STANFORD UNIVERSITY

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STANFORD UNIVERSITY

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NOVEMBER 2006

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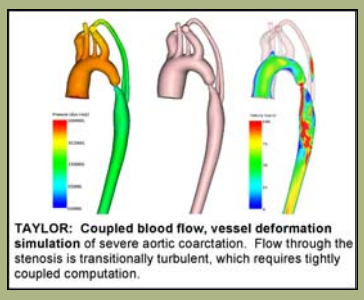

TAYLOR: Coupled blood flow, vessel deformation simulation of severe aortic coarctation. Flow through the stenosis is transitionally turbulent, which requires tightly coupled computation.

Paul Yock Career Achievement Award Winner

The Cardiovascular Research Foundation honored Paul G. Yock, MD, with this years TCT Career Achievement Award.

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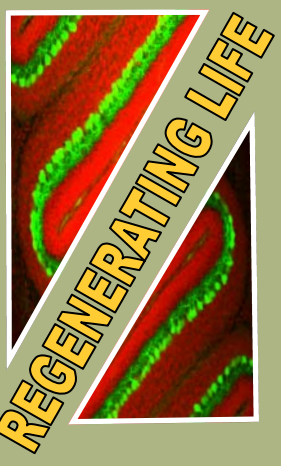


Yock is Career Achievement Award Winner

Paul Yock

Renowned cardiologist recognized for decades of service

The Cardiovascular Research Foundation (CRF) honored Paul G. Yock, MD, with this years TCT Career Achievement Award. Yock is the Martha Meier Weiland Professor of Medicine and Professor of Mechanical Engineering at Stanford University, Stanford, Calif.

The award honors Yocks achievements not only as a world-renowned inventor, but also as an outstanding educator and leader.
Full story:
http://www.tct2006.com/Dailies_TCT2006/wednesday_fulltext/Yock_Is_Career_Achievement_Award_Winner.html

New Super Computing Cluster

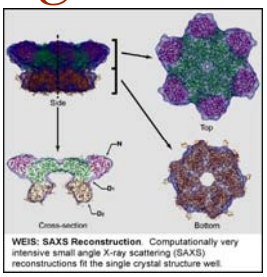
Bio-X Program Awarded Grant for New Super Computing Cluster

In August, a group of 21 Bio-X affiliated faculty members were awarded $2 million to create the next generation super computing cluster at Stanford University. The faculty consortium consists of faculty who are members of 13 Departments and 4 Schools at Stanford and whose research lies along the interface of biology and computer science. The diversity of the research problems that will be enabled by the cluster is truly remarkable, and ranges in scale from sub-molecular to organismal.

The proposed architecture of the system is a hybrid shared-memory, massively parallel cluster. Each compute node will have a high number of processor cores and shared memory. These nodes will be interconnected with a high-speed, Infiniband network, allowing for efficient parallel calculations. The final component is a parallel file system, allowing all of the compute nodes fast and simultaneous access to a single data storage system. The proposal is based on commodity hardware, delivering high performance computing power while remaining cost effective.

"The ability to have 5 times as many cores all connected by high bandwidth, low latency interconnects will make the next generation cluster a true supercomputer, enabling a new generation of simulation and data analysis for our group", said Vijay Pande, Professor of Chemistry and Director of the folding@home project.

The new cluster will replace two, older, high performance systems: a retired SGI Origin 3800 supercomputer and the Dell Supercomputing Cluster. Both of these systems were hugely successful in enabling the research of ~150 users from ~40 labs across Stanford.



WEIS: SAXS Reconstruction. Computationally very intensive small angle X-ray scattering (SAXS) reconstructions fit the single crystal structure well.

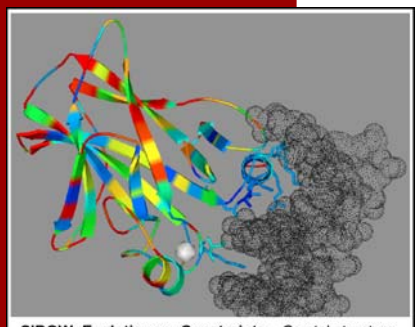
The new system will surpass the older systems in terms of sheer number of processor cores, speed and parallelism. The new cluster will be able to accommodate more users and larger calculations.

Axel Brunger, Professor of Molecular and Cellular Physiology, is one of the researchers who will benefit from the new cluster, "The new computational facility will be an important step towards realistic simulations of protein-mediated membrane fusion, a major research area in my laboratory. We are involved in a collaboration with Vijay Pande to perform large-scale simulations of small liposomes tethered by trans protein complexes. The new cluster will enable us to significantly extend the time-scale of the simulations and to use larger liposomes."

Professor Sandy Napel is a co-director of the Radiology 3D Laboratory. The 3D Laboratory is "developing advanced multidimensional visualization, quantitation, and computer-aided detection methods" to "provide clinical information relevant to patients seen in the Radiology Department." Sandy predicts that the calculations his group will run on the new cluster will ultimately benefit patients, "Access to a powerful supercomputer cluster will not only speed up the development of [computer] algorithms, but will result in code that could someday run on centralized radiology interpretation servers ... bringing powerful computing hardware to bear for a large number of patients being evaluated or already suffering from a host of different diseases and disabilities."

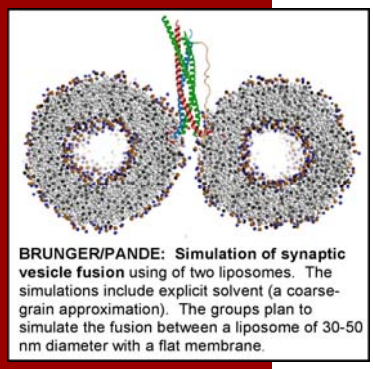
The new computing cluster is expected to make its debut in early 2007.

