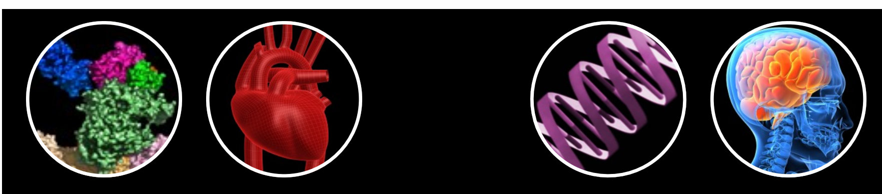
Bio-X *fellowships*

2011

The Bio-X Fellowships are made possible by various gifts in order to promote interdisciplinary research for promising scientists working on projects that bridge the gap between biology and other fields.

Students are encouraged to work collaboratively with professors in different departments or schools, drawing on expertise campus-wide.

NEW ADVANCES IN SCIENCE AND ENGINEERING



Bio-X Fellowships

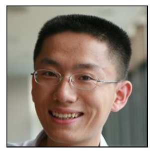
Bio-X Graduate Student Fellowships 2011

Ron Alfa
Neurosciences/MSTP

Professor Seung Kim (Developmental Biology)
Diabetes mellitus is a chronic disease defined clinically by increased blood glucose levels resulting from decreased peripheral insulin sensitivity or impaired in insulin secretion by pancreatic beta cells. While diabetes mellitus is historically one of the oldest diseases, the complex genetics underlying the most prevalent form, type-2 diabetes mellitus (T2DM), are only beginning to be elucidated. Ron's work is directed at harnessing the powerful genetics of the fruit fly, Drosophila melanogaster, to study the genetics of diabetic states. To this end, he is drawing on approaches from the neurosciences and bioengineering to study metabolism and glucose homeostasis in the fly.

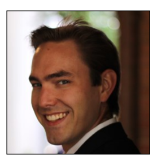
Craig Buckley
Chemical Engineering

Professor Alex Dunn (Chemical Engineering)
The motor protein dynein contains a component termed the linker that is predicted to generate the force that drives cytoplasmic dynein stepping along microtubules; however, its actual force-generating abilities have never been directly examined. Craig will use single molecule techniques to perform the first direct test of the hypothesis that the linker is the primary force generating mechanical element in dynein. If it is, he will map out the energetic surface underlying force production by tracking the linker swing in real time. These measurements will elucidate the mechanism of dynein force production and test fundamental models of motor protein biophysics.



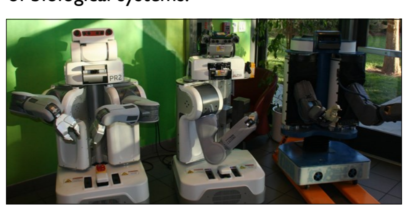
Jing-yu Cui
Electrical Engineering

Profssor Craig Levin (Radiology)
Jing-yu is designing algorithms and systems for real-time cardiac Positron Emission Tomography (PET) for non-invasive *in vivo* visualization of molecular signatures of disease and guidance of surgical interventions. Jing-yu applies the state-of-the-art technologies in computer graphics, optimization, and computer vision for removing motion artifacts and speeding up the imaging process by hundreds of times to enable real-time visualization of molecular activities in cardiology.



Christopher Emig
Bioengineering

Professor Stephen Quake (Bioengineering)
De novo genetic material construction enables the complete programmatic control of genetic systems, paving the way for advances in biological research, molecular medicine, fuels, environmental remediation, materials, and countless industrial processes. The Quake lab is building a device for rapid fabrication of single DNA molecules to enable iterative engineering of biological systems.



Robots from the Salisbury lab

Denitsa Milanova
Bio-X Medtronic Fellow
Mechanical Engineering

Professor Annelise Barron (Bioengineering)
Most would agree that extracting accurate, quantitative diagnostic information from biological samples, FAST, is "difficult." The challenging part of the analysis is sample preparation. The analyst must deconvolute a complex mixture of biological molecules into a clean isolate of the information-carrying molecules, which is hard to do quickly and requires large, expensive equipment. Current diagnostics rely upon fluorescence; however, an urgent need for rapid virus ID and viral particle counting demands a simpler analytical platform. A low-cost FET (field effect transistor) device that obviates fluorescence and operates with minimal sample prep requirements will enable a rapid medical response to emerging infectious diseases.

Patricia Ortiz-Tello
Genetics

Professor Carlos D. Bustamante (Genetics)
Preeclampsia, a disorder that complicates 3-8% of pregnancies worldwide, occurs at 2-3 fold higher prevalence at higher altitudes – most likely due to the hypoxic environment. Interestingly, the prevalence remains low in populations that are indigenous to high altitude. The Bustamante lab hypothesizes that populations that have adapted to living in a hypoxic environment have acquired adaptations that may confer protection against preeclampsia. Such adaptations may have imprinted a molecular signature in the genome, which they can recognize by looking at the genomic patterns of the population. They aim to disentangle the underlying genetic mechanism of this clinical consequence of human evolution.

Steven J. Petsche
Mechanical Engineering

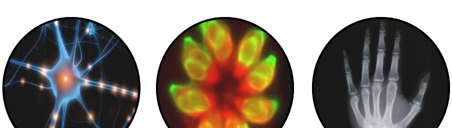
Professor Peter M. Pinsky (Mechanical Engineering)
As a result of advances in imaging and experimentation at small scales, the molecular mechanisms that give rise to the mechanical properties of human connective tissue can be better understood. Steven follows a new "multi-scale" modeling approach where improved macro-scale continuum models are directly linked to micro-scale models of these molecular mechanisms. Due to its well-characterized regular and hierarchical structure, the human cornea is his target tissue. A coordinated approach between modeling and novel experimentation at different scales combines areas of biology, chemistry, imaging, and applied mechanics to engineer a computational model for direct clinical applications in refractive surgery.

Jack Wang
Neurobiology

Professor Ben Barres (Neurobiology)
Degeneration of the nerve fibers, or axons, is a pivotal event and a major determinant of clinical outcome in many neurodegenerative diseases; however, the mechanisms that regulate this process remain largely unclear. Remarkably, expression of a mutant protein (WldS) significantly delays axon degeneration from many neurological insults. Through a series of genetic, biochemical and proteomic approaches, Jack proposes to understand how this protein is able to exert such a profound neuro-protective effect. The goals of his research are to understand the molecular mechanisms of axon degeneration and to identify therapeutic targets to prevent axon loss following neurological injuries and diseases.

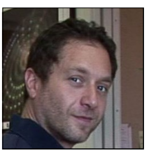
Jongmin Kim
Bio-X SIGF
Bruce and Elizabeth Dunlevie Fellow
Chemical and Systems Biology

Professor Margaret Fuller (Developmental Biology)
Most of our tissues are constantly replenished by tissue specific adult stem cells. The goal of Jongmin's research is to understand how the switch from proliferation to differentiation in adult stem cell lineages is regulated. He has developed an *in vivo* differentiation system that can trigger proliferating progenitor cells to synchronously differentiate in the male germ line of fruit flies. By employing this differentiation assay, he will identify genes critical for the switch and will determine how those genes are regulated. Understanding this switch will be important in regenerative medicine and cancer therapy.



Paul Lebel
Bio-X SIGF
Applied Physics

Professor Zev Bryant (Bioengineering)
Paul's goal is to further our mechanistic understanding of molecular motors by capturing single molecule microscopy data at unprecedented bandwidth and resolution. He has developed an imaging and data acquisition system to track gold nanoparticles as precise probes of length and twist of single DNA molecules at more than 20,000 frames per second. Their lab exploits the resolution of this technique as a tool to study various systems: they observe individual torque-generating steps of a single ATP-powered enzyme as it winds up DNA and measure the basic physical properties of DNA itself under applied tension and torque. Additionally, through independent collaborations with Professors Stephen Quake and Jody Puglisi, he is developing nanoparticle-based assays for high-throughput condition screening and real-time dynamics of translating ribosomes.



Mark Longo
Bio-X SIGF
Morgridge Family Fellow
Biology

Profs. Ward Watt (Biology) and Jay McClelland (Psychology)
In the course of Mark's research in evolutionary genetics, he has noticed striking parallels between certain aspects of the cognitive and biological sciences. He intends to explore these similarities further in pursuit of a complex adaptive systems conception of genetics. This work will yield a book-length manuscript with the working title *The Genetic Mind: Genes as Learning Networks.* At issue is the very way we think of evolution and what exactly it means for genes to be "for" things.

Samir Menon
Bio-X SIGF
Colella Family Fellow
Computer Science

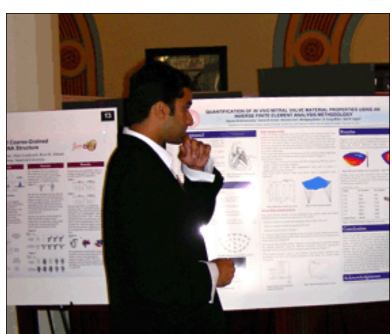
Profs. Oussama Khatib (Computer Science) and Kwabena Boahen (Bioengineering)
The ability to coordinate muscles and resolve inter-task conflicts is fundamental to human motor control and underlies even simple motions like holding a cup with a hand and flipping a switch with the same arm's elbow. Samir is using insights from humanoid robotic control theory to predict how the brain coordinates multiple tasks and is using functional magnetic resonance imaging to identify the brain regions responsible. His work promises to help target rehabilitation for neurological disorders as well as improve how neural prosthetics decode the brain's motor activity.

Daniel Newburger
Bio-X SIGF
Morgridge Family Fellow
Biomedical Informatics

Profs. Serafim Batzoglou (Computer Science) and Hanlee Ji (Oncology)
Each year more than three hundred thousand people develop colorectal cancer (CRC) due to inherited genetic risk factors. Identifying the germline mutations responsible for CRC susceptibility in affected families dramatically improves preventative care and clinical outcome, but the vast majority of these mutations remain uncharacterized. In order to identify these unknown mutations, Daniel will help develop machine learning algorithms for evaluating genomic data from high-throughput DNA sequencing technologies. They hope this work will provide genetic findings that immediately inform clinical intervention and that it will illuminate new aspects of CRC pathogenesis.

