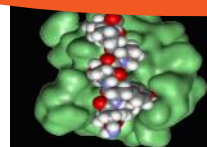
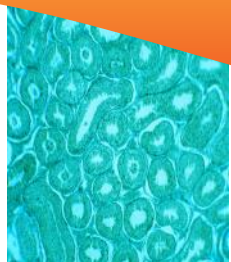


BIO-X

2011 Undergraduate Summer Research Program



BIO-X
Stanford University



Bio-X Undergraduate Research Program



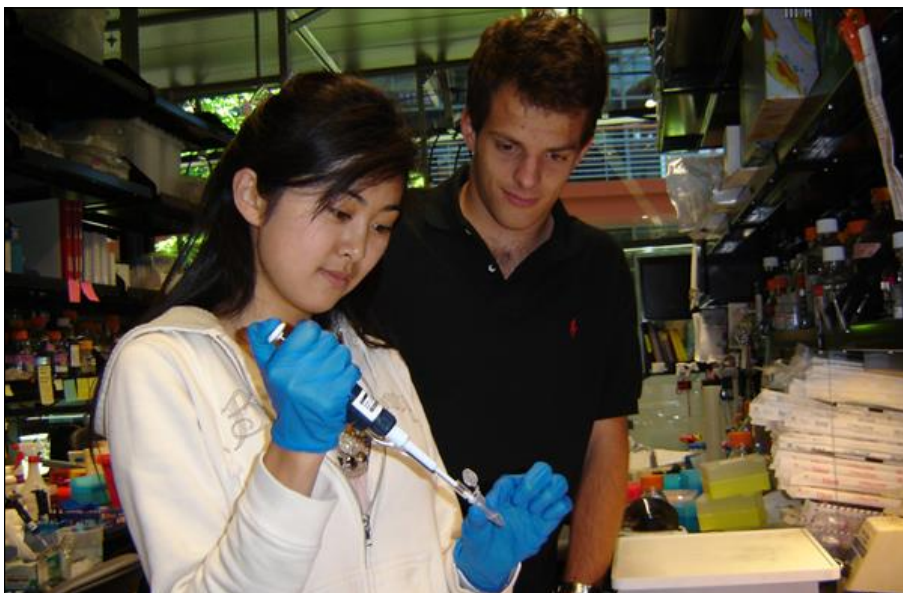
The Bio-X Undergraduate Summer Research Program funds undergraduate research training through an award designed to support interdisciplinary undergraduate summer research projects. Awards are made through an application process available to any Bio-X affiliated faculty across campus (nearly 500 Faculty are affiliated with the Bio-X program). Student awardees receive a stipend equivalent to ten weeks of laboratory work.

The program is an invaluable opportunity for students to conduct hands-on research, learn how to carry out experiments in the laboratory, and develop the skills to read and analyze scientific literature. To date, 127 students have been awarded the opportunity to participate in the Bio-X Undergraduate Summer Research Program.

A unique component of the Bio-X Undergraduate Summer Research Program is the Undergraduate Research Talks given by the mentors of our student awardees. These weekly Faculty talks expose students to a variety of scientific fields and enrich their summer research experience. These talks are also open to the entire Stanford community. This is a unique opportunity for students 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 2011, students learned about the research in the laboratories of 38 Faculty and learned about new areas of research to which they may not otherwise have been exposed. At the conclusion of the ten-week period, the students presented the results of their summer research experience in the form of a poster presentation open to the public.

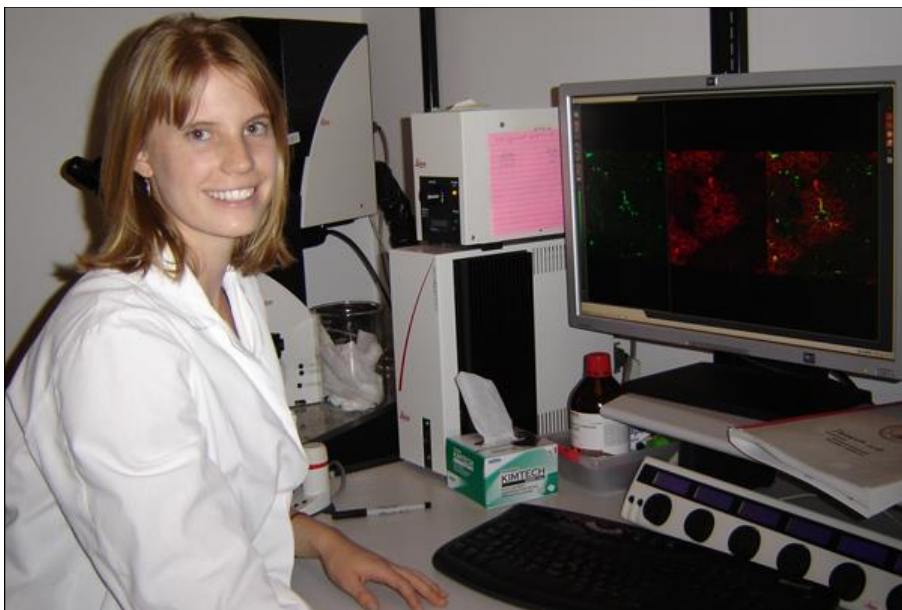
Funding for the support of our undergraduate summer research program was provided by generous contributions from the Bio-X Director, Dr. Carla Shatz, and other donors, including The Rose Hills Foundation and Pitch Johnson.

In 2011, we supported 46 participants, the largest group of undergraduate students in the history of the Bio-X Undergraduate Summer Research Program.



Sarah Cheng and Richie Sapp completed their summer research training in Dr. Carla Shatz's lab.

Bio-X Undergraduate Research Program



Jenelle Wallace completed her summer research training in Dr. Karl Deisseroth's lab.

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"

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"

Bio-X Undergraduate Research Program



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 "BPAG In4: 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"

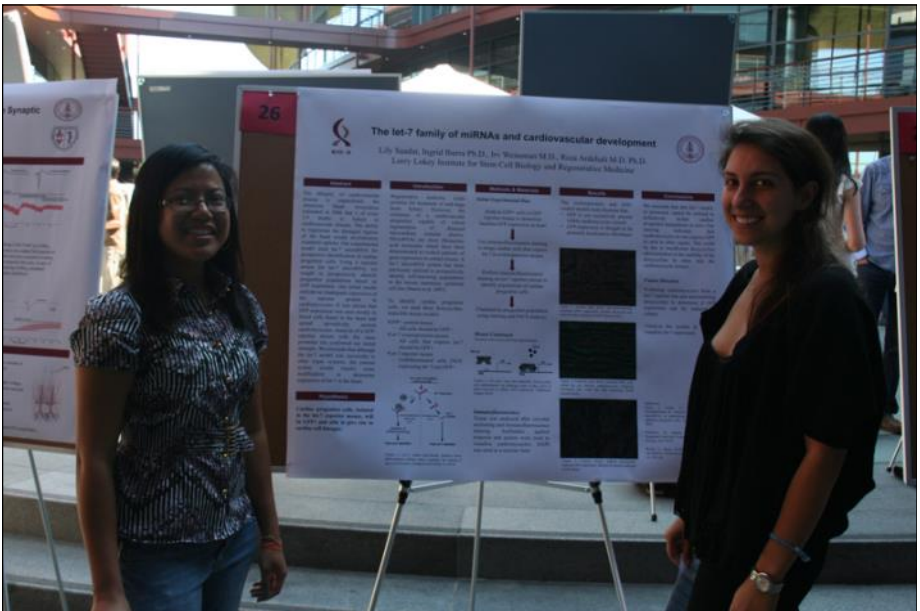
August 17

Steven Block "Single molecule biophysics"

Joe Wu "Clinical hurdles of pluripotent stem cell therapy"

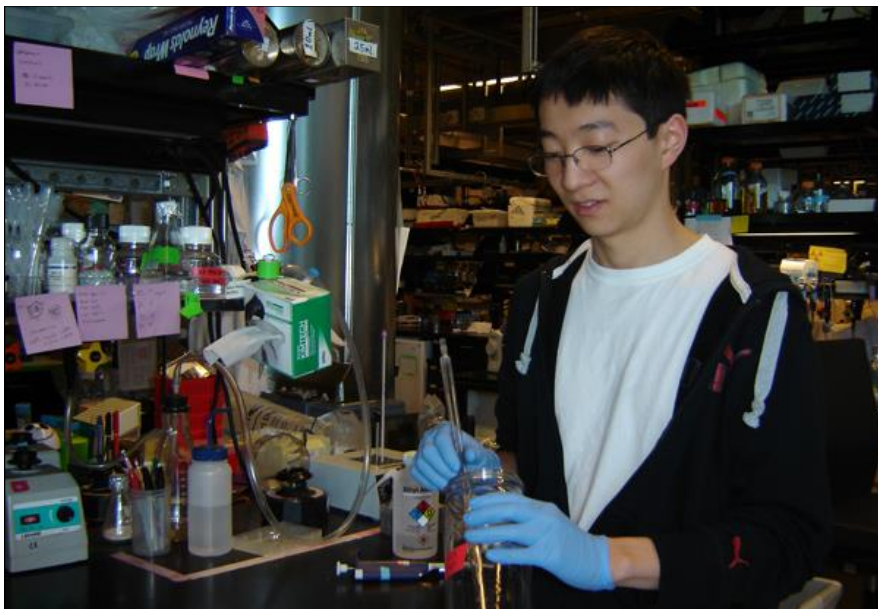
Scott Delp "Dynamics of running"

Judith Frydman "Molecular origami: protein folding and misfolding in the cell"



Vivian Ngo (left) completed her summer research training in Dr. Theo Palmer's lab.