Subscribe to the Bio-X Email list:
https://mailman.stanford.edu/mailman/listinfo/bio-x_program



SIDOW: Evolutionary Constraints. Crystal structure of p53, "guardian of the genome", bound to DNA and colored by residue-specific physicochemical constraints obtained from evolutionary comparisons. Blue, strong constraint; red, weak constraint. Surface residues involved in binding are most strongly constrained.

SMIS Program



BRUNGER/PANDE: Simulation of synaptic vesicle fusion using of two liposomes. The simulations include explicit solvent (a coarse-grain approximation). The groups plan to simulate the fusion between a liposome of 30-50 nm diameter with a flat membrane.

The National Institute of Health (NIH) has awarded a five year R25T training grant referred to as the new Stanford Molecular Imaging Scholars (SMIS) Program. "The R25T is a special kind of training program whose goals are to bridge across disciplines and across departments—i.e. Bio-X," explains Dr. Sam Gambhir, principal investigator on the grant. The first four postdoctoral fellowships were awarded this fall to Bryan Smith, Hen-Tzu Jill Lin, Richard Kimura, and Jennifer Prescher. These fellows will be working with faculty including but not limited to: Dr. Sam Gambhir, Dr. Christopher Contag, Dr. Jennifer Cochran, and Dr. David Paik.

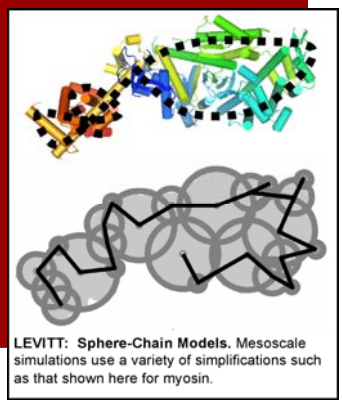
The interdisciplinary environment in Bio-X and the Clark Center is a key component of the program and helped secure funding for this unique training grant. More than 40 faculty members from over 13 different departments in the Schools of Medicine, Humanities and Sciences, and Engineering will participate in mentoring the fellows to train them in molecular imaging and other disciplines.

Each postdoctoral scholar will be co-mentored by faculty from two different disciplines from eight program areas, including: chemistry of molecular probes, *in vivo* molecular imaging, molecular/cell pharmacology, therapeutic applications in cancer, nanotechnology, tumor immunology/biology, imaging instrumentation, and clinical imaging. Postdoctoral fellows with an interest in both molecular imaging and pursuing an academic career will spend three years in the program, completing course work in molecular imaging and other elective fields in addition to conducing research.

"In addition to the students learning across fields...they will actually learn how to write a grant." Dr. Gambhir added. This program is unique because it requires not only an interdisciplinary research commitment—in the form of joint advisors—but also incorporates a grant preparation process into the final year of the program to help familiarize fellows to the grant writing process. In doing so, the fellows leaving this program will be in an excellent position to compete for a faculty position at a university.

To find out more about the program and the current fellows, please visit: http://mips.stanford.edu/smis/index.adp

To learn more about the Bio-X Program, visit: http://biox.stanford.edu



LEVITT: Sphere-Chain Models. Mesoscale simulations use a variety of simplifications such as that shown here for myosin.

Special Bio-X Seminar

"Structuring a Scientific Talk"

Presentations are integral to your career regardless of your chosen path. Whether you enter academia or industry you will need to secure funding, update progress of your projects or just show results. Your presentations will build your reputation.

Please Join us on November 2nd at 1:30PM in Clark Auditorium to benefit from an exceptional presentation by Dr. Sue McConnell designed to show clearly what makes an oral presentation effective.

Dr. Sue McConnell has a longstanding interest in the art of giving excellent scientific presentations. Her talk will focus on two practical challenges that each of us faces in designing a talk: how to use Powerpoint effectively, and how to structure a scientific talk to be engaging and understandable.

NEW

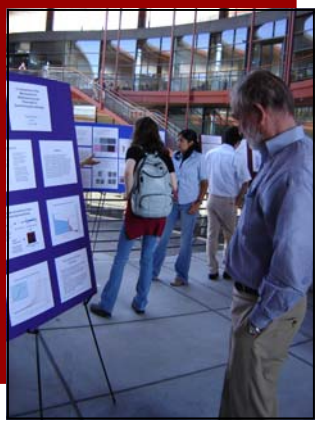
Bio-X Fellow Program

The Bio-X fellow program attracts young, highly talented researchers after their PhD or first postdoctoral experience to start an independent, yet integrated research program with the potential of groundbreaking impact on biosciences.

Further information and application details: http://biox.stanford.edu/grant/index.html

Interdisciplinary Initiatives

Through the Interdisciplinary Initiatives Program (IIP), under the direction of Harvey Cohen, Professor of Pediatrics, Bio-X stimulates innovative interdisciplinary research



Bio-X Interdisciplinary Initiatives Program (IIP)

Once again this year we were able to award the Bio-X Interdisciplinary Initiative Program seed grants. As most of you are aware one of our major goals is the enhancement of interdisciplinary science among the communities at Stanford. Once again this year, with the support of President Hennessy, we were able to fund 24 interdisciplinary proposals submitted by Stanford faculty teams. This was the third round of funding for the program, bringing the number of awarded teams to 64.

The first round of grants was funded in October 2000: nineteen proposals were awarded seed grants, averaging $158,000 over a two-year period.
The second round was awarded in October 2002. Twenty-one proposals were awarded seed grants during this second round, averaging $143,000 over a three-year period.