Ruth Sommese
Bio-X SIGF
Paul Berg Fellow
Biochemistry

Professor James Spudich (Biochemistry)
In the United States, cardiovascular disorders are a leading cause of morbidity and mortality. Familial cardiomyopathies are among the most frequently occurring inherited cardiac diseases, and many result from mutations in the fundamental force generating system of cardiac muscle, myosin and the thin filament. The interaction between myosin and the thin filament has been fine-tuned in cardiac muscle in terms of power output and the rates of force generation and relaxation. The goal of this project is to characterize how cardiomyopathy mutations affect the force producing capabilities of cardiac muscle at the single molecule, single cell, and whole organ level.



Gaurav Krishnamurthy (see pg. 12 for project details)

Carolina Tropini
Bio-X SIGF
Bruce and Elizabeth Dunlevie Fellow
Biophysics program

Professor KC Huang (Bioengineering)
Cells are much more than the sum of their parts thanks to their underlying organization, which allows for signal amplification, stimuli response, cell division, and many other critical life processes; however, the mechanisms underlying localization and its contribution to fitness have been difficult to uncover due to the often prohibitive task of creating mutants with normal enzymatic activity but altered localization. Carolina proposes to develop a simple, adaptable genetic tool to program the spatial localization of proteins in any genetically tractable bacterial species by targeting the existing localization landscape, focusing on the role of two-component systems in development.

Austin Lee-Richerson
Bio-X Bioengineering Fellowship

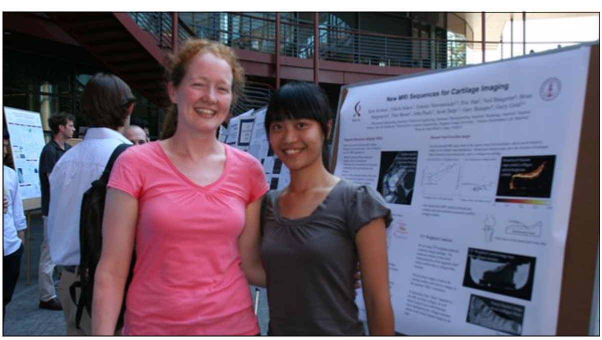
Austin's research as an undergraduate consisted of building a model of the cellular metabolism of glioblastoma multiforme, the most lethal type of brain cancer. A combination of data about the activity of genes and the presence of proteins within glioblastoma biopsies and cell lines provided the basis for the model. This model will be used to identify potential therapeutic targets within the metabolism of the brain cancer. As a graduate student, he hopes to continue to apply engineering principles to current challenges in medicine and biology to develop the next generation of medical therapeutics.

Carmichael Ong
Bio-X Bioengineering Fellowship

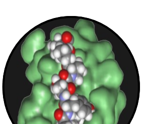
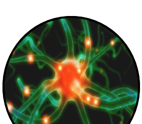
Carmichael's research interests lie within the boundaries between mechanical engineering, biology, and medicine and in the interface between fundamental research and clinical application. He would like to focus on device design or robotics and biomechanics for improving medical applications by using engineering concepts to more effectively and efficiently develop better technology for biology and medicine as well as to better understand biological systems. By building a strong foundation in mechanical and bioengineering concepts, his graduate studies will give him the flexibility and ability to work on a wide variety of medical projects.

Sungwon Lim
Bio-X Bioengineering Fellowship

Sungwon is particularly passionate about the process of developing molecular therapeutics and delivery systems. He will focus on his interests by investigating the structural and chemical properties of biomaterials to enhance the stability and delivery efficiency of therapeutics to their target sites *in vivo* by studying cell physiology to understand the precise mechanisms of the cellular uptake of therapeutic macromolecules and by exploring the field of molecular engineering to discover the elements that determine proper activation of the delivered therapeutics. All of these explorations will accelerate overcoming substantial barriers in the drug delivery system and maximize the therapeutic effect of molecular medicines.



Katy Keenan (see pg. 16) and Xiaoxue Zhou (see pg. 8)


Jaimie Adelson
Honorary Fellow
Neurosciences

Professor Carla Shatz (Biology, Neurobiology)
Our brains have the remarkable ability to change and learn. The cerebral cortex has intrinsic mechanisms that limit or promote plasticity by converting neural activity into lasting structural changes at synapses. Jaimie considers the model that, in neurons, two major histocompatibility complex class I genes, Kb and Db, signaling via the innate immune receptor PirB, act as a brake on cortical plasticity. The goal of her research is to "release the brake" in mutant mice lacking these molecules and examine if it is possible to not only increase cortical plasticity but also to promote faster recovery following acute cortical injury.

Jennifer J. Brady
Bio-X Skippy Frank Fellow
Microbiology & Immunology

Professor Helen M. Blau (Microbiology & Immunology)
Jennifer's research focuses on understanding how cells change their fate. How does a cell change its identity, and what factors are important for making this decision? All the cells in our body have an identical genome, and what makes cells differ in cancer or development is gene expression. This is controlled by transcription factors and epigenetic modifications such as DNA methylation, which determine whether a gene is on or off. Jennifer is particularly interested in mechanisms of mammalian DNA demethylation, and she uses a cell fusion based system as a model to understand factors that control DNA methylation and gene expression.

Alex Grant
Bioengineering

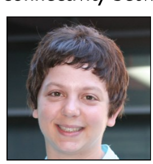
Professor Craig Levin (Radiology)
Alex is working on novel technology for improving PET (positron emission tomography) system performance. PET allows non-invasive cellular and molecular assays of a subject's tissues and is widely used for cancer diagnosis and staging. His project involves using nanophotonic crystals to optically process PET signals in order to achieve faster system response times and eliminate costly processing electronics. This work has the potential to increase PET image signal-to-noise ratio, enabling significant improvements in disease visualization and quantification. This will allow better detection and diagnosis of cancer and other diseases and make these procedures more widely available.

Andrew Lee
Chemical &
Systems Biology

Profs. Joseph Wu (Radiology, Medicine) and Paul Wender (Chemistry)
Coronary artery disease (CAD) is the leading cause of death in the Western world and is responsible for 1 out of every 5 deaths in America. Stem cell therapy is a novel method of treating CAD through the replacement of injured myocardium with healthy cells capable of restoring contractility to the heart. While initial clinical trials for this therapy have shown some short-term restoration of function, beneficial results have rarely persisted due to donor cell death. Andrew aims to improve donor cell engraftment in the ischemic heart through the development of a pro-survival nanoparticle-molecular transporter complex.

Jonathan Leong
Neurosciences, MSTP

Professor Thomas Clandinin (Neurobiology)
Many functions of the human brain are distinctly human, many even unique to specific individuals. Brain function depends on precise patterns of neuronal connectivity, which are reflected in the morphology of individual neurons within populations. Much remains to be learned about the morphological correlates of human brain function–and dysfunction–at this level. Jonathan is developing novel DNA-based molecular machines that will enable him to study neuronal morphology and connectivity, especially long distance connectivity between brain areas, in humans.

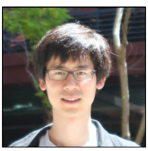


Joanna Mattis
Neurosciences

Professor Karl Deisseroth (Bioengineering, Psychiatry)
Joanna's research involves optogenetics, a method in which light-activated proteins are used to manipulate specified neuronal circuits within an intact mammalian brain. To expand the utility of this technique, she is working to develop different strategies for targeting these proteins to neuronal populations based on their projection patterns. In addition, she is using optogenetics to study the circuitry that underlies oscillatory network activity within the hippocampus.

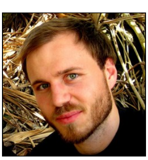
William Noderer
Chemical Engineering

Professor Cliff Wang (Chemical Engineering)
The transcription factor p53 is considered the protector of the genome. γ-irradiation (e.g., from the sun) causes double stranded breaks of DNA. p53 becomes activated upon DNA damage and prevents the damaged cell from dividing. It was recently shown that p53 nuclear protein levels oscillate after γ-irradiation. Does oscillatory behavior aid the cells in responding to DNA damage? William will create an inducible system to manually control p53 oscillations and manipulate the period, amplitude, and duration of oscillations. The experiment will directly show how p53 dynamics affect DNA repair, cell survival, gene expression, and ultimately tumor suppression.



Joo Yong Sim
Mechanical Engineering

Professor Beth Pruitt (Mechanical Engineering)
Joo Yong is interested in the interdisciplinary research for micro-electro-mechanical systems (MEMS), mechanics, and mechanobiology. He has been working in the Pruitt Lab and collaborating with the Nelson lab on the mechanics of cell to cell adhesions. He is developing mechanical stimulation systems and custom measurements for studying mechanotransduction of cells and the proteins associated with cell-cell and cell-matrix adhesion including vinculin and E-cadherin. His research will focus on revealing the role of the mechanical loading on regulating the cell adhesion and motility using the high-throughput mechanical stimulation systems and traction microscopy techniques.



Ryan Fox Squire
Neurosciences

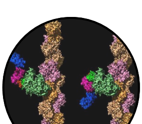
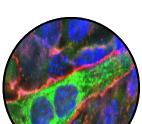
Profs. Tirin Moore (Neurobiology) and
Karl Deisseroth (Bioengineering, Psychiatry)
The ability to pay attention is a central feature of our day-to-day life that enables us to selectively process some aspects of our sensory world while ignoring others. Identifying the specific brain cells and circuits that bring about attention is essential for understanding both normal and impaired cognition, yet this is currently beyond the reach of established neurobiological techniques. Ryan's research utilizes new technologies to measure, turn off, and turn on specific brain circuits as primates perform attention-demanding tasks. This research hopes to understand at an unprecedented level of specificity how brain activity underlies cognitive functions such as attention.

