentor: Tanya Stoyanova, Radiology

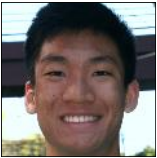


Austin is studying how gene deregulation could lead to the development of prostate cancer. Specifically, he is working with mouse models to investigate the role of the glycosyltransferase GCNT1 in prostate cancer initiation.

Daniel Tang, undeclared

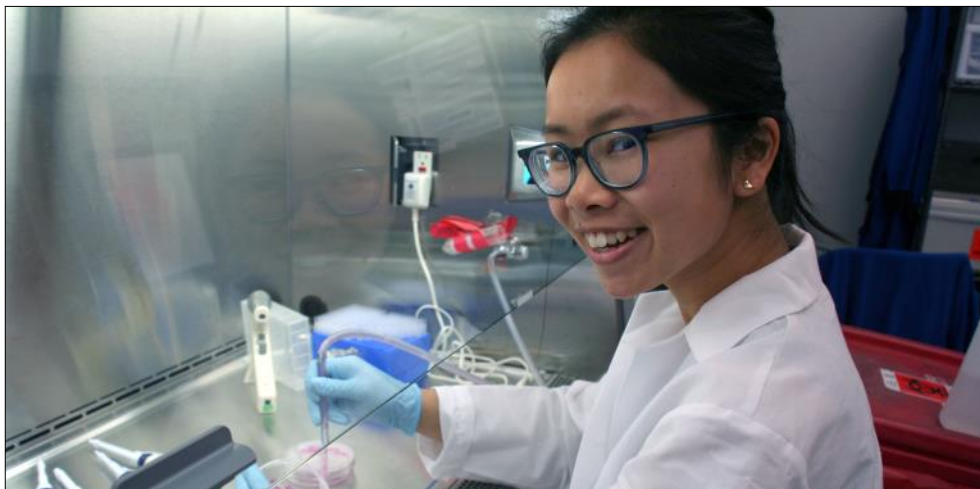
Supported by: Bio-X

Mentor: Karl Deisseroth, Bioengineering and Psychiatry & Behavioral Sciences



Daniel is investigating how individual groups of neurons respond to specific stimuli over time by studying shock-responsive neurons in the medial prefrontal cortex. The biggest challenge that Daniel will address is the capability to permanently label the neurons so that they can be reexamined at later time points without losing intensity. By implementing techniques from molecular biology, optics, and imaging, including the CLARITY technique developed in the Deisseroth lab, Daniel will be using an activity-dependent labeling system to bring better understanding to shock-responsive neurons in the medial prefrontal cortex.





Cindy Nguyen, 2017 cohort, completed her Stanford Bio-X summer research training in Dr. Stanley Qi's lab



Nicole Ticea, Bioengineering

Supported by: Bio-X

Mentor: Liqun Luo, Biology

Nicole's project will use synthetic biology to develop new genetic methods for accessing and manipulating neurons. These efforts will help us gain insights into how populations of neurons process information and drive behavior.

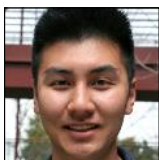


Bruce Tiu, Biology

Supported by: Vice Provost for Undergraduate Education

Mentor: Kathleen Sakamoto, Pediatrics

The Ribosomal S6 Kinase (RSK) has been linked to the proliferation of acute myeloid leukemia, and efforts at targeting RSK have had differential effects on normal and leukemic cells. Bruce will work to characterize the role of RSK in the myeloid development of normal hematopoietic cells. This project seeks to better profile important players in myelopoiesis and study signaling pathways downstream of RSK that may be appropriate for future therapeutics.



Kevin Tran, undeclared

Supported by: Vice Provost for Undergraduate Education

Mentor: Melanie Hayden-Gephart, Neurosurgery

Brain metastases which originate from primary thymic tumors currently have limited therapies. Using next generation sequencing technologies, Kevin aims to discover the unique thymic tumor mutations that predispose some patients to develop brain metastases. By comparing genes of thymic tumors that lead to brain metastases to those that cause metastases outside of the CNS, Kevin can better understand the genetic basis of thymic brain metastases and find new targets for treatment.

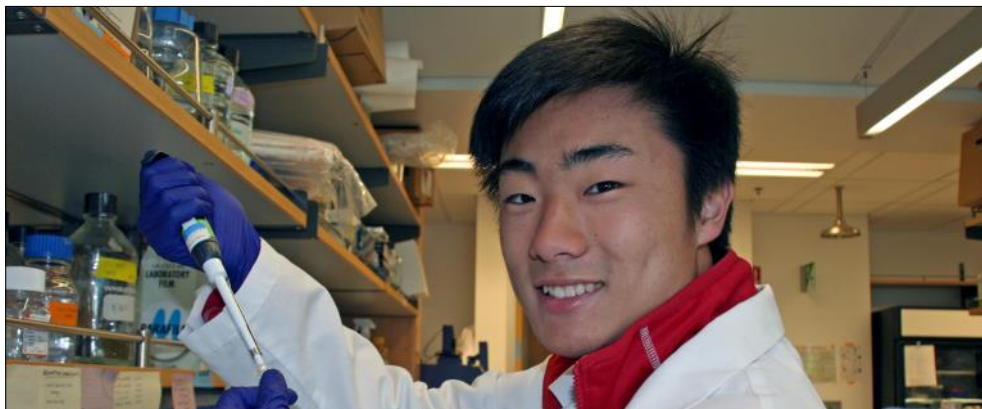


Ashley Utz, Biology

Supported by: Bio-X

Mentor: Carolyn Bertozzi, Chemistry

There is a critical need for point-of-care diagnostic tools that rapidly and selectively label *Mycobacterium tuberculosis*, the causative agent of tuberculosis. Ashley will be developing new environment-sensitive small molecule tools that can only be metabolized by *M. tuberculosis*, allowing detection of this specific bacterium in biological samples. She will be optimizing the tools' biophysical properties and pharmacokinetics to not only diagnose but also study infection in humans and live model organisms.



