Picking up the Pace of Therapeutics Research and Application
Inaugural Symposium
DEPARTMENT OF BIOENGINEERING AND THERAPEUTIC SCIENCES
UCSF SCHOOLS OF PHARMACY AND MEDICINE
UNIVERSITY OF CALIFORNIA, SAN FRANCISCO

January 26, 2010  n  8:00 a.m. – 4:50 p.m.
Robertson Auditorium, Second Floor, William J. Rutter Center,
UCSF Mission Bay, 1675 Owens Street, San Francisco, California
We drive the innovation of intelligent therapeutics.

In the Department of Bioengineering and Therapeutic Sciences at the University of California, San Francisco we are looking at science problems with fresh eyes and from new perspectives to reveal more quickly the biological reasons that support health and give rise to disease, and to develop new and effective ways of diagnosing disease and of treating disease with medicines and medical devices.

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Acknowledgements

Symposium Partners

We are pleased to acknowledge the following partners who helped transformed the symposium from a concept to a reality.*

UCSF School of Pharmacy
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Organizing Committee

Kathy Giacomini, PhD, Symposium Co-chair
Professor and Co-chair, UCSF Department of Bioengineering and Therapeutic Sciences

Sarah Nelson, PhD, Symposium Co-chair
Professor and Co-chair, UCSF Department of Bioengineering and Therapeutic Sciences

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Su Guo, PhD
Associate Professor, UCSF Department of Bioengineering and Therapeutic Sciences

Tanja Kortemme, PhD
Assistant Professor, UCSF Department of Bioengineering and Therapeutic Sciences

Program Team

Development and implementation of the symposium was carried out by Jaime Kenyon, program coordinator for symposia and events in the UCSF Department of Bioengineering and Therapeutic Sciences, in consultation with Maria Friciello, department manager, and with the assistance of Ingrid Keir, executive assistant to department Co-chair Sarah Nelson, PhD, and Claire Weiss, executive assistant to department Co-chair Kathy Giacomini, PhD.
Welcome to this, the first of what we anticipate will be many symposia that bring together the best minds in the nation to share, discuss, and inspire new directions in therapeutics research and application. We are especially pleased to mark with this gathering the formation, in 2009, of the UCSF Department of Bioengineering and Therapeutic Sciences.

Our hope is that from this new department and inaugural symposium will evolve new ideas, new directions, and new ways of working across academia, industry, and government—all aimed at driving the innovation of better, more effective, intelligent therapeutics for patients everywhere.

Kathy Giacomini, PhD (right)
Sarah Nelson, PhD (left)
Co-chairs, Symposium
Co-chairs, UCSF Department of Bioengineering and Therapeutic Sciences
The creation of the UCSF Department of Bioengineering and Therapeutic Sciences was inspired by the worldwide need for novel diagnostics and therapeutics to effectively diagnose and treat disease. The department was officially approved by UCSF Chancellor J. Michael Bishop, MD, on February 25, 2009.

The department was the idea of Kathy Giacomini, PhD, and Sarah Nelson, PhD, together with School of Pharmacy faculty members Andrej Sali, PhD, and Chao Tang, PhD, who first discussed the concept in early fall 2006. It would be a new department with a new mission, formed from a union of the Department of Biopharmaceutical Sciences in the UCSF School of Pharmacy, led by Giacomini, and the Program in Bioengineering in the UCSF School of Medicine, led by Nelson. The concept was subsequently refined and embraced by the two department faculties, and gained approval by the respective deans, their School faculties, and ultimately the San Francisco Division of the UC Academic Senate. It is UCSF’s first inter-School department.
All symposium activities take place in the Robertson Auditorium, Second Floor, William J. Rutter Center, UCSF Mission Bay, 1675 Owens Street, San Francisco, California.

8:00 a.m. - Registration and Continental Breakfast

8:30 a.m. - Welcome

Kathy Giacomini, PhD, and Sarah Nelson, PhD, Professors; Symposium Co-chairs; and Co-chairs, UCSF Department of Bioengineering and Therapeutic Sciences

Mary Anne Koda-Kimble, PharmD, Professor of Clinical Pharmacy and Dean, UCSF School of Pharmacy

Sam Hawgood, MBBS, Professor and Dean, UCSF School of Medicine

9:00 a.m. - Keynote Address

Bioengineering and Therapeutic Sciences: A Vision for the Future

Douglas Lauffenburger, PhD, Professor and Head, Department of Biological Engineering, Massachusetts Institute of Technology, Cambridge, Massachusetts

The twin bioscience revolutions of the past couple of decades—molecular and genomic—have given rise to expectation for consequent revolutionary advances in medicine, and rightfully so. Academic, clinical, and commercial efforts are increasingly directed toward use of molecular- and cell-based approaches for treatment of a wide variety of pathologies and injuries. A major challenge, however, is whether these approaches will incorporate a more effective measure of predictive design in order to maximally apprehend the power of molecular/cellular manipulation, now that fundamental mechanistic bases for these kinds of treatments is promised. A fusion between molecular/cellular life science with formal engineering analysis and synthesis perspectives holds the potential for facilitating this aspired progress, and the new UCSF Department of Bioengineering and Therapeutic Sciences manifests this vision in resonance with the Department of Biological Engineering at the Massachusetts Institute of Technology. This presentation will outline conceptual foundations for this vision, along with some brief example vignettes of the engineering/bioscience fusion in medical therapeutic applications.