Limor Bursztyn
Bio-X SIGF
Bruce and Elizabeth Dunlevie Fellow
Electrical Engineering

Profs. Mark Horowitz (Electrical Engineering, Computer Science) and Thomas Clandinin (Neurobiology)
How do neural circuits perform the computations that drive visually guided behaviors? To answer this question, Limor would like to identify the algorithms used to extract specific types of visual information and to link these features to behavioral modulations. In order to then connect these computations to specific types of neurons, she is using *in vivo* imaging to record neural activity and statistical modeling to quantify behavioral responses in wild-type and genetically modified flies. By focusing on a model organism, the fruit fly, she hopes to gain insight into the general mechanisms of neural computation relevant even to humans.

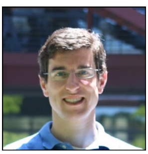
Remy Durand
Bio-X SIGF
Bruce and Elizabeth Dunlevie Fellow
Bioengineering

Professor Karl Deisseroth (Bioengineering, Psychiatry)
Noninvasive imaging that looks at brain activity has opened a new window into understanding how the brain functions and communicates information; however, the relationship between cells in the brain called neurons and signals measured with functional brain imaging techniques remains poorly understood. Remy's research combines a novel way to precisely control the activity of neurons in the brain called optogenetics with functional magnetic resonance imaging (fMRI) to determine how neurons communicate between brain regions. Remy's work will aid in understanding the function organization of the normal brain and also the diagnosis and treatment of diseased brain states.


William Parsons
Bio-X SIGF
Chemistry

Professor Justin Du Bois (Chemistry)
Voltage-gated sodium channels (VGSCs) mediate electrical conduction in neurons and play an essential role in pain sensation. Consequently, VGSC malfunction, improper regulation, and abnormal cellular localization have been implicated in a number of medical conditions. To better understand the causative link between VGSCs and pain, William has designed small molecule probes derived from the potent VGSC blocker saxitoxin that can be used for real-time imaging of this protein class. William's studies capitalize on the interplay of complex molecule synthesis, molecular biology, electrophysiology, fluorescent imaging, and live animal experiments to investigate fundamental aspects of VGSC dynamics.



Aaron Wenger
Bio-X SIGF
Morgridge Family Fellow
Computer Science

Professor Gill Bejerano (Dev. Biology, Computer Science)
Since the completion of the draft genome in 2000, researchers have identified genomic associations for hundreds of human traits, from height and weight to breast cancer susceptibility. Surprisingly, most trait-associated genomic regions do not contain protein-coding "genes." Instead, the regions encode regulatory elements that activate gene expression in specific tissues in the body at different timepoints in development or in response to environmental conditions. To study how information is encoded in these regulatory elements, Aaron integrates large scale, genome-wide experimental measurements with computational learning methods. Understanding this encoding will explain why certain genetic changes result in trait differences and suggest therapeutic targets for numerous human diseases.

Xiaoxue Zhou
Bio-X SIGF
Larry Yung Fellow
Chemistry

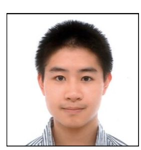
Professor Lynette Cegelski (Chemistry)
Xiaoxue is interested in integrating chemistry, biology, and physics to investigate the assembly and function of macromolecular and whole-cell systems. Solid-state NMR is uniquely able to provide a measure of structural and dynamical information for molecular assemblies in their native environments. She wants to employ biophysical and biochemical tools and to design new strategies using solid-state NMR spectroscopy to examine assemblies such as bacterial cell walls (to understand the modes of action of newly discovered antibiotics) and membrane protein ClC-ec1 (to understand at a molecular and atomic level the structure and mechanism of this Cl^-/H^+ antiporter).

Melina Mathur
Bio-X Bioengineering Fellowship

Professor Christina Smolke (Bioengineering)
Melina aims to pursue research in synthetic biology by developing genetically encoded devices that reprogram cellular fate and function. She intends to design novel devices with tightly controlled functions for diagnosing and treating disease. Synthetic RNA molecules can be used to build these devices as they are capable of biological sensing, actuation, information processing, and control functions. The ability of these programmable devices to respond to specific molecular signals in a precise and controlled manner will result in more effective, safe, and targeted approaches for diagnostic strategies and disease treatment.

Haisam Islam
Bio-X Bioengineering Fellowship

Professor Gary Glover (Radiology)
Haisam will work on developing new methods to improve the performance of MRI. Currently, he is working on acquiring fMRI data more rapidly with no SNR loss in uniform brain regions. The method involves exciting two slices simultaneously and using specific information obtained from a calibration scan to reconstruct each slice separately. By acquiring two slices at a time instead of one, the temporal resolution is effectively doubled, allowing better resolvement of brain activity. MRI may still be improved in many ways; thus, for his graduate career, Haisam wants to explore its possibilities and push its limits.



Remus Wong
Bio-X Bioengineering Fellowship

Remus plans to pursue research in synthetic biology with specific goals to design, construct, and engineer biological functions in cells. Adoptive T-cell therapy is a promising treatment for cancer, and the approach of using genetically engineered T cells is currently the subject of intensive research in this field. Remus hopes to develop RNA-based genetic regulatory systems to control T-cell antigen reactivity, proliferation, and survival in response to pharmaceutical drug inputs.

Aakash Basu
Applied Physics

Professor Zev Bryant (Bioengineering)
Molecular motors are macromolecular machines that convert chemical energy into mechanical work. DNA gyrase is a motor that couples ATP hydrolysis to torque generation in DNA. Using a single molecule assay, Aakash has identified several key structural intermediates of the motor. He has observed that transitions between these intermediates are imperfectly coupled to the ATP hydrolysis cycle and is currently studying the mechanism of gyrase inhibition by several antibiotic drugs that target the motor. A detailed understanding of mechanochemical coupling in biological molecular motors will enable the engineering of artificial motors with novel functions.

Elsa Birch
Chemical Engineering

Professor Markus Covert (Bioengineering)
Although viral genomes are relatively short and well studied, there are no reliable treatments for viral infection. This is because the complexity of infection is largely governed by the host machinery that the virus commandeers in order to replicate. Understanding the role of host genes in infection is therefore crucial to the development of new treatment strategies. The Covert lab presents a differential equation population model of E. coli infection by bacteriophage lambda. When fit to experimental infection timecourse data for E. coli knockouts, the parameters of this model give insight into the particular role of host genes in infection.

Graham Dow
Biology

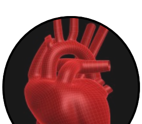
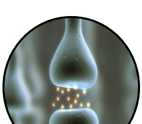
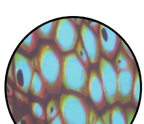
Professor Dominique Bergmann (Biology)
Plants are dependent on their ability to sense and respond to their surrounding environment in order to successfully grow and reproduce. Stomata are specialized cells on the above ground surface of plants that control the flux of gases, such as CO_2 and H_2O, between internal plant structures and the outside world. Stomatal development and physiology are finely tuned to environmental conditions and ultimately help plants optimize their relationship with the environment. The goal of this project is to elucidate the molecular mechanisms that underlie the relationship between stomata and the environment, particularly with respect to development and its feedback on physiology.

Alia Schoen
Materials Science & Engineering

Professor Sarah Heilshorn (Materials. Science & Eng.)
The Heilshorn lab intends to develop clathrin as a protein-based template for the creation of hierarchically ordered inorganic nanostructures. Combining theoretical and experimental methods to gain insight into kinetic and thermodynamic processes that regulate the self-assembly of clathrin will enable the prediction and formation of ordered 2D and 3D nanostructured materials. They anticipate these to be widely applicable to other self-assembly systems. They will develop rational designs of bi-functional peptides to bridge the biologic-inorganic interface, and to enable efficient formation and screening of nanostructured materials for a range of applications.

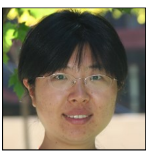
Jong Min Sung
Applied Physics

Professor James Spudich (Biochemistry)
The objective of Jong's research is to obtain a precise correlation between the mechanical, structural, and biochemical aspects of actomyosin interactions associated with human beta-cardiac myosin cardiomyopathies at a single molecule level. The Spudich lab's hypothesis is that the structural changes caused by the mutations will cause malfunctions of beta-cardiac myosin in terms of 1) force generation roles (step size, force), 2) enzymatic roles (actin-activated ATPase), and 3) coordination between them. To clarify with molecular precision which aspects of chemo-mechanical transduction are altered by selected HCM familial mutations, they will directly measure individual actomyosin interactions using a variety of single molecule tools.

Sanaz Saatchi
Bio-X Amgen Fellow
Bioengineering

Profs. Charles Taylor (Bioengineering) and Paul Yock (Bioengineering)
Abdominal aortic aneurysms are a life-threatening degenerative disease in which the structural organization and integrity of the blood vessel wall is lost, resulting in vessel dilation and possible rupture. Sanaz's work, with Professors Charles Taylor and Paul Yock, has enabled the application of a novel, high resolution, three-dimensional imaging technology, Immunofluorescent Array Tomography, to blood vessels for the first time. Her studies qualitatively and quantitatively characterized both the spatial and temporal remodeling of the microarchitecture and cellular response to aneurysm development. These studies provide a new perspective into aneurysm pathology and may help the development of preventative therapies.



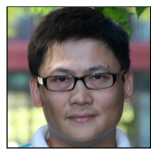
Liang Liang
Bio-X SIGF
Applied Physics

Profs. Liqun Luo (Biology) and Mark Schnitzer (Biology, Applied Physics)
Liang is interested in the organization and information processing principles of neural circuits. She uses the fruit fly olfactory system as a model to study the functional connections and computation in the central nervous system. For example, she is trying to understand where and how the olfactory circuitry integrates food, sex and alarm signals. She is incorporating advanced fly genetics, light-activated microbial opsins, and genetically-encoded calcium indicators to manipulate and record neuronal activity with high spatiotemporal resolution. The novel noninvasive optogenetic approach will help us to better understand the neural coding in the olfactory circuitry and to gain insight into the organization principles of neural systems.