Enoch Park, 2017 cohort, completed his Stanford Bio-X summer research training in Dr. Calvin Kuo's lab

Jonathan Wang, Computational Biology

Supported by: Bio-X

Mentor: Edward Graves, Radiation Oncology

Jonathan is working to determine the role macrophages play in tumor recurrence following radiotherapy. He is setting up several models observing macrophage migration after irradiation, and analyzing the effect these have on tumor cell recruitment and recurrence. This research may shed light on the mechanisms behind radiation therapy and tumor recurrence, helping researchers to discover potential clinical solutions and more effective post-radiotherapy treatments.



Alan Wei, Biology

Supported by: Bio-X

Mentor: Carla Shatz, Biology and Neurobiology

Memories are stored at synapses, and if mechanisms driving the loss and extensive pruning of synapses known to occur in Alzheimer's Disease (AD) were understood, then this devastating disease could be halted or even reversed. The aim of Alan's project is to study the role of a neuronal receptor, PirB, in synapse pruning during normal developmental critical periods and in the adult mouse cerebral cortex. These experiments should expand our understanding of how PirB receptor works in mice, and may even aid in translating the results to Alzheimer's disease in human patients.



Ashley Westerfield, undeclared

Supported by: Bio-X

Mentor: Katja Weinacht, Pediatrics

Reticular Dysgenesis (RD) is one of the most serious forms of severe combined immunodeficiency (SCID) because it affects both innate and adaptive immunity. The disease is characterized by arrested neutrophil maturation, excess lymphocytes in the blood, and hearing loss. It disproportionately affects infants and children unless immune reconstitution is achieved by stem cell transplantation. Ashley will analyze how *in vitro* derived stem cells can model this disease and contribute toward possible treatment for the disease.



Kamina Wilkerson, Human Biology

Supported by: Bio-X

Mentor: Carolyn Lee, Dermatology

Kamina is exploring the clinical and histological characteristics of Squamous Cell Carcinoma, the second most common cancer worldwide, that are most predictive of poor survival outcomes. Patients with metastasized tumors will be sequenced in the hopes of finding mutations that better predict clinical outcomes. Candidate mutations will then be further studied for impacts on cell growth, migration, and tumorigenesis.





David Wu, undeclared

Supported by: Bio-X

Mentor: Peter Jackson, Microbiology & Immunology and Pathology

David's work is to examine how the Kras oncogene regulates cell migration and adhesion, an important determinant of how cancer cells move within the body. Using proteomic and bioinformatic methods, he is looking for unknown factors that could couple cell migration to tumor metastasis, the deadliest part of cancer progression.



Michelle Xiao, Biomechanical Engineering

Supported by: Bio-X

Mentor: Marc Levenston, Mechanical Engineering

Osteoarthritis (OA) of the knee is a debilitating disease, and degradation of the meniscus during OA compromises its ability to stabilize and distribute load at the knee. Currently, we cannot detect early changes in the meniscus that lead to OA, but Michelle's research will use novel MRI techniques that are sensitive to meniscal changes and combine these results with biochemical and biomechanical testing of the meniscus. This could lead to methods for detecting early osteoarthritic changes non-invasively.



Benjamin Yeh, Bioengineering

Supported by: Vice Provost for Undergraduate Education

Mentor: Justin Annes, Medicine (Endocrinology)

All forms of diabetes, whether Type I autoimmune diabetes or Type II obesity-associated diabetes, are caused by a loss of insulin-producing beta-cells. Ben is trying to determine the three-dimensional crystal structure of an enzymatic drug target bound to an inhibitory small molecule that has been shown in prior studies to have the potential to increase beta-cell replication. If successful, the structural information will be an invaluable tool in guiding synthetic strategies for increasing potency and selectivity for the drug target.