Lily Saadat (right) completed her summer research training in Dr. Irv Weissman's lab.



Jake Wang completed his summer research training in Dr. Judith Frydman's lab.

2011 Program Participants:

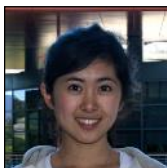


Christopher Brunson *Chemistry*

Supported by: Bio-X Program

Mentor: Prof. Mary Teruel, *Chemical and Systems Biology*

Christopher Brunson is a rising senior majoring in chemistry. He is currently conducting research on the transcription factors that control adipogenesis through a chemical biology approach in the Teruel lab. While his current focus is diabetes, he has also done research in synthetic biology. Last year he participated in the Stanford iGEM team mentored by Christina Smolke and Drew Endy while working to develop a ratiometric sensor in *E. coli*. He plans to pursue medical school after graduation.



Sarah Cheng *Biology*

Supported by: The Rose Hills Foundation

Mentor: Prof. Carla Shatz, *Neurobiology*

Sarah Cheng is a senior majoring in biology. She hails from sunny San Diego, where she spent the majority of her childhood fascinated by the swiveling eyeballs of critters bathing in tide pools. At Stanford she became exposed to the wonders of brain development and has since been at the Shatz lab studying brain development using the visual system as a handy tool. At the lab, Sarah works on a project studying the effect of visual deprivation on gene expression in the visual cortex. She is interested in whether lack of vision influences the expression of select MHC Class I genes.

Bio-X Undergraduate Research Program



Anna Cushing *Biomedical Computation*

Supported by: Pitch Johnson

Mentor: Prof. Hanlee Ji, *Oncology*

Anna is a rising senior from Washington DC. She is majoring in biomedical computation with a focus in organs and organ systems. This summer, Anna is working to implement an algorithm that uses next generation sequencing to find rare mutations in H1N1 and gastric cancer tumors. She is interested in the use of new technologies and computational methods to solve clinical issues, and she plans to apply to medical school after graduating.



Michael Davies *Biology*

Supported by: The Rose Hills Foundation

Mentor: Prof. Gavin Sherlock, *Genetics*

Michael is a member of the class of 2012 and is majoring in biology. His project involves the genetic and biochemical characterization of the *S. cerevisiae* gene *XDHI*, which allows yeast to grow on the pentose xylose. Improving growth on xylose has essential applications to the biofuel industry as xylose is the second most common sugar (after glucose) in lignocellulosic biomass such as corn stover, wood byproducts, and dedicated fuel crops. His primary research question addresses whether over-expression of *XDHI* will improve the modest “xylose growth” phenotype. After Stanford, he hopes to attend medical school.

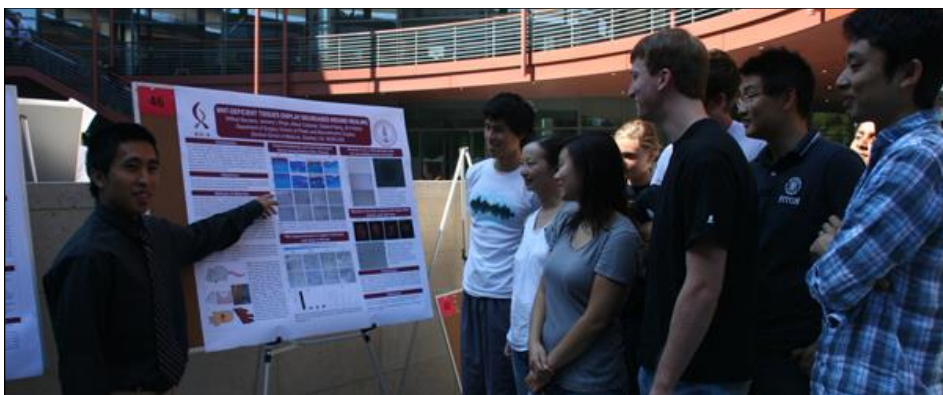


Everett Frost *Human Biology-Neurobiology*

Supported by: Pitch Johnson

Mentor: Prof. Yanmin Yang, *Neurology*

Everett Frost is a junior from Los Angeles majoring in human biology with a concentration in neurobiology. Everett works in Dr. Yanmin Yang's Neurology lab, where he focuses on the use of phosphor nanoparticles for imaging axonal transport in neurodegenerative diseases. In his spare time, he enjoys mountain bicycling and competitive swimming.



Wilfred Manzano completed his summer research training in Dr. Jill Helms' lab.

Bio-X Undergraduate Research Program



Makiko Fujimoto (*undeclared*)

Supported by: Pitch Johnson

Mentor: Prof. Kalanit Grill-Spector, Psychology

Makiko Fujimoto is a rising sophomore, potentially majoring in human biology. She is Japanese but moved multiple times and graduated from International School Bangkok. She is working in Dr. Grill-Spector's Vision and Perception Neuroscience Lab. Makiko is investigating whether the fixating movements of people's eyes determine how effective they are at facial recognition, and how different fixating patterns influence this. She hopes to study more about how human behavior is affected by biological functions and to eventually investigate more factors affecting facial recognition including brain mechanisms. In her free time, she does ballet and likes to scan through music blogs.



Andrea Goldstein *Biology (Neuroscience)*

Supported by: Pitch Johnson

Mentor: Prof. Matthew Scott, Developmental Biology

Andrea Goldstein, a student from St. Louis, Missouri, recently finished her freshman year at Stanford University. She is hoping to major in biology with a specialization in neuroscience and has been fascinated by science and the medical field since the age of seven. She plans to pursue such fields in the future. This summer in Matthew Scott's lab, she is studying various neuropeptides in the *Drosophila melanogaster* brain and the subsequent effects of these peptides on insulin secretion and growth.



John Hawkins *Human Biology*

Supported by: Bio-X Program

Mentor: Prof. Marius Wernig, Pathology

John proudly hails from the great Mountain West. At Stanford, he studies human biology with a focus in developmental biology. He has also enjoyed exploring the humanities studying Buddhism while traveling abroad, pursuing an art minor, and in the Structured Liberal Education program. He is not yet sure where these paths will intersect, but he is also not too worried about that just yet. In the Wernig lab, he is learning how to keep cells happy, reprogram them, and then make sure they are still happy. He is thrilled to be working on potential iPS-derived treatments for epidermolysis bullosa and sickle cell disease.



Eric Johnston *Physics, Electrical Engineering*

Supported by: Bio-X Program / Physics Department

Mentors: Profs. Peter Maxim and Billy Loo, Radiation Oncology

Eric is a rising senior majoring in physics and electrical engineering. Eric grew up in Palo Alto, attending Gunn High School. He is working in the department of radiation oncology under the advisement of Peter Maxim and Bill Loo to help improve treatment plans for patients with tumors in the lung and esophagus.

Bio-X Undergraduate Research Program

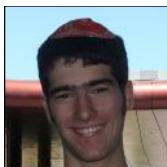


Christine Khademi *Biology (Neurobiology)*

Supported by: Bio-X Program

Mentor: Prof. Sanjiv Sam Gambhir, *Radiology and Bioengineering*

Christine is a senior majoring in biological sciences and minoring in chemistry at Stanford University. She is excited to be working in the lab of Professor Gambhir through the Bio-X Undergraduate Summer Research Program. Her research involves the synthesis, characterization, and bio-functionalization of various nanoparticles for use as contrast agents in ultrasound and MRI. She hopes to attend graduate, medical and/or business school as well as to start her own nonprofit.



Isaac Kauvar *Engineering Physics*

Supported by: VPUE

Mentor: Prof. Karl Deisseroth, *Bioengineering and Psychiatry*

Isaac Kauvar, a senior in engineering physics from Denver, is fascinated by photons, neural systems, renewable energy conversion, and making things. As a member of the Deisseroth lab, he is using optogenetic neural control with simultaneous bulk calcium imaging in a freely moving rodent to probe how the brain processes information. In particular, he is investigating the role played by the cortical and dopaminergic modulatory systems in orchestrating goal-directed animal behavior.



Julie Koenig *Biology*

Supported by: Bio-X Program

Mentor: Prof. Ravindra Majeti, *Stem Cell Biology and Regenerative Medicine*

Julie Koenig is a junior majoring in biology from Cincinnati, Ohio. In Dr. Ravi Majeti's lab, Julie is working on a transposable element system that will allow her to manipulate leukemia cells to study certain pathways that are activated in these cells. In general, Julie is interested in biology, particularly cellular biology and physiology, with a future in graduate school, perhaps medical school. She is very interested in marine life and the ocean and recently did oceanography and marine organism research on a vessel that traveled across the Pacific Ocean. Outside of science, she plays squash for Stanford and enjoys the outdoors.