9:40 a.m. - Session 1

Systems and Computational Biology and Pharmacology

Moderator: Andrej Sali, PhD, Professor, UCSF Department of Bioengineering and Therapeutic Sciences

Life emerges from an interplay between biological molecules, which are organized in extensive networks of interactions that are embedded in space and may change with time. There is a close relationship between a network’s architecture and its function. In this session, the speakers will address how our understanding of the biological networks can help therapeutical modulation of a network and engineering networks with novel functions.

Systems Biology and Systems Medicine: Catalyzing the Transition from Reactive to Proactive Medicine / Leroy Hood, MD, PhD, President, Institute for Systems Biology, Seattle, Washington

Molecular Networks / Chao Tang, PhD, Professor, UCSF Department of Bioengineering and Therapeutic Sciences

Genomics as a Tool for Discovering New Small Molecules from the Human Microbiome / Michael A. Fischbach, PhD, Assistant Professor, UCSF Department of Bioengineering and Therapeutic Sciences

10:55 a.m. ~ Break

11:05 a.m. - Session 2

Pharmacogenomics

Moderator: Deanna L. Kroetz, PhD, Professor, UCSF Department of Bioengineering and Therapeutic Sciences

The contribution of genetic variation to variability in drug response and toxicity is well recognized among clinical pharmacologists and clinicians. In recent years, genetic markers have been identified for the response or toxicity associated with numerous drugs, including warfarin, irinotecan, 6-mercapto purine, abacavir, and clopidogrel. This session will highlight the use of genomewide scans to further our understanding of drug response pathways, our current knowledge of genetic variation in noncoding regions of drug transporters, and the use of admixture mapping to understand population differences in disease risk and drug response.

Cancer Pharmacogenomics: The Fruits of Genomewide Studies in Acute Lymphocytic Leukemia / William E. Evans,
Finding Function in ‘Junk DNA’ / Nadav Ahituv, PhD, Assistant Professor, UCSF Department of Bioengineering and Therapeutic Sciences

Genomics Approaches in Health Disparities / Esteban González Burchard, MD, MPH, Associate Professor, UCSF Department of Bioengineering and Therapeutic Sciences

12:15 p.m. ~ Session 3, Lunch

Enhancing Education and Research Partnerships between the UCSF Department of Bioengineering and Therapeutic Sciences and Industry

Co-moderators: Susan Desmond-Hellmann, MD, MPH, UCSF Chancellor and Regis B. Kelly, PhD, Director, California Institute for Quantitative Biosciences

To facilitate translation of its discoveries to patient care, the UCSF Department of Bioengineering and Therapeutic Sciences must partner successfully with the private sector. This session brings together key individuals from academia, industry, and formerly from the FDA to discuss best practices for enhancing partnerships. The department’s educational outreach programs will also be discussed with an emphasis on further shaping and extending current pioneering courses sponsored by the department.

Leslie Z. Benet, PhD, Professor, UCSF Department of Bioengineering and Therapeutic Sciences
Ellen G. Feigal, MD, Adjunct Professor, UCSF Department of Bioengineering and Therapeutic Sciences
Corey S. Goodman, PhD, Managing Director and Co-founder, venBio, LLC, San Francisco, California
Carl C. Peck, MD, Adjunct Professor, UCSF Department of Bioengineering and Therapeutic Sciences
George Scangos, PhD, President and Chief Executive Officer, Exelixis, Inc., South San Francisco, California

2:05 p.m. ~ Break

2:15 p.m. ~ Session 4

Bioengineering

Moderator: Francis C. Szoka, PhD, Professor, UCSF Department of Bioengineering and Therapeutic Sciences

Interactions between engineers and clinical scientists have fueled numerous advances in the development of new treatment strategies, as well as novel methods for delivering cell and drug-based therapies. Critical areas of collaborative research include the design of new probes that target specific kinds of pathology, sensors for assessing biological activity, and devices for more effective delivery of the agent to the region of interest. This session will provide examples of how bioengineering is contributing to translational research and providing broader educational experiences to basic and clinical scientists.