The third round was awarded this month and the grants averaged approximately $129,000.
The program has proven to be a huge success. Many manuscripts have been published by the awarded teams, many scientists have received training, and many external grants have been awarded to the teams that were received the Bio-X IIP seed funding.

This year the awarded proposals included:

High-Resolution MRI of Prostate Cancer
James Brooks (Urology)
Dwight Nishimura (Electrical Engineering)
Bob S. Hu (Electrical Engineering)
John Higgins (Pathology)

Enhancement of neuron:device interactions by surface presentation of small molecule neurotrophin receptor agonists
Stefan Heller (Otolaryngology)
Frank Longo (Neurology & Neurological Sciences)
Gerald Fuller (Chemical Engineering)

Novel nanoparticles for delivery of small molecules in cancer therapy
Chris Contag (Pediatrics)
Richard Zare (Chemistry)

Molecular and Functional Characterization of Colon Tumor Cancer Stem Cells and Stroma
Michael F. Clarke (Internal Medicine)
Patrick Brown (Biochemistry)
Steven Quake (Bioengineering)

Inventing a Microendoscope to Measure Sarcomere Lengths in Humans
Scott Delp (Bioengineering)
Terry Sanger (Neurology and Neuroscience)
Mark Schnitzer (Biological Sciences)
Stephen Smith (Molec. and Cell. Physiology)

Interferometric Analysis of Membrane Protein Conformation
Steven Boxer (Chemistry)
Nick Melosh (Materials Science & Engineering)

Determination of Muscle Stem Cell Fate in Bioengineered Artificial Niches
Helen Blau (Microbiology and Immunology)
Curtis Frank (Chemical Engineering)

Wound Management with Intelligent Materials
Curtis Frank (Chemical Engineering)
Jennifer Cochran (Bioengineering)
George Yang (Surgery)
Michael Longaker (Medicine)

Engineering Fluorophore-Binding Protein Tags for *In Vivo* Molecular Imaging
Sanjiv Sam Gambhir (Radiology)
Jennifer Cochran (Bioengineering)
JiangHong Rao (Radiology)

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Construction of a Conditional Stem Cell Niche
Gerald Crabtree (Pathology)
Tom Wandless (Chemistry)
Tobias Meyer (Molecular Pharmacology)
Steven Quake (Bioengineering)

Gating Mechanisms of Metazoan Sensory Mechanotransduction Channels
Miriam Goodman (Molec. and Cell. Physiology)
Eric Darve (Mechanical Engineering)

High-speed transcranial magnetic force pulses to drive stem cell migration
Karl Deisseroth (Bioengineering)
Bret Schneider (Psychiatry)

Carbon Nanotube Mediated Therapy for Lymphoma
Hongjie Dai (Chemistry)
Dean Felsher (Medicine-Oncology)

Understanding Pterosaur Flight An Interdisciplinary Study of Flight and Wing Dynamics
Margot Gerritsen (Energy Resources Eng.)
Scott Delp (Bionegineering)
Ilan Kroo (Aeronautics and Astronautics)
Jonathan Payne (Geo.and Environ. Sciences)

Interdisciplinary Initiatives

Vascular Anastomosis Using Thermoreversible Gels
Gerald Fuller (Chemical Engineering)
Geoffrey Gurtner (Surgery)

Nanoreservoir Arrays to Study Neuronal Signaling
Ricardo Dolmetsch (Neurobiology)
Nicholas Melosh (Mat. Science & Engineering)

A Novel Transducer Array and Intelligent Softwarefor Automated Detection of Asymptomatic Carotid Artery Stenosis
Sandy Napel (Radiology)
T. Khuri-Yakub (Electrical Engineering)
R. Brooke Jeffrey (Radiology)

Development of Novel Nanocrystal-Based MRI Contrast Agents for In-Vivo Cellular and Vascular Imaging
Dwight Nishimura (Electrical Engineering)
Hongjie Dai (Chemistry)
Phillip Yang (Medicine-Cardiovascular)
Michael McConnell (Medicine-Cardiovascular)
Bruce Daniel (Radiology)

Mapping the functional surface of the ribosome exit tunnel with novel antibiotics: a combined approach using computational design, chemo-biosynthesis, and experimental characterization
Chaitan Khosla (Chemistry)
Vijay Pande (Chemistry)
Jody Puglisi (Structural Biology)

A novel approach to study the neural circuitry of learning
Jennifer Raymond (Neurobioogy)
Mark Schnitzer (Biological Sciences)
Gregory Barsh (Genetics)

How are synapses eliminated to generate a functional neural circuit?
Mark Schnitzer (Biological Sciences)
Ben Barres (Neurobiology)

Development of integrated semiconductor optical imaging sensors for chronic minimally invasive optical imaging of rodent brain functions
Stephen Smith (Molec. and Cell. Physiology)
Krishna Shenoy (Electrical Engineering)
James Harris (Electrical Engineering)

An FPGA-Based Bioinformatics Accelerator and Application to Ultra-High-Throughput Sequencing
William Dally (Computer Science)
Arend Sidow (Genetics)
Serafim Batzoglou (Computer Science)

Investigation of Directed Cell Migration Using Microfluidic Electrokinetic Systems
Eugene Butcher (Pathology)
Juan Santiago (Mechanical Engineering)

Bio-X Research Themes:

Biocomputation

Biodesign

Biomedical Imaging

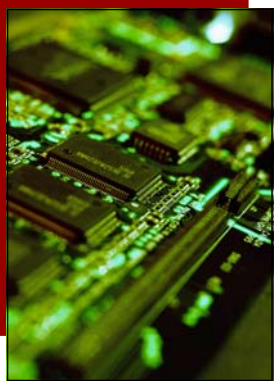
Brain & Behaviour

Cell/Molec. Engineering

Chemical Biology

Genomics & Proteomics

Regenerative Medicine



To see an abstract for the awarded proposals, please go to the Bio-X web site:
http://biox.stanfod.edu/grant/iip_program.html

You will also be able to read about the previous proposals on the site.