Sam Lawrence *Human Biology-Neurobiology*

Supported by: Bio-X Program

Mentor: Prof. Raphael Guzman, *Neurosurgery*

Sam Lawrence is a rising senior at Stanford University, majoring in human biology with an emphasis in neurobiology. He is from Washington DC and attended Woodrow Wilson High School. Sam's interest in neurology traces back to when he was very young, and he plans to attend medical school after graduating from Stanford with the intention of entering the field of neurosurgery. Sam joined Dr. Raphael Guzman's lab in January of 2011 and will be completing his honors thesis on human neural progenitor cell protein expression and involvement in remyelination following hypoxic ischemic stroke.

Bio-X Undergraduate Research Program



Steven Lee *Bioengineering*

Supported by: Bio-X Program

Mentor: Prof. Helen Blau, Microbiology & Immunology

Steven is a sophomore intending to major in bioengineering and currently studying the effects of aging and microenvironmental niches on skeletal muscle stem cell self-renewal and regenerative properties. His current project investigates the effects that small-molecule compounds have on signaling pathways involved with muscle stem cell function and regeneration in mouse transplants and *ex vivo*. As an active member of the Stanford Archery Team, Steven enjoys training with his recurve bow as well as coaching beginner archers and competing in tournaments. In his free time, Steven likes to build and modify computers, one of which is entirely water-cooled.



Scott Livingston *Human Biology*

Supported by: Bio-X Program

Mentor: Prof. Carlos Bustamante, Genetics

Scott Livingston is a rising sophomore likely majoring in human biology and studying pre-med. He is a Bay Area native who is now in his second summer with the Bustamante genetics lab. This year, his project will focus on using genetic tools to understand why hunter-gatherer populations in South Africa do not get dental cavities. In addition to his interest in medicine, Scott is also highly involved with Ram's Head Theatrical Society, for whom he will be tech directing the Fall 2011 production of *Gaieties*. He is also an avid sports fan.



Chen Lossos *Biology*

Supported by: Undergraduate Advising and Research

Mentor: Prof. Ronald Levy, Medicine

Chen Lossos is a rising senior pursuing a degree in biology with honors, concentrating in cellular and molecular biology. A native of Israel and current resident of Miami, his research pursuits include determining the nature of ongoing *in vitro* mutations in the immunoglobulin gene of Follicular Lymphoma Cells as surrogates of B-Cell antigen selection, analyzing the idiotypes of Follicular Lymphoma patients as surrogates of immunogenicity and clinical response to anti-idiotypic vaccinations, and exploring the nature of somatic mutation in B-Cell derived malignancies. In the future, he hopes to pursue a joint MD/PhD Degree and advance his current research endeavors.



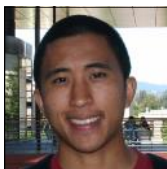
Catherine Lu *Biomedical Computation*

Supported by: Bio-X Program

Mentor: Prof. Russell Fernald, Biology

Catherine Lu is a rising sophomore working in the Fernald lab under the close mentorship of postdoc Rosa Alcazar. She is looking at small RNA expression and biogenesis in an African cichlid fish, *A. burtoni*, using biocomputation techniques. She intends to major in biomedical computation and hopes to go to graduate school or medical school in the future.

Bio-X Undergraduate Research Program



Wilfred Manzano *Biology*
Supported by: Bio-X Program
Mentor: Prof. Jill Helms, Surgery

Wilfred Manzano is a rising junior originally from Fairfield, California. A recently declared biology major, Wilfred works in the Helms lab, currently investigating the effect of Wnt on hair growth and on wound healing. After Stanford, Wilfred hopes to go to medical school. Science and medicine aside, Wilfred thoroughly enjoys watching and doing mixed martial arts (MMA). Wilfred is part of the Stanford Brazilian Jiu-Jitsu club and has recently taken up Muay Thai kickboxing at Fairtex Academy.



Nicholas Mascarenhas *Biology*
Supported by: Bio-X Program
Mentor: Prof. Paul Khavari, Dermatology

Nicholas, a native of Houston, Texas, is currently a senior majoring in biology. He has worked in the Khavari lab for the past two years studying various aspects of skin cell differentiation and presently the role of long noncoding RNAs in melanoma development. He hopes to enter an MD/PhD program in the future.



Christina Mich *Psychology*
Supported by: Bio-X Program
Mentor: Prof. Antonio Hardan, Psychiatry

Christina Mich is a fourth year undergraduate student studying psychology while also doing a coterm in the same field. She is from Sacramento, California where she was born and grew up. Christina is currently working in Dr. Antonio Hardan's autism research lab in Stanford's psychiatry department, mainly focusing on a study assessing the effectiveness of a pivotal response training therapy for children with autism when taught to parents in a group format. Christina's future plans are to work in behavioral therapy with children with autism, and her ultimate goal is to become a clinical psychologist.



Bojan Milic *Biology, Chemistry*
Supported by: Bio-X Program
Mentor: Prof. Steven Block, Biology and Applied Physics

Bojan Milic is a junior at Stanford University majoring in biology (biochemistry/biophysics) and chemistry. Born in Belgrade, Yugoslavia, and having spent his childhood in Kuwait, Bojan arrived at Stanford with a passion for science and an interest in the intersection between the physical and life sciences. During his freshman year, he joined the single-molecule biophysics laboratory of Professor Steven Block. Bojan's research is aimed at elucidating the mechano-chemical properties of various constructs of the dimeric motor protein, kinesin, using laser-based gradient-force optical trapping. He intends to pursue graduate studies in biophysics, applied physics, or chemistry.

Bio-X Undergraduate Research Program



Raman Nelakanti (*undeclared*)

Supported by: Bio-X Program

Mentor: Prof. Richard Zare, Chemistry

Raman is a rising sophomore about to declare majoring in Bioengineering. He is from Sunnyvale, CA, which is quite close to Stanford. His interests include singing, cricket, hiking, and reading science books. His research this summer deals with developing a novel high-resolution RNA separation technique for microfluidic chips using capillary electrophoresis. The end goal for the project is to be able to analyze and detect RNA from single cells. Raman hopes to be a synthetic biologist and either work in academia or start a biotech company.



Vivian Ngo *Biology and American Studies*

Supported by: The Rose Hills Foundation

Mentor: Prof. Theo Palmer, Neurosurgery

From West Covina, California, Vivian Ngo is a rising senior majoring in biology and American Studies. She has worked in the Palmer Lab for over a year. This summer, she is researching adult neurogenesis in mice whose working memories have been impaired by irradiation, the Rac1 mutation, or the cancer treatment TEMODAR. Using the Morris water maze, she hopes to show that neurogenesis during learning is important in destabilizing previously learned information. When Vivian is not in the lab, she enjoys going to theme parks, hiking nature trails, and anything that involves an adventure!

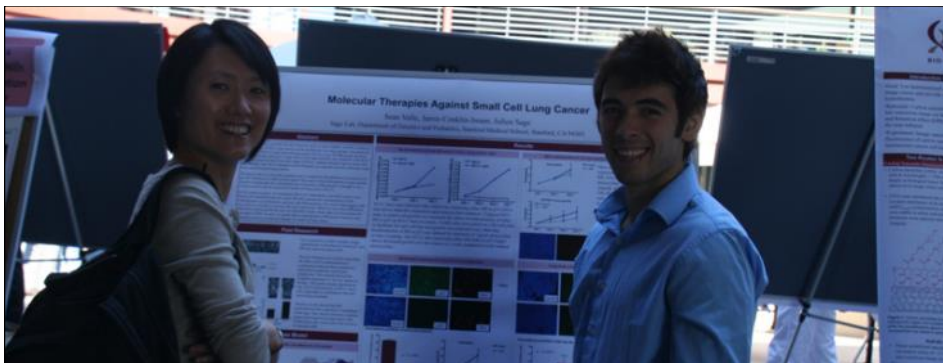


Andy Nguyen *Chemistry*

Supported by: Undergraduate Advising and Research

Mentor: Prof. Aaron Straight, Biochemistry

Andy Nguyen ('12) is a chemistry major from Oakland, CA. This summer he will be pursuing honors research in the Straight lab (biochemistry) on centromere proteins to better understand the mechanism underlying cell division. Outside of the lab, Andy is also interested in medicine and health policy. In his free time, Andy likes to watch indie films and attend street festivals.



Prof. Fan Yang and Sean Valle.

Sean Valle completed his summer research training in Dr. Julien Sage's lab.

Bio-X Undergraduate Research Program



Michelle Nii *Materials Science and Engineering*

Supported by: The Rose Hills Foundation

Mentor: Prof. Fan Yang, Bioengineering and Orthopaedic Surgery

Michelle Nii is a rising senior pursuing a bachelor's degree in materials science and engineering. For the past year and a half, Michelle has been applying her materials science knowledge towards bioengineering goals in the Yang lab. She works on optimizing high-throughput platforms, focusing specifically on microenvironments for differentiating stem cells by controlling environmental cues from both the extracellular matrix components and material properties (such as pore size and matrix rigidity) this summer. The ultimate goal is a better understanding of the complex interplay of microenvironment signals to create better materials that promote differentiation for tissue regeneration purposes.



