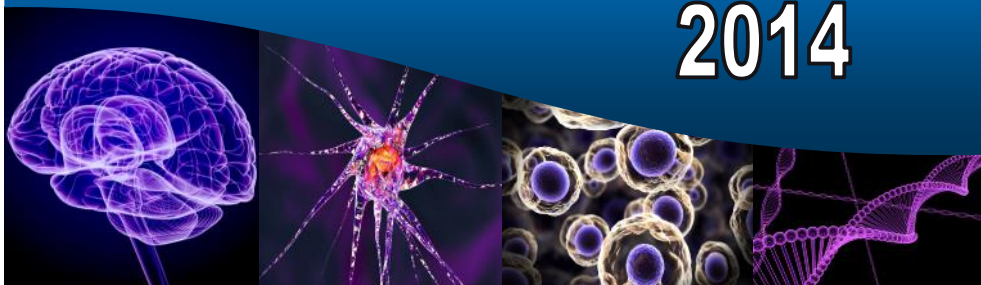


BIO-X

Undergraduate Summer Research Program



2014



Bio-X Undergraduate Summer Research Program



For the past 9 years, the Bio-X Undergraduate Summer Research Program (Bio-X USRP) has offered Stanford students an exciting opportunity to experience interdisciplinary research and to interact with the Stanford scientific community in a variety of ways. The Bio-X USRP awardees gain valuable knowledge and experience throughout the ten-week program by: conducting their own research project under a Bio-X affiliated faculty mentor, attending weekly faculty talks which broaden their exposure to research across the university, and presenting their summer project during a poster session at the conclusion of their ten weeks. Since 2005, 306 awardees and 176 faculty members have participated in the program. Students conduct hands-on research, learn how to carry out experiments in the laboratory, develop the skills to read and analyze scientific literature, and present the results of their summer research experience to the Stanford scientific community and the public.

A unique component of the Bio-X Undergraduate Summer Research Program is the Undergraduate Research Talk series. Each week, Faculty talks delivered by the Faculty mentors expose the students to a variety of scientific fields and enrich their summer research experience. In addition, the talks offer the students an opportunity to hear more about the broad range of research within Stanford, to meet faculty in a variety of scientific fields, and to meet each other as potential future collaborators and colleagues. In 2014, students listened to 39 Faculty members discuss new areas of research which they may not otherwise have encountered in the course of their own projects, enhancing their interdisciplinary experience and learning about the diversity of research conducted at Stanford. An invaluable resource, these talks have also been made available online to the entire Stanford community: <https://biox.stanford.edu/research/undergraduate-research>

The awards are made through an application process available to any Bio-X affiliated faculty across campus (over 650 Faculty are affiliated with the Bio-X program), and all Stanford undergraduates are eligible to apply. Student awardees receive a stipend equivalent to ten weeks of research work, while their mentors receive support for their laboratory. To date, 306 awardees have been given the opportunity to participate in the Bio-X Undergraduate Summer Research Program.

Funding for the support of our undergraduate summer research program was provided by generous contributions from the Dean of Research, an anonymous donor, the Vice Provost for Undergraduate Education and The Office of Undergraduate Advising and Research (VPUE/UAR), The Rose Hills Foundation, Pitch and Catherine Johnson, Burroughs Wellcome Fund, and Bio-X.

In 2014, we supported 65 participants, the largest group of undergraduate students in the history of the Bio-X Undergraduate Summer Research Program.



Undergraduate Summer Research Program Participants 2014

Bio-X Undergraduate Summer Research Program



2014 Bio-X Undergraduate Research Talks given by Stanford Faculty:

June 25

Margaret Fuller "Control of Proliferation and Differentiation in an Adult Stem Cell Lineage"

Edward Graves "Effects of Radiation on Tumor Cell Migration"

Geoffrey Gurtner "Stem Cells and Wound Healing"

July 2

Joy Wu "Bone and Blood: How the Skeleton Controls Blood Cell Production"

Anthony Wagner "Imaging Human Memories: Understanding the Mechanisms of Learning and Remembering"

Alfred Spormann "Unusual Microbes"

Alexandria Boehm "Sunlight Inactivation of Waterborne Pathogens"

July 9

Lars Steinmetz "Extensive Diversity in the Transcriptional Output of Genomes"

Carla Shatz "New Synapses in Old Brains?"

Rajat Rohatgi "The Connections between Cancer and Development"

Daria Mochly-Rosen "What Does Translational Research Mean?"

July 16

Thomas Sudhof "Neurexins and the Molecular Logic of Neural Circuits"

Paul Bollyky "Translational Immunology and Immunoengineering"

Marc Levenston "Improving Repair of Articular Cartilage Defects"

Lucy Shapiro "The Architecture of a Bacterial Cell Cycle in Time and Space"

July 23

David Prince "Prophylaxis of Posttraumatic Epilepsy"

Julien Sage "Reversing Evolution to Enhance Regeneration"

Bianxiao Cui "Tracking Cargo Transport in Neurons"

Emilie Cheung "Rotator Cuff Tears"

July 30

Sharon Pitteri "Molecular Approaches for Cancer Early Detection"

Audrey Ellerbee "Optical Coherence Tomography: Technology and Applications"

Russ Fernald "Social Control of the Brain"

Jeffrey Glenn "Translating Molecular Virology into Novel Antiviral Therapies"

August 6

Michelle Monje "Neuron-glial Interactions in Development and Disease"

Marius Wernig "Reprogramming Fibroblasts to Neurons"

Anne Brunet "Mechanisms that Regulate the Aging Process"

Giles Plant "Stem Cell Transplantation to Repair the Injured Spinal Cord"

August 13

Daniel Madison "Fundamental Synaptic Circuitry: Plasticity and Disease"

Alan Cheng "Regeneration of Inner Ear Sensory Organs"

Kevin Wang "Unlocking Royal Secrets from the Queen"

Manish Butte "Immunology and Mechanobiology"

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August 20

Mindie Nguyen "Epidemiology/Outcome Research in Viral Hepatitis and Liver Cancer: What We Do and How Students Can Participate"

Daniel Jarosz "Quantitative Analysis of the Evolving Genotype-to-Phenotype Map"

Roeland Nusse "Stem Cells and Tissue Maintenance"

Sean Wu "Stem Cells in Heart Development and Regeneration"

August 27

Upi Singh "Discovering Novel Aspects of Pathogenesis in the Protozoan Parasite *Entamoeba histolytica*"

Atul Butte "Translating a Trillion Points of Data into Therapies, Diagnostics, and New Insights into Disease"

Stephen Skirboll "A Novel Live Cell Antibody Array to Identify Cancer Stem Cells in Glioblastoma"

Euan Ashley "Genomic Medicine"



Undergraduate Summer Research Program Participants 2011

2014 Program Participants:



Aristos Athens, Biomechanical Engineering

Supported by: *Bio-X*

Mentor: *Marc Levenston, Mechanical Engineering*

Aristos's research in Dr. Levenston's lab examines the effects of using lysyl oxidase in conjunction with photo-chemical bonding to integrate pieces of cartilage. This work can potentially lead to treatments for arthritis and joint trauma.



Tatum Banayat, Bioengineering

Supported by: *Bio-X*

Mentor: *Daria Mochly-Rosen, Chemical & Systems Biology*

Tatum Banayat's research in Dr. Mochly-Rosen's lab is investigating the effect of rationally designed peptides from glucose-6-phosphate dehydrogenase on inhibiting the inactivation of G6PD by tumor suppressor p53. Several conditions are impacted by G6PD deficiency, including hemolytic anemia, kernicterus, and jaundice.



Alex Bautista, English

Supported by: *Bio-X*

Mentor: *Gary Steinberg, Neurosurgery*

Alex's research in Dr. Steinberg's lab focuses on the effects of optogenetic neuronal stimulation, which is a technique that utilizes light-activated microbial proteins in order to stimulate or inhibit specific cell types with millisecond scale temporal precision. Specifically, he is using the optogenetic technique to stimulate the contralesional cerebellar dentate nucleus in order to enhance neuronal plasticity and promote functional recovery after stroke.



Lance Bettinson, Chemical Engineering

Supported by: *Bio-X*

Mentor: *Joy Wu, Medicine (Endocrinology)*

Lance is investigating the utility of parathyroid hormone (PTH) as a potential treatment of metastatic bone disease. In particular, he is performing various transwell migration assays to study the effects of PTH on the chemotactic invasion/migration of metastatic breast tumor cells to osteoblasts.



Maheetha Bharadwaj, Biology

Supported by: *Bio-X*

Mentor: *Michael Snyder, Genetics*

Maheetha aims to identify the extent of allele specific translation and to explore the role of differences in expression of translation regulatory proteins, bringing us closer to the ability to link genetic information to phenotypic impact, specifically in relation to human disease.



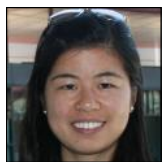
Kiana Brown, Biology

Supported by: *Bio-X*

Mentor: *Carla Shatz, Biology and Neurobiology*

Kiana Brown's research in Dr. Shatz's lab investigates the effects of the soluble protein PirB on synaptic plasticity in the mouse brain and its use as a potential therapeutic for Alzheimer's disease.