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FALL 2006

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New Bio-X Fellowships

The Bio-X Program integrates the creative talents and spirit of Stanford faculty in a way that remodels the landscape of science and technology on the campus

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, such as physics, engineering, computer science, and chemistry. Researchers are encouraged to work collaboratively with professors in different departments or schools, drawing on expertise campus-wide. The following students were awarded three year Fellowships starting September 2006.

2006 Bioengineering Bio-X Fellows:

Angela Wu

Angela graduated from the University of California, Berkeley with a major in bioengineering with an emphasis in Computational and Biomedical Systems Engineering, and a minor in electrical engineering and computer science. During her undergraduate years, she mostly worked in the Lee BioPOEMS Lab at UC Berkeley, testing and characterizing a BioMEMs microfluidic patch clamp device that was developed by the group. She also spent a summer at the Hong Kong University of Science and Technology. At Stanford, Angela plans to further her knowledge of bioengineering principles and applications, and she hopes to do her PhD research on microfluidic and bio-electronic devices for medical applications.

Murtaza Mogri

Murtaza graduated with a double major in Bioengineering/ Biotechnology and Math/Computer Science from UC San Diego, where he focused on bioinformatics and systems biology. Since he had a budding interest in neuroscience, he spent a year at the NIH studying the mechanism of rhythm generation in the respiratory control system and developing software to analyze neuronalactivity. His current research interest is in neuroengineering, specifically the study of neural circuit dynamics using computational and experimental techniques.

2006 Bio-X Endowed Fellows:

Namiko Abe
Paul Berg Biomedical Fellow
Neurosciences
Professor T. Meyer

Although phosphoinositides(PIs) represent a minor fraction of cellular lipids, they are integral components of cell membranes. Recent evidence suggests that PIs have not only a structural role but may also act as

2006 Bio-X Endowed Fellows, cont.

important second messengers during membrane trafficking events. My laboratory in collaboration with Tom Wandless's group has recently developed a chemically-inducible translocation strategy to rapidly synthesize or degrade specific PIs at the plasma membrane. I plan to make improvements upon this chemical strategy while developing new bioengineered probes to manipulate levels of different PIs in specific membrane compartments. I will then use these tools to investigate the role of specific PI species in various steps of receptor-mediated endocytosis as well as the synaptic vesicle cycle.

Bertrand Lui
Lubert Stryer Fellow
Bioengineering
Profs. J.R. Cochran and J.R. Swartz

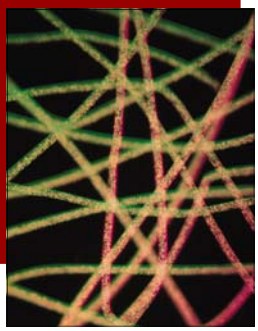
The goal of my research is to develop a technology platform which combines yeast surface display and cell-free protein synthesis to engineer proteins for enhanced biological efficacy. It will be demonstrated by evolving epidermal growth factor, which plays a role in the healing process and has great therapeutic potential for wound repair and regenerative medicine.

Daniel Kimmel
Affymetrix Fellow
Neurobiology
Prof. B. Newsome

As you read these words, your nervous system is coordinating countless small eye movements to different locations on the page. The problem for your oculomotor system is how to encode this information in an efficient, accurate, and decipherable way. A computer system would encode movement commands as a series of binary numbers, whose meaning is universally interpretable and independent of the rate at which the code is transmitted. The nervous system is distinct in that the neural code is highly sensitive to the timing of information—not unlike the Morse code, in which the mere occurrence of a "beep" carries less information than whether the beep was long or short in duration. My research harnesses the oculomotor system to understand the temporal dynamics that encode the planning, selection, and execution of eye movements.

2006 Bio-X Fellows

Bio-X was formed in recognition of the enormous potential for biology, engineering, physics, chemistry, mathematics, and clinical science to join in mutually enriching research projects



Edith Arnold
Mechanical Engineering
Profs. S. Delp and G. Gold

Musculoskeletal modeling and simulation tools are powerful resources for both basic research and clinical applications. However, current models incorporate a major simplification by representing muscles as single lines following the effective line of action. In my research I will develop a modeling pipeline that incorporates diffusion tensor magnetic resonance imaging to create three-dimensional finite element models of muscle representing the geometry and architecture of muscle fibers. These models will be used to explore the functional implications of altered muscle architecture and to simulate surgical treatments designed to treat movement abnormalities.

Jennifer Blundo
Mechanical Engineering
Professor B. Pruitt

The powerful potential of stem cell therapy motivates a better understanding of the basic mechanisms regulating developmental biology. The role of mechanical and electrical forces in the adult physiology and pathology has been well documented, and I am interested in what clues these phenomena may hold for generating robust, terminally differentiated stem cells. The pluripotent capacity of human embryonic stem cells makes them an attractive source for cell-based myocardial therapy. Specifically, the delivery of cardiac myocytes, which constitute 70-80% of the adult myocardium, may restore tissue viability and function to ischemic tissue damaged by a heart attack. My research is motivated by the limitations of current methods to derive cardiac myocytes from stem cells. The aim is to increase the differentiation yield of cardiac myocytes through electromechanical conditioning and ultimately the *in vivo* performance of myocardial cell-transplants.