Heidi Norton *Materials Science and Engineering*

Supported by: Bio-X Program

Mentor: Prof. Jennifer Cochran, Bioengineering

Heidi Norton is a rising senior majoring in materials science and engineering with an emphasis in biomaterials. She is working on developing a new scaffold for protein engineering with applications in cancer imaging and therapeutics in Dr. Jennifer Cochran's lab under the mentorship of Sarah Moore. Peptides engineered using this scaffold, which is derived from spider venom, appear to be metabolically stable and have high tumor uptake in mice. Heidi is from Utah and enjoys outdoor activities such as skiing and rock climbing. She plans on going to graduate school in bioengineering.

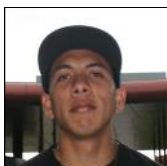


Tunmise Olayinka *Mathematics*

Supported by: Bio-X Program

Mentor: Prof. Julie Theriot, Biochemistry

Tunmise Olayinka was raised in central Florida, where he naturally developed a deep love for science. Working with Tony Tsai of the Theriot lab, Tunmise has explored the world of the microscopic and the motile, studying how the dynamic reorganization of actin and myosin in cell couple variations in its shape with its migratory phenotypes. Originally working with a neutrophil-like leukemic cell line, he has moved on to investigating these processes in the notorious slime mold, *Dictyostelium discoideum*. Only the future knows what is in store for him and this fascinating amoeba!



Oscar Ortiz *Chemistry*

Supported by: Bio-X Program

Mentor: Prof. Vijay Pande, Chemistry

Oscar is an upcoming senior from Indio, CA. He is majoring in chemistry and has been working on projects that involve drug repurposing in the Pande Lab for the past year. His main project this summer involves searching for an inhibitor of botulin toxin using computational methods such as superposition and docking. He will also be searching for an inhibitor of Chagas Disease and helping develop an educational video game that involves protein folding.

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Sujin Park (*undeclared*)

Supported by: Bio-X Program

Mentor: Prof. Joseph Wu, Radiology and Medicine

Sujin Park will be a sophomore in the coming school year and is planning on majoring in biology or bioengineering. Although her primary interest is in neuroscience, Sujin currently works in a cardiovascular stem cell lab to explore her other growing interest in stem cells. She hopes that since current cardiovascular stem cell research is further along than that of neural stem cells, she will be able to gain a comprehensive background in stem cells, which she can later apply to neuroscience research.



Ashwin Peres-da-Silva *Biology (Molecular & Cellular Biology)*

Supported by: Bio-X Program

Mentor: Prof. Howard Chang, Dermatology

Ashwin is a rising junior majoring in biology with a focus in molecular and cellular biology. He grew up in Chapel Hill, North Carolina and attended the North Carolina School of Science and Mathematics. Currently working in the Chang lab, he is researching long intergenic noncoding RNAs (lincRNAs), which are recently discovered genes that do not encode proteins. His project involves characterizing a specific lincRNA and understanding how it controls gene activity. Outside the lab, Ashwin is a sports fanatic and loves being in the outdoors. After his undergraduate work at Stanford, he plans to go on to medical school.



Edmund Posadas *Biology (Neurobiology)*

Supported by: Bio-X Program

Mentor: Prof. Bruce MacIver, Anesthesia

Hailing from San Diego, Edmund is a rising junior who is majoring in biology with a concentration in neurobiology. Over the summer, Edmund is doing research in Dr. MacIver's neuropharmacology lab in the Stanford Medical School. Currently, he is using electrophysiology techniques to analyze the effects of ethanol on GABA receptors in the CA1 region of the hippocampus in rat brain slices. During his free time, he enjoys eating, playing basketball, and volunteering at Stanford Hospital and Clinics. In the future, Edmund hopes to attend medical school.



Lily Saadat *Biology*

Supported by: Bio-X Program

Mentor: Irv Weissman, Stem Cell Biology and Regenerative Medicine

Lily is a rising senior biology major from Danville, California. Her primary interest is the developing role of stem cells in providing clinical treatment for chronic diseases. This summer, Lily is working in the field of stem cell biology with a specific concentration in cardiac regeneration. In her free time, Lily enjoys traveling, learning new languages and spending time with family and friends.

Bio-X Undergraduate Research Program



Nicelio Sanchez-Luege *Computer Science and Biomedical Informatics*

Supported by: The Rose Hills Foundation

Mentor: Prof. Serafim Batzoglou, Computer Science

Nicelio Sanchez-Luege is a co-terminal student in biomedical informatics and computer science. He is working with Serafim Batzoglou's group to develop models and algorithms for analyzing genomic data. Nicelio will apply to MD/PhD programs in the fall and hopes to one day lead his own research group. He also enjoys coding, playing darts, and trying new foods. He is from Orange County, CA.

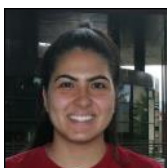


Richie Sapp *Biology*

Supported by: Bio-X Program

Mentor: Prof. Carla Shatz, Neurobiology

Richie Sapp is a junior majoring in biology with a concentration in neurobiology. He is planning to pursue a career in medicine with a specialty in either neurology or pediatrics. He was born in England and lives in San Diego. This summer he is working in Dr. Carla Shatz's lab where he is examining the role of the immune receptor PirB in age dependent synapse plasticity. In his spare time, Richie enjoys practicing the violin and piano, hanging out with friends, and playing basketball.



Zahra Sayyid *Biology*

Supported by: Bio-X Program

Mentor: Prof. Alan Cheng, Otolaryngology-HNS

Zahra Sayyid is a rising senior majoring in Biology. She is originally from Fairfax, Virginia about half an hour south of D.C. She is interested in regenerative medicine and hopes to attend medical school after she graduates.



Lilly Shi *(undeclared)*

Supported by: Bio-X Program

Mentor: Prof. Calvin Kuo, Hematology

Lilly Shi, class of 2014, is from Salt Lake City, UT and loves working with Calvin Kuo, MD/PhD and Kelley Yan, MD/PhD this summer. Her project lies in the boundary between medicine and materials science in which she is attempting to improve and control intestinal stem cell proliferation in protein-engineered hydrogels. While she still has no idea what she'd like to major in, she is avidly interested in medicine, engineering, literature, and creative writing. When she is not in the lab, she can be found swimming, hiking, or reading in the California sun.

Bio-X Undergraduate Research Program



Rebekah Silva *Chemistry*

Supported by: The Rose Hills Foundation

Mentor: Prof. Chaitan Khosla, Chemistry

Rebekah M.B. Silva (class of 2012) is majoring in chemistry. She transferred to Stanford in Autumn 2009 and joined the celiac sprue project in the Khosla lab the following summer. With the support of Bio-X, she will focus on tissue transglutaminase 2, a potential therapeutic target for celiac disease. After completing her degree at Stanford, she plans to pursue a Ph.D. in chemistry and later a career in academia.



Maya Talbott *Biology*

Supported by: Bio-X Program

Mentor: Prof. James Chen, Chemical and Systems Biology

Maya Talbott is a rising junior majoring in biology and minoring in creative writing. She grew up in New Haven, CT and Palo Alto, CA, where she moved in 2004. She is currently studying zebrafish tail regeneration in James Chen's laboratory. She plans to pursue her passion for the arts and creative writing while studying abroad in Paris next fall. Following the completion of her undergraduate career, Maya aspires to go to medical school where she is interested in studying either endocrinology or gynecology.



Lauren Taylor *Biomechanical Engineering*

Supported by: Bio-X Program

Mentor: Prof. Scott Delp, Bioengineering and Mechanical Engineering

Lauren Taylor is a rising junior from Los Altos, California. She is studying biomechanical engineering and plans to eventually specialize in medical device design. Currently, she is interested in combining biomechanics with her love for sports and is conducting research on running and walking gait in the Human Performance Lab under the advising of Dr. Scott Delp. With the effective alteration of multiple Vicon and MATLAB programs, she intends to streamline the process of gait analysis which needs significant improvement. Success in this regard would mean that the lab could ultimately perform more efficient clinics and community outreach programs to significantly enhance injury prevention and rehabilitation measures.



Annie Tran *Biology*

Supported by: The Rose Hills Foundation

Mentor: Prof. Ben Barres, Neurobiology

Annie Tran is a senior from Aliso Viejo, California. Amidst her biology studies at Stanford, she spends much time in Dr. Ben Barres's lab investigating the mechanism by which oligodendrocytes myelinate axons in the central nervous system. She is devoted to this research for its therapeutic potential in promoting remyelination in neurodegenerative diseases such as multiple sclerosis. Ultimately, Annie wants to become a physician so that she can combine her love for learning with her desire to help others. When she is not doing research or volunteering at Pacific Free Clinic, Annie loves to travel, go camping, and pursue outdoor adventures.

Bio-X Undergraduate Research Program



Sean Valle *Bioengineering*

Supported by: Bio-X Program

Mentor: Prof. Julien Sage, Pediatrics

Sean Valle is a rising junior originally from Portola, California, a half-hour north of Lake Tahoe. He is currently researching the therapeutic potential of RB and p53 reintroduction within small cell lung cancer tumors cells. His research interests also encompass the rising field of synthetic biology and the construction of biological systems from a genomic level. Sean is majoring in biosynthetic engineering, an individually-designed major created under the mentorship of Andrew Endy (bioengineering) and Julien Sage (genetics/pediatrics). He hopes to become an active part of the synthetic biology revolution with regards to research, ethical ideology, and technological advancement.