One of the wonderful things about the Bio-X program here at Stanford is its commitment to multidisciplinary collaborations, bringing teams together to help solve these otherwise unanswerable questions. It gives you the freedom to ask a challenging question, and facilitates the means to pursue it. These collaborations result in a much more diverse educational experience where students can benefit from the mentorship of professors in different fields.
- Jennifer Brady, Ph.D. candidate in Micro. & Immuno.

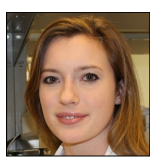
Peter Olcott
Bio-X SIGF
Bioengineering

Profs. Craig Levin (Radiology) and Jim Harris (Electrical Engineering)
PET is a non-invasive, *in vivo*, functional, molecular imaging technology—an important tool for clinical disease management and pre-clinical small animal research. Peter wishes to investigate advances in photonics to improve the performance of PET for clinical applications. First, he is researching how small vertical cavity surface emitting lasers can be used to improve the compatibility of combined PET/MRI instrumentation. Second, Peter is investigating materials that are alternatives to scintillation crystals to enable very precise timing for time-of-flight PET.



Shawn Ouyang
Bio-X SIGF
Affymetrix Fellow
Chemical & Systems Biology

Professor James Chen (Chemical & Systems Biology)
Zebrafish have the unique ability to regenerate several of its tissues (e.g. those of the heart, retina, spinal cord, and fins). Understanding the molecular mechanisms that underlie this process should provide insights into how tissue regeneration is achieved and reveal strategies for their reactivation in humans. Shawn's goal is to decipher the molecular and cellular events associated with larval tail regeneration. He has identified genes that are upregulated or downregulated in posterior cells after the tail is amputated and is working to determine their roles in the regenerative process.



Kathryn Montgomery
Bio-X Bioengineering Fellowship

Professor Scott Delp (Bioengineering)
Kate is designing and developing devices to control muscles. She is using optical activation of neurons to achieve better muscle control than electrical stimulation. This project combines the fields of electrical engineering, material science, neuroscience, and molecular biology. Research in this field will improve the available therapies for people with paralysis and movement disorders caused by brain and spinal cord damage.

Rebecca Snyder
Bio-X Bioengineering Fellowship

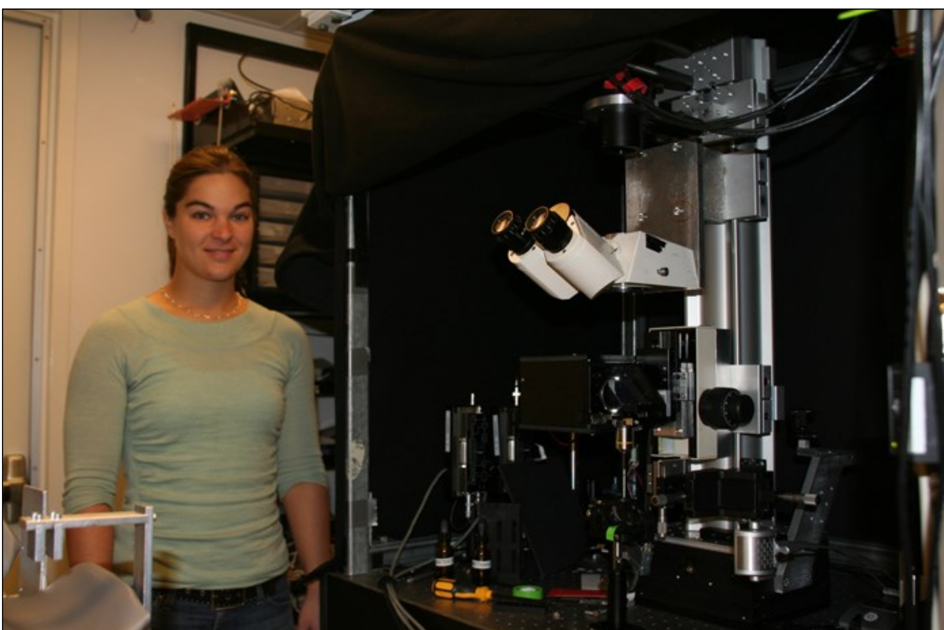
Professor Sarah Heilshorn (Materials Science & Eng.)
Rebecca is working on developing an improved *in vitro* model of the intestinal epithelium. There is currently no long term *in vitro* model that utilizes primary intestinal epithelial cells in a physiologically-relevant configuration. Establishment of such a model would facilitate notable improvements in preclinical drug screening techniques and would enable significant progress to be made in the use of regenerative medicine to treat various debilitating GI conditions, including short bowel syndrome, inflammatory bowel diseases, chemotherapy-induced mucositis, and colorectal cancer.

The more we learn about biology, the more apparent it becomes that an interdisciplinary approach is fundamental to advancing bioengineering research. The Bio-X program facilitates this type of work by bringing faculty and students together from diverse disciplines and providing them with the resources necessary to ask the questions that push the boundaries of science.
- Mihalis Kariolis, Ph.D. candidate in Bioengineering

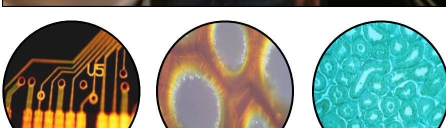
Yen-Hsiang Wang
Bio-X Bioengineering Fellowship

Professor Christina Smolke (Bioengineering)
Yen-Hsiang is interested in building *in vivo* biological controllers with a synthetic RNA approach. Synthetic biological controllers are important for their capability to regulate gene expression with high precision. He is trying to biologically implement an operational amplifier (op-amp), which is a fundamental building block in most electrical circuits due to its well-studied mathematical characteristics. He has identified several prominent features of an ideal op-amp and will build and test each feature separately before the final assembly. Now, he is working on the first stage: a genetic differential sensor implemented with synthetic riboswitches and antisense RNA pairs.

The following student fellows from 2009 have graduated:
Li Ma, (Bio-X SIGF 2009)
Noureddine Tayebi, (Bio-X Fellow)
For more details, see page 20.



Melinda Cromie (see pg. 13 for project details)



Mario Diaz de la Rosa
Chemical Engineering

Professor Andrew Spakowitz (Chemical Engineering)
The Spakowitz lab examines how proteins find their target sites on DNA, a process central to proper cellular function and survival. Of particular interest is the role that DNA conformation, including supercoiling and higher-order chromatin organization, plays in this search. They have developed a novel theoretical framework to address this phenomenon on linear, supercoiled, and nucleosomal DNA, and their predictions will be subsequently verified experimentally. The resulting elucidation of the mechanisms behind target site localization will provide fundamental knowledge of gene regulation processes and the nature of protein-DNA interactions.

Lisa Gunaydin
Neurosciences

Professor Karl Deisseroth (Bioengineering, Psychiatry)
Elucidating the neurobiological basis of social behavior is critical to understanding normal human behavior and its dysregulation in psychiatric diseases like autism. Lisa is studying the neural circuits involved in social behavior using light-activated microbial opsins that their lab has engineered for fast optical control of neural activity. These optogenetic tools provide high spatiotemporal resolution in probing the activity of specific cell types within large neuronal populations, which will help elucidate the basic circuit dynamics underlying this complex behavior.

Ian Marshall
Civil & Environmental Engineering

Professor Alfred Spormann (Civil & Environmental Engineering, Chemical Engineering)
Complex microbial communities play an important role in a range of environments, including the biodegradation of toxic compounds in groundwater, interactions in the human gut affecting health, and the contribution of agriculture to global atmospheric methane concentrations. Ian is applying novel molecular methods, specifically, tiling DNA microarray, to query the presence and expression of functional genes from a wide range of microbes in the environment to better understand interspecies microbial interactions.

Brian Wilt
Applied Physics

Profs. Mark Schnitzer (Biology, Applied Physics) and Karl Deisseroth (Bioengineering, Psychiatry)
In order to crack the neural code, we require new tools for probing neural circuitry *in vivo*. Brian developed a framework that quantifies the performance of our fluorescence microscopes monitoring calcium or voltage activity in cells. These metrics directly relate the physical properties of an experiment – kinetics of the optical indicator and the relative fluxes of signal and background photons – to spike detection and timing performance. The Schnitzer lab currently employs this framework for fluorescent probe and microscope design, the latter of which Brian is directly involved with. These projects draw on his background in physics, optics, applied math, and computer science.

Gaurav Krishnamurthy
Bio-X Medtronic Fellow
Mechanical Engineering

Profs. D. Craig Miller (Cardiothoracic Surgery), Drew Nelson (Mechanical Engineering), and Neil Ingels (Cardiothoracic Surgery)
The mitral valve, which is the valve between the left atrium and left ventricle of the heart, has long been thought to be a passive flap, but Gaurav's research, using a combination of radiopaque marker technology and inverse finite element analysis, has provided new insights into the behavior of this important heart valve. Gaurav's research has shown that the mitral valve is an active structure with active muscle and interstitial cell components. Further, his research has shown for the first time that the mitral valve varies its mechanical properties and stiffness during the cardiac cycle in order to deal with the changing pressure loads across the valve leaflets.

"The diversity of science [in Bio-X and the Clark Center] enables you to become a real generalist—to feel comfortable jumping into a new field. My work in Bio-X, the Neurosciences Program, and at Stanford allowed me to look for something interesting [when ready to graduate], knowing that I had the ability to learn quickly, solve problems, and work with researchers from many different fields."
-Leslie Meltzer, Ph.D. (Bio-X Fellow 2004)

Melinda Cromie
Bio-X SIGF
Mechanical Engineering

Profs. Scott Delp (Bioengineering, Mechanical Engineering) and Mark Schnitzer (Biology, Applied Physics)
Melinda's goal is to understand the fundamental behavior of muscle by imaging sarcomeres, the smallest units of muscle tissue that contract to generate force. Sarcomeres have never been imaged in humans because they are smaller than the resolution of current clinical imaging modalities. Using a novel microendoscopy system, their laboratory imaged sarcomeres in humans for the first time. Melinda's current work is to use this newly developed system to quantify muscle contractile behavior in healthy humans and in individuals with spinal cord injury to improve surgical treatments that restore muscle function.