Ian Chen
Bioengineering
Professor S. Gambhir

Stem cell therapy has emerged over the past decade as a promising treatment for congestive heart failure. Current clinical studies on cell therapy lack an objective method to noninvasively assess the survival and migration of stem cells following implantation. The goal of my project is to develop a novel multimodality reporter gene for labeling stem cells and monitoring their behaviors in living subjects using a combination of positron emission tomography (PET), optical bioluminescence imaging, and magnetic resonance imaging (MRI). Efforts are underway to develop and validate such reporter gene in terms of its ability to lead to highly specific and sensitive imaging signals which are reflective of stem cell viability. The development and characterization of such reporter gene should provide a valuable tool for investigators in the future to accurately assess the efficacy of stem cell therapy in humans.

Sanjay Dastoor
Mechanical Engineering
Professor M. Cutkosky

I am 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. I am developing methods for fabricating these actuators using shape deposition manufacturing, which allows customized geometries, heterogeneous materials, and embedded components. With the help of Professor Scott Delp, biomechanical modeling and analysis can be applied to these actuators, inspiring the next generation of dynamic, agile machines.

Katy Keenan
Mech. Engineering and Radiology
Profs. S. Delp, G. Gold and G. Beaupre

Cartilage is a complex tissue, capable of withstanding large compressive loads during everyday activities. Determining the mechanical properties of articular cartilage is important for understanding how the tissue behaves *in vivo*, how the tissue properties might change with age, injury, or disease, and also how we might try to replicate the function of cartilage using tissue engineered constructs. The first step of my research is to develop a robust and computationally-efficient method to calculate cartilage material properties using creep or stress-relaxation indentation experiments. The next step is to develop non-invasive methods to determine the cartilage properties using magnetic resonance imaging.

Guillem Pratx
Electrical Engineering
Professor C. Levin

Positron emission tomography (PET) is an imaging modality that has the powerful capability to non-invasively interrogate cellular and molecular processes

Continued on page 9

Bio-X Research and Travel Awards

The overarching goal of the Bio-X Program is to assure a broad-based , campus-wide integration of efforts in interdisciplinary teaching and research encompassing the Schools of Engineering, Medicine and Humanities & Sciences

Allison Waters

Bio-X Undergraduate Award for Interdisciplinary Research

The Bio-X program awarded its first Undergraduate Research Awards, and will be accepting applications for the winter and spring quarters in 2007. Stanford students eligible to participate should be in communication with faculty to decide on a project that may be supported by this award. The Bio-X Undergraduate Research Award provides funding for a total of $4000, for a 10 week period of full-time (40 hours per week) research, or the equivalent.
Applications are available at - http://biox.stanford.edu/grant/pdf/Undergraduate_Research_Application_2006.pdf and should be completed by faculty who are interested in having a student work in their lab. Bio-X affiliated faculty are eligible to apply, and the undergraduate may be from any department on campus. The project should be outlined in the research description. Students awarded the Bio-X Undergraduate Research Award will be asked to give a poster presentation upon completion of their funded period. Please send applications and any questions to Jill Sakata, Education and Fellowship Manager (jsakata@stanford.edu). Applications for research in winter and/or spring quarter(s) will be accepted on Monday, Dec. 4, 2006 by 5:00pm. Awards will be announced on Jan. 3, 2007.

Undergraduate Award:

Allison Waters: Senior in Biological Sciences with a specialization in Neurobiology. Allison worked with primarily with Dr. Jurgen Jung, and also with Dr. Tony Ko and Robert Barretto. With the support of Bio-X, Allison helped to further develop a preparation of live mice for chronic, deep brain imaging. She was trained in the careful surgery required to implant a glass cannula above the hippocampus, allowing the observation of neuronal and vascular dynamics in deep brain tissues using confocal and multi-photon microscopy. The new preparation is now being applied to a number of experiments and hypotheses involving learning and behavior, tumor angiogenesis and between species comparison.

Bio-X Travel Subsidy for Graduate Students

Bio-X is pleased to announce the Travel Subsidy for Graduate Students program has provided $500 travel subsidies for graduate students giving oral presentations at scientific conferences. Graduate students in Bio-X affiliated labs conducting interdisciplinary research, who were accepted to give an oral presentation at a scientific meeting were eligible for the award. Students may apply for the travel subsidy once a year and should submit award applications prior to attending the meeting. Up to two students from one lab attending the same meeting may apply each year. Applications are available online and should be submitted electronically to Bio-X Education and Fellowship Manager, Jill Sakata (jsakata@stanford.edu). A copy of the conference schedule confirming the talk title and presentation date must be submitted with the application. In the case that a confirmation is not available, please contact Jill Sakata. Applications will be accepted on January 8, 2007, for Winter awards.

Summer Awards:

Jing Chen, "Investigation of DWI to Evaluate Prostate Thermal and Cyro Lesions," *ISMRM 14th Scientific Meeting*.

Angela Hahn, "Monitoring the Cell Cycle Phase Durations Using Live Cell Fluorescent Biosensors," *Cold Spring Harbor Laboratory, The Cell Cycle Meeting*.

Yang Huang, "A Standards-Based Approach to Represent Clinical Documents," The 10th China Hospital Information Network Conference.

Erik Huntzicker, "Dual Degradation Signals control Gli1 Protein Stability and Basal Cell Carcinoma Formation," Society for Investigational Dermatology.

Ryan Spilker, "Patient-specific Pulmonary Hemodynamic Simulations Linking Lumped-Parameter Boundary Conditions to Morphometric Data," World Congress of Biomechanics.

Fall Awards:

Sonal Josan, "Modified double Half Pulse for Reduced Sensitivity to Linear Eddy Currents in Ultrashort T2 Imaging," 6th Interventional MRI Symposium.

Elena Kaye, "Consistency of MR Parameters in Frozen Porcine Heart Muscle, Kidney and Liver," 6th Interventional MRI Symposium.

Gregory Larkin, "Incentive Processing in the Aging Brain: Neural responsiveness to anticipated gain and loss," Gerontological Society of America.

Shaohua Sun, "Lung Nodule Registration Using a Semi-Rigid Model and a Knowledge-enhanced Simulated Annealing Optimizer," Radiological Society of North America 92nd Scientific Assembly and Annual Meeting.

David Tran, "Lower Extrimity CY Angiography: Can contralateral shape information be used to interpolate occluded femoropopliteal arterial centerlines in patients with peripheral arterial occlusive disease?" Radiological Society of North America 92nd Scientific Assembly and Annual Meeting.

BioNexus

There's no question that Stanford campus is home to some of the greatest and most innovative minds in the world. But they are not all professors; our fellow students, post-docs, and staff are not only extremely bright, but they are treasure troves of useful information. Everyone has felt that they are re-inventing the wheel at one point in their education. Wouldn't it be great if you could simply send an email to, or even have lunch with, a veritable expert in the field and engage in a useful discussion about your specific interests? The current alternative of endless Googling is often fruitless and tiresome.

A group of graduate students, postdocs, and others affiliated with Bio-X have banded together in order to try to take advantage of the great unused asset on campus: each other. Their group, BioNeXus, is devoted to promoting and facilitating a community of interdisciplinary research and recreation here in Bio-X. They aim to increase the number of professional and personal relationships in the department not only to help us learn from each other, but also to help make us a more cohesive group of researchers. But how? Everyone on campus is already so busy, and most people simply do not have time to try to meet new people. For this reason, BioNeXus offers several opportunities this quarter. They will continue the popular Happy Hours as well as sponsor some more intimate lunches and dinners. The kick off event on October 5th at the Clark Center was enjoyed by many. They will also be inviting several speakers to campus, including those from various fields of industry, to talk about career options after Stanford (see Jim Fox, pg 10). In addition to these activities, BioNeXus is creating an academic social networking website for the Bio-X community (details to come). Please visit their website: bionexus.stanford.edu, or email the president, Afsheen Afshar (afsheen@stanford.edu), for more information.

BioNeXus, is devoted to promoting and facilitating a community of interdisciplinary research and recreation here in BioX.

2006 Bio- Fellows, Continued from page 7

occurring deep within the tissue of living subjects. However, image reconstruction algorithms, which are used to generate tomographic images from collected data, have become extremely computational. For high (< 2 mm) resolution PET systems, algorithms that optimize the image resolution and quantitative accuracy require a large computer cluster. To accelerate PET image reconstruction by an order-of-magnitude, I have used graphics processing units (GPUs) as cost-effective high performance co-processor. GPUs are off-the-shelf processors that are designed to deliver high-definition graphics for video games in real-time. This technology will facilitate the use of advanced reconstruction methods for high resolution PET for both the clinical and research use. This is an exciting project that involves collaborations with the graphics industry as well as biomedical scientists.

Aaron Wang
Bioengineering
Professors C. Taylor and D. Liang

My overall goal is to improve the ability of real-time 3D ultrasound to detect and aid in treating internal bleeding. The application of my work will be for a portable device which uses diagnostic ultrasound to detect internal bleeding and then applies high intensity focused ultrasound to non-invasively coagulate the bleed. I propose adding parametric ultrasound data such as color and power Doppler and B-flow to the B-mode grayscale images to aid in identifying and segmenting vessels. I then propose using physics-based models of blood flow on segmented vasculature to predict expected normal flows and locate vascular injury in the patient.

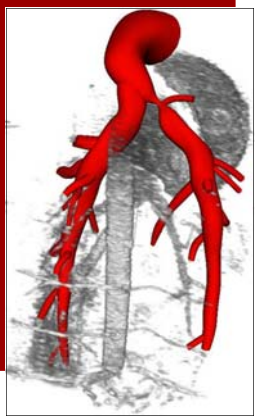
Peggy Yao
Biomedical Informatics
Professor J-C Latombe

It is increasingly appreciated that protein function is not strictly related to its three dimensional structure of the folded state, but to its structural dynamics. Conformational changes occur in various biological events: protein folding upon the presence of appropriate ligand, protein-molecule recognition, enzyme catalysis, etc. Noting that these events are critical in maintaining normal metabolism and understanding protein structural motion is important in drug and protein design. However, there is no experimental technique existing that allows us to observe all proteins at atomic level in real time. Although NMR spectroscopy enables the visibility of dynamic properties of proteins, protein size is limited. Much effort has been paid to developing computational methods. But neither the problem is close to solved nor the solutions are accurate enough for practical use. I would like to study protein structural dynamics using computer science and statistics techniques, starting from short loops and continuing with loop modeling and flexible protein docking.

Bio-X "Talks in English"

BioNexus Alternative Careers Series Speaker, Jim Fox

Bio-X "Talks in English" (T.I.E) Introducing a broad range of scientific research in the Bio-X community through jargon-free lectures and discussion. http://biox.stanford.edu



For the past few years Bio-X has been hosting a series of talks called "Talks In English" (TIE). Most of you may have had the chance to attend some of these.

These talks differ from typical seminars in that emphasize the latest findings in a jargon-free format. The TIEs are usually about the general thrust of the research and the landmark advances that characterize the field. The speaker balances a description of his or her own work and its significance while articulating general directions in the field. We ask the speakers to highlight opportunities for people from other fields to contribute to overcoming current research obstacles. The goal of these talks are to convey to people outside the speaker's field what is important about the work in the field, where it stands, and where it is going.

In keeping with the title of the series, "Talks in English", speakers avoid jargon and convey their ideas in plain English.

Some of the question that the speakers would answer with their presentation would include:
1. What field or fields they are working in? What are the main biological goals in that field or fields? These could be discovery or invention goals, for example in basic understanding of mechanisms or in medical applications. Speakers are encouraged to address social values of the work, ethical issues arising from the work, and implications of the work for our daily lives.
2. What are the main technological approaches used in your field? What advantages do they have and what advances would be useful in improving them? (This is an opportunity to convey to the audience how their skills might be helpful in advancing toward your field's goals).
3. What are the goals of a specific project from your own work?
4. How will reaching these goals give rise to new understanding or new devices?
5. What experiments are you doing? It's useful to give a sense of how long it takes to do something, e.g. building a specialized microscope for the job or purifying a protein complex or isolating mutants.
6. What are the main results of the experiments and what do the results imply?
What is a main obstacle to dramatic new progress? In other words, if you could have any technological advance what would it be? This relates to #3 above, and again should be an invitation to people in other fields to concentrate their energy on something important, attainable, difficult, and rate-limiting.

Upon permission from speakers, the talks are videotaped for future education of the Bio-X community and are made available as DVDs.

NEW:
BioNexus Alternative Careers Series

Speaker: Jim Fox, Ph.D., J.D.

Dec. 4, 12:30pm in Clark Auditorium

(followed by Question and Answer session)

What is IP? - basic concepts and facts about patent law.
IP for academic scientists - IP issues to be aware of, including publication issues, collaboration issues, and realizing that inventorship requires more input than authorship.

Talks presented:

July 19th, 2006
Speaker: Beth Pruitt, Mechanical Engineering
"Microsystems for studying mechanotransduction"

May 17th, 2006
Speaker: Stephen Quake, Bioengineering
"Microfluidics: how and why small plumbing is changing biology"

April 13th, 2006
Speaker: Lucy Shapiro, Developmental Biology
"Spatial and Temporal Control of a Multicomponent Genetic Network"

March 7th, 2006
Speaker: Sanjiv Sam Gambhir, Radiology
"Imag(in)ing the Future of Molecular Imaging"

April 19th, 2005
Speakers: Richard Zare (Chemistry)
"Counting on This: A search for low copy number proteins in cells"

Harley McAdams (Developmental Biology)
"A biochemical control system operates the bacterial cell"

Commentators: Mike Cherry (Genetics), Matthew Scott (Developmental Biology) and James Ferrell (Molecular Pharmacology)

February 23rd, 2004
Speakers: Jim Spudich (Biochemistry), Claire Tomlin (Astronautics & Aeronautics)
Commentators: Scott Delp (Bioengineering), Hank Greely (Law) and Tony Oro (Dermatology)

Upcoming: November 15th, 2006
Speaker: Richard Luthy, Civil and Env. Eng.
Clark Center, S360 / 4:15pm

Clark Center hosts EPGY students

The Education Program for Gifted Youth (EPGY) admitted over 50 students into the first "Introduction to Bioscience and Biotechnology" course this summer.

Four instructors, Eon Rios, Joy Ku, Rachel Henderson, and Gregor Zimmermann, each taught a section of the course in the following focused areas: Biomedical Technology, Biotechnology & Eletrophysiology, Neurobiology, and Techniques in Biotechnology. Robin Trujillo also assisted as lab instructor with Gregor Zimmerman, and Sara Temiyasathit, Stephen Lee, and Michael Chen participated as drop-in TAs. The Clark teaching lab was host to two of the four sections.

For more information about the EPGY summer program, please see: http://epgy.stanford.edu/summer/index.html.

Teaching lab schedule:

Fall QTR 2006
BioE 201 Molecular Cellular Engineering Lab

Jan 2-5 2007
Bio-X Tissue Culture workshop

Winter QTR 2006
ME 385
Tissue Engineering Lab

Spring QTR 2007
BioE 201C Medical Device Lab
Chem 183 Biological Chemistry

Summer 2007
Jun 25– Jul 6, Jul 23—Aug 3
EPGY

July 6-19
Stickleback Molecular Genetics Course

Bio-X Sponsored Workshops

Bio-X Tissue Culture Workshop

The objective of the workshop is to familiarize non biologist to the art of tissue culture. We will cover care and basic feeding of basic robust cell lines, best practice and behavior for shared facilities, sterile techniques, identifying contamination, storing cells, RNA and DNA isolation, bioassays, and gel electrophoresis.

Place: Clark Center Teaching Lab
Dates: January 2nd –January 5th, 2007
Time: 8:00am-12:00noon daily (STUDENTS)
1:00pm – 5:00pm daily (FACULTY)

Program (Jan.2nd – Jan. 5th)
Tuesday:
Introduction, measurements, sterile techniques, and safety
Wednesday:
Cell culture maintenance, feeding, subculture, cell counting, viability
Thursday:
RNA/DNA isolation
Friday :
Gels, PCR, ELISA

Please find the registration form and additional information at (http://biox.stanford.edu/news/workshop-tc.html), or contact Dr. Jill Sakata, Bio-X Education and Fellowship Manager (jsakata@stanford.edu).

Registration is on a first-come, first-serve basis, and space is limited.

BIO-X
STANFORD UNIVERSITY

Bio-X Workshop for students and faculty
Design of Experiments (DOE)
http://www.dr-tom.com/doe1.html
Engineering Statistics and Data Analysis (ESDA)
http://www.dr-tom.com/tengineering.html

Upon completion of the course the participants will be able to:

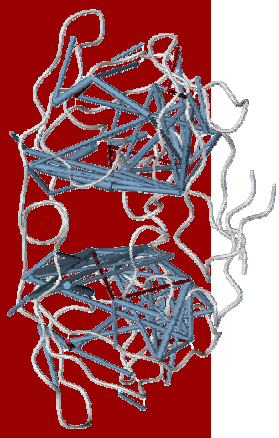
- Understand the ideas associated with sampling and data collection
- Demonstrate the ability to evaluate distributions.
- Select appropriate sample sizes for performance evaluation.
- Conduct comparative tests using data.
- Use regression techniques to analyze the results and make process/product improvement
- Select an appropriate analysis technique based on the type of data.
- Apply the principles of robust design.
- Design experiments appropriate for the information of interest
- Use and apply the structures of orthogonal arrays for industrial problem solving.
- Assure the experimental design is efficient Use software to design and analyze experiments.

Place: Clark Center S361
Dates: January 2nd –January 5th, 2007
Time: 9:00am-5:00pm daily, lunch provided

Please find the registration form and additional information at (http://biox.stanford.edu/news/workshop-stat.html), or contact Dr. Jill Sakata, Bio-X Education and Fellowship Manager (jsakata@stanford.edu). Registration is on a first-come, first-serve basis for up to two participants from the same group, and space is limited.

Regenerating Life Symposium and workshop

November 10-11 Stanford Fairchild Auditorium



The Bio-X Annual Symposium: Another new tradition. We initiated this last year with our "Watching Life" Symposium which was held on March 25-26, 2005. The symposium fostered presentations ranging from imaging molecules to imaging human and aimed to contribute to an integrative approach to imaging across all scales of observation. Watching Life was a joint initiative of The Bio-X Program at Stanford, Stanford Molecular Imaging Program, and the Beckman Center for Molecular and Genetic Medicine. The program was a great success, with hundreds of attendees from Stanford, other nearby universities, and Bay Area biotechnology companies. This year Bio-X has teamed up with Stanford's Program in Regenerative Medicine to hold a symposium entitled, "Regenerating Life". The goal of this symposium is to educate students and scientists from different disciplines about the rapidly advancing field of regenerative medicine. Different aspects of regeneration science will be presented by a series of experts and innovators from around the world. Speakers are asked to give a twenty-five minute lecture on new developments in their area of research, with sufficient introduction and context to help people trained in other fields to appreciate the research. Lectures and discussions will be videotaped for future reference for students. Regenerating Life Symposium is planned for November 10-11th, 2006. Talks will be presented during the day on November 10th, followed by a poster session at 5:00 PM, where Stanford graduate students and postdoctoral fellows will present their research. Workshops will be held on November 11, as was done successfully last year.

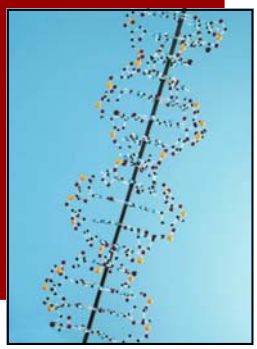
NEW Bio-X Sponsored Workshops:

Tissue Culture

Design of Experiments

Engineering Statistics and Data Analysis

Details on Page 11



Friday, November 10th, Fairchild Auditorium

Alejandro Sánchez Alvarado
University of Utah School of Medicine
"Regeneration, stem cells and the planarian *Schmidtea mediterranea*"

Kristi Anseth
University of Colorado at Boulder
"Design of Macromolecular Structures to Synthesize Gel Niches that Promote Tissue Regeneration"

Paul Martin, University of Bristol
"Wound healing and inflammation studies in mice and flies and fish"

Clifford Tabin, Harvard Medical School
"Patterning the vertebrate embryo"

Deepak Srivastava, University of California, SF
"Cardiac Regeneration: Development Revisited"

Sean Morrison, University of Michigan
"Stem cell self-renewal versus cancer cell proliferation"

Aileen Anderson, University of California, Irvine
"Mouse over Matter or Matter over Mouse? Mechanisms of recovery after transplantation of human stem cells in rodent spinal cord injury models"

Alysson Renato Muotri
Salk Institute for Biological Sciences
"Regulation of Neurogenesis in the Adult Brain"

Markus Grompe
Oregon Health Sciences University
"Therapeutic interventions in genetic liver disease"

Kim Jensen, London Research Institute
"Stem cells and lineage selection in adult mammalian epidermis"

Jeffrey Hubbell
Swiss Federal Institute of Technology (EPFL)
"Biomimetic and bioresponsive materials in regenerative medicine and drug delivery"

Laura Johnston, Columbia University
"Winners and losers during the control of growth in Drosophila"

Henry Greely, Stanford University
"Why Does Society Care So Much About Regenerative Medicine?"

Jill Helms, Stanford University
"Development, repair and regeneration of the skeleton"

Poster session / Reception

Saturday, Nov. 11, Clark Center Auditorium

Alejandro Sanchez
"Working with the planarian *Schmidtea mediterranea*"

Fred Gage
"Epigenetic Regulation of Neurogenesis in Adult Mammalian Brain"

Kristi Anseth
"Design of Macromolecular Structures to Synthesize Gel Niches that Promote Tissue Regeneration"

Cliff Tabin
"Taking advantage of multiple systems to explore developmental problems"

Geoffrey Gurtner, Stanford University
"Why Scar? Inhibitors of Tissue Regeneration during Wound Healing"

FULL PROGRAM: http://biox.stanford.edu/news/symposiums.html