Daniel Vinh *Chemistry*

Supported by: Bio-X Program

Mentor: Prof. Hongjie Dai, Chemistry

Daniel Vinh is a senior (class of 2012) majoring in biochemistry. He works in the Dai lab focusing on the biomedical applications of nanoparticles for drug delivery and tumor imaging. He plans to continue research into his post-graduate studies and go to medical school.



Jenelle Wallace *Biology*

Supported by: Bio-X Program

Mentor: Prof. Karl Deisseroth, Bioengineering

Jenelle Wallace is a junior from Tucson, Arizona, who is majoring in biology with a minor in statistics. This summer, in addition to studying the mechanisms of memory in the hippocampus using optogenetics in the Deisseroth lab, she plans to get a scuba diving license, continue her jujitsu training, and learn how to play the bagpipes.



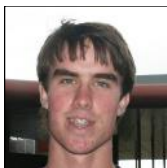
Jake Wang *Biology*

Supported by: Bio-X Program

Mentor: Prof. Judith Frydman, Biology

Jake Wang, a rising senior, is studying biology at Stanford. His research interests include protein folding, aggregation mechanisms and molecular pathways. Under the tutelage of Dr. Joachimiak in the Frydman lab, Jake is exploring the role of chaperones in neurodegenerative diseases such as Huntington's disease. Jake has lived in China, the Netherlands, as well as Colorado, Kentucky and Massachusetts but only roots for Boston sports teams. He hopes to attend medical school after graduation.

Bio-X Undergraduate Research Program



Christopher Weyant *Chemical Engineering and Biology*

Supported by: Bio-X Program

Mentor: Prof. Christina Smolke, Bioengineering

Christopher Weyant is a rising senior studying chemical engineering and biology. He is working in the Smolke Lab on engineering viruses to selectively kill specific subpopulations of cells based on RNA or protein expression profiles. To accomplish this, he is using riboregulators and riboswitches. In the future he hopes to pursue a PhD and then work on solving problems of medical importance. When not in the lab, he enjoys swimming, writing, and teaching.



Dana Yeo *Biomedical Computation*

Supported by: Bio-X Program

Mentor: Prof. Daniel Rubin, Radiology

Dana Yeo is a junior majoring in biomedical computation. She is interested in how computational power can be used to increase the efficiency of medical practices in diagnostics. This summer she is working in Dr. Daniel Rubin's lab developing a novel paradigm for visualizing mammogram data in the form of a web application. After graduating from Stanford, she hopes to work at either a BioTech start-up or VC firm for 2 years before pursuing an MD/MBA.



Bio-X Undergraduate Research Program

2011 Poster Titles



“Quantitative Investigation of Adipogenic Proteins Through Protein Separation and Targeted Mass Spectrometry”

Christopher Brunson¹, Robert Ahrends², Josh Elias², Randall Mann³, Mary Teruel²
Departments of Chemical Engineering¹ and Chemical and Systems Biology Operations², Stanford University; Howard Hughes Medical Institute³

“Visual Experience Dependent Regulation of Plasticity Genes”

Sarah Cheng¹, Jaimie Adelson², Barbara Brott¹, Carla Shatz^{1,2}
Departments of Biology¹ and Neurosciences², Stanford University

“Rare Variant Detection on the Viral Genome”

Anna Cushing¹, Patrick Flaherty², Hanlee Ji³
Departments of Biomedical Computation¹, Biochemistry², and Oncology³; Stanford University

“Towards Cellulosic Ethanol: Determining the Limitations for Xylose Growth in *S. cerevisiae*”

Michael Davies¹, Jared Wenger², Gavin Sherlock²
Departments of Biology¹ and Genetics², Stanford University

“Is there Differential MAP8 Expression in Alzheimer’s Disease?”

Everett Frost¹, Michael Maloney², Yanmin Yang²
Departments of Human Biology-Neurobiology¹ and Neurology², Stanford University

“Investigations of Eye Tracking During Encoding and Recognition of Visual Categories”

Makiko Fujimoto², Alina Liberman¹, Golijeh Golarai¹, Kalanit Grill-Spector¹
Department of Psychology¹, Stanford University; undeclared major²

“Elucidating the Role of Candidate Genes in *Drosophila* Insulin Secretion and Growth Regulation”

Andrea Goldstein¹, Julie Ni¹, Matthew Scott^{1,2,3}
Departments of Developmental Biology¹, Genetics², and Bioengineering³; Stanford University

“Personalizing Treatment Plans Using Deep Inspiration, Expiration, and Free Breathing”

Eric Johnston^{1,2}, Maximilian Diehn³, Bill Loo³, Peter Maxim³
Departments of Physics¹, Electrical Engineering², and Radiation Oncology³; Stanford University

“Optogenetic Feedback Control of Genetically Targeted Populations of Neurons in a Freely Moving Mouse”

Isaac Kauvar¹, Logan Grosenick², Kelly Zalocusky², Karl Deisseroth^{3,4}
Departments of Engineering Physics¹, Neuroscience², Bioengineering³, and Psychiatry and Behavioral Sciences⁴; Stanford University

“Carbon Nanotubes for Imaging and Cancer Treatment”

Daniel Vinh, Joshua Robinson, Guosong Hong, Hongjie Dai
Department of Chemistry, Stanford University

“Ongoing Mutation in Follicular Lymphoma”

Chen Lossos¹, Behnaz Taidi², Shoshana Levy², Ron Levy²
Departments of Biology¹ and Oncology², Stanford University

Bio-X Undergraduate Research Program

2011 Poster Titles continued



“Protein and mRNA Expression of Human Embryonic-Derived Neural Progenitor Cells and Potential Mechanisms of Interaction with the Post-Stroke Brain Environment”

Sam Lawrence^{1,2}, Tenille Smith³, Nancy Wang³, Raphael Guzman⁴

Departments of Human Biology¹, Neurobiology², Surgery³, and Neurosurgery⁴; Stanford University

“Cancer Transcriptome Remodeling by Oncogenic BRAF”

Nicholas Mascarenhas¹, Ross Flockhart², Paul Khavari²

Departments of Biology¹ and Dermatology², Stanford University

“Comparing Communication Change Across 12 Weeks in Children with Autism After Their Parents' Participation in a Parent Education Group Versus a Pivotal Response Training Group”

Christina Mich¹, Grace Gengoux², Mendy Minjarez², Kari Berquist², Rachel Travolta², Robin Libov², Antonio Hardan²

Departments of Psychology¹ and Psychiatry & Behavioral Sciences², Stanford University

“Probing the Effects of Neck-Linker Length Modulation on Kinesin Mechanochemistry”

Bojan Milic^{1,2}, Steven Block³, Johan Andreasson⁴

Departments of Biochemistry¹, Biophysics², Applied Physics³, and Physics⁴; Stanford University

“Microchip Capillary Electrophoresis for High-Resolution RNA Separation and Analysis”

Raman Nelakanti², Sam Kim¹, Richard Zare¹

Department of Chemistry¹, Stanford University; undeclared major²

“Learning-Evoked Neurogenesis Provides Cognitive Flexibility”

Vivian Ngo¹, Ursula Haditsch², Theo Palmer²

Departments of Biology¹ and Neurosurgery², Stanford University

“Investigating the Functions of M18BPI and CENP-C in Centromeric Chromatin Assembly”

Andy Nguyen¹, Corey Meyer², Ben Moree², Bradley French², Aaron Straight²

Departments of Chemistry¹ and Biochemistry², Stanford University

“Engineering Biomimetic Hydrogels to Enhance Vascular Differentiation of Human Stem Cells”

Michelle Nii¹, Anthony Behn², Fan Yang^{2,3}

Departments of Materials Science & Engineering¹, Orthopedic Surgery², and Bioengineering³; Stanford University

“Development of Stable Knottin Scaffolds for Protein Engineering”

Heidi Norton¹, Sarah Moore², Alan Leung³, Jennifer Cochran²

Departments of Materials Science & Engineering¹, Bioengineering², and Chemical Engineering³; Stanford University

“Gadolinium Doped Silica Nanoparticles as Multimodal Contrast Agents for Ultrasound and MRI Tracking of Mesenchymal Stem Cells *In vivo*”

Christine Khademi^{1,2}, Jesse Jokerst³, Sam Gambhir³

Departments of Biology¹, Neurobiology², and Radiology³; Stanford University

“Gene Targeting and Characterization of Induced Pluripotent Stem Cells Derived From Patients Affected By *Epidermolysis Bullosa*”

John Hawkins¹, Bahareh Derafshi², Vittorio Sebastiano³, Marius Wernig⁴

Departments of Human Biology¹, Stem Cell Biology², Obstetrics & Gynecology³, and Pathology⁴; Stanford University

Bio-X Undergraduate Research Program

2011 Poster Titles continued



“Characterizing the Morphospace of *Dictyostelium discoideum* and the Correlation with its Migration Dynamics”