Mihalis Kariolis
Bio-X Bioengineering Fellowship

Professor Jennifer Cochran (Bioengineering)
Directed evolution is a powerful method that can be used to engineer proteins for therapeutic applications. Using this method, Mihalis is engineering proteins to target and inhibit receptors on the cancer cell surface that are crucial for cell growth and survival. The engineered proteins also hold potential to disrupt critical signaling pathways important for disease progression. As such, they have potential value as targeted therapeutics agents as well as diagnostic imaging probes.

Murtaza Mogri (see pg. 20)

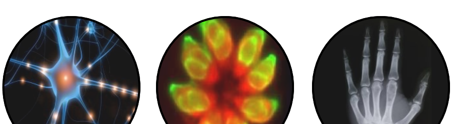
Ton Subsoontorn
Bio-X Bioengineering Fellowship

Professor Drew Endy (Bioengineering)
The ability to program sequential logic within living systems would enable new approaches to the study and control of biological processes. For example, a simple sequential logic device like an 8-bit counter which can count and report up to 256 discrete biochemical events (e.g. cell division) is sufficient for tracking and controlling entire cell lineages during the development and aging across most known organisms; however, state-of-the-art genetically encoded sequential logic devices can reliably handle only few states. Ton's research is focused on developing a platform for using site-specific recombination and horizontal gene transfer to implement more complex sequential logics in living cells.

Grace Tang
Bio-X Bioengineering Fellowship

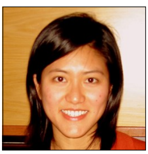
Professor Russ Altman (Bioengineering, Genetics)
Fragment-based drug design focuses on optimizing low affinity low-molecular-weight fragments into high affinity lead molecules. Key in this process is the initial identification of fragments binding to a protein of interest. Structural data for proteins whose bound ligands share common substructures can be used as a proxy to enhance our understanding of fragment binding to facilitate the development of fragment binding predictors; thus, the Altman lab proposes an unsupervised machine learning approach to automate the discovery of ligand substructure binding environment preferences. These clusters are a basis for identifying putative binding pockets in other proteins for drug design or repurposing.

The following student fellows from 2008 have graduated:
Andreas Rauschecker (Bio-X Fellow)
Mark Sellmyer (Bio-X Fellow)
Adam de la Zerda (Bio-X Skippy Frank Fellow)
Viviana Gradinaru (Bio-X SIGF)
Tyler Hillman (Bio-X Fellow)
For more details, see page 20.



Kelsey Clark
Neurosciences

Professor Tirin Moore (Neurobiology)
The visual world contains far more information than we can process or respond to at any one time. How does the brain select specific stimuli to enter awareness and guide behavior? In addition, goal-driven behavior—from baking a cake to changing lanes on the freeway—often involves "holding in mind" certain facts about the state of the world. How is task-relevant information selected for entry into memory and maintained in the absence of continued sensory input? To what extent are the same neural circuits involved in processing sensory stimuli used to maintain and manipulate remembered stimuli?



Frances Lau
Electrical Engineering

Profs. Craig Levin (Radiology) and Mark Horowitz (Electrical Engineering, Computer Science)
Frances is developing an ultra-high resolution Positron Emission Tomography (PET) system dedicated to breast cancer imaging. PET is a non-invasive, *in vivo* molecular imaging technology that has shown promise for early identification of breast cancer due to its ability to visualize biochemical changes in malignant tissue well before structural changes occur. She applies hardware design and signal integrity concepts to develop data acquisition electronics that read out and process the small signals detected. She is also using ideas from high speed data communication circuits to propose and design a novel integrated circuit for a future PET system.

Rebecca Taylor
Mechanical Engineering

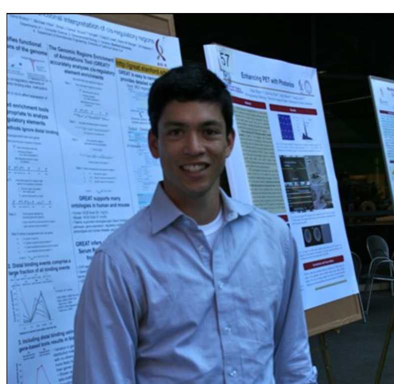
Profs. Ellen Kuhl (Mechanical Engineering) and Beth Pruitt (Mechanical Engineering)
Stem cell derived heart cells hold promise for creating therapeutic patches or "cellular bandaids" to heal the heart after a heart attack. In Rebecca's research, she conditions these cells using microfabricated, dynamic cell culture systems that mimic the electromechanical environment of the heart. She has also developed a novel microfabricated, elastomeric force assay to measure the axial forces generated by these developing heart cells. This functional assay tells us when cardiomyocytes are physically capable of augmenting heart function. Further, this assay provides a window into cardiac developmental biology by tracking myocyte force generation through time in both healthy cells and disease models.

Jacob Hughey
Bio-X Bioengineering Fellowship

Professor Markus Covert (Bioengineering)
Jake is focused on uncovering the molecular signaling events of the innate immune response, which orchestrates the first actions against an invading pathogen. To accomplish this, he is using a combination of live-cell fluorescence microscopy, microfluidics, and computational modeling.

Jayodita Sanghvi
Bio-X Bioengineering Fellowship

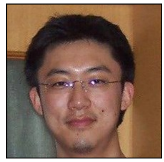
Professor Markus Covert (Bioengineering)
Jayodita is building a comprehensive computational model of a living cell that describes all of the cell's molecular functions and interactions. Given the complexity of this problem, she is starting with the smallest known bacterium, the human pathogen Mycoplasma genitalium. The model includes all known gene functions and cellular process and contains the highest level of detail of such a model to date. This model will enable a better understanding of cell physiology and help uncover unknown cell mechanisms. Future expansion of the model may help predict cell responses to drugs or provide insight on how to engineer cells to perform desired functions.



Cory McLean (see pg. 20)

Min-Sun Son
Bio-X Bioengineering Fellowship

Professor Marc Levenston (Mechanical Engineering)
Min-Sun's work involves studying the role of the meniscus in the progression of osteoarthritis. She looks at the gene expressions of various proteins such as collagen, aggrecan, and aggrecanase in the menisci using animal models. These proteins are known to have important roles in the degradation of the meniscus and cartilage. In addition, she is also trying to find a way to detect meniscal degradation non-invasively using MRI. As the meniscus does not have much regenerative capabilities and often precedes cartilage in degeneration, such methods would contribute to early diagnosis of osteoarthritis and prevent further progression of the disease.

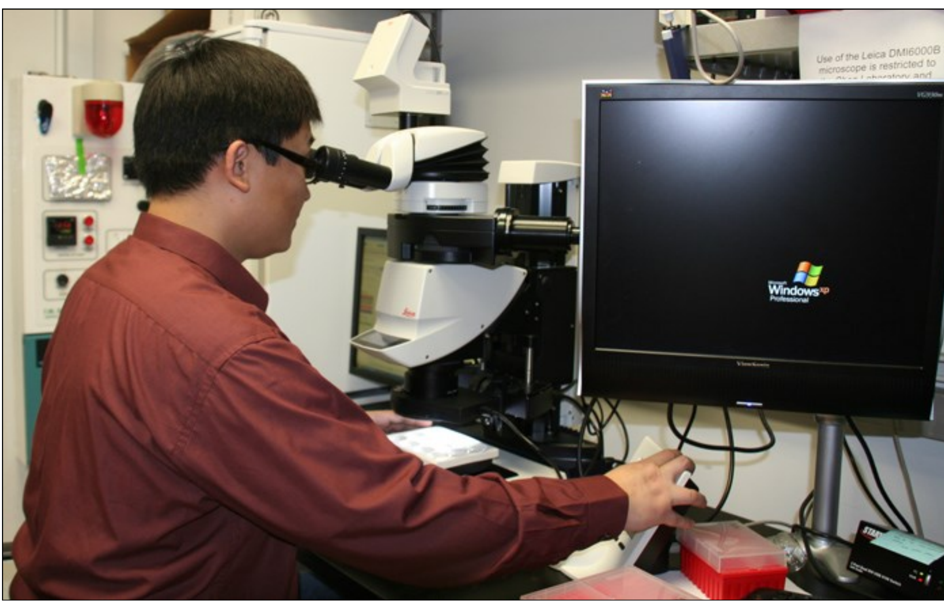


Nan Xiao
Bio-X Bioengineering Fellowship

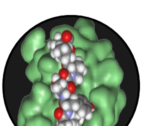
Professor Charles Taylor (Bioengineering, Mechanical Eng.)
Recent advances in modern medical imaging and computing have enabled researchers to build increasingly realistic computer models of the cardiovascular system. Understanding the propagation of pressure and flow waves as a function of arterial stiffness is a crucial factor in unveiling the mechanisms behind diseases such as hypertension. Nan's work involves combining medical image data and other non-invasive clinical measurements with computational mechanics to construct realistic, three-dimensional simulations of blood flow in the large arteries of the human body in order to study the impact of changing arterial stiffness on the wave propagation behavior of arterial blood flow.

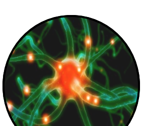
"The Bio-X Program and Fellowship allowed me to do riskier research for my Ph.D. because we didn't have outside funding for that [specific] project. I think it directly contributed to the success of that work, specifically in the publication of the work in the Proceedings of the National Academy of Sciences."
Amanda Malone, Ph.D. (Bio-X Fellow 2004)

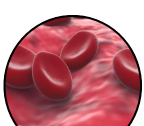
The following student fellows from 2007 have graduated:
Cory McLean (Bio-X Fellow)
Larry Wang (Bio-X Fellow)
Jennifer Hicks (Bio-X Fellow)
Kitchener Wilson (Bio-X Fellow)
Sheng Ding (Bio-X Bioengineering Fellow)
For more details, see page 20.