Education of Clinician Scientists in Bioengineering and Therapeutic Sciences / Paul Yock, MD, Martha Meier Welland Professor of Medicine and Mechanical Engineering; Director of the Center for Research in Cardiovascular Interventions; and Director of the Stanford Biodesign Program, Stanford University, Stanford, California

Modular, Multi-Functional Micelles to Target Pathological Tissue / Matthew Tirrell, PhD, Professor and Chair, Department of Bioengineering, University of California, Berkeley, Berkeley, California

Nanotechnology for Therapeutic Devices / Tejal Desai, PhD, Professor, UCSF Department of Bioengineering and Therapeutic Sciences

A Quantum Leap for the Kidney / Shuvo Roy, PhD, Associate Professor, UCSF Department of Bioengineering and Therapeutic Sciences

3:55 p.m. ~ Closing Remarks

Kathy Giacomini, PhD, and Sarah Nelson, PhD, Symposium Co-chairs and Co-chairs, UCSF Department of Bioengineering and Therapeutic Sciences

4:05 p.m. ~ Poster Session and Reception

Moderators: Tanja Kortemme, PhD, Assistant Professor; Patricia Babbitt, PhD, Professor; Su Guo, PhD, Associate Professor—UCSF Department of Bioengineering and Therapeutic Sciences

More than 30 posters are being presented, representing research in bioengineering and therapeutic sciences at UCSF. Awards for the best posters by a graduate student and a postdoctoral researcher will be given at the reception.

4:50 p.m. ~ Adjourn
Nadav Ahituv, PhD, is an assistant professor in the UCSF Department of Bioengineering and Therapeutic Sciences and a core faculty affiliate in the UCSF Institute for Human Genetics. His current work focuses on discovering gene regulatory elements in the human genome and linking mutations within them to human disease. He earned a PhD in human genetics from Tel-Aviv University where he worked on hereditary hearing loss. He then did postdoctoral research, specializing in human genomics, in the United States Department of Energy’s Lawrence Berkeley National Laboratory and its Joint Genome Institute.

Patricia Babbitt, PhD, is a professor and vice chair in the UCSF Department of Bioengineering and Therapeutic Sciences. She holds a joint appointment in the UCSF School of Pharmacy’s Department of Pharmaceutical Chemistry and is a faculty affiliate of the California Institute for Quantitative Biosciences at UCSF. Her laboratory uses superfamily analysis to understand how protein sequence and structure determine protein function. One primary goal of her computational work is to develop a methodology for “rational protein design” that can be used in the laboratory to engineer new functionalities into proteins. Dr. Babbitt earned a BS in biology from Mills College and a PhD in pharmaceutical chemistry from UCSF. She continued her career as a postdoctoral researcher and assistant research chemist, then joined UCSF in 1993.

Leslie Benet, PhD, is a professor in the UCSF Department of Bioengineering and Therapeutic Sciences and former chair of the UCSF School of Pharmacy’s Department of Pharmaceutical Sciences. Since 1995, he has served as chairman, president, or chief executive officer of AvMax Inc., a biopharmaceutical company. He has also served as president of the American Pharmacists Association Academy of Pharmaceutical Sciences, and he founded and became the first president of the American Association of Pharmaceutical Scientists. Dr. Benet is a member of the Institute of the Medicine of the National Academies. He has received the highest scientific awards of the American Association of Pharmaceutical Scientists, Rho Chi, the American Association of Colleges of Pharmacy, the American Society for Clinical Pharmacology and Therapeutics, the American Pharmaceutical Association, and the International Pharmaceutical Federation. He has been honored with the Pharmaceutical Sciences World Congress Research Achievement Award and the Controlled Release Society Career Achievement in Oral Drug Delivery Award. Dr. Benet earned an AB, a BS, and an MS from the University of Michigan, and a PhD from the University of California. He has received six honorary doctorates and is listed among the 250 most highly cited pharmacologists worldwide.

Esteban González Burchard, MD, MPH, is an associate professor in the UCSF Department of Bioengineering and Therapeutic Sciences and holds a joint appointment in the UCSF School of Medicine. His research focuses on the role of genetic and environmental risk factors for asthma and drug response among racially/ethnically diverse populations. He is the principal investigator for the Genetics of Asthma in Latino Americans Study and the Study of African Americans, Asthma Genes and Environments, and he serves as the director of the UCSF DNA Bank and Asthma Genetics Core Facility. He is also an attending physician in pulmonary and critical care medicine at the San Francisco General Hospital and Trauma Center. He earned an MD from the Stanford University School of Medicine, completed clinical training in internal medicine at Harvard University’s Brigham and Women’s Hospital, and completed pulmonary/critical care medicine training at UCSF. He also completed clinical research training at the Harvard School of Public Health. He earned an MPH in epidemiology from the University of California, Berkeley.