Tunmise Olayinka¹, Tony Tsai^{2,3}, Julie Theriot^{2,4}

Departments of Math & Computational Science¹, Biochemistry², Chemical and Systems Biology³, and Microbiology & Immunology⁴; Stanford University

“Inhibiting Botulin Toxin”

Oscar Ortiz¹, Paul Novick¹, Jorge Zuniga², James Burnette³, Laura Gomba³, Axel Brunger², Vijay Pande¹

Departments of Chemistry¹ and Molecular & Cellular Physiology², Stanford University; National Institute of Health³

“Characterization of Noncoding RNA 964 in the DNA Damage Response”

Ashwin Peres-da-Silva¹, Tiffany Hung², Howard Chang³

Departments of Biology¹, Cancer Biology², and Dermatology³; Stanford University

“Circuit Level Analysis of Aesthetic Effects on Synaptic Integration”

Edmund Posadas¹, Melis Sunay², Bruce MacIver²

Departments of Biology¹ and Anesthesia², Stanford University

“The let-7 family of miRNAs and Cardiovascular Development”

Lily Saadat¹, Ingrid Ibarra², Reza Ardehali³, Irv Weissman⁴

Departments of Biology¹, Stem Cell Biology², Cardiovascular Medicine³, and Pathology⁴; Stanford University

“Disrupting the Function of Paired-Immunoglobulin-Like Receptor B PirB”

Richard Sapp¹, David Bochner², George Vidal², Carla Shatz^{1,2}

Departments of Biology¹ and Neuroscience², Stanford University

“Tympanic Border Cells are Wnt-Responsive and Act as Stem/Progenitor Cells in the Postnatal Mouse Cochlea”

Zahra Nabi Sayyid^{1,2}, Taha Adnan Jan³, Renjie Chai³, Anping Xia³, Saku Tapani Sinkkonen³, Jared Ruben Levin³, Yi Arial Zeng^{4,5}, Stefan Heller³, Roel Nusse⁴, Alan Cheng³

Departments of Biology¹, Anesthesia², Otolaryngology³, and Developmental Biology⁴, Stanford University; Howard Hughes Medical Institute⁵

“Culturing Intestinal Stem Cells”

Lilly Shi⁴, Kelley Yan¹, James Su², Sarah Heilshorn², Calvin Kuo³

Departments of Gastroenterology¹, Materials Science & Engineering², and Medicine³, Stanford University; undeclared major⁴

“*In vitro* and *In vivo* Analysis of Transglutaminase 2 Mutants with Altered Allosteric Properties”

Rebekah Silva¹, Xi Jin¹, WeiWei Li¹, Chaitan Khosla²

Departments of Chemistry¹ and Chemical Engineering², Stanford University

“Proliferation and Signaling Behaviors Controlling Muscle Stem Cell Self-Renewal/Expansion Within an Bioengineered Niche Culture Platform”

Steven Lee¹, Ben Cosgrove², Helen Blau³

Departments of Bioengineering¹, Radiology², Microbiology & Immunology³; Stanford University

Bio-X Undergraduate Research Program

2011 Poster Titles continued



"Biomechanics of Gait Analysis: Streamlining the Vicon Motion Capture System"

Lauren Taylor², Rebecca Shultz¹, Scott Delp^{3,4}

Human Performance Lab¹ and Departments of Biomechanical Engineering², Bioengineering³, and Mechanical Engineering⁴; Stanford University

"The Transcriptional Regulation of CNS Myelination by Oligodendrocytes"

Annie Tran¹, Anja Scholze², Ben Barres³

Departments of Biology¹, Developmental Biology², and Neurobiology³; Stanford University

"Molecular Therapies Against Small Cell Lung Cancer"

Sean Valle¹, Jamie Conklin³, Julien Sage^{2,3}

Departments of Bioengineering¹, Cancer Biology², and Genetics³; Stanford University

"Optogenetic Deconstruction of Dynamic Retrieval Strategies for Long-term Memories"

Jenelle Wallace¹, Inbal Goshen², Matthew Brodsky, Rohit Prakash³, Viviana Gradinaru⁴, Charu Ramakrishnan², Karl Deisseroth^{2,4}

Departments of Biology¹, Bioengineering², Neuroscience³, and Psychiatry & Behavioral Sciences⁴; Stanford University

"Huntingtin Protein Remodeling by the Eukaryotic Chaperonin TRiC/CCT"

Jake Wang, Koning Shen, Lukasz Joachimiak, Judith Frydman

Department of Biology, Stanford University

"Engineering Viruses with Riboregulators to Selectively Lyse Cells"

Christopher Weyant¹, Josh Michener², Christina Smolke²

Departments of Chemical Engineering¹ and Bioengineering², Stanford University

"Molecular Imaging of Autologous Canine Induced Pluripotent Stem Cell Transplantation"

Sujin Park¹, Dan Xu², Andrew Lee², Jordan Plews², Patricia Nguyen³, Jennifer Lyons³, Mei Huang², Divya Nag², Shijun Hu², Leng Han², Zhumur Ghosh², Fangjun Jia², Junwei Liu², Benjamin Levi⁴, Tyler Long⁵, Dana Bangs⁷, Cholawat Pacharinsak⁵, Alan Yeung³, Sam Gambhir², Michael Longaker⁶, Joseph Wu³

Departments of Biology¹, Radiology², Cardiovascular Medicine³, Plastic and Reconstructive Surgery⁴, Comparative Medicine⁵, Surgery⁶, and Pathology⁷; Stanford University

"Visual Breast Map VBM : A Novel Paradigm for Visualizing Mammogram Lesions and Patient Data"

Dana Yeo¹, Jafi Lipson², Daniel Rubin²

Departments of Biomedical Computation¹ and Radiology², Stanford University

"Redefinition of the Leukemia Stem Cell Subpopulation Using Pathway Activity"

Julie Koenig³, Ryan Corces-Zimmerman¹, Ravindra Majeti²

Departments of Cancer Biology¹ and Stem Cell Biology², Stanford University; undeclared major³

"Tails of Regeneration: Assessing the Role of sbno2b in Zebrafish Larval Tail Fin Regeneration"

Maya Talbott¹, Alex Payumo², Shawn Ouyang², James Chen²

Departments of Biology¹ and Chemical & Systems Biology², Stanford University

"Small RNA Expression in *A. burtoni* Oogenesis"

Catherine Lu², Rosa Alcazar¹, Shruti Tibrewala¹, Russ Fernald¹

Department of Biology¹, Stanford University; undeclared major²

Bio-X Undergraduate Research Program

2011 Poster Titles continued/2010 Poster Titles



"Wnt-deficient Tissues Display Decreased Wound Healing"

Wilfred Manzano¹, Jemima Whyte², Allison Coleman³, Edward Wang, Jill Helms³
Departments of Biology¹, Surgery², and Plastic and Reconstructive Surgery³; Stanford University

"Sharing of *Streptococcus Mutans* Isolates Between Humans and Their Pet Dogs"

Scott Livingston², Muh-Ching Yee³, Adam Boyko¹, Omar Cornejo³, Carlos Bustamante³
School of Medicine¹ and Departments of Human Biology² and Genetics³; Stanford University

"Global Ancestry Interference Using Multi-Perspective Principal Components"

Nicelio Sanchez-Luege¹, Sivan Bercovici², Serafim Batzoglou²
Departments of Biomedical Informatics¹ and Computer Science², Stanford University

2010 Poster Titles

"The Diuretic Effect of a Small Molecule Inhibitor of CLC-K1 in Rats"

Huy Phan², Paru Kathpalia¹, Andrew Howery³, Justin Du Bois⁴, Lise Bakir
School of Medicine¹ and Departments of Biology², Public Policy³, and Chemistry⁴; Stanford University

"Amygdalar and Hippocampal Volumes of Children and Adolescents at High Risk for Bipolar Disorder"

Erica Sanders¹, R. Kelly, Laya Bararpour², A. Garrett, M. Howe, K. Chang, Allan Reiss^{3,4}
Departments of Psychology¹, Bioengineering², Psychiatry & Behavioral Sciences³, and Radiology⁴; Stanford University

"Exploration of ERDA1, SEF2-1B, and MAB21L Trinucleotide Repeat Expansion Influence on Anticipation in Pediatric Bipolar Disorder"

Cheri Dijamco¹, Meghan Howe², Kiki Chang², Joachim Hallmayer²
Departments of Human Biology¹ and Psychiatry & Behavioral Sciences², Stanford University

"Mesenchymal Stem Cell Fate in a Biomimetic Collagen Hydrogel: A Regenerative Matrix for Enhanced Cutaneous Wound Healing"

Sarah Cheng¹, Kristine Rustad², Victor Wong, Michael Sorkin⁴, Jason Glotzbach⁴, Dean Nehama³, Melanie Major⁵, Jayakumar Rajadas, Michael Longaker⁴, Geoffrey Gurtner⁴
Departments of Biology¹, Medicine², Neurology³, Surgery⁴, and Chemical Engineering⁵; Stanford University

"Targeting of VEGF-Receptor for Imaging and Treatment of Embryonic Stem Cell Derived Tumor Formation"