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Anna Cai, Biology and Chinese

Supported by: Bio-X

Mentor: Firdaus Dhabhar, *Psychiatry & Behavioral Sciences*

Anna's research in the Dhabhar lab will explore the relationship between the body's psychological and physiological states. This summer, she will be investigating the effects of chronic stress on the production and activity of various cells of the immune system.

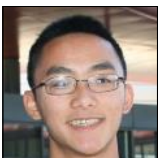


Matthew Callahan, Chemistry and Chemical Engineering

Supported by: Bio-X

Mentor: Justin Du Bois, *Chemistry*

Matt Callahan's research in the Du Bois lab focuses on placing light-sensitive caging groups on the neurotoxin saxitoxin, which will assist in the creation of a tool that understands the complex function of Na_v (voltage-gated sodium channel) subtypes in pain sensation.

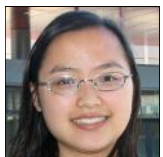


Brian Do, Biology

Supported by: Bio-X and Burroughs Wellcome Fund

Mentor: Howard Chang, *Dermatology*

Brian Do's research in the lab of Dr. Chang focuses on discovering conditions that significantly alter gene expression programs in cells. Specifically, he is identifying mechanisms that contribute to the transcription and stability of noncoding RNAs as a gene class. Noncoding genes are important because their misregulation broadly impacts cellular function, often leading to disease states. Brian is integrating both computational and wet-lab approaches in his analyses.



Rachel Do, Biology

Supported by: Dean of Research

Mentor: Dean Felsher, *Medicine (Oncology and Pathology)*

Rachel is characterizing changes in the tumor microenvironment associated with regression and relapse of MYC-driven tumors. Her research specifically focuses on the effect of the immune response on angiogenesis and senescence.



Andrea Fisher, Biology

Supported by: Dean of Research

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

Andrea Fisher is using behavioral and brain MRI data collected from the same children over a twelve-year period for Dr. Allan Reiss's Early Childhood/School Age Longitudinal Fragile X study, in order to investigate differences in subcortical brain volumes and behavioral characteristics between children with Fragile X syndrome and non-Fragile X syndrome children exhibiting Autism Spectrum Disorder. Her research focuses on the relationship between early amygdala development and demonstrations of social interest later in life.



Nick Flores, Biology

Supported by: Dean of Research

Mentor: Sean Wu, *Medicine (Cardiovascular Medicine)*

Nick is using cardiac stem cells to investigate the molecular regulation of cardiac progenitor cells by the gene Yin Yang 1 (YY1) *in vivo* and *in vitro*. This research will contribute to the knowledge of cardiac lineage commitment, which is crucial for devising successful therapies in congenital heart disease and regenerative medicine.

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Larry Ge, Biology

Supported by: Dean of Research

Mentor: Giles Plant, Neurosurgery

Larry Ge in Dr. Plant's lab is investigating Schwann cell delivery within an injectable peptide hydrogel as a potential regenerative therapy for spinal cord injuries. He is optimizing hydrogel injection properties and evaluating the biocompatibility, bioresorption, and biodistribution of the hydrogel/Schwann cell construct within a rat cervical contusion spinal cord injury model.



Rebecca Gold, Human Biology

Supported by: The Rose Hills Foundation and Burroughs Wellcome Fund

Mentor: Margaret Fuller, Developmental Biology

Rebecca's research focuses on investigating the protein Bgcn in mouse models to determine the role it could play in mammals to pave the foundations for developing better fertility treatments, as well as understanding how to regulate adult stem cell proliferation and differentiation.



Meghana Golla, Biomechanical Engineering

Supported by: Dean of Research

Mentor: Edward Graves, Radiation Oncology

Meghana's research in Dr. Graves's lab focuses on the effects of irradiation on circulating tumor cell recruitment. Specifically, she is using intravital microscopy to track the migration of fluorescently-labeled tumor cells in a dorsal skin-fold window chamber.



Diana Gong, Bioengineering

Supported by: Dean of Research

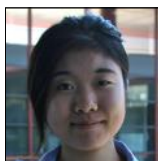
Mentor: Julien Sage, Pediatrics (Cancer Biology) and Genetics

Diana Gong is studying wound healing and regeneration in mammals. The hypothesis behind her work is that genes that normally prevent cancer ("tumor suppressors") also limit the regenerative potential of adult tissues and organs. To test this idea, she is specifically investigating how mice mutant for tumor suppressor genes repair a small hole punch in their ear.



Monica Thieu completed her summer research training in Dr. Anthony Wagner's lab

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Ryoko Hamaguchi, Biology

Supported by: Dean of Research

Mentor: Sean Wu, Medicine (Cardiovascular Medicine)

Ryoko Hamaguchi is using human induced pluripotent cell-derived cardiomyocytes (hiPSC-CMs) as an *in vitro* model to investigate the mechanisms of doxorubicin-induced cardiotoxicity. Her project focuses specifically on how doxorubicin, a common chemotherapeutic agent, affects processes governing intracellular and mitochondrial iron levels in heart cells.



Nicholas Hansen, Human Biology

Supported by: Dean of Research

Mentor: Stephen Skirboll, Neurosurgery

Nicholas is working in Dr. Skirboll's lab, which is searching for antibodies that will bind to distinct surface proteins specific to cancer stem cells. Identifying these specific antibodies would allow for the detection of stem cells (which are crucial for the survival and growth of the tumor) apart from regular tumor cells.



Lana Ho, Biology

Supported by: The Rose Hills Foundation and Bio-X

Mentor: David Prince, Neurology & Neurological Sciences

Lana Ho is investigating the use of the anti-inflammatory molecule alpha-B crystallin as a prophylactic treatment in a post-traumatic epilepsy model.

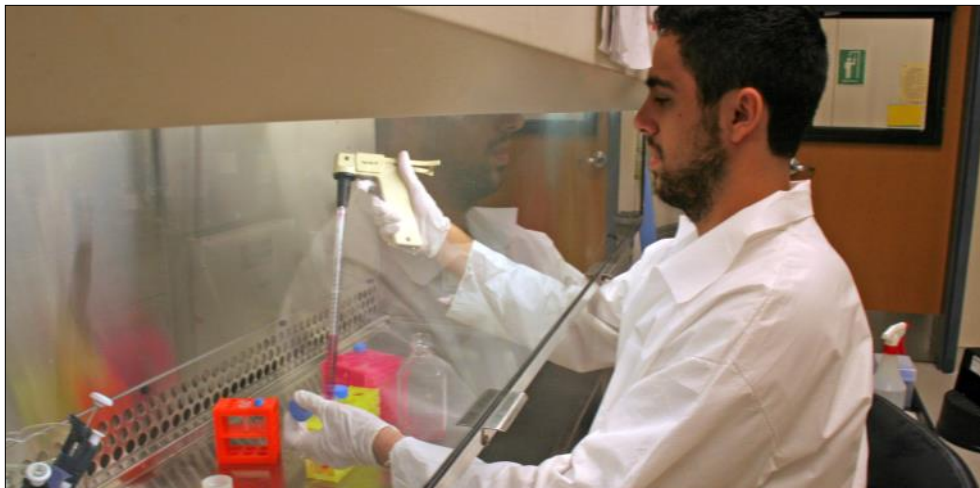


Zachary Hoskins, Psychology

Supported by: Dean of Research

Mentor: James Gross, Psychology

Zach Hoskins's research in Dr. James Gross's lab focuses on designing new interventions to motivate individuals to spend less time in sedentary activities. The study incorporates tools from affective science, decision science, and health psychology to improve health behavior and outcomes and using personalized strategies for each participant to reappraise negative valuations and encourage positive ones, with the goal of changing long-term health behavior.



Aristos Athens completed his summer research training in Dr. Marc Levenston's lab

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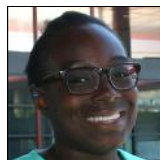


Tsao-Wei (Brad) Huang, Biology and Linguistics

Supported by: Dean of Research

Mentor: Alexandria Boehm, Civil & Environmental Engineering

Brad's research in the Boehm group focuses on the development of marine biofilms, which are central in understanding the mechanism of biofouling, in which organisms settle onto surfaces, causing inefficiency in underwater vehicles while increasing yield for aquatic farms. He conducts field, mechanical, and molecular experiments to investigate the changes in surface properties, successions of biofilm community on different materials, and how these processes influence biofouling.

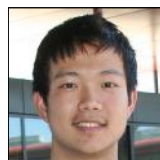


Mia Hutchinson, Mechanical Engineering

Supported by: Dean of Research

Mentor: Mary Teruel, Chemical & Systems Biology

Mia is experimenting with fluorescent proteins as a means of tracking biological processes in adipose cells. Specifically, she is engaging with digital microscopy in order to follow the process by which PPARG activates the change from stem cell to fat cell.



Michael Jin, Biology

Supported by: Dean of Research

Mentor: Laura Attardi, Radiation Oncology

Michael's research in Dr. Attardi's lab focuses on elucidating pathways through which the protein p53 regulates tumor suppression. Specifically, he is interested in the role that Pard6g, a known regulator of cellular polarity, plays in mediating p53 tumor suppressor function.