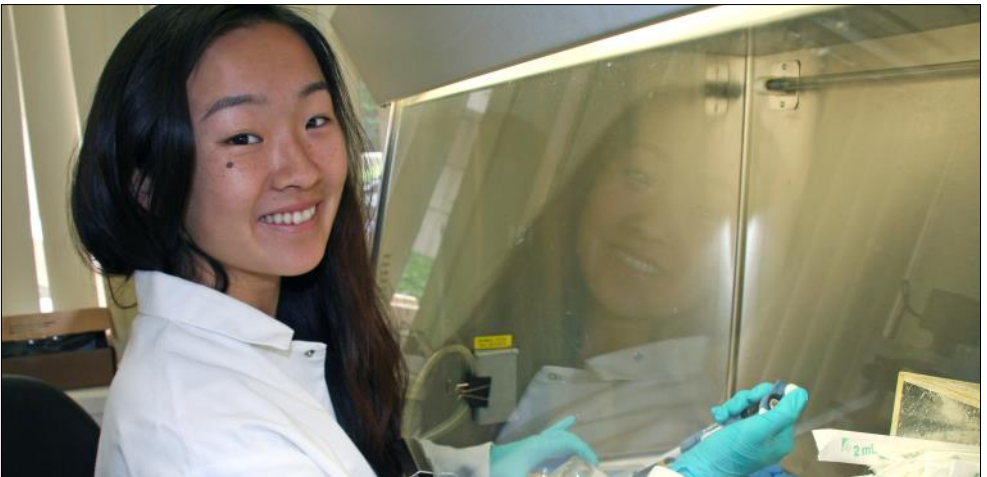


Victoria Yuan, undeclared

Supported by: Bio-X

Mentor: Kim Butts Pauly, Radiology

Antibodies and immunotherapy show promise in shrinking malignant brain tumors. However, the blood brain barrier (BBB), a protective filtration system of blood vessels, only allows molecules of certain sizes to pass, and these antibodies are almost 400 times too large to pass through and attack the tumor. Victoria is exploring the application of focused ultrasound to open the BBB for antibody transport, then analyzing the activity of antibodies as they target brain tumors.



Elisa Liu, 2017 cohort, completed her Stanford Bio-X summer research training in Dr. Fan Yang's lab



Sophia Zhang, Biology

Supported by: Bio-X

Mentor: Joseph Wu, Medicine (Cardiovascular) and Radiology

One of the most common genetic heart diseases in the nation is familial hypertrophic cardiomyopathy (HCM), in which there is a thickening of the heart muscle. Sophie is studying the pathogenicity and molecular basis for functional defects of a mutation in a gene implicated in HCM causation. The project demonstrates the clinical significance of the mutation and the value of genome editing technology in disease modeling and personalized medicine, and may also lead to better diagnostic and therapeutic modalities for patients with HCM.



Audrey Zhu, Chemical Engineering

Supported by: Vice Provost for Undergraduate Education

Mentor: Sarah Heilshorn, Materials Science & Engineering

Migration of cancer cells is known to correlate with extracellular matrix (ECM) stiffening; however, much of the research to date has not been able to monitor cancer progression in real time due to the use of destructive mechanical testing. Audrey is developing a novel approach that combines non-destructive soft-matter characterization with insights from polymer physics, cell biology, and mechanobiology to study the interplay between tumor progression and ECM dynamics.

2017 Stanford Bio-X Undergraduate Summer Research Program Honorary Fellows:

These outstanding USRP alums also acted as mentors for the new cohort.

Isabel Goronzy, Chemistry

Mentor: Steven Boxer, Chemistry



Envelope viruses, such as influenza, spread rapidly to cause worldwide epidemics and are challenging to treat, with few effective antivirals available. For these pathogens, infection begins when individual viruses bind and enter host cells, an event that depends on multiple host receptor-viral ligand interactions facilitated by the dynamic reorganization of these binding partners on both the viral and host cell surface. Isabel will develop a new methodology based on single molecule fluorescence and fluorescence interference microscopy to track the movement of biomolecules such as viral proteins on highly curved lipid surfaces. With these new techniques, Isabel hopes to elucidate critical steps in the virus-host binding interaction, introducing viral membrane dynamics as a therapeutic target.



Aris Kare, Bioengineering

Mentor: Lei Stanley Qi, Bioengineering and Chemical & Systems Biology

Aris is using the CRISPR-Cas9 system to study gene-editing mechanisms in Huntington's disease iPSCs. He is particularly interested in finding an allele-specific therapy to delay the onset of the disease. Ultimately, he hopes to quantify editing efficiency while finding optimal conditions for CRISPR-Cas9 therapies.



Persiana Saffari, Electrical Engineering

Mentor: Jonathan Pollack, Pathology

Ameloblastomas are rare tooth bud tumors in humans, but are remarkably common in dogs, where we have shown the dog tumors carry the same cancer driving mutations. Persiana proposes to create cell culture models from readily-available canine ameloblastomas, and then use these cells to determine the most effective cancer drugs, which will later be evaluated in living dogs and humans. The findings will benefit both humans and canines with ameloblastoma.

2017 Poster Titles - presented August 24, 2017

“Antibodies Against Pf Phage Prevent *Pseudomonas aeruginosa* Wound Infections by Promoting Phagocytosis”

Michelle Bach¹, Jolien Sweere¹, Heather Ishak¹, Gina Suh¹, Paul Bollyky¹
Department of Medicine (Division of Infectious Diseases¹), Stanford University

“Visualizing Neuronal Release of Sonic Hedgehog in Taste Receptor Cell Regeneration”

Ankit Baghel¹, Wan-Jin Lu¹, Philip Beachy^{1,2,3}
Department of Biochemistry², Institute for Stem Cell Biology & Regenerative Medicine¹, and Howard Hughes Medical Institute³, Stanford University

“Deep Learning-Driven Protein-Protein Docking”

Rishi Bedi¹, Raphael Townshend¹, João Rodrigues², Ron Dror¹
Departments of Computer Science¹, and Structural Biology², Stanford University

“NIRS Neurofeedback for Improving Executive Function in Children with ADHD”

Sarah Bell¹, Hadi Hosseini¹, Allan Reiss¹
Department of Psychiatry & Behavioral Sciences¹, Stanford University

“Elucidating the Biological Targets and Pathways of Novel Drugs in Breast Cancer”