Wendy Zhang¹, Andrew Lee, Kevin Guo², Edwin Chang³, Jayakumar Rajadas, Shawn Chen, Zhen Cheng³, Joseph Wu⁴
Departments of Human Biology¹, Math & Computational Science², Radiology³, and Cardiovascular Medicine⁴; Stanford University

"3D Motional Analysis of Wrist Kinematics"

Jeremy Goodman¹, Julia Lee, Amy Ladd²
Departments of Human Biology¹ and Orthopaedic Surgery²; Stanford University

"Combinatorial 3D Matrices for Optimizing Stem Cell Niche Towards Osteogenesis"

Michelle Nii¹, Galym Imanbayez², Fan Yang²
Departments of Materials Science & Engineering¹, Economics², and Geological & Environmental Sciences³; Stanford University

Bio-X Undergraduate Research Program

2010 Poster Titles continued



“Using Markov State Models to Study the Folding of Protein Fragments”

Jeremy Lai, Vincent Voelz, Vijay Pande
Department of Chemistry, Stanford University

“What a Difference an Exon Makes: A Comparison of MIM Isoforms”

Shire Beach¹, Scott Atwood², Tony Oro²
Departments of Biology¹ and Dermatology², Stanford University

“Neocortical Circuit Activity in Layer 6 Neurons”

Claire Durkin¹, Shaul Hestrin²
Departments of Bioengineering¹ and Comparative Medicine², Stanford University

“Characterization of Imprinting Effects of Mouse Chromosome 11 Using Mosaic Analysis with Double Markers (MADM)”

Catherine Nguyen, Simon Hippenmeyer, Liqun Luo
Department of Biology, Stanford University

“Identifying Cancer Stem Cells in Human Malignant Gliomas Using the Colony Forming Antibody Cell Array (CFACA)”

Jonathan Noguchi¹, Vanita Natu², Stephen Skirboll²
Departments of Biology¹ and Neurosurgery², Stanford University

“Solid Phase Sub-Monomer Synthesis of Poly-N-Substituted Glycines (Peptoids) for Capillary Electrophoresis”

Nathan Barnett¹, Zachary Urdang¹, Rinki Kapoor², Annelise Barron¹
Departments of Bioengineering¹ and Electrical Engineering², Stanford University

“The Role of Toll-Like Receptors in Neurogenesis and Neural Progenitor Cell Allotransplantation”

Jeesun Kim¹, Lori Phillips², Theo Palmer³
Departments of Bioengineering¹, Immunology², and Neurosurgery³; Stanford University

“Effect of GABA A Antagonist on Epileptic Brain Slice”

Yoon Seok Kim^{1,2}, Vytas Dargis-Robinson³, Bruce MacIver³
Departments of Computer Science¹, Biology², and Anesthesia³; Stanford University

“A Potential Role for the Rab GTPase Activating Protein RUTBC1 in Regulation of Autophagy”

Carmel Schindelhaim^{1,2}, Ryan Nottingham³, Peter Lee⁴, Suzanne Pfeffer³
Departments of Chemistry¹, Biology², Biochemistry³, and Medicine⁴; Stanford University

“Engineering a Stable Single-Chain Platelet Derived Growth Factor Variant Using Yeast Surface Display”

Andrew Chou¹, Mihalis Kariolis², Jennifer Cochran²
Departments of Biochemical Engineering¹ and Bioengineering², Stanford University

“A Platform for the Shearing of Cell Monolayers”

Fasika Asrat, Claire Anderson, Gerald Fuller
Department of Chemical Engineering, Stanford University

“Improving Electrophysiological Recordings: Using Morpholinos to Reduce Background Signal”

Kevin Tran¹, Merritt Maduke², Sierra Simpson²
Departments of Biology¹ and Molecular & Cellular Physiology², Stanford University

Bio-X Undergraduate Research Program

2010 Poster Titles continued



“Evolutionary and Imaging Approaches to Assaying the Fitness of Rod-Shaped and Round Bacteria”

Dominique Dabija, KC Huang

Department of Bioengineering, Stanford University

“Early Predication of Bronchopulmonary Dysplasia in Premature Infants by Integration of Physiological Markers”

Laney Kuenzel^{1,2}, Suchi Saria¹, Daphne Koller¹

Departments of Computer Science¹ and Mathematics², Stanford University

“Measuring Telomere Length at the Single Cell Level in Normal and Malignant Colon Stem Cells”

Kamen Simeonov², Michael Rothenberg³, Ysbrand Nusse⁴, Piero Dalerba¹, Michael Clarke³

Institute for Stem Cell Biology¹ and Departments of Biology², Medicine³, and Biochemistry⁴; Stanford University

“Characterizing Tail Regeneration and Wild Populations’ Genetic Structure in the Short-Lived Fish *Nothobranchius furzeri*”

Elisa Zhang¹, Dario Valenzano², Anne Brunet²

Departments of Human Biology¹ and Genetics², Stanford University

“The Hedgehog Pathway: Discovering Smoothened Mutations that Confer Drug Resistance”

Louis Lu⁶, Nicholas Conley², Tyler Hillman³, Matthew Scott^{1,4,5}

Departments of Biology¹, Radiology², Medicine³, Genetics⁴, and Bioengineering⁵, Stanford University; undeclared major⁶

“Improving Visualization of Opsin-Transduced Neuronal Cell Bodies with a 2A Self-Cleaving Peptide”

Minsuk Hyun^{1,2}, Joanna Mattis³, Charu Ramakrishnan³, Karl Deisseroth^{3,4}

Departments of Biology¹, Mathematics², Bioengineering³, and Psychiatry & Behavioral Sciences⁴; Stanford University

“Developing a New Method for Protein Labeling Using Fluorescent Derivatives of the Firefly Luciferin Precursor 2-Cyanobenzothiazole”

Linyi Gao¹, Ke Zhan², Jianghong Rao²

Departments of Chemistry¹ and Radiology², Stanford University

“Peptide-Modified Alginate as Tissue-Engineered Cartilage Scaffolds”

Tru-Khang Dinh, Marc Levenston

Department of Biomechanical Engineering, Stanford University

“Generation and Testing of a Myb Regulatory Network in *Drosophila* Spermatogenesis”

Robert Schiemann^{1,2}, Heather Stalker³, Joseph Lipsick⁴

Departments of Biology¹, Computer Science², Genetics³, and Pathology⁴; Stanford University

“Detection of Reaction Intermediates Using Desorption Electrospray Ionization (DESI) Mass Spectrometry”

Nick Davis², Richard Perry³, Maurizio Splendore¹, Allis Chien¹, Richard Zare³

Mass Spectrometry Center¹ and Departments of Bioengineering² and Chemistry³; Stanford University

Bio-X Undergraduate Research Program

2010 Poster Titles continued/2009 Poster Titles



"Pharmacology of Liposomal Wnt3a"

Mark Fang^{1,2}, Nicholas Evans, Steven Lee, Samuel Bockenbauer³, Jill Helms⁴
Departments of Biology¹, Mathematical & Computational Sciences², Physics³, and Surgery⁴;
Stanford University

"Direct Conversion of Fibroblasts to Motor Neurons"

Daniel Fuentes¹, Thomas Vierbuchen², Troy Yang, Marius Wernig³
Departments of Biology¹, Cancer Biology², and Pathology³; Stanford University

"The Role of Adaptor Proteins, Tks4 and Tks5, in Podosome Formation: A Photoactivation Approach"

Ian Connolly¹, Sean Collins², Silvia Carrasco², Milos Galic², Samuel Bandara², Tobias Meyer²
Departments of Biology¹ and Chemical & Systems Biology², Stanford University

2009 Poster Titles

"Thalamocortical Oscillations in the 4th Dimension: Calcium Imaging of an Epileptic Network"

Max Kleiman-Weiner¹, Mark P. Beenhakker², John R. Huguenard²
Departments of Biological Sciences¹ and Neurology², Stanford University

"Matrix Rigidity Regulates Skeletal Muscle Stem Cell Self Renewal in Culture"

Penney M. Gilbert¹, Karen Havenstrite², Alessandra Sacco¹, Nora Leonardi¹, Nghi Nguyen³, Peggy Kraft¹, Matthias P Lutolf¹, Helen M. Blau¹
Departments of Microbiology & Immunology¹, Chemical Engineering², Molecular & Cellular Biology³; Stanford University

"Analyzing the Efficacy of Protein-Engineered Vaccines Against B-Cell Lymphoma"

Alejandro Virrueta¹, Patrick Ng²
Department of Biomedical Engineering¹ and School of Medicine²; Stanford University

"Intraarterial Transplantation Results in Superior Delivery of Neural Stem Cells to the Ischemic Brain in Contrast to Intravenous Infusion"

Arjun V Pendharkar², Xavier Gaeta³, Josh Y Chua⁴, Nancy Wang¹, Hui Wang⁵, Abhijit De⁶, Raymond Choi¹, Robert H. Andres⁴, Shawn Chen⁶, Brian Rutt⁶, Sanjiv S Gambhir⁶, Raphael Guzman⁴
School of Medicine¹ and Departments of Neurology², Biological Sciences³, Neurosurgery⁴, Pediatrics⁵, and Radiology⁶; Stanford University