Shawn Ouyang (see pg. 10 for project details)







Edith Arnold
Mechanical Engineering

Profs. Scott Delp (Bioengineering, Mechanical Engineering) and Garry Gold (Radiology)
Muscles turn our thoughts into actions. We speak, reach, grasp, and walk because our muscles interpret signals from our brains to produce coordinated forces. Since these forces cannot be measured directly, musculoskeletal models that predict them are powerful resources for basic research and clinical applications. Edith is building a model of the lower limbs that uses measurements of muscle structure to give accurate predictions of force. This project unites muscle physiology, computational modeling, and scientific communication to answer questions about the role of muscle structure in walking; develop models that address variation due to age, sex, and strength; and share these models with the research community.

Sanjay Dastoor
Mechanical Engineering

Profs. Mark Cutkosky (Mechanical Engineering) and Scott Delp (Bioengineering, Mechanical Engineering)
Sanjay is researching the application of artificial muscles to robotics and prosthetics through a novel manufacturing method. Electric motors lack many of the dynamic characteristics of biological muscle, limiting their use in biomimetic devices. Electroactive polymer actuators are a promising alternative with muscle-like performance, light weight, low cost, and silent operation. He is developing methods for fabricating these actuators using shape deposition manufacturing, which allows customized geometries, heterogeneous materials, and embedded components.

Adam de la Zerda (see pg. 20)

Katy Keenan
Mechanical Engineering,
Radiology

Profs. Scott Delp (Bioengineering, Mechanical Engineering), Garry Gold (Radiology), and Gary Beaupre (Mechanical Engineering)
The goal of Katy's work is to better diagnose cartilage health, enabling early detection of diseases such as osteoarthritis. Currently, because cartilage disease cannot be diagnosed early, there is no metric of cartilage health to non-invasively evaluate restorative therapies. She is combining magnetic resonance imaging techniques with mechanical testing of *ex vivo* cartilage to develop a correlation between imaging parameters and mechanical properties of cartilage. Several of the novel MRI techniques she is using, e.g. sodium, T1rho, and bound pool fraction maps, are being developed at Stanford. She will translate the correlation between imaging parameters and mechanical properties to *in vivo* imaging of human patients.

Daniel Kimmel
Bio-X Affymetrix Fellow
Neurosciences, Medicine

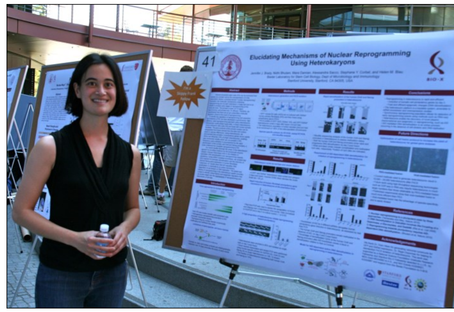
Professor William Newsome (Neurobiology)
When we make decisions, we must consider both the costs and benefits associated with each choice. In the world of economics, this problem is often solved by reducing costs and benefits to a common currency, namely money. The Newsome laboratory believes the brain may solve the problem similarly by representing benefit, cost, and net value as discrete neural signals. To test this, they make economic offers to monkeys while they record from or manipulate the activity of neurons that may underlie the animals' decision to accept or reject their offers. Their results will shed light on how the brain represents value and uses this information to make decisions.

James H. Clark Center, Stanford University

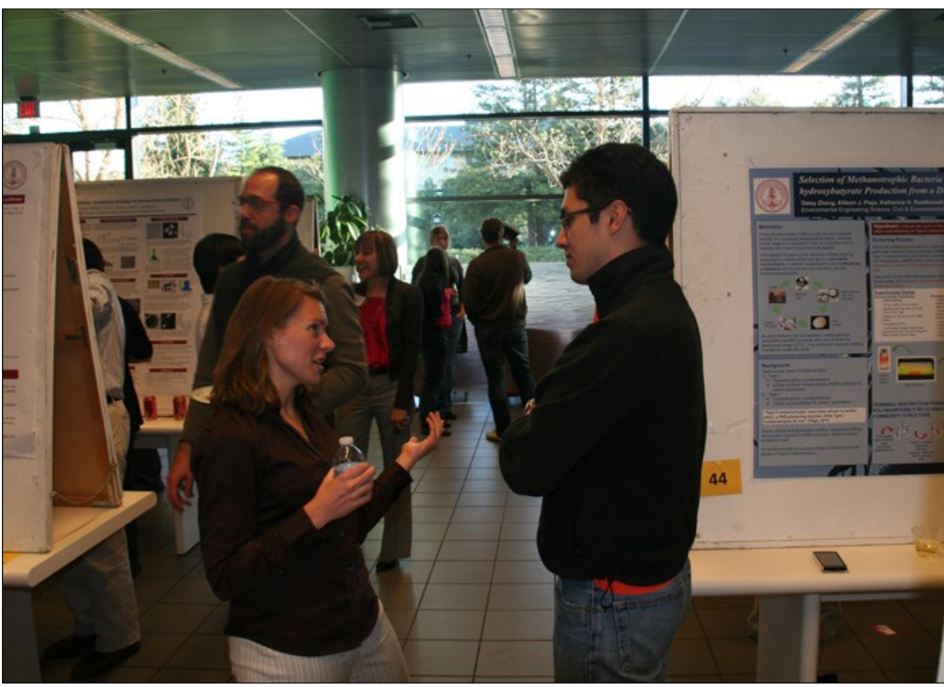
Angela Wu
Bio-X Bioengineering Fellowship

Professor Stephen Quake (Bioengineering)
Chromatin immunoprecipitation (ChIP) is a powerful assay used to probe DNA–protein interactions. Traditional methods of implementing this assay are cumbersome and require a large number of cells, making it difficult to study rare cancer and stem cells. The Quake lab has designed a microfluidic device (named AutoChIP) to perform sensitive ChIP analysis on low cell numbers in a rapid, automated fashion while preserving the specificity of the assay. The recently demonstrated AutoChIP results from 2,000 cells were comparable to conventional ChIP methods using 50,000–500,000 cells. She is using this device to study oncogene addiction in cancer cells and to do profiling of cancer stem cells. She believes that their device provides a solution to the need for a high sensitivity, rapid, and automated ChIP assay, and in doing so, will change the way we study cancer and enable studies of cancer stem cells that were not possible previously.

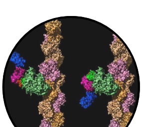
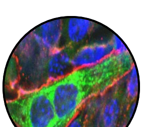
The following student fellows from 2006 have graduated:
Ian Chen (Bio-X Fellow)
Guillem Pratx (Bio-X Fellow)
Aaron Wang (Bio-X Fellow)
Namiko Abe (Bio-X Paul Berg Medical Fellow)
Bertrand Lui (Bio-X Lubert Stryer Fellow)
Murtaza Mogri (Bio-X Bioengineering Fellow)
Peggy Yao (Bio-X Fellow)
Jennifer Blundo (Bio-X Fellow)
For more details, see page 20.



Jennifer Brady, Bio-X Skippy Frank Fellow (see pg. 6)



(right) Prof. KC Huang, Bio-X Fellow mentor


Bio-X Graduate Student Fellowships 2005

Jules VanDersarl
Materials Science & Engineering

Profs. Nicholas Melosh (Materials Science & Engineering) and Michael Longaker (Surgery)
Jules developed a variety of platforms for mimicking cell-cell signaling. Controlling the cell signaling environment is important in cell research because many cell functions are determined by signals from neighboring cells. Jules developed semiconductor based arrays of fluid filled nano-reservoirs that mimic subcellular signaling through electrochemically gated release. This device allowed for unprecedented control over the local cellular soluble signal environment. He also developed novel microfluidic systems for multicellular signaling. These systems uniquely combined active chemical control and diffusive delivery. Topped with an innovative "nano straw" interface, direct access to the cell cytosol was also achieved with these systems.

Mindy Chang
Bio-X Bioengineering Fellowship

Professor Tirin Moore (Neurobiology)
The retina receives a constant stream of sensory input that the visual system integrates to create a useful representation of the outside world. The neural representation of visual information is known to be highly context dependent. In particular, Mindy's work focuses on quantifying sensory information in both frontal and visual cortex during different behavioral contexts, including passive viewing, eye movements, attention, and working memory.

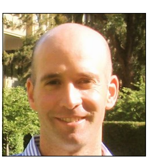
Prasheel Lillaney
Bio-X Bioengineering Fellowship

Professor Rebecca Fahrig (Radiology)
Prasheel works on the design of a hybrid X-ray fluoroscopy/MRI system to be used in the interventional suite to assist in image guidance for minimally invasive surgical procedures. His focus is on redesigning components of the x-ray source that are sensitive to magnetic fields. Using these modalities with each other offers several advantages, such as the ability to have both the real time tracking capability of x-ray along with the 3-D visualization and soft tissue contrast of MRI. These advantages can lead to an increase in the efficiency and safety for procedures in the interventional suite.

The following student fellows from 2005 have graduated:
Afsheen Afshar ((Bio-X Fellow)
Georgios Asimenos (Bio-X Fellow)
David Myung (Bio-X Fellow)
Rachel Kalmar (Bio-X Fellow)
Yufeng Yang (Bio-X Fellow)
Vincent Chu (Bio-X Pfizer Fellow)
Virginia Chu (Bio-X Bioengineering Fellow)
Stephen Lee (Bio-X Bioengineering Fellow)
For more details, see pages 20-21.

Prof. Jim Swartz, Bert Lui (see pg. 20), Prof. Jennifer Cochran

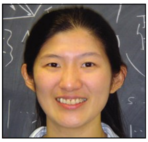
Bio-X Graduate Student Fellowships 2004



Sergio Moreno
Physics

Profs. Michael Levitt (Structural Biology) and Sebastian Doniach (Applied Physics)
Sergio works in Professor Levitt's group using simple theoretical models of proteins to address important questions that are still unknown for proteins occurring in living organisms. Their models allow them to study very large collections of proteins and compare their properties with those of real proteins. They also use their models to address fundamental questions about proteins such as the interplay of chemistry and evolution in different scenarios.