Tejal Desai, PhD, is a professor in the UCSF Department of Bioengineering and Therapeutic Sciences. She is also a faculty affiliate of the California Institute for Quantitative Biosciences at UCSF and co-chair of the UCSF/UCB Joint Graduate Group in Bioengineering. Dr. Desai directs the UCSF Laboratory of Therapeutic Micro and Nanotechnology. Prior to joining UCSF, she was an associate professor of biomedical engineering and associate director of the Center for Nanoscience and Nanobiotechnology, both at Boston University. She earned an ScB in biomedical engineering from Brown University and a PhD in bioengineering from the UCSF/UCB Joint Graduate Group in Bioengineering.

Susan Desmond-Hellmann, MD, MPH, is the chancellor of UCSF. Immediately before assuming the position in August 2009, Dr. Desmond-Hellmann served as president of product development at Genentech. In this role, she was responsible for Genentech’s pre-clinical and clinical development, process research and development, business development, and product portfolio management. She joined Genentech in 1995 as a clinical scientist and was subsequently named as chief medical officer, then executive vice president of development and product operations before assuming the product development post in 2004. She served as a member of Genentech’s executive committee beginning in 1996. Dr. Desmond-Hellmann earned a BS in pre-medicine and an MD from the University of Nevada, Reno, and an MPH from the University of California, Berkeley. She completed clinical training at UCSF and is board-certified in internal medicine and medical oncology.

William Evans, PharmD, is director and chief executive officer of St. Jude Children’s Research Hospital in Memphis, Tennessee and holds the St. Jude Professorship and Endowed Chair at the University of Tennessee Colleges of Medicine and Pharmacy. For the past 30 years, his research
at St. Jude has focused on the pharmacogenomics of anticancer agents in children. For this work he has received three consecutive National Institutes of Health MERIT Awards from the National Cancer Institute. Dr. Evans has published more than 300 research articles and book chapters. He earned a PharmD from the University of Tennessee and an honorary Doctor of Science degree (honoris causa) from The Ohio State University.

**Ellen Feigal**. MD, is an adjunct professor in the UCSF Department of Bioengineering and Therapeutic Sciences and director of the department’s American Course on Drug Development and Regulatory Sciences. She is currently executive medical director of global development at Amgen, Inc. Prior to joining the company in 2008, she was chief medical officer of Insys Therapeutics. Dr. Feigal has served as director of medical devices and imaging at the Critical Path Institute, and vice president of clinical sciences and deputy scientific director at the Translational Genomics Research Institute. She directed the National Cancer Institute’s Division of Cancer Treatment and Diagnosis and served as the division’s deputy director. Dr. Feigal earned a BS in biology and an MS in molecular biology and biochemistry from the University of California, Irvine, and an MD from the University of California, Davis. She completed a residency in internal medicine at Stanford University, and a fellowship in hematology/oncology at UCSF. She was on the faculties of UCSF and the University of California, San Diego before joining the National Cancer Institute.

**Michael Fischbach**, PhD, is an assistant professor in the UCSF Department of Bioengineering and Therapeutic Sciences. He is also a faculty affiliate of the California Institute for Quantitative Biosciences at UCSF. His research focuses on identifying and characterizing small molecules from microbes with an emphasis on the human microbiome. Dr. Fischbach earned a PhD in chemistry from Harvard University, where he worked jointly in the laboratories of Christopher Walsh and David Liu on the role of iron acquisition in bacterial pathogenesis and on the biosynthesis of small molecule natural products. Before coming to UCSF, he spent two years as an independent fellow at Massachusetts General Hospital coordinating a collaborative effort based at the Broad Institute to develop genomics-based approaches to the discovery of natural products from microbes.

**Kathy Giacomini**, PhD, is a professor in and co-chair of the UCSF Department of Bioengineering and Therapeutic Sciences. She is also a faculty affiliate of the California Institute for Quantitative Biosciences at UCSF. Dr. Giacomini is a leader in the field of pharmacogenomics of membrane transporters. She led the discovery of coding region variants of about 50 membrane transporters that play a role in drug response in ethnically diverse populations. Dr. Giacomini has co-authored more than 150 manuscripts and has received many awards for her research, including the Dawson Award of the American Association of Colleges of Pharmacy and the Rawls Palmer Award of the American Society for Clinical Pharmacology and Therapeutics. In 2007, she was inducted into the Institute of Medicine of the National Academies. She earned a PhD in pharmaceutics from the State University of New York at Buffalo and completed a postdoctoral fellowship at Stanford University.

**Corey Goodman**, PhD, is managing director and co-founder of venBio, LLC, San Francisco, California. He is currently chair of the board of Limerick, iPierian, PhyloTech and Oligasis; and a member of the board of Neurotherapeutics and Mirna. Until May 2009, Dr. Goodman was president of Pfizer’s Biotherapeutics and Bioinnovation Center (