"Single Cell Genomics: Shining Light on Microbial 'Dark Matter'"

Geoff Schiebinger¹, Paul Blainey², Stephen Quake³
Departments of Physics¹, Bioengineering², and Applied Physics³; Stanford University

"Characterizing the Rwandan HIV Epidemic in 1990-1993 Through Sequencing Analysis of Archived Plasma Specimens and Insights on Mother-to-Child Transmission"

Philip Bulterys¹, Sudeb Dalai², Betsy Johnston², David Katzenstein², Dmitri Petrov¹
Department of Biology¹ and School of Medicine²; Stanford University

"Characterization of the Role of the Heparosulfate Proteoglycans Dally-like and Syndecan in Drosophila Germline Stem Cells"

Maryam Zamanian², Shrividhya Srinivasan¹, Margaret T. Fuller¹
Department of Developmental Biology¹, Stanford University; undeclared major²

Bio-X Undergraduate Research Program

2009 Poster Titles continued



"Identification of Endogenous Substrates of the Group II Chaperonin Mm-cpn from the Archaeal Methanogen *Methanococcus maripaludis* using Computational and Biochemical Approaches"
Anthony Tuan Nguyen¹, Lukasz Joachimiak¹, Jeremy Dodsworth², Murray Hackett³ and Judith Frydman¹

Department of Biology¹, Stanford University; School of Life Sciences², University of Nevada; Department of Chemical Engineering³, University of Washington

"Toward Holistic Diagnostic Models: Time Series Modeling of Neonate Laboratory Tests"

Andrew Duchi², Suchi Saria¹, Daphne Koller¹, Anna Penn³

Departments of Computer Science¹ and Pediatrics³, Stanford University; undeclared major²

"Determining the roles of Aromatic and Hydrophobic Residues of an Interacting Amphipathic *Caenorhabditis elegans* MEC-6 Helix via Electrophysiological Expression in *Xenopus laevis* Oocytes"

Don Vongviphut¹, Amy L. Eastwood², Valeria Vásquez², Miriam B. Goodman²

Departments of Biology¹ and Molecular & Cellular Physiology², Stanford University

"Development of a Recombinase-Driven Mammalian DNA Oscillator"

Kim Tran¹, Wes Overton², Cliff Wang²

Departments of Materials Science & Engineering¹ and Chemical Engineering², Stanford University

"Intradermal Scaffold Implantation Model For Improved Acellular Dermal Matrix Incorporation"

Melanie Major¹, Michael Galvez², Victor Wong², Geoffrey C. Gurtner²

Departments of Chemical Engineering¹ and Surgery², Stanford University

"Characterization of Skin Wound Healing in Axin2LacZ/+ Reporter Mice"

Dani Zhao¹, Nick Evans², Zachary Stein⁴, Alan Chen, Jill Helms³

School of Medicine² and Departments of Chemical Engineering¹ and Surgery³, Stanford University; Department of Psychology⁴, Hamilton College

"The Association of Polymorphisms in Circadian Genes CLOCK and PERIOD3 and Risk for Developing Pediatric Bipolar Disorder"

Arpine Davtyan¹, Joachim Hallmayer²

Departments of Biology¹ and Psychiatry & Behavioral Sciences², Stanford University

"The Taming of the Ion"

Simon H. Ye, Griffin K. Barbula, Matthew D. Robbins, Richard N. Zare

Department of Chemistry, Stanford University

"Synthesis and Evaluation of Matriptase-Selective Activity-Based Probes"

Thinh Nguyen Duc^{1,2}, Margot Paulick³, and Matthew Bogoy^{3,4}

Departments of Biological Science¹, Chemistry², Pathology³, and Microbiology & Immunology⁴; Stanford University

"Protein Interactions with MHC Class I at the Mouse CNS Synapse"

Xuchen Zhang¹, Barbara K. Brott¹, Carla Shatz²

Departments of Biology¹ and Neurosciences², Stanford University

"Toward High-throughput Analysis of Processive Stepping by Engineered Myosin Motors"

Sanjay Saraf¹, Tony D. Schindler², Zev Bryant²

Departments of Mechanical Engineering¹ and Bioengineering², Stanford University

Bio-X Undergraduate Research Program

2009 Poster Titles continued



"BMP Induced Healing of Calvarial Defects in the Athymic Nude Mouse Model"

Ankur Gupta¹, Nicholas Panetta², Deepak Gupta², Michael Longaker²

Departments of Biological Sciences¹ and Surgery², Stanford University

"Quantification of Abdominal Aortic Aneurysms During Disease Progression Using Small Animal Magnetic Resonance Imaging"

Kyla N. Barr¹, Craig J. Goergen^{2,4}, Maj Hedehus⁴, Junya Azuma³, Charles Taylor², Philip S. Tsao³, Joan M. Greve⁴

Departments of Mechanical Engineering¹, Bioengineering², and Cardiovascular Medicine³, Stanford University; Biomedical Imaging, Genentech, Inc.⁴

"Identifying the Role of Land Use in Coastal Water Quality in Northern California"

Debbie Lee¹, Sarah P. Walters², Alexandria B. Boehm²

Departments of Human Biology¹ and Civil & Environmental Engineering², Stanford University

"An ErbB Ligand Inhibits Hippocampal Neural Progenitor Cell Differentiation"

Rafael Wabl¹, Harish Babu², Theo Palmer²

Departments of Biology¹ and Neurosurgery², Stanford University

"Improving the Efficiency of Cell Transplantation through Biomaterials Development"

Brian Aguado¹, Sarah C. Heilshorn²

Departments of Biomechanical Engineering¹ and Materials Science & Engineering², Stanford University

"Creating a Lentivirus Expressing USPI6, a Possible Negative Player in Self-Renewal"

Jonathan Noguchi¹, Maddalena Adorno², Michael F. Clarke³

Department of Biology¹, Institute for Stem Cell Biology and Regenerative Medicine², and School of Medicine, Oncology Division³; Stanford University



Undergraduate Summer Research Program Participants 2010

Bio-X Undergraduate 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"

Liquan 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 Delivery"

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 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 Bogyo "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"

Bio-X Undergraduate Research Program

Some student comments about the program:



2010 cohort

This summer program was the best research experience that I had. I gained a lot of independence and developed my creativity. It enabled me to feel more confident in pursuing independent research.

- Carmel Schindelheim

Awesome! I have never thought that I would have a chance to talk to Professor Carla Shatz about my research. I have been to my friends' different research programs' poster sessions, but I really liked Bio-X the most because the audiences were more professional than the other undergraduate research programs. I was able to get really good comments and suggestions for my future research and had great conversations with different people. Also, just communicating with other people [about] my research was such a great experience.

- Minsuk Hyun

The program has shown me that in one small corner of this huge campus, so much research goes on simultaneously with a great deal [of] diversity but also a large amount of collaboration.

- Kevin Tran

I will take away not only skills in many lab techniques, but also a better understanding of the patience and persistence that goes into scientific discovery. Honest and thorough research definitely takes time, finesse, and understanding.

- Claire Durkin

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

I learned numerous lab techniques that will be valuable to me in future research projects. I saw tremendous potential in my research project to make a difference in the lives of people.

- Cheri Dijamco

It was really amazing to see all the projects going on at Stanford and how various labs are utilizing different techniques to obtain their research goals.

- Wendy Zhang

[The program] changed my outlook on research such that now I can think of some research happening faster than I thought before. I learned many techniques and skills that I can use in the future.

- Jeremy Goodman

Bio-X Undergraduate Research Program



2009 cohort

This program helped reinforce the fact that I was going to be a bioengineer/medical researcher. I will be attending Northwestern University in the fall for my PhD in biomedical engineering, and I feel that this program helped me get a positive outlook on the research process.

- *Brian Aguado*

This program...gave me a chance to explore an area which I may not have otherwise explored. I am very grateful for the opportunity and the chance to hear speakers from such a diversity of fields.

- *Philip Bulterys*

I learned critical thinking skills and lab techniques that will be helpful for me in the future. The program confirmed what I already knew about my future goals, but this confirmation was very important to me.

- *Arpine Davtyan*

The process of composing and presenting a poster was an experience that has made me a more well-rounded scientist. It is not enough to propose and carry out experiments if you cannot clearly and enthusiastically relate the findings to others in different fields.

- *Xavier Gaeta*

(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 in real-life situations and thereby buttress the material in textbooks.

- *Debbie Lee*

The program provided structure and support as I approached my research project last summer. I now realize that science is a collaborative effort, and it is sometimes important to reach out to peers and other labs when questions arise.

- *Melanie Major*

The program showed me the power of research to innovate and probe unanswered questions in the biomedical sciences...The financial support is key to the program, and it is great that the stipend has been increased to compete with other fellowships.

- *Anthony Nguyen*

My experience working during the summer has made me consider taking a more research-oriented direction in some of my future academic plans.

- *Maryam Zamanian*

If you're interested in performing cutting-edge research, hearing fascinating guest seminars, and getting paid to live at Stanford for a summer, Bio-X makes it all possible!

- *Xuchen Zhang*

Professor Carla Shatz

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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>



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