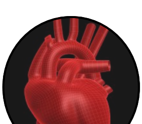
The following student fellows from 2004 have graduated:
Relly Brandman (Bio-X Fellow)
David Camarillo (Bio-X Fellow)
Samuel Kim (Bio-X Fellow)
Andreas Loening (Bio-X Fellow)
Leslie Meltzer (Bio-X Fellow)
Sara Zhao (Bio-X Fellow)
Amanda Malone (Bio-X Bioengineering Fellow)
Adam Grossman (Bio-X Bioengineering Fellow)
For more details, see page 21.

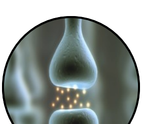


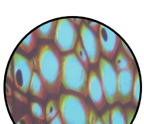
Yu-Shan Lin
Bio-X Postdoctoral Fellowship 2009
Bio-X Fellow
Chemistry

Professor Vijay Pande (Chemistry)
The oligomerization of amyloid beta (Aβ) peptides plays an important role in the development of Alzheimer's disease. This research project describes an interdisciplinary approach to provide valuable insight into this important problem. The Pande lab has performed simulations of ~1 millisecond on the Aβ monomer, the starting point of oligomerization. This unprecedented sampling enables us to observe the effects of peptide length and amino acid substitutions on the Aβ monomer structure. Differences in the monomer ensembles are significant and could help explain experimentally observed alterations in the kinetics/mechanisms of aggregation and cellular toxicity. Based on the monomer results, they are currently investigating the oligomerization process and computing spectroscopic predictions using theoretical vibrational spectroscopy.

James H. Clark Center, Stanford University



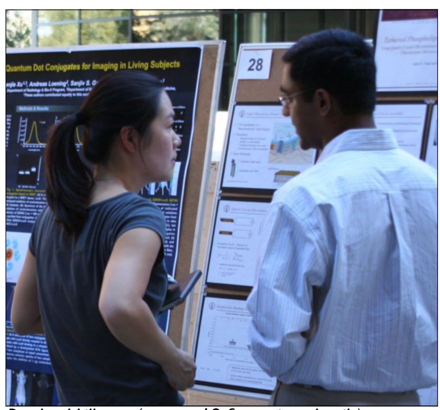




Tristan Ursell
Bio-X Postdoctoral Fellowship 2009
Bio-X Genentech Fellow
Bioengineering

Professor Kerwyn Huang (Bioengineering)
Tristan's current research concentrates on the mesoscopic scale where cells and their constituent parts are examined as mechanical elements that respond to stresses in the environment. His goal is to probe the importance of physical and mechanical forces in mechanisms driving cellular organization by integrating approaches from experimental cell biology, biochemistry, and biophysics with theoretical studies based on mechanics, statistical physics, and computational biology. Recent projects include experimental and computational analysis of the growth of bacterial cells to better understand cell wall construction and enzymatic activities and computational studies of the community structure and interactions of cyanobacteria that respond to light.

The following students have completed their postdoctoral program:
Shilpa Sambashivan
Elena Rykhlevskaia
Tiffany Chung
Sergey Solomatin



Prasheel Lillaney (see pg. 18 for project details)

"One of the many ways Bio-X led me to what I'm doing now is by getting me initially connected to people in the device and venture community, and these connections led to others that helped get the company started and funded."
David Myung, Ph.D. (Bio-X Fellow 2005)

Where are they now?

Li Ma is an assistant professor in the department of statistical science at Duke University.

Noureddine Tayebi is a research scientist within the Integrated Biosystems Laboratory, Intel Research Labs, Intel Inc. Santa Clara, CA.

Andreas Rauschecker began medical school in July of 2011.

Mark Sellmyer is in his last clinical year of the MD program and still works in the Wandless lab and Longaker lab when he has the chance.

Adam de la Zerda is a Damon Runyon Cancer Research Foundation Postdoctoral Fellow at the University of California-Berkeley. He studies the unique sugar patterns that cover cancer cells by building molecular tools that allow, for the first time, to visualize these unique sugars in living cells and living animals.

Viviana Gradinaru is a research associate at Stanford University in the CNC Center.

Tyler Hillman is in his last year of the MD program at Stanford. He plans to complete a residency in Ob/Gyn and pursue a career as an academic perinatologist.

Cory McLean is a postdoctoral scholar at UCSF in the department of neurosurgery, working on epigenomics in brain cancer.

Larry Wang is a software engineer at Yahoo!

Jennifer Hicks is the OpenSim Project Manager at Stanford's NIH funded National Center for Simulation in Rehabilitation Research. As the project manager, she is focused on guiding the development of OpenSim and facilitating its use in research and clinical settings around the world.

Kitchener Wilson is a clinical pathology resident at Stanford University. He is training to be a physician-scientist where he has a clinical practice and also a basic research lab.

Sheng Ding works for a biotech start-up company as a research scientist, focusing on developing protein therapeutic drugs with extended half-life.

Ian Chen is an internal medicine resident at Stanford University and will be starting his cardiology fellowship in 2012.

Guillem Pratx is a postdoctoral fellow in radiation oncology at Stanford University, where he is exploring novel and unconventional approaches to biomedical imaging.

Aaron Wang is at Johns Hopkins University for his residency in ophthalmology.

Namiko Abe is a postdoctoral scholar at Columbia University in the biochemistry and molecular biophysics department.

Bertrand Lui is an associate at McKinsey & Company, a global management consulting firm.

Murtaza Mogri focuses on strategy projects in the medical device and broader healthcare sector as a consultant in the Minneapolis office of Boston Consulting Group (BCG).

Peggy Yao is working on supply chain management optimization for Oracle.

Afsheen Afshar is working at the Goldman Sachs Group, developing quantitative models to help them conduct their businesses with less risk, greater speed, and more efficacy.

Georgios Asimenos is Director of Science and Engineering at DNAnexus, a startup company founded by two Stanford faculty members (Serafim Batzoglou and Arend Sidow) and a former student of Serafim Batzoglou's, Andreas Sundquist.

David Myung graduated from Stanford Medical School and is now a resident in Internal Medicine at Kaiser Permanente. Beginning next year, he will be doing his residency in ophthalmology at the Byers Eye Institute at Stanford.

Rachel Kalmar was a postdoctoral scholar at Stanford University before she set off to explore applications of mobile technology in the field. She spent 7 months doing informal research as she traveled through Southeast Asia, India and Brazil. Currently, she is a student at Singularity University.

Yufeng Yang is a principal investigator and assistant professor in the Institute of Life Sciences at Fuzhou University.

Vincent Chu is the Director of Engineering at Posterous, a simple blogging platform based in San Francisco.

Virginia Chu is a postdoctoral fellow at the Rehabilitation Institute of Chicago working with Dr. Brian Schmit and Dr. George Hornby. She was recently awarded a 2-year postdoctoral fellowship grant from the American Heart Association to study loading perception during walking in stroke survivors.

Stephen Lee is concluding a year-long fellowship with Global Health Corps working in Rwanda on improving health center management. He will be returning to Stanford as an MBA candidate at the Graduate School of Business.

Relly Brandman is a postdoctoral scholar in the department of pharmaceutical chemistry at University of California, San Francisco.

David Camarillo will be a Biodesign Fellow (Fall 2011) working to identify needs in the gastroenterology space.

Samuel Kim is a postdoctoral scholar at Stanford/Postech.

Andreas Loening is a radiology resident at Stanford University.

Leslie Meltzer is an Associate Director in Medical Affairs, Leslie oversees Phase IV clinical studies and patient registries designed to continuously provide the medical community with emerging data in the field of pulmonary arterial hypertension for Actelion, an emerging biopharmaceutical company that develops novel therapies for highly unmet medical needs.

Amanda Malone is the VP COO at Auritec Pharmaceuticals.

Adam Grossman is an analyst in the emerging risk group at Risk Management Solutions. He analyzes and makes computational models of long term latent product health liability risk due to chemical exposures from commercial products.

Postdoctoral Fellows:

Shilpa Sambashivan is a scientist in the neuroscience group at Amgen. She is involved in early stage drug discovery efforts focused on Alzheimer's Disease and related protein misfolding diseases.

Sergey Solomatin is at Stanford biochemistry department, working as a Life Sciences Research Assistant.

Elena Rykhlevskaia is a Customer Insight Analyst at The Walt Disney Company.

Tiffany Chung is currently a chemist for the Hong Kong government.

BIO-X

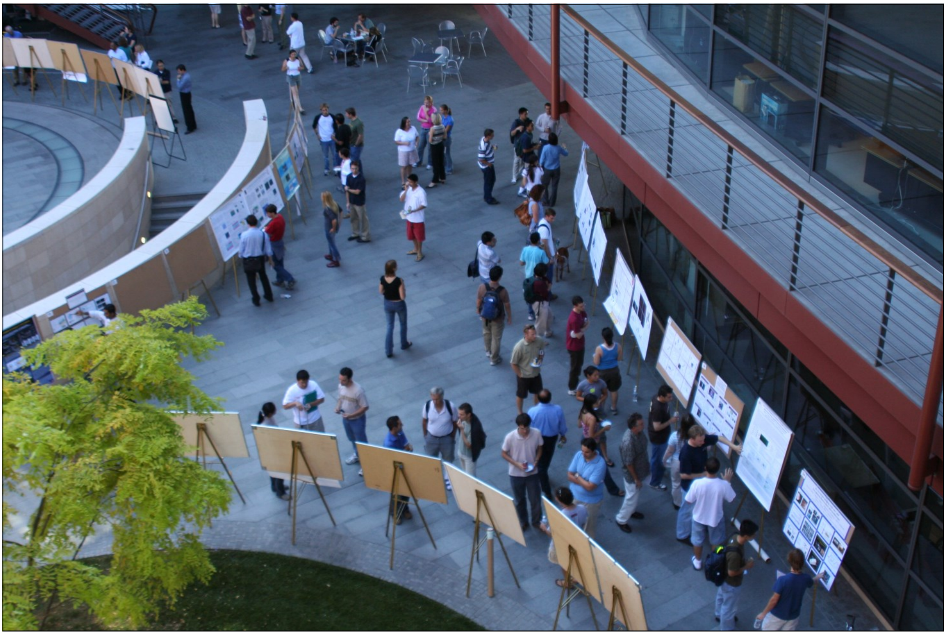
BIO-X AT STANFORD

TO EDUCATE...