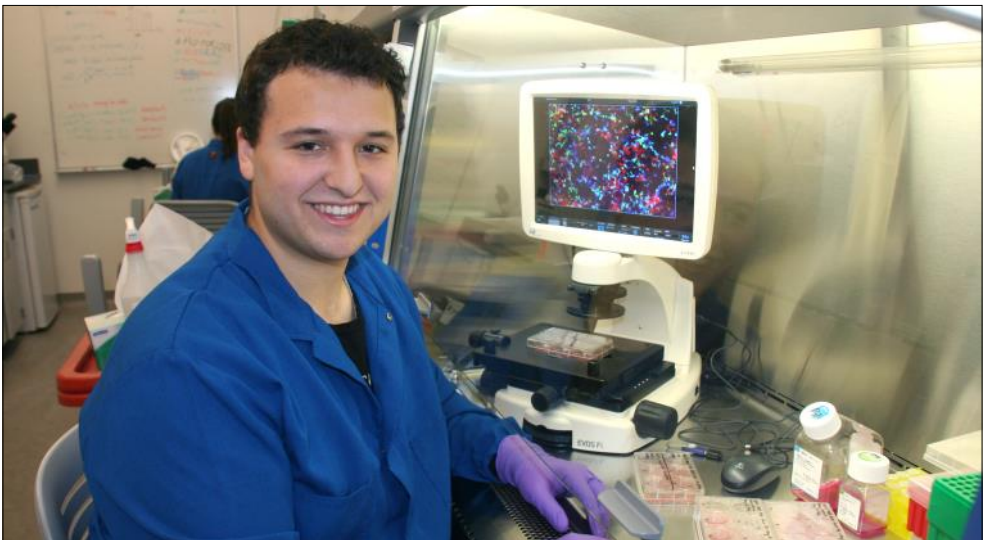
Alisha Birk¹, Catherine Going¹, Vineet Kumar², Sanjay Malhotra², Sharon Pitteri¹
Departments of Radiology¹, and Radiation Oncology², Stanford University

“Early Steps Towards Automating Surgical Tasks Through Physics and Soft-Body Simulation”

Alexandra Bourdillon¹, Animesh Garg², Hanjay Wang¹, Jack Boyd¹, Marco Pavone³, Joseph Woo¹
Departments of Cardiothoracic Surgery¹, Computer Science², and Aeronautics & Astronautics³, Stanford University

“MicroRNA Regulation of Neuronal Mitochondrial Function During Oxidative Stress”

Ryan Buchanan¹, Anand Rao¹, Georgia Kaidonis¹, Xiaoyun Sun¹, Creed Stary¹
Department of Anesthesia¹, Stanford University



“Dissecting Mechanisms of Drug Action by Structure-Function Mapping with CRISPR Saturation Editing of Amino Acids”

Tucker Burnett¹, Kevin Roy², Justin Smith^{2,3}, Maddison Morgan⁴, Julia Schulz⁵, Kevin Orsley⁶, Lars Steinmetz², Bob St. Onge³, Ron Davis^{2,3}

Departments of Chemistry¹, Genetics², Biochemistry³, and Bioengineering⁵, Stanford University; Department of Biology⁴, Middlebury College; Department of Biology⁶, Emmanuel College

“Targeting CREB for Novel AML Therapies”

Tae-León Butler^{1,2}, Justin Chan^{1,2}, Hee-Don Chae^{1,2}, Kathleen Sakamoto^{1,2}

Departments of Pediatrics¹, and Medicine (Division of Hematology/Oncology)², Stanford University

“Aging-Induced Neurodegeneration in the African Turquoise Killifish”

Sharon Chen¹, Andrew McKay¹, Anne Brunet²

Departments of Biology¹ and Genetics², Stanford University

“Optimizing Super-Resolution Microscopy to Visualize Chromatin Conformation of Cis-Regulatory Elements During Development”

Zack Cinquini¹, Leslie Mateo², Alistair Boettiger²

Departments of Computer Science¹ and Developmental Biology², Stanford University

“The Consolidation of Memory: An Analysis of Cortical Circuits Involved in Remote Memory Retrieval”

Kendall Costello¹, Laura DeNardo¹, Cindy Liu¹, Eliza Adams¹, Will Allen¹, Liqun Luo^{1,2}

Department of Biology¹ and Howard Hughes Medical Institute², Stanford University

“Automatic Phenotype Extraction from Medical Records”

Cole A. Deisseroth¹, Johannes Birgmeier¹, Jonathan A. Bernstein², Gill Bejerano¹

Departments of Developmental Biology¹ and Pediatrics², Stanford University

“Modulating Visual Sensitivity with Transcranial Electrical Stimulation”

Jorge Delgado¹, Guillaume Riesen¹, Molly Lucas², Anthony Norcia¹

Departments of Psychology¹ and Neuroscience², Stanford University

“Impact of Recurrent Seizures on Myelin Plasticity in a Rat Model of Absence Epilepsy”

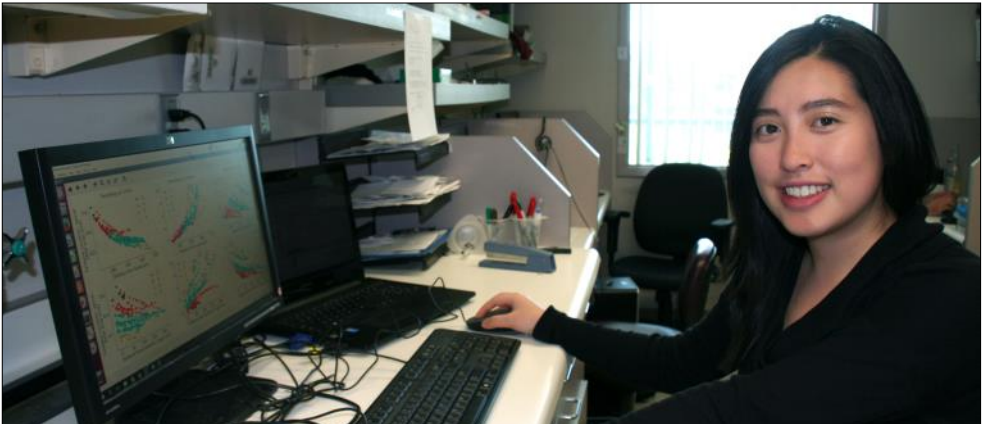
Eleanor Frost¹, Juliet Knowles¹, Michelle Monje¹

Department of Neurology & Neurological Sciences¹, Stanford University

“Multimodal Imaging of the FMRI Knockout Mouse: A Model of Fragile X Syndrome”

Scarlett Guo¹, Samantha Reyes¹, Bin Shen¹, Shawn Scatliffe¹, Jun Hyung Park¹, Zheng Miao¹, Jessa Castillo¹, Sanaz Mohajeri¹, Meng Gu¹, Christoph Leuze¹, and Frederick T. Chin¹

Department of Radiology¹, Stanford University



“Genetic Determinants of Physical Activity”

David Amar³, Daryl Waggott³, David Hsu^{1,3}, Anna Shcherbina², Euan Ashley^{2,3}
Department of Biology¹, Program in Biomedical Informatics², and Division of Cardiovascular Medicine³,
Stanford University

“3D Printing of Vascular Architecture for Myocardial Tissue Constructs”

James Hu¹, Vahid Serpooshan¹, Ken Hinh¹, Ryan Ferdowsian¹, Sean Wu^{1,2,3}
Stanford Cardiovascular Institute¹, Institute for Stem Cell Biology & Regenerative Medicine², and Department of Medicine (Division of Cardiovascular Medicine³), Stanford University

“Robust Cancer Image Feature Discovery through Novel Digital Phantoms”

Akshay Jaggi¹, Sebastian Echerday¹, Shaimaa Bakr², Sandy Napel¹
Departments of Radiology¹ and Electrical Engineering², Stanford University

“Single-Cell Ribo-Seq via Affinity Purification”

Mika Jain¹, Stephen Quake²
Departments of Computer Science¹ and Bioengineering², Stanford University

“Characterization of Novel Cell Lines Isolated from Human Brain Arteriovenous Malformations (AVMs)”

Ketan Jain-Poster¹, Lorelei Shoemaker¹, Breanna Allen¹, Steven Chang¹
Department of Neurosurgery¹, Stanford University

“SNARE Proteins as Antagonistic Regulators of KRAS”

Tiffany Jiang^{1,2}, Yonglu Che³, Paul Khavari⁴
Departments of Music¹, Biology², Cancer Biology³, and Dermatology⁴, Stanford University

“c-Jun, a New Player in Regulating Bone Mass, as a Clinical Target for the Treatment of Osteopenic Disease”

Yong-hun Kim^{1*}, Tristan Lerbs^{1*}, Camille Van Neste¹, Gerlinde Wernig¹
(*equal contribution) Department of Pathology¹, Stanford University

“Effects of Categorization on the Other-Race Effect”

Hee Joo Ko¹, Annabelle Tao¹, Jennifer Yih¹, Omri Raccach¹, Josef Parvizi¹
Department of Neurology & Neurological Sciences¹, Stanford University

“Uncovering the Hidden Role of Ribosomes in Mammalian Development”

Pallavi Krishnarao^{1,4}, Gerald Tiu², Maria Barna^{2,3}
Departments of Biology¹, Genetics², and Developmental Biology³ and Symbolic Systems Program⁴, Stanford University

“Identification of Novel Interactions Between Astrocytic Neurexin-1 and Synaptic Ligands”

Jason Li^{1,2}, Justin Trotter³, Thomas Südhof³
Departments of Computer Science¹, Biology², and Molecular & Cellular Physiology³, Stanford University

“Validation Studies of Live Cell Array-Derived Markers to Identify Cancer Stem Cells in GBM”

Cindy Liu¹, Hai Li¹, Stephen Skirboll¹
Department of Neurosurgery¹, Stanford University

“A Novel Method to Fabricate 3D Gradient Hydrogels with Clinically Relevant Dimensions for Cartilage Repair”

Elisa Liu¹, Danqing Zhu¹, Fan Yang^{1,2}
Departments of Bioengineering¹ and Orthopaedic Surgery², Stanford University

“Discovering Agonist Nanobodies to Muscle Stem Cell GPCRS for use as Therapeutic Biologics”

Helen Liu^{1,2,3}, David M. Burns^{1,2,3}, Helen Blau^{1,2,3}
Baxter Laboratory for Stem Cell Biology¹, Department of Microbiology & Immunology², and Institute for Stem Cell Biology & Regenerative Medicine³, Stanford University

“Investigating the Role of Gpr126 and cAMP in Schwann Cells”

Hannah Llorin¹, Mariapaola Sidoli¹, William Talbot¹
Department of Developmental Biology¹, Stanford University

“Patient-Specific Blood Flow Simulations of Kawasaki Disease for Thrombotic Risk Stratification”

Alexander Lu¹, Noelia G. Grande², Alison L. Marsden^{3,4,5}
Departments of Mechanical Engineering², Bioengineering³, Cardiology (Division of Pediatric Cardiology⁵),
Institute for Computational & Mathematical Engineering⁴, and Biomedical Computation Program¹, Stan-
ford University

“Examining Arrhythmogenic Indicators: Advanced Portable Telemetry for Monitoring Post-Operational Atrial Fibrillation”

Jonathan Jia-An Mak¹, Cody Carlton², Miguel Rodrigo³, Joy Aparicio Valenzuela⁴, Xinyuan Zhang⁴, Patrick D. Loftus⁴, Anson Lee⁴
Departments of Electrical Engineering¹, Computational Biology², Cardiovascular Medicine³, and Cardio-
thoracic Surgery⁴, Stanford University

“Investigating the Role of CDPC1 and CD47 in Metastatic Prostate Cancer Immune Evasion and Tumorigenesis”

Anoop Manjunath¹, Gunsagar S. Gulati², Rosalynd Upton², Elly Seo³, Owen Marecic³, Michael Lopez³, Jun Seit⁴, Debashis Sahoo⁵, Anne Leyrat⁶, Michael Gonzales⁶, Norma Neff⁷, Sopheak Sim⁴, Stephen Quake⁷, Michael T. Longaker³, Charles K. F. Chan³, Irving L. Weissman^{8,9}
Departments of Biology¹, Cancer Biology², Surgery³, Bioengineering⁷, Pathology⁸, and Developmental Biology⁹ and Institute for Stem Cell Biology & Regenerative Medicine⁴, Stanford University; Department of Pediatrics⁵, University of California, San Diego; Fluidigm Corporation⁶

“Effect of Intranasal Oxytocin on Contagious Response to Yawning and Laughter in Children with Autism”

Michael G. Mariscal¹, Sophie M. Rose¹, Robin A. Libove², Antonio Y. Hardan², Karen J. Parker²
Departments of Human Biology¹ and Psychiatry & Behavioral Sciences², Stanford University

“Divided Attention’s Effect on Flexible Prospection During Navigation”

Sarah Matsunaga¹, Stephanie Gagnon², Thackery Brown³, Anthony Wagner²
Departments of Human Biology¹ and Psychology², Stanford University; School of Psychology³, Georgia Institute of Technology

“Localizing Origins of the Essential Tremor Phenotype in a Novel Mouse Model”

Max Melin¹, Mu Zhou¹, Thomas C. Sudhof^{1,2,3}
Departments of Molecular & Cellular Physiology¹, Neurology², and Psychiatry & Behavioral Sciences³, Stanford University

“Determining the Role of VCAM1⁺ Brain Endothelial Cells in Mediating Neuroinflammation and Brain Aging”

Taylor Merkel¹, Hanadie Yousef¹, Davis Lee², Tony Wyss-Coray^{1,2}
Department of Neurology & Neurological Sciences¹, Stanford University; VA Palo Alto Health Care System², Palo Alto

“Characterization of the p53 Tumor Suppressor Protein-Protein Interactions Identified by Affinity Purification and Mass Spectrometry”

Clare Moffatt¹, Nitin Raj¹, Nancie Moonie², Janos Demeter², Ahlima Roumane¹, Sara Sakowitz¹, Peter Jackson², Laura Attardi¹
Departments of Radiation Oncology¹ and Microbiology & Immunology², Stanford University

“Novel Parallel Computing Methods for Fitting Neuronal Network Models to Experimental Data”

Grace Ng¹, Aaron Milstein¹, Ivan Raikov¹, Ivan Soltesz¹
Department of Neurosurgery¹, Stanford University

“Appropriation of Tissue Renewal Signals Drives Development of Intestinal Stem Cell Adenomas”

Sang Ngo¹, Jackson Liang², Lucy O'Brien¹

Department of Molecular & Cellular Physiology¹, Stanford University; Genentech, Inc.²

“Human Chromatin Reorganization Using a CRISPR/dCas9-Based Dimerization System”

Cindy Nguyen¹, Haifeng Wang¹, Stanley Qi¹

Department of Bioengineering¹, Stanford University

“Sex Differences in White Matter Tract Development Across Puberty”

Kira Oskirko¹, Tiffany Ho¹, Natalie Colich¹, Ian Gotlib¹

Department of Psychology¹, Stanford University

“Generating *in vitro* Models of HER2 Positive Gastric Cancer from Patient Derived Normal Tissue”

Enoch Park¹, Amanda Mah¹, Calvin Kuo¹

Department of Hematology¹, Stanford University

“Understanding the Roles of AP2A and P63 in Guiding Non-Neural Ectoderm Cell Commitment”

Jennifer Parker¹, Jillian Pattison², Jessica Torkelson², Sandra Carlos², Anthony Oro²

Department of Biology¹ and Dermatology², Stanford University

“The Effect of Augmented Reality on Gait in Parkinson’s Disease”

Jordan Parker¹, Johanna O'Day², Russell Mendonca¹, Chioma Anidi¹, Helen Bronte-Stewart¹

Departments of Neurology & Neurological Sciences¹ and Bioengineering², Stanford University

“The Effects of the Heterozygous 16p11.2 Deletion on Cell Proliferation in the Embryonic Brain”

Tess Rinaldo¹, Brooke Babineau¹, Aditi Narayan¹, Michelle Kielhold¹, Amy Moon¹, Theo Palmer¹

Department of Neurosurgery¹, Stanford University

“Improving the Efficiency of Homologous Recombination in High-Throughput CRISPR Editing in *Saccharomyces cerevisiae*”

Julia Schulz¹, Justin D. Smith^{2,3}, Kevin Roy², Maddison Morgan⁴, Tucker Burnett⁵, Kevin Orsley⁶, Sundari

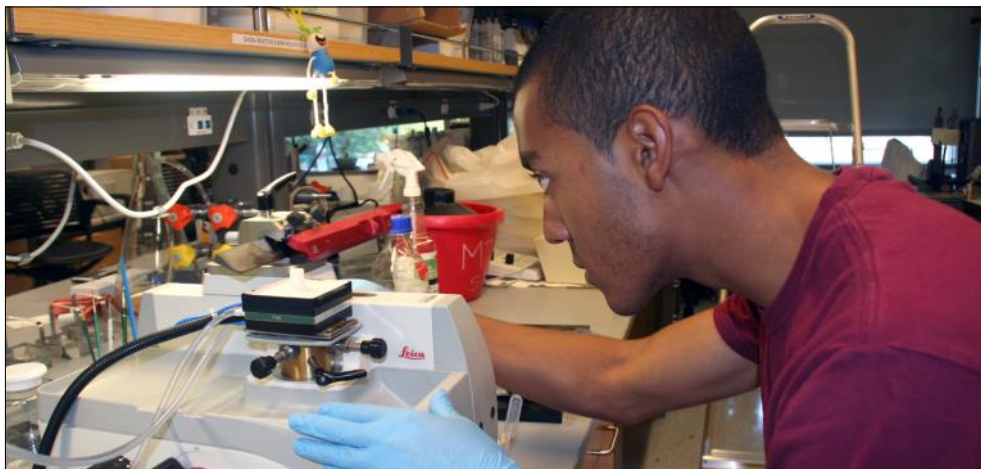
Suresh³, Angela Chu³, Ron Davis^{2,3}, Bob St. Onge³, Lars Steinmetz²

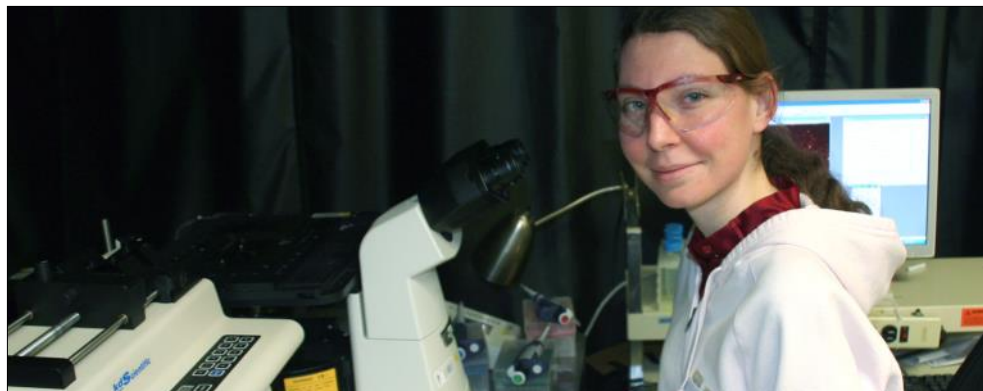
Departments of Bioengineering¹, Genetics², Biochemistry³, and Chemistry⁵, Stanford University; Department of Biology⁴, Middlebury College; Department of Biology⁶, Emmanuel College

“Photogrammetry for Morphological Analysis of African Cichlids”

Maricela Sistos¹, Sebastian Alvarado¹, Russell Fernald¹

Department of Biology¹, Stanford University





2017 honorary fellow Isabel Goronzy completed her Stanford Bio-X summer research training in Dr. Steven Boxer's lab

“Project SERVE: An Insomnia Clinical Trial for Military Veterans”

Gia Paige Soles^{1,2}, Alan F. Schatzberg¹, Steven E. Lindley³, Rebecca Ann Bernert^{1,2}

Department of Psychiatry & Behavioral Sciences¹ and Suicide Prevention Research Laboratory², Stanford University; VA Palo Alto Health Care System³, Menlo Park Division

“The Role of GCNT1 in Prostate Cancer Development”

Austin Su³, En-Chi Hsu¹, Meghan Rice¹, Mark Buckup³, Rosalie Nolley², James Brooks², Donna Peehl², Tanya Stoyanova¹

Departments of Radiology¹, Urology², and Biology³, Stanford University

“Activity-Dependent Investigation of Insular Cortex Circuitry Dynamics”

Daniel Tang¹, Brian Hsueh^{3,4}, Li Ye^{2,5}, Josh Jennings¹, Karl Deisseroth^{1,2,5}

Departments of Bioengineering¹ and Psychiatry & Behavioral Sciences², Neurosciences Program³, Medical Scientist Training Program⁴, and Howard Hughes Medical Institute⁵, Stanford University

“Genetic and Functional Dissection of Neural Circuits: Decoding Motivational Drives”

Nicole Sabina Ticea¹, Ethan Richman², Karl Deisseroth^{1,3}, Liqun Luo⁴

Departments of Bioengineering¹, Psychiatry & Behavioural Sciences³, and Biology⁴ and Neurosciences Program², Stanford University

“Inhibition of the Ribosomal S6 Kinase Causes Cell Cycle Arrest and Apoptosis in Acute Myeloid Leukemia Cells”

Bruce Tiu¹, Hee-Don Chae¹, Ritika Dutta¹, Kathleen Sakamoto¹

Department of Pediatrics¹, Stanford University

“The Role of Reactive Astrocytes in the Surrounding Microenvironment of Brain Metastases”

Kevin Tran¹, Sophia Chernikova¹, Ian Connolly¹, Eli Johnson¹, Bina Kakusa¹, Lina Khoeur¹, Yingmei Li¹, Dina Polyak¹, Melanie G. Hayden Gephart¹

Department of Neurosurgery¹, Stanford University

“Synthesis of Solvatochromic Probes to Label the Mycobacterial Cell Wall”

Ashley Utz¹, Samantha G. L. Keyser^{2,4}, Mireille Kamariza¹, Aidan Pezacki^{3,4}, Carolyn R. Bertozzi^{4,5}

Departments of Biology¹ and Chemistry⁴ and Howard Hughes Medical Institute⁵, Stanford University; Department of Chemistry², University of California, Berkeley; Departments of Chemistry & Biomolecular Sciences³, University of Ottawa, Canada

“Effects of Tumor Irradiation on Circulating Macrophage Localization”

Jonathan Wang¹, Laura Barnes¹, Stavros Melemenidis¹, Luis Soto², Edward Graves¹

Department of Radiation Oncology¹ and Cancer Biology², Stanford University

“Developmental Expression of the Non-Classical MHC1 Qa-I, a Regulator of Visual Plasticity”

Alan Y. Wei¹, Ioana A. Marin¹, Kylie S. Chew¹, Carla J. Shatz^{1,2}
Departments of Biology¹ and Neurobiology², Stanford University

“Tissue-Restricted Redundancy of Adenylate Kinases 1 and 2 Explains SCID-Phenotype in Reticular Dysgenesis (AK2 Deficiency)”

Ashley Westerfield¹, Avni Awani¹, Katja Weinacht¹
Department of Pediatrics¹, Stanford University

“Understanding the Role of the Gene C2orf54 in the Epidermal Differentiation Process”

Kamina Wilkerson¹, Angela Peralta¹, Dane Sessions¹, Carolyn Lee¹
Department of Dermatology¹, Stanford University

“How to Feed a Cancer Cell: The KRAS Gene and Macropinocytosis”

David Wu¹, Marcus Kelly^{1,2}, Peter K. Jackson^{1,3}
Departments of Immunology & Microbiology¹ and Cancer Biology² and Baxter Laboratory for Stem Cell Biology³, Stanford University

“T2, T2*, and T1ρ Variations of Cartilage Imaged in Four ex-vivo Environments”

Michelle Xiao¹, Marianne S. Black^{1,2}, Garry E. Gold^{2,3}, Brian A. Hargreaves^{2,3}, Marc E. Levenston^{1,2,3}
Departments of Mechanical Engineering¹, Radiology², and Bioengineering³, Stanford University

“Modeling Kinetics of GLPIR-Mediated Peptide-Based Drug Delivery”

Benjamin Yeh¹, Tim Horton², Justin Annes³
Departments of Bioengineering¹, Chemistry², and Medicine (Division of Endocrinology³), Stanford University

“Kinetics of Contrast Agents Extravasation Across the Blood Brain Barrier After Focused Ultrasound Opening”

Victoria Yuan^{1,2}, Aurea Pascal-Tenorio^{1,2}, Kim Butts Pauly^{1,2}
Department of Radiology¹ and Radiological Sciences Laboratory², Stanford University

“Investigating NAA10 Mutation-Based Cardiac Dysfunction Using Human iPSC Disease Modeling”

Sophia Zhang¹, Ning Ma¹, Joseph Wu¹
Department of Medicine (Stanford Cardiovascular Institute¹), Stanford University

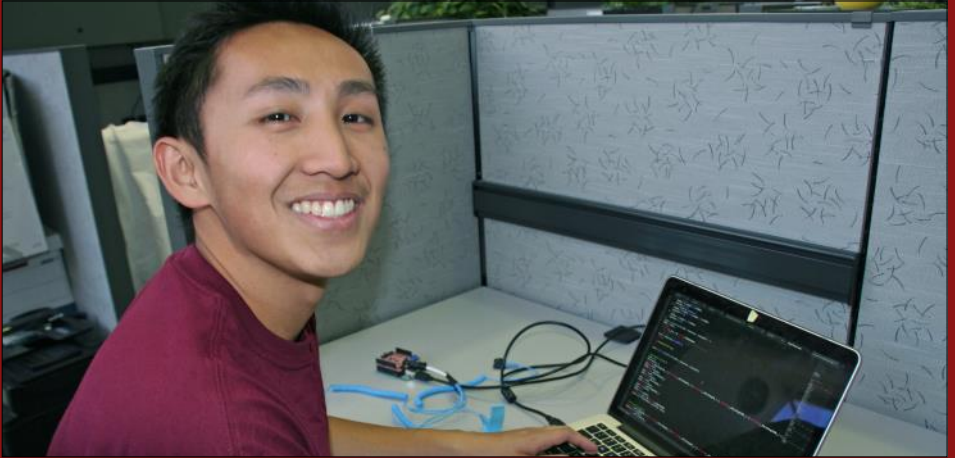
“Multi-Scale Matrix Mechanics in Breast Cancer Models Revealed by Dynamic Light Scattering Microrheology: At the Intersection of Biology and Polymer Physics”

Audrey Zhu¹, Brad Krajina¹, Sarah Heilshorn²
Departments of Chemical Engineering¹ and Materials Science & Engineering², Stanford University



2015 Undergraduate Summer Research Program (USRP) Participants

Stanford Bio-X Undergraduate Summer Research Program



Jonathan Mak, 2017 cohort, completed his summer research training in Dr. Anson Lee's lab

<https://biox.stanford.edu>

To learn more, please email us at:

contact-biox@stanford.edu



2015 Stanford Bio-X Undergraduate Summer Research Program (USRP) Participants