Danielle Katz, undeclared

Supported by: Bio-X

Mentor: Russell Fernald, Biology

Danielle Katz's research in Dr. Russell Fernald's lab focuses on the role of the vagal lobe in the reproductive behavior of *A. burtoni*, a species of African cichlid fish. This work aims to answer a larger question: How does social experience influence the brain?

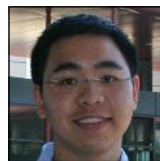


Hyoung June (Mark) Kwon, Computer Science

Supported by: Dean of Research

Mentor: Roger Kornberg, Structural Biology

Mark's research is focused on simulating cryo-EM (electron microscope) for protein 3D reconstruction using gold particles to align the images for better signals. The project includes working with programs such as EMAN2 and Relion to understand the status quo of the research and to improve the programs to fit the specific needs of the lab.



Jeffrey Kwong, Biology

Supported by: Dean of Research

Mentor: Calvin Kuo, Medicine (Hematology)

Jeffrey Kwong's research in the Calvin Kuo lab investigates the use of primary human organoid cultures in cancer modeling. Using this 3-D culture technique, he is transforming normal human gastric and intestinal organoids with lentivirus to generate tumors with defined oncogenes in order to analyze the development of cancer in a controlled setting.

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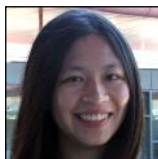


Ted Li, Biology

Supported by: Dean of Research

Mentor: Kevin Wang, Dermatology

In this age of increasingly sophisticated medicine, the molecular mechanisms by which many non-western medicinal agents work are still largely unknown. Ted's research in the Wang Lab explores the epigenetic mechanisms underlying the regulation and maintenance of stem cell pluripotency by utilizing RJ50, a protein component of royal jelly used by honey bees to rear queens, which also has a profound effect on mammalian cells.



Cindy Lin, Computer Science

Supported by: Dean of Research

Mentor: Atul Butte, Pediatrics (Systems Medicine) and Genetics

Cindy Lin is developing and applying integrative computational analysis techniques to identify novel therapeutic and diagnostic strategies for rheumatoid arthritis in the context of other autoimmune diseases using public data.

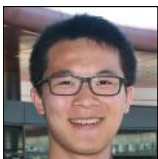


Eric Lopez, Biology

Supported by: Dean of Research

Mentor: Kang Shen, Biology and Pathology

Eric's research in Dr. Kang Shen's laboratory focuses on the characterization of a metalloprotease-mediated synapse formation pathway of the neuronal extracellular matrix. Making use of the *C. elegans* GON-1 pathway as a homologous model, he hopes to elucidate this developmental mechanism of the human nervous system as well as gain insight into related neurodevelopmental pathologies and potential factors necessary for the repair of damaged nerve tissue.

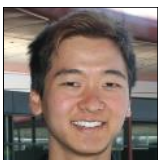


John Louie, Computer Science

Supported by: Dean of Research

Mentor: Euan Ashley, Medicine (Cardiovascular Medicine) and Genetics

John's research focuses on utilizing bioinformatics to optimize the detection of genetic variants within patients' genomes. This will bring potentially new insight into potential causes of cardiovascular diseases as well as treatment options.



Matthew Lum, Biology

Supported by: Dean of Research

Mentor: Thomas Sudhof, Molecular & Cellular Physiology

Matthew's research involves the CIQL3 protein found in the insular cortex and amygdala regions of the brain. The Sudhof lab hypothesizes that drug-seeking behavior depends on the normal functions of CIQL3.



Alexander Martinez, Engineering Physics

Supported by: The Rose Hills Foundation and Bio-X

Mentor: Daniel Palanker, Ophthalmology

Alex Martinez's research in Dr. Palanker's lab focuses on developing a photovoltaic retinal prosthesis for restoring eyesight to the blind. Specifically, he is developing software around three tasks: 1) Developing real-time video processing algorithms that can be adjusted so as to optimize performance; 2) Implementing "smart" computer vision algorithms to further enhance performance; 3) Implementing software on a mobile phone platform (android OS) and developing tests to evaluate efficacy of the device when in use.

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Anna McGregor, Bioengineering

Supported by: Dean of Research

Mentor: Thomas Sudhof, Molecular & Cellular Physiology

The ability for neurons to establish synapses having specific properties with select cells involves a complex system that gives rise to the extraordinary abilities of the brain. Anna McGregor is studying the effect of transmembrane adhesion molecules on spontaneous calcium activity in neurons in the Sudhof lab.



Laura McMartin, Biology

Supported by: VPUE/UAR and Bio-X

Mentor: Daniel Madison, Molecular & Cellular Physiology

Laura McMartin's project intends to clarify mechanisms underlying learning impairments that occur in the absence of circadian rhythms. She is using electrophysiological techniques to evaluate the function of hippocampal synapses in control versus arrhythmic models and how neural network properties bear on memory.



Jennifer Meylor, Biology

Supported by: VPUE/UAR and Bio-X

Mentor: Josef Parvizi, Neurology & Neurological Sciences

Jennifer Meylor's research in Dr. Parvizi's lab uses electrophysiological methods to understand the spatiotemporal neuronal dynamics of regions in the ventral temporal cortex during the process of learning foreign words and numbers.



Matthew Millett, Computer Science

Supported by: Dean of Research

Mentor: Audrey Ellerbee, Electrical Engineering

Matt is working in Dr. Ellerbee's lab to design and prototype a cheap, portable, and user-friendly urinalysis device. The device combines standard dipsticks with urine microscopy on a smartphone application to provide a report that otherwise would require clinical lab testing to obtain.



Karli Thompson completed her summer research training in Dr. Lucy Shapiro's lab

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Nina Myers, Biology

Supported by: VPUE/UAR and Bio-X

Mentor: Alan Cheng, Otolaryngology

Nina Myers's research in Dr. Cheng's lab focuses on manipulating the canonical Wnt pathway in transgenic mice to understand the pathway's role in cochlear development, with the future therapeutic goal of hair cell regeneration.



Samar Naamo, Biology

Supported by: The Rose Hills Foundation and Bio-X

Mentor: Marius Wernig, Pathology

Samar is investigating the role of presenilin 1 gene mutation in Alzheimer's disease. Specifically, she is assessing the mechanism through which it leads to accumulation of beta-amyloid 42.



Christie Nguyen, Biology

Supported by: The Rose Hills Foundation and Bio-X

Mentor: Paul Khavari, Dermatology

Christie Nguyen is identifying and investigating genes with a causative role in the tumorigenesis of human cutaneous squamous cell carcinoma, and using this research to advance our understanding of disease mechanisms in this malignancy.



Thai Nguyen, Bioengineering

Supported by: The Rose Hills Foundation and Bio-X

Mentor: Jeffrey Glenn, Medicine (Gastroenterology & Hepatology) and Microbiology & Immunology

Thai is investigating how viruses can modulate receptor CD47 to evade host immune defense, by determining mutations in the viral genome that can trigger up-regulation of the receptor.



Eric Lopez completed his summer research training in Dr. Kang Shen's lab

Bio-X Undergraduate Summer Research Program

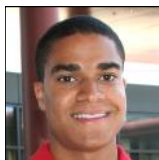


Alyssa Noll, Biology

Supported by: *Dean of Research*

Mentor: *Michelle Monje, Neurology & Neurological Sciences*

Alyssa Noll's research in Dr. Monje's lab focuses on the role of neurons in the pediatric high grade glioma microenvironment, specifically whether neuronal activity promotes tumor growth *in vivo*.



Nnaoma Oji, Biology

Supported by: *Dean of Research*

Mentor: *Giles Plant, Neurosurgery*

In his second year in the Plant lab, Nnaoma's research is part of an interdisciplinary project in biomaterials and regenerative medicine. He is investigating the structural and biological properties of hydrogel delivery mechanisms that encapsulate various types of stem cells and may serve as an optimal form of treatment for spinal cord injuries.



Bhavenkumar Patel, Biology

Supported by: *Dean of Research*

Mentor: *Rajat Rohatgi, Medicine (Oncology) and Biochemistry*

Bhaven is developing a bioinformatic pipeline to map insertions of retroviral mutagens in an unbiased and genome-wide manner in human cells. These techniques can be applied to analyzing data from genome-wide screens using insertional mutagenesis and also to map insertion sites of pathogenic viruses in tissues.



Saurabh (Anuj) Patel, Biology

Supported by: *Dean of Research*

Mentor: *Manish Butte, Pediatrics*

CapZ and Adducin are the two major actin-capping proteins in T cells, which are integral in the body's defense against pathogens. Anuj is investigating the role played by the actin-capping protein CapZ in T cell motility and formation of the immune synapse with antigen-presenting cells.



Karthik Ramasubramanian, Biology

Supported by: *anonymous donor*

Mentor: *Matthew Scott, Developmental Biology and Genetics*

Karthik Ramasubramanian's research in Dr. Matthew Scott's lab focuses on the genetic underpinnings of Niemann-Pick type C disease, a fatal lysosomal storage disease that causes progressive neurodegeneration due to mutations in the *npc1* gene. Specifically, he is utilizing the genetics of the model organism *Drosophila melanogaster* to study possible genetic suppressors of the mutated *Npc1* protein, such as *Arfgef* (a class of guanine nucleotide exchange factors), and their effect on endoplasmic reticulum reorganization in somatic cells.



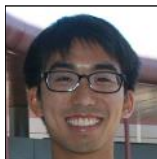
Michael Schoof, Biology

Supported by: *anonymous donor*

Mentor: *Anne Brunet, Genetics*

Michael's research in Dr. Brunet's lab focuses on characterizing substrates of AMP-activated protein kinase. These proteins are implicated in important functions such as cell motility, an essential cellular process for a variety of biological events.

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Wayne Sheu, Chemical Engineering

Supported by: *anonymous donor*

Mentor: *Alfred Spormann, Civil & Environmental Engineering and Chemical Engineering*

Wayne's research involves using the qPCR technique for amplifying DNA to characterize expression of genes in methanogens involved in methane production. The potential large-scale application of his contribution to the Spormann lab's work is microbe cultures producing methane across the country that can be stored and used to fuel everything from airplanes to cars.



Delaney Sullivan, Biology

Supported by: *anonymous donor*

Mentor: *Dean Felsher, Medicine (Oncology) and Pathology*

Delaney Sullivan is characterizing potential drivers for MYC addicted lymphomas, with specific interest in proteins influencing chromatin architecture. Delaney is conducting this research under Dr. Felsher, whose lab investigates oncogene addiction in cancer.



Gordon Sun, Bioengineering

Supported by: *anonymous donor*

Mentor: *Robert Malenka, Psychiatry & Behavioral Sciences*

Gordon is investigating neural connectivity patterns within the striatum and nucleus accumbens, in particular, an autism linked point mutation R451C in neuroligin 3's impact on reward associated behavior and any alterations in circuitry that may result due to this mutation.



Christine Tataru, Computer Science

Supported by: *anonymous donor*

Mentor: *Lars Steinmetz, Genetics*

Christine Tataru is employing bioinformatic analysis to characterize the transcripts in the thymus that are used to train T cells against auto-immunity. Her work will focus on comparing these transcripts to those that are produced in the regular tissues, with hopes of improving knowledge on the development of auto-immune disease and furthering understanding of gene regulation.



Monica Thieu, Psychology

Supported by: *anonymous donor*

Mentor: *Anthony Wagner, Psychology*

Monica is investigating the relationship between a person's media multitasking level (the amount that someone uses multiple forms of media simultaneously) and their capacity to manipulate and remember stimuli using working and long-term memory.



Karli Thompson, Human Biology

Supported by: *anonymous donor*

Mentor: *Lucy Shapiro, Developmental Biology*

Karli is investigating the functional role of small proteins such as small peptide, CCRP 00547, in the regulation of asymmetric cell division in bacterium *Caulobacter crescentus*. Asymmetrical cell division is one of the fundamental processes in biology and ultimately leads to the generation of different cell fates.

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Sally Tran, undeclared

Supported by: *anonymous donor*

Mentor: *Mindie Nguyen, Medicine (Gastroenterology & Hepatology)*

Sally is updating the database of chronic hepatitis B patients to estimate their risk for liver cancer, focusing on the subset of patients with cirrhosis only.



Emily Truong, East Asian Studies

Supported by: *anonymous donor*

Mentor: *Upi Singh, Medicine (Infectious Diseases)*

Emily Truong is investigating the destabilization domain approach adapted for regulated protein expression in the protozoan parasite *Entamoeba histolytica*, the causative organism of dysentery and liver abscess and is prevalent in countries with poor sanitary conditions.



Nicole Urman, Biology

Supported by: *anonymous donor*

Mentor: *Anthony Oro, Dermatology*

Nicole is investigating how the various clinical mutations in Gli (a protein in the hedgehog signaling pathway) play a role in developing resistance to a basal cell carcinoma drug.



Kristina Vaculik, Human Biology

Supported by: *anonymous donor*

Mentor: *Roeland Nusse, Developmental Biology*

Kristina's research focuses on characterizing Wnt-responsive cells in adult skeletal muscle, while also investigating whether Wnt responsive progenitor cells in developing embryos give rise to adult muscle stem cells. This research has a potential impact on developing novel regenerative medical therapies, specifically to injured muscles.



Karthik Ramasubramanian completed his summer research training in Dr. Matthew Scott's lab

Bio-X Undergraduate Summer Research Program



Camille Van Neste, Chemistry

Supported by: *Burroughs Wellcome Fund*

Mentor: *Marius Wernig, Pathology*

Camille's research in Dr. Wernig's lab focuses on virally reprogramming oligodendrocyte precursor cells (OPCs), which normally form glial cells, into inhibitory neurons. Ideally, this work will shed more light on the treatment for epilepsy, which is caused by a focal imbalance of excitatory and inhibitory synaptic transmission.



Abhishek Venkataramana, Biology

Supported by: *Pitch and Catherine Johnson*

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

Abhi aims to shed light on the molecular basis of familial hypertrophic cardiomyopathy by using TALEN-mediated gene editing to replace the mutant allele with the wild-type allele in patient-derived induced pluripotent stem cell (iPSC) lines. Cardiomyocytes derived from the mutant and 'corrected' iPSC lines will be analyzed using genome-wide expression profiling in order to build a molecular model of the genes and pathways associated with this disease.



Catherynn Vuong, Biology

Supported by: *Pitch and Catherine Johnson*

Mentor: *Nidhi Bhutani, Orthopaedic Surgery*

Catherynn Vuong is working in Dr. Nidhi Bhutani's lab, where her current focus lies in analyzing the role of Wnt-target genes in the process of cartilage differentiation and development. Using both *in vitro* methods of chondrogenic differentiation and *in vitro* analysis of developing limb buds in mice, she hopes to find the key to unlocking the regenerative potential of cartilage through its epigenetic and molecular mechanisms.



Evelyn Wang, Materials Science & Engineering

Supported by: *Pitch and Catherine Johnson*

Mentor: *Emilie Cheung, Orthopaedic Surgery*

Evelyn is testing a polyurethane-based polymer with mechanical properties that can be altered to mimic tendon and bone tissue by exposure to different amounts of UV light. She is evaluating the utility of a functionally graded biomaterial for reducing stress concentration at bone-tendon interfaces such as the rotator cuff, and also determining the biological response of cells to the polyurethane.



Jason Yang, Bioengineering

Supported by: *Bio-X*

Mentor: *Paul Bollyky, Medicine (Infectious Diseases)*

Jason Yang's research in Dr. Paul Bollyky's lab focuses on a wound healing model done in mice induced with diabetes. This summer, Jason is bioengineering special hydrogels that can sustainably release cytokines, such as IL-2, on the wound bed.

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Christine Yeh, Biology

Supported by: Bio-X

Mentor: Sharon Pitteri, Radiology

Christine is profiling the global omics of fat biopsy specimens from the Stanford Endocrinology Clinic in order to investigate the biomolecular changes that occur in the fat during the progression to type 2 diabetes mellitus. Specifically, she is responsible for characterizing and quantifying the glycoproteome of adipocytes by liquid-chromatography mass spectrometry to analyze changes in protein post-translational modifications induced by an experimental overfeeding model for insulin resistance in humans.



Yuki Yoshiyasu, Biomedical Computation

Supported by: Bio-X

Mentor: Garry Nolan, Microbiology & Immunology

Yuki's research in Dr. Nolan's lab utilizes fluorescence and mass-based cytometry to better elucidate the activation of signaling pathways in different cell populations. This visualization in immune signaling will bring more insight into the study of cancer.

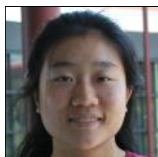


Alex Yuan, Biology

Supported by: Bio-X

Mentor: Daniel Jarosz, Chemical & Systems Biology and Developmental Biology

Alex's research in Dr. Jarosz's lab focuses on understanding how changes in activity of the chaperone Hsp90 can alter the distribution of fitness of different genotypes. This summer, Alex is testing the hypothesis that inhibition of Hsp90 can alter the set of accessible mutational trajectories in the evolution of antifungal drug resistance.



Connie Zeng, undeclared

Supported by: Bio-X

Mentor: Bianxiao Cui, Chemistry

Connie is working on a functional algorithm to provide a more efficient, reliable analysis of axonal transport, a vital process for neuron function and cell health. This could offer valuable insight into the development of neurodegenerative diseases such as Alzheimer's disease and Parkinson's disease.



Samar Naamo completed her summer research training in Dr. Marius Wernig's lab

Bio-X Undergraduate Summer Research Program

2014 Poster Titles



"The Effects of Lysyl Oxidase and APC Photochemical Bonding on Articular Cartilage Integration"

Aristos Athens¹, Chunhua Zheng¹, Alberto Arvayo¹, Marc Levenston¹

Department of Mechanical Engineering (BME STBL - Biomechanical Engineering, Soft Tissue Biomechanics Lab)¹, Stanford University

"Regulation of Glucose-6-Phosphate Dehydrogenase by p53"

Tatum Banayat¹, Sunhee Hwang², Daria Mochly-Rosen²

Departments of Bioengineering¹ and Chemical & Systems Biology², Stanford University

"The Effects of Optogenetic Neuronal Stimulation of the Contralateral Cerebellar Dentate Nucleus on Functional Recovery Post-Stroke"

Alex Bautista^{1,2}, Michelle Cheng^{1,2}, Eric Wang^{1,2}, Shunsuke Ishizaka^{1,2}, Aatman Shah^{1,2}, Gary Steinberg^{1,2}

Department of Neurosurgery¹ and Stanford Stroke Center², Stanford University

"The Utility of Parathyroid Hormone in Regulating the Migration of Breast Cancer Cells to Osteoblasts *In Vitro*"

Lance Bettinson¹, Srilatha Swami¹, Joy Y. Wu¹

Department of Medicine (Division of Endocrinology)¹, Stanford University

"RNA to Protein: Detecting Differences in Allele Specific RNA Expression and Translation Across Individuals"

Maheetha Bharadwaj¹, Can Cenik¹, Mike Snyder¹

Department of Genetics¹, Stanford University

"Is There an Early Effect of APP/PS1 Mutation on Dendritic Spines?"

Kiana Brown^{1,2}, Richie Sapp^{1,2}, Taeho Kim^{1,2}, George S. Vidal^{1,2}, Carla Shatz^{1,2}

Departments of Biology¹ and Neurobiology², Stanford University

"Effects of Long-Term Stress on Regulatory T cells"

Anna C. Cai¹, Tuong D. Phan¹, Arlene M. Laeno¹, Krista N. Ring¹, Firdaus S. Dhabhar^{1,2,3,4}

Department of Psychiatry & Behavioral Sciences (Laboratory of Stress Immunology)¹, Institute for Immunity, Transplantation & Infection², Cancer Institute³, and Bio-X⁴, Stanford University

"A Protocol for Photocaging Guanidines: Progress Towards a Controlled-Release Saxitoxin"

Matthew Callahan¹, Rhiannon Thomas-Tran², Justin Du Bois²

Departments of Chemical Engineering¹ and Chemistry², Stanford University

"Mechanisms of Class-Specific Control of Regulatory RNAs"

Brian T. Do¹, Ryan A. Flynn¹, Howard Y. Chang¹

Howard Hughes Medical Institute and Program in Epithelial Biology¹, Stanford University

"The Role of the Immune System in Tumor Regression upon MYC Inactivation"

Rachel K. Do¹, Stephanie C. Casey¹, Dean W. Felsher¹

Department of Medicine (Division of Oncology)¹, Stanford University

"How Brain Structure Drives Behavioral Development: Early Amygdala Volume and Later Behavioral Outcome in Individuals with Fragile X Syndrome and Idiopathic Autism"

Andrea Fisher^{1,2}, Jennifer L. Bruno^{1,2}, Ashley Stark^{1,2}, Amy A. Lightbody^{1,2}, Allan L. Reiss^{1,2,3,4}

Center for Interdisciplinary Brain Sciences Research¹ and Departments of Psychiatry², Radiology³, and Pediatrics⁴, Stanford University

Bio-X Undergraduate Summer Research Program

2014 Poster Titles



"YY1 Expression is Sufficient for the Maintenance of the Cardiac Progenitor Cell State"

Nick Flores¹, Guang Li¹, Serge Gregoire², Sean Wu¹

Institute of Stem Cell & Regenerative Biology (Division of Cardiovascular Medicine, Cardiovascular Institute)¹, Stanford University; Department of Medicine (Cardiovascular Research Center, Division of Cardiology)², Massachusetts General Hospital

"Schwann Cell Delivery Within a Hydrogel for Spinal Cord Injuries"

Larry Ge¹, Sarah Heilshorn², Giles Plant³

Departments of Biology¹, Materials Science & Engineering², and Neurosurgery³, Stanford University

"The Role of *mBgc* in the Switch from Proliferation to Differentiation in the Adult Mammalian Germ Line Stem Cell Lineage"

Rebecca Gold¹, Alexis Bailey¹, Margaret Fuller¹

Department of Developmental Biology¹, Stanford University

"Investigating the Effects of Radiation on Tumor Cell Migration Using Intravital Microscopy"

Meghana Golla¹, Marjan Rafat¹, Megan Albertelli², Marta Vilalta¹, Edward Graves¹

Departments of Radiation Oncology¹ and Comparative Medicine², Stanford University

"Enhancing Wound Healing and Regeneration Through Inactivation of the Rb Pathway"

Diana Gong^{1,2}, Julia Arand^{1,2}, Anne-Flore Zmoos^{1,2}, Frederique Zindy³, Julien Sage^{1,2}

Departments of Pediatrics¹ and Genetics², Stanford University; Department of Tumor Cell Biology³, St. Jude Children's Research Hospital, Memphis, TN

"An *In Vitro* Human Induced Pluripotent Stem Cell-Derived Cardiomyocyte Model Reveals Alterations in Iron Metabolism in Doxorubicin-Induced Cardiotoxicity"

Ryoko Hamaguchi^{1,2,3,4}, Arun Sharma^{1,2,3,4}, Paul Burrige^{1,2,3,5}, Joseph C. Wu^{1,2,3,4,5}, Sean M. Wu^{1,2,3}

Departments of Medicine (Division of Cardiology)¹, Biology⁴, and Radiology⁵, Institute for Stem Cell Biology & Regenerative Medicine², and Stanford Cardiovascular Institute³, Stanford University

"Screening of Candidate Cancer Stem Cell Markers in Glioblastoma Using a Live Cell Array"

Nicholas Hansen¹, Hai Li¹, Stephen Skirboll¹

Department of Neurosurgery¹, Stanford University

"Use of α B-Crystallin as Prophylactic Treatment for Post-Traumatic Epilepsy"

Lana Ho¹, Lawrence Steinman², David A. Prince²

Departments of Biology¹ and Neurology & Neurological Sciences², Stanford University

"Using Affective Science to Decrease Sedentary Behavior and Increase Physical Activity"

Zachary B. Hoskins¹, Arlene L. Amieva², Martine S. Madill¹, Edward D. Salonga², Ashley A. Shurick¹, James J. Gross¹

Departments of Psychology¹ and Human Biology², Stanford University

"Size Fractionation of *Enterococci* in Coastal Water of Northern California"

Tsao-Wei Huang¹, Lauren Murray Sassoubre², Alexandria Boehm²

Departments of Biology¹ and Civil & Environmental Engineering², Stanford University

"Frequency-Encoding of Fat Cell Differentiation"

Mia Hutchinson¹, Karen Tkach¹, Wenting Yang¹, Mary Teruel¹

Department of Chemical & Systems Biology¹, Stanford University

"Assessing the Role of the p53 Target Gene, *Pard6g*, in Tumor Suppression"

Michael Jin¹, Kathryn Bieging¹, Laura Attardi¹

Department of Radiation Oncology¹, Stanford University

Bio-X Undergraduate Summer Research Program

2014 Poster Titles



"Which Neurons Control Reproductive Behavior in Cichlid Fish?"

Danielle Katz¹, Nicole Gurtler¹, Scott Juntti¹, Mariana Jimenez¹, Russ Fernald¹
Department of Biology¹, Stanford University

"Reconstruction of Protein Aligned with Gold Particles"

Hyoung June Kwon¹, Maia Azubel¹, Roger Kornberg¹
Department of Structural Biology¹, Stanford University

"Establishing Organoid Cultures of Human Gastrointestinal Tissues"

Jeffrey Kwong¹, H. Chuck Zhang¹, Michael Cantrell¹, Brian Deutsch¹, Olivier Gevaert², Xingnan Li¹, J.T. Neal¹, Katie Planey², Steven Wang¹, Calvin Kuo¹
Department of Medicine (Division of Hematology)¹ and Center for Biomedical Informatics Research², Stanford University

"Identifying the Molecular Mechanisms of RJ50 in Mammalian Cells and Its Effect on the Maintenance of Stem Cell Pluripotency"

Ted Li¹, Andrew Spencley¹, Peter Janki¹, Cole Dovey², Jennifer Lumb², Jan Carette², Kevin Wang¹
Departments of Dermatology¹ and Microbiology & Immunology², Stanford University

"Identification of Novel Therapeutic and Diagnostic Strategies for Rheumatoid Arthritis Using Gene Expression Data"

Cindy Lin¹, Hyojung Paik¹, Dexter Hadley¹, Marina Sirota¹, Atul J. Butte¹
Department of Pediatrics (Division of Systems Medicine)¹, Stanford University

"Neuronal Extracellular Matrix Components Implicated in *C. elegans* Model of Novel Synapse Formation Pathway"

Eric Lopez¹, Peri Kurshan¹, Kang Shen¹
Department of Biology¹, Stanford University

"Comparisons and Annotations of INDEL Variants from Next Generation Sequencing Data"

John Louie¹, Rachel Goldfeder², Daryl Waggot³, Euan Ashley^{4,5,6}
Departments of Computer Science¹, Biomedical Informatics², Cardiovascular Medicine³, Medicine⁴, Genetics⁵, and Pathology⁶, Stanford University



Mia Hutchinson completed her summer research training in Dr. Mary Teruel's lab

Bio-X Undergraduate Summer Research Program

2014 Poster Titles



"The C1qI3 Protein Affects Emotional Memory"

Matthew Lum¹, David Martinelli¹, Thomas Südhof¹

Department of Molecular & Cellular Physiology¹, Stanford University

"Simulating and Enhancing Vision through Photovoltaic Retinal Prosthesis"

Alex Martinez^{1,2}, John Doherty^{1,2}, Daniel Palanker^{1,2}

Department of Ophthalmology¹ and Hansen Experimental Physics Laboratory², Stanford University

"Investigating the Role of Toll-like Receptors in Neuronal Connectivity and Synapse Formation"

Anna McGregor¹, Louise Giam¹, Ozgun Gokce¹, Peng Zhou¹, Thomas Südhof¹

Department of Molecular & Cellular Physiology¹, Stanford University

"Functional Properties of the Hippocampus in Siberian Hamsters: Illuminating the Relationship Between Circadian Rhythms and Learning"

Laura McMartin¹, Daniel V. Madison²

Departments of Biology¹ and Molecular & Cellular Physiology², Stanford University

"Neural Dynamics in the Human Ventral Temporal Cortex During Letter and Number Processing"

Jennifer Meylor^{1,2}, Sandra Gattas^{1,2}, Josef Parvizi^{1,2}

Department of Neurology & Neurological Sciences¹ and Stanford Human Intracranial Cognitive Electrophysiology Program (SHICEP)², Stanford University

"Robust Dipstick Urinalysis with a Mobile Phone Using a Low-Cost, Micro Volume SlipChip"

Matthew Millett¹, Kiran Magar¹, Monica Bendernagel¹, Genna Smith¹, Saara Khan¹, Kristen Lurie¹, Mehdi Javanmard¹, Audrey K. Ellerbee¹

Department of Electrical Engineering (Stanford Biomedical Optics Group)¹, Stanford University

"Beta-Catenin Stabilization Promotes Proliferation, Migration, and Fate Change of Cochlear Axin2+ Cells"

Nina Myers¹, Sara Billings¹, Elvis Huarcaya Najarro¹, Alan G. Cheng¹

Department of Otolaryngology¹, Stanford University

"Alzheimer's Disease: The Impact of Presenilin 1 Mutation on Autophagy in Human Neurons"

Samar Naamo¹, Daniel Haag¹, Marius Wernig¹

Department of Stem Cell Biology & Regenerative Medicine¹, Stanford University

"Recurrent Mutations in KNSTRN and Disruption of Multiple Notch Signaling Genes in Cutaneous Squamous Cell Carcinoma"

Christie B. Nguyen¹, Carolyn S. Lee¹, Aparna Bhaduri¹, Angela Mah¹, Whitney Johnson¹, Cody J. Aros¹, Alexander Ungewickell¹, Zurab Siprashvili¹, Aaron Straight¹, Jinah Kim¹, Sumaira Aasi¹, Paul A. Khavari¹

Program in Epithelial Biology¹, Stanford University

"An Investigation of the Role of CD47 in HCV Infection"

Edward Pham¹, Benjamin Fram¹, Thai Nguyen², Jeffrey S. Glenn¹

Departments of Medicine¹ and Bioengineering², Stanford University

"Neuronal Activity Promotes Pediatric High-Grade Glioma Growth *In Vivo*"

Humsa Venkatesh^{1,2,3,4}, Viola Caretti^{1,2,3,4}, Tessa Johung^{1,2,3,4}, Alyssa Noll^{1,2,3,4}, Michelle Monje^{1,2,3,4}

Departments of Neurology¹, Neurosurgery², and Pediatrics³ and Institute for Stem Cell Biology & Regenerative Medicine⁴, Stanford University

2014 Poster Titles



Nnaoma Oji¹, Jim Weimann¹, Karen Dubbin², Sarah Heilshorn², Giles Plant¹
Departments of Neurosurgery¹ and Materials Science & Engineering², Stanford University

Departments of Medicine¹, Microbiology & Immunology², and Biochemistry³, Stanford University

Anuj Patel¹, Timothy Thauland¹, Manish Butte¹
Department of Pediatrics¹, Stanford University

Karthik Ramasubramanian¹, Luis A. Milla¹, Matthew P. Scott^{1,2,3}
Departments of Developmental Biology¹, Genetics², and Bioengineering³, Stanford University

Michael L. Schoof², Bethany E. Schaffer^{1,2}, Nicholas T. Hertz³, Rebecca S. Levine³, Travis J. Maures², Bérénice A. Benayoun², Max R. Banko², Reuben J. Shaw⁴, Kevan M. Shokat³, Anne Brunet²
Departments of Cancer Biology¹ and Genetics², Stanford University; Department of Cellular & Molecular Pharmacology³, University of California, San Francisco; Molecular & Cell Biology Laboratory⁴, Salk Institute for Biological Studies, La Jolla, CA

Wayne Sheu¹, Ann Lesnfsky², Alfred Spormann^{1,2}
Departments of Chemical Engineering¹ and Civil Engineering², Stanford University

Delaney K. Sullivan¹, Daniel C. Koch¹, Dean W. Felsher¹
Department of Medicine (Division of Oncology)¹, Stanford University

Gordon Sun^{1,2}, Marc Fucillo^{1,2}, Patrick Rothwell^{1,2}, Rob Malenka^{1,2}
Departments of Neurology¹ and Psychiatry², Stanford University

Christine Tataru¹, Phillip Brennecke¹, Aino Jarvelin², Wu Wei¹, Lars Steinmetz¹
Department of Genetics¹, Stanford University; Genome Biology², European Molecular Biology
Laboratory

Monica Thieu¹, Melina Uncapher¹, Anthony Wagner^{1,2}
Department of Psychology¹ and Neurosciences Program², Stanford University

Karli Thompson¹, Jared Schrader¹, Lucy Shapiro¹
Department of Developmental Biology¹, Stanford University

Bio-X Undergraduate Summer Research Program

2014 Poster Titles



"Low Treatment Rates in Patients Meeting Guideline Criteria in Diverse Practice Settings"

Sally A. Tran¹, Lily H. Kim¹, Vincent G. Nguyen², Huy N. Trinh^{2,3}, Jiayi Li⁴, Jian Q. Zhang⁵, Mindie H. Nguyen¹

Division of Gastroenterology & Hepatology¹, Stanford University; Pacific Health Foundation², San Jose, CA; San Jose Gastroenterology³, San Jose, CA; Gastroenterology⁴, Palo Alto Medical Foundation, Mountain View, CA; Chinese Hospital⁵, San Francisco, CA

"Constructing a Destabilization Domain Vector for *Entamoeba invadens*"

Emily Truong¹, Susmitha Suresh¹, Upi Singh¹

Department of Infectious Diseases¹, Stanford University

"Determining the Role of Clinical Mutations in Gli I on Basal Cell Carcinoma Drug Resistance"

Nicole Urman¹, Scott Atwood¹, Anthony Oro¹

Department of Dermatology¹, Stanford University

"Wnt Signalling in Skeletal Muscle"

Kristina Vaculik¹, Makiko Mizutani¹, Roeland Nusse¹

Department of Developmental Biology¹, Stanford University

"Using Viral Vectors to Induce Inhibitory Neuron Formation in the Dentate Gyrus"

Camille Van Neste¹, Yan Li², Marius Wernig²

Departments of Chemistry¹ and Pathology², Stanford University

"Genetic Correction of Myosin-7 Mutations in an iPSC-based Disease Model of Familial Hypertrophic Cardiomyopathy"

Abhishek Venkataramana¹, Ioannis Karakikes², Vittavat Termglinchan², Sebastian Diecke², Joseph Wu²

Departments of Biology¹ and Medicine (Division of Cardiology)², Stanford University

"Role of Novel Wnt Receptor Complexes in Cartilage Development"

Catherynn Vuong¹, Piera Smeriglio¹, Subba Lakshmi Dhulipala¹, Nidhi Bhutani¹

Department of Orthopaedic Surgery¹, Stanford University

"Novel Tendon Graft for Rotator Cuff Repair"

Evelyna Wang¹, Elmer Ker², Angel Mercado², Anthony Behn², Peter Yang², Emilie Cheung²

Departments of Materials Science & Engineering¹ and Orthopaedic Surgery², Stanford University

"Bioengineered Hydrogels for Sustained Release of Interleukin 2 in the Treatment of Chronic Wounds"

Jason Yang¹, Maria Birukova¹, Vivekananda Sunkari¹, Paul Bollyky¹

Division of Infectious Diseases & Geographic Medicine¹, Stanford University

"Integrating Glycoproteomics and RNA-seq in Profiling Adipose Tissue"

Christine Yiwen Yeh¹, Brian Donald Piening², Sarah Michelle Totten³, Tracey Lynn McLaughlin⁴, Michael Snyder², Sharon Pitteri³

Departments of Biology¹, Genetics², Radiology³, and Medicine⁴, Stanford University

"Single-Cell High-Throughput Analysis of Nuclear Localization"

Yuki Yoshiyasu¹, Tyler Burns¹, Jake Batchelder¹, Julie Yu¹, Andreas Frei¹, Pier Federico Gheradini¹, Felice Alessio Bava¹, Wendy J. Fantl¹, Garry P. Nolan¹

Department of Microbiology & Immunology (Baxter Laboratory for Stem Cell Biology)¹, Stanford University

2014 Poster Titles



"Hsp90 and the Evolution of New Traits"

Alex Yuan¹, Daniel Jarosz^{1,2}Departments of Chemical & Systems Biology¹ and Developmental Biology², Stanford University

"Optical Measurement of the Electrochromic Response of Prussian Blue"

Connie Zeng¹, Allister McGuire¹, Felix Alfonso¹, Bianxiao Cui¹

Department of Chemistry¹, Stanford University

To view the poster titles of previous Bio-X USRP participants, visit:

<http://biox.stanford.edu/research/undergraduate-research>



Matthew Millett completed his summer research training in Dr. Audrey Ellerbee's lab

Bio-X Undergraduate Summer Research Program



2013 Bio-X Undergraduate Research Talks given by Stanford Faculty:

June 26

Josef Parvizi "Studying the Localization of Functions in the Human Brain with Intracranial Electrodes"
Vinod Menon "Development of Functional and Structural Brain Networks: Implications for Neurodevelopmental Disorders"
Lawrence Steinman "When Bad is Good: Beneficial Amyloid to Protect the Brain"
Dean Felsher "Modeling and Predicting Oncogene Addiction"

July 3

Mark Pegram "Therapeutic Strategies Targeting ERBB2"
Firdaus Dhabhar "A Hassle a Day May Keep the Doctor Away - Protective Versus Harmful Effects of Stress"
Renee Reijo Pera "Reprogramming and Programming in Human Embryo Development"
Alexander Urban "Genomic Basis of Mental Disorders"

July 10

Beth Pruitt "Microsystems for Mechanobiology"
Kang Shen "Using a Small Nervous System to Answer Big Questions"
Liqun Luo "Of Mice and Flies: How Neural Circuits are Organized and Built"
Carla Shatz "Restoring Plasticity to Old Brains"

July 17

Jason Dragoo "The Clinical Use of Stem Cells in Orthopaedic Surgery"
Howard Chang "Genome Regulation by Long Noncoding RNAs"
Yoon-Jae Cho "A Bedside to Bench to Bedside Approach to Childhood Brain Tumors"

July 24

Sean Mackey "The Strain in Pain Lies Mainly in the Brain: Lessons Learned from Neuroimaging of Pain"
Nicholas Melosh "Engineering Cell Access"
Yunzhi Yang "Bio Inspired Approaches for Musculoskeletal Tissue Engineering"
Sarah Heilshorn "Biomaterials to Improve Stem Cell Transplantation Therapies"

July 31

Elizabeth Sattely "Antibiotic Biosynthesis in Plants: Implications for Plant and Human Health"
Nigam Shah "Making Sense of Unstructured Data in Medicine"
David Stevenson "Targeted Chemoprevention of Neonatal Jaundice"
Judith Frydman "Molecular Origami: Protein Folding and Misfolding in Health and Disease"

August 7

Steven Boxer "Not Your Grandmother's GFP"
Matthew Porteus "Genome Editing Using Engineered Nucleases"
Sheri Krams "Visualizing the Functional Interactions between NK Cells and Their Targets"
Robert Malenka "Mechanisms and Functions of Synaptic Plasticity"

August 14

David Paik "Imaging-based Models of Cancer Treatments"
Susan Holmes "Studying the Resilience of Bacterial Communities in the Human Microbiome"
Gary Steinberg "Genetics and Pathogenesis of Moyamoya Disease"
Anthony Oro "Hedgehog and the Race Against Tumor Evolution"

Bio-X Undergraduate Summer Research Program



August 21

Andrew Fire "The Difficulties of Genome Engineering and What We Can Learn From Them"

Ravindra Majeti "Therapeutic Targeting of Human Acute Myeloid Leukemia Stem Cells"

James McClelland "Understanding the Cognitive Consequences of Neurodegenerative Disease Through Simulated Damage to Artificial Neural Networks"

Joseph Wu "iPSCs for Cardiovascular Diseases"

August 28

Alesha Castillo "Mechanical Stimulation in Bone Adaptation and Healing"

Michael Snyder "Getting Your Genome Sequenced: What Can You Learn?"

Heng Zhao "The Protective Effects of Ischemic Postconditioning Against Stroke"

2012 Bio-X Undergraduate Research Talks given by Stanford Faculty:

June 27

Alejandro Sweet-Cordero "Functional Analysis of the EWS/FLI-1 Translocation"

Ian Gotlib "Understanding and Reducing Risk for Depression"

Anthony Oro "Definitive Genetic Therapies for Skin Diseases"

July 6

Philip Beachy "Hedgehog Signaling in Development, Disease, and Regeneration"

Virginia Walbot "Origin of Meiotic Cells in Plants"

May Han "Multiple Sclerosis and Brain Autoimmunity"

Alex Dunn "The Cell as Machine: Understanding How Cells Detect and Respond to Mechanical Information"

July 11

Gerald Crabtree "Engineering mice to study chromatin *in vivo*"

Stefan Heller "How Our Senses of Hearing and Balance Work and What Happens When They Don't Work"

James Gross "Emotion Regulation"

Paul Khavari "Genomic Reprogramming in Stem Cell Differentiation and Cancer"

July 18

Anne Brunet "Regulation of Aging and Longevity"

Sharon Pitteri "New Strategies for the Imaging of Cancer"

Michael Hsieh "Studying an Ancient Enemy with 21st Century Tools: Vanquishing the World's Deadliest Worm"

Marius Wernig "Direct Conversion of Skin Cells to Neurons"

July 25

Calvin Kuo "Engineering Cancer Cells in 3D Environments"

Stephen Montgomery "The Genetics of Gene Expression"

C. Andrew Bonham "Transplantation of Intestinal Stem Cells"

M. Bruce MacIver "The Time-Course of Synaptic Inhibition in Human vs Rat Brain Circuits"

August 1

Robert Chang "Peristat Online Visual Field Screening for Glaucoma"

Michelle Monje-Deisseroth "Remodeling the Brain's Infrastructure: Mechanisms of Postnatal Neurodevelopment in Health and Disease"

Miriam Goodman "How Do We Feel? The Mystery and Importance of Touch and What *C. elegans* can Teach Us About How It Works"

Karen Parker "The Role of Oxytocin Biology in the Social Impairments of Autism"

Bio-X Undergraduate Summer Research Program



August 8

Karl Deisseroth "Optogenetics: Development and Application"

Mary Teruel "Using Single-Cell Imaging and Targeted Mass Spectrometry to Uncover the Feedback Loops Controlling Differentiation"

Laura Attardi "Deconstructing p53 Pathways *In Vivo* using Mouse Models"

Allan Reiss "Integrating Genes, Brain and Behavior in Fragile X (FXS) and Williams Syndromes (WS): The 'Yin and Yang' of Social Behavior"

August 15

Anthony Norcia "Using EEG to Image the Dynamics of Human Vision"

Steven Block "Optical Tweezers: Biophysics, One Molecule at a Time"

Josh Elias "Measuring Dynamic Proteomes with Quantitative Mass Spectrometry"

Drew Nelson "Fatigue and Residual Stresses in Bones and Arteries"

August 22

Scott Delp "Dynamics of Walking and Running"

Olivia Martinez "Challenges and Opportunities for the Future in Transplant Immunology"

Russ Altman "Understanding the Interaction of Genes and Drugs"

Julie Theriot "Life on the Inside: Secrets of Bacterial Pathogens"

August 29

Dean Felsher "Modeling and Predicting Therapeutic Efficacy of Cancer Treatments"

Justin du Bois "Turning Toxins into Tools for Ion Channel Studies"

Yanmin Yang "Calcium Tips the Balance"

Tom Quertermous "Dissecting the Genetic Risk for Coronary Heart Disease"

2011 Bio-X Undergraduate Research Talks given by Stanford Faculty:

June 15

Fan Yang "Engineering Biomaterials for Directing Stem Cell Differentiation and Tissue Regeneration"

Matthew Scott "Developmental Biology and Cancer"

Theo Palmer "New Neurons in Learning, Memory and Forgetting"

June 22

Gavin Sherlock "Watching Yeast Change: Using Genomics to Understand the Adaptive Landscape"

Hanlee Ji "Next Generation Human Disease Genetics through Digital Genome Analysis"

Carlos Bustamante "Genomic Insights into the Great Human Diasporas"

June 29

Alan Cheng "Development and Function of the Mammalian Cochlea"

James Chen "Zebrafish Models of Regeneration"

Serafim Batzoglou "When will Everyone be Sequenced?"

Aaron Straight "Organizing and Segregating the Genome"

July 6

Russell Fernald "How does Behavior Change the Brain?"

Daniel Rubin "Imaging Informatics: From Pixels to Biomedical Meaning"

Richard Zare "Fun with Nanoparticles"

Vijay Pande "Folding@home: Pushing the Limits of Molecular Simulation"

Bio-X Undergraduate Summer Research Program



July 13

Calvin Kuo "Gastrointestinal Tissue Engineering"

Chaitan Khosla "Biological Chemistry or Chemical Biology?"

Ron Levy "Using the Immune System to Treat Cancer"

Jill Helms "Modeling the Salamander: Using Developmental Signals to Enhance Tissue Regeneration"

July 20

Raphael Guzman "Intravascular Stem Cell Therapy for Experimental Neonatal Hypoxia"

Hongjie Dai "Nanomaterials for Detection, Imaging and Therapy"

Paul Khavari "How Cancers Arise"

Antonio Hardan "Pivotal Response Group Treatment Studies for Parents of Young Children with Autism"

July 27

Carla Shatz "Releasing the Brake on Neural Plasticity"

Julie Theriot "Mechanics and Dynamics of Cell Motility"

Christina Smolke "Programming Cellular Behavior with RNA Controllers"

Peter Maxim "Motion Management in Radiotherapy"

August 3

Marius Wernig "Direct Induction of Neuronal Cells from Fibroblasts"

Julien Sage "The RB Gene Family in Stem Cells and Cancer Initiation"

Bruce MacIver "Using EEG to Measure Loss of Consciousness in Fighter Jet Pilots"

Kalanit Grill-Spector "Neural Basis of Face, Body, and Object Recognition in the Human Brain"

August 10

Yanmin Yang "BPAG1n4: A Sensory Neuron's Sustainer"

Ben Barres "What do Astrocytes do?"

Mary Teruel "Understanding PI3K Signaling and Variation in the Control of Fat Cell Function"

Sam Gambhir "Imaging Cancer Using Molecular Spies"

August 17

Steven Block "Single Molecule Biophysics"

Joe Wu "Clinical Hurdles of Pluripotent Stem Cell Therapy"

Scott Delp "Dynamics of Running"

Judith Frydman "Molecular Origami: Protein Folding and Misfolding in the Cell"



Undergraduate Summer Research Program Participants 2010

Bio-X Undergraduate Summer Research Program



2010 Bio-X Undergraduate Research Talks given by Stanford Faculty:

June 16

Jennifer Cochran "Engineered Protein Therapeutics and Diagnostic Agents Inspired by Nature"
Jill Helms "Saving the Cheerleader, Saving the World: What Can Regenerative Medicine Really Achieve?"
Paul Brown "3-D Digital Anatomy"

June 23

KC Huang "How Bacteria Get Into Shape"
Joseph Lipsick "Epigenetic Regulation by Proteins Encoded by Cancer Genes"
Liqun Luo "Studying Imprinting Chromosome by Chromosome in Mice"

June 30

Daphne Koller "Machine Learning for Systems Biology and Medicine"
Manpreet Singh "Prevention of Early Onset Bipolar Disorder: Clues from Genetics and Neurobiology"
Bruce MacIver "Using EEG to Measure Loss of Consciousness in Fighter Jet Pilots"

July 7

Vijay Pande "Folding@home: Pushing the Limits of Molecular Simulation"
Gerald Fuller "Creating a Cellular Pied Piper"
Tobias Meyer "Systems Biology of Cell Migration"

July 14

Shaul Hestrin "Definition of Cortical Circuits"
Marius Wernig "Direct Conversion of Fibroblasts to Neurons"
Michael Longaker "Stem and Progenitor Cell Recruitment Following Injury"

July 21

Theo Palmer "Stem Cell Therapies for Neurological Disease"
Fan Yang "Stem Cell and Biomaterials Engineering for Tissue Regeneration"
Matt Scott "Controlling Growth of the Cerebellum"

July 28

Suzanne Pfeffer "How the Golgi Works"
Joachim Hallmayer "The Genetics of Autism and Pervasive Developmental Disorders"
Richard Zare "Making Nanoparticles for Drug Deliver"
Annelise Barron "Toxic Granulocyte Peptides of Innate Immunity: Disease Culprits, Hiding in Plain Sight?"

August 4

Joseph Wu "Clinical Hurdles of Pluripotent Stem Cell Therapy"
Anne Brunet "Mechanisms of Aging and Longevity"
Karen Parker "Oxytocin Biology and the Social Deficits of Autism Spectrum Disorders"

August 11

Merritt Maduke "Inhibiting Chloride Transport: Why and How"
Jianghong Rao "Building Molecules to Spy on Cells"
Michael Clarke "Regulation of Self Renewal in Stem Cells"

August 18

Marc Levenston "Biophysical and Biochemical Cues in Controlling Cell Behavior"
Alan Pao "Development of a New Class of Aquaretics for the Treatment of Hyponatremia"
Karl Deisseroth "Optogenetics: Development and Application"

Bio-X Undergraduate Summer Research Program



2009 Bio-X Undergraduate Research Talks given by Stanford Faculty:

June 24

Zev Bryant "Engineering Molecular Motors"

Sarah Heilshorn "Designing New Medical Materials for Stem Cell Transplantation"

Dmitri Petrov "Studies of Molecular Adaptation"

July 1

Miriam Goodman "Using *C. elegans* to Understand Pleasant and Painful Touch Sensation"

Geoff Gurtner "Understanding the Role of Progenitor Cell Mediated Repair Following Injury"

Cliff Wang "Evaluation of Combinatorial Gene Expression in Lymphocytes"

July 8

Carla Shatz "Brain Tuning"

Matthew Bogoy "Applications for Small Molecules in the Study of Protease Function"

July 15

Judith Frydman "Protein Folding and Misfolding in the Eukaryotic Cytosol"

Michael Longaker "Adipose-derived Cells for Skeletal Tissue Engineering"

Charles Taylor "Biomechanical Factors in Vascular Disease"

July 22

Kevan Yamahara "California Beach Sands - Reservoirs for Fecal Indicator Bacteria"

Margaret Fuller "Regulation of Self-renewal and Differentiation in Adult Stem Cell Lineages"

Suchi Saria "Towards Holistic Diagnostic Models"

July 29

Helen Blau "Bioengineering Stem Cell Fate"

Jill Helms "Wnt-mediated Tissue Regeneration"

Steve Quake "Turning the Spotlight to Dark Matter in Biology"

August 5

Matthew Scott "Genetic Control in Development and Disease"

John Huguenard "Dissecting Neural Circuitry One Cell at a Time"

August 12

Richard Zare "Cell, Cell, Cell!"

Michael Clarke "Molecular Regulation of Self Renewal"

August 19

Patrick Ng "Vaccines for the Treatment of Lymphomas"

Theo Palmer "Functional Roles for New Neurons in Old Neural Networks"

Raphael Guzman "Multimodality Imaging in Stroke Stem Cell Therapy"

August 26

Joachim Hallmayer "Genetics of Autism"

Kang Shen "Small Connections in Tiny Worms: Molecular Mechanisms of Synapse Formation"

Student comments about the program:

"[Because of the program] I feel encouraged that I would be able to participate in academia if that is the path I choose, but I also have a much more full picture on the intense work that goes into even the smallest of projects. The techniques I learned in lab were also very helpful, and I will continue to use them in my research in the future, but I think the most valuable part of the program was being exposed to the broad spectrum of research that is going on and deepening my understanding through the Wednesday talks."

- Christine Yost, 2012 cohort

"The program gave me a great appreciation for the sheer amount of research occurring just at Stanford. It was wonderful to be surrounded by peers who were all working on such interesting projects. I had definitely not been surrounded by such a motivated group of students in any previous grant program. The weekly lectures were very useful in providing me with directions and techniques to apply to my own project."

- Sam Lawrence, 2011 cohort

"[The program] provided me the unique experience of formulating research questions and thinking critically about my project. I think that the Bio-X research program really affords students the opportunity to get a hands-on experience to apply concepts learned in classes [to] real-life situations and thereby buttress the material in textbooks."

- Debbie Lee, 2009 cohort

"I found my experience at the poster session to be especially gratifying. It was so wonderful to have other scientists at all different levels ask great questions that really made me reexamine my own project... In addition, I really enjoyed speaking with scientists who were genuinely interested in my project as it related to their own project. It was great to be able to compare experimental techniques and talk about the aims, progress, and current results of each other's projects."

- Annie Tran, 2011 cohort

"I learned the value of carefully planning future experiments in detail. The clearer the picture I have of what I am attempting to do will help me greatly in successfully carrying out my experiments and also of troubleshooting problems should any arise. I love to learn, and these seminars were action-packed with fascinating science. I especially appreciated how eclectic the range of topics was."

- Khang Dinh, 2010 cohort

"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."

- Tally Buckstaff, 2013 cohort



Undergraduate Summer Research Program Participants 2012

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**To learn more about the Bio-X program at Stanford,
please visit the Bio-X website at:
<http://biox.stanford.edu>**



Undergraduate Summer Research Program Participants 2013