TO DISCOVER....

TO INVENT....

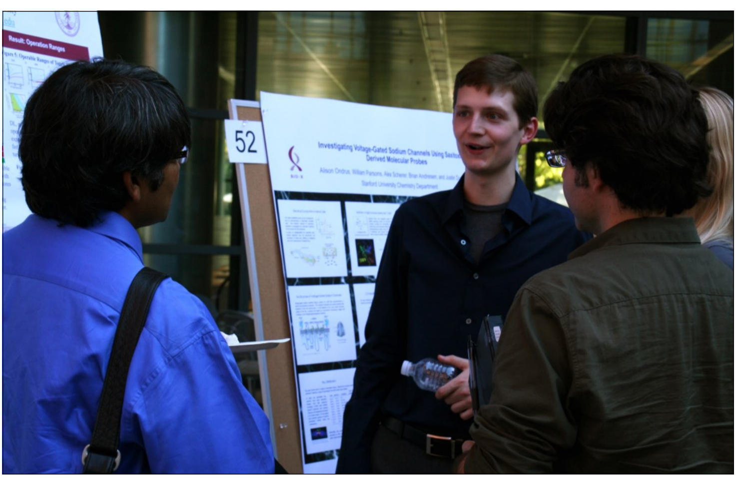
Fellows Holiday Photo 2008



2010 Bio-X IIP Symposium

Graduated Bio-X Fellows

Student	Department	Degree Year
Namiko Abe	Neurosciences	2007
Afsheen Afshar	Electrical Engineering	2008
Georgios Asimenos	Computer Science	2009
Relly Brandman	Chemical & Systems Biology	2009
David Camarillo	Mechanical Engineering	2008
Ian Chen	Bioengineering	2008
Vincent Chu	Applied Physics	2009
Virginia Chu	Bioengineering	2009
Adam de la Zerda	Electrical Engineering	2011
Sheng Ding	Bioengineering	2011
Viviana Gradinaru	Neurosciences	2010
Adam Grossman	Bioengineering	2010
Jennifer Hicks	Mechanical Engineering	2010
Rachel Kalmar	Neurosciences	2010
Samuel Kim	Chemistry	2009
Stephen Lee	Bioengineering	2010
Andreas Loening	Bioengineering	2006
Bertrand Lui	Bioengineering	2011
Li Ma	Statistics	2011
Amanda Malone	Bioengineering	2007
Cory McLean	Computer Science	2010
Leslie Meltzer	Neurobiology	2008
Murtaza Mogri	Bioengineering	2011
David Myung	Chemical Engineering	2008
Guillem Pratx	Electrical Engineering	2010
Andreas Rauschecker	Neurosciences	2011
Mark Sellmyer	Chemical and Systems Biology	2010
Noureddine Tayebi	Electrical Engineering	2011
Aaron Wang	Bioengineering	2009
Larry Wang	Materials Science & Engineering	2008
Kitchener Wilson	Bioengineering	2010
Yufeng Yang	Neurosciences	2009
Peggy Yao	Biomedical Informatics	2011
Sara Zhao	Mechanical Engineering	2005



William Parsons (see pg. 8 for project details)

Completed Bio-X Graduate Fellowships

Student	Department	Yr completed
Edith Arnold	Mechanical Engineering	2010
Jennifer Blundo	Mechanical Engineering	2009
Mindy Chang	Bioengineering	2008
Kelsey Clark	Neurosciences	2010
Melinda Cromie	Mechanical Engineering	2011
Sanjay Dastoor	Mechanical Engineering	2009
Mario Diaz de la Rosa	Chemical Engineering	2011
Lisa Gunaydin	Neurosciences	2011
Tyler Hillman	Genetics, Medicine	2010
Jacob Hughey	Bioengineering	2010
Mihalis Kariolis	Bioengineering	2011
Kathryn Keenan	Mechanical Engineering	2009
Daniel Kimmel	Neurobiology	2009
Gaurav Krishnamurthy	Mechanical Engineering	2011
Frances Lau	Electrical Engineering	2010
Prasheel Lillaney	Bioengineering	2008
Ian Marshall	Civil & Environmental Engineering	2011
Christine McLeavey	Neurosciences	2010
Sergio Moreno	Physics	2007
Jayodita Sanghvi	Bioengineering	2008
Min-Sun Son	Bioengineering	2010
Ton Subsoontorn	Bioengineering	2011
Grace Tang	Bioengineering	2011
Rebecca Taylor	Mechanical Engineering	2010
Jules VanDersarl	Materials Science & Engineering	2008
Brian Wilt	Applied Physics	2011
Angela Wu	Bioengineering	2009
Nan Xiao	Bioengineering	2010
Peggy Yao	Biomedical Informatics	2010

Bio-X Fellows 2009 group photo

Current Bio-X Fellows

Student	Department
Jaimie Adelson	Neurosciences
Ron Alfa	Neurosciences
Aakash Basu	Applied Physics
Elsa Birch	Chemical Engineering
Jennifer Brady	Microbiology & Immunology
Craig Buckley	Chemical Engineering
Limor Bursztyn	Electrical Engineering
Jing-yu Cui	Electrical Engineering
Graham Dow	Biology
Remy Durand	Bioengineering
Christopher Emig	Bioengineering
Alex Grant	Bioengineering
Haisam Islam	Bioengineering
Jongmin Kim	Chemical & Systems Biology
Paul Lebel	Applied Physics
Andrew Lee	Chemical & Systems Biology
Austin Lee-Richerson	Bioengineering
Jonathan Leong	Neurosciences, MSTP
Liang Liang	Applied Physics
Sungwon Lim	Bioengineering
Mark Longo	Biology
Melina Mathur	Bioengineering
Joanna Mattis	Neurosciences
Samir Menon	Computer Science
Denitsa Milanova	Mechanical Engineering
Kathryn Montgomery	Bioengineering
Daniel Newburger	Biomedical Informatics
William Noderer	Chemical Engineering
Peter Olcott	Bioengineering
Carmichael Ong	Bioengineering
Patricia Ortiz-Tello	Genetics
Shawn Ouyang	Chemical & Systems Biology
William Parsons	Chemistry
Steven J. Petsche	Mechanical Engineering
Sanaz Saatchi	Bioengineering
Alia Schoen	Materials Science & Engineering
Joo Yong Sim	Mechanical Engineering
Rebecca Snyder	Bioengineering
Ruth Sommese	Biochemistry
Ryan Squire	Neurosciences
Jong Min Sung	Applied Physics
Carolina Tropini	Biophysics
Jack Wang	Neurobiology
Yen-Hsiang Wang	Bioengineering
Aaron Wenger	Computer Science
Remus Wong	Bioengineering
Xiaoxue Zhou	Chemistry

Bio-X Endowed SIGF Fellows

Student	Department
Namiko Abe	Neurosciences
Limor Bursztyn	Electrical Engineering
Melinda Cromie	Mechanical Engineering
Remy Durand	Bioengineering
Viviana Gradinaru	Neurobiology
Jongmin Kim	Chemical & Systems Biology
Daniel Kimmel	Neurosciences, Medicine
Paul Lebel	Applied Physics
Liang Liang	Applied Physics
Mark Longo	Biology
Bertrand Lui	Bioengineering
Li Ma	Statistics
Samir Menon	Computer Science
Daniel Newburger	Biomedical Informatics
Peter Olcott	Bioengineering
Shawn Ouyang	Chemical & Systems Biology
William Parsons	Chemistry
Ruth Sommese	Biochemistry
Carolina Tropini	Biophysics
Aaron Wenger	Computer Science
Xiaoxue Zhou	Chemistry

Industry and Donor Sponsored Awards

Student	Department
Jennifer Brady	(Skippy Frank Foundation) Microbiology & Immunology
Vincent Chu	(Pfizer) Applied Physics
Tiffany Chung	(Stanford Faculty funded) Radiology
Adam de la Zerda	(Skippy Frank Foundation) Electrical Engineering
Gaurav Krishnamurthy	(Medtronic Foundation) Mechanical Engineering
Denitsa Milanova	(Medtronic Foundation) Mechanical Engineering
Elena Rykhlevskaia	(Lubert Stryer) Psychiatry
Sanaz Saatchi	(Amgen) Bioengineering
Shilpa Sambashivan	(Genentech) Chemical & Systems Biology
Sergey Solomatin	(Stanford Faculty funded) Chemistry
Tristan Ursell	(Genentech) Bioengineering

Bio-X Fellows 2008 group photo

Professor Carla Shatz
Director of Bio-X
James H. Clark Center
318 Campus Drive, W157
cshatz@stanford.edu

Heideh Fattaey, Ph.D.
Executive Director of Operations and Programs
James H. Clark Center
318 Campus Drive, S135
hfattaey@stanford.edu

Gabriella Martelino
Bio-X Education and Fellowship Coordinator
James H. Clark Center
318 Campus Drive, S131
gfsm@stanford.edu

Olgalydia Urbano-Winegar
Bioengineering Student Services Manager
James H. Clark Center
318 Campus Drive, S166
ourbano@stanford.edu

Bio-X Fellows 2011 group photo

Bio-X Program

To learn more about the Bio-X Program at Stanford, please visit the Bio-X website at:

http://biox.stanford.edu

BIO-X

Cover Photo: 2011 Bio-X Fellows Symposium speakers: George Asimenos, Mark Sellmyer, Lisa Gunaydin, Rebecca Snyder

Brochure designed by F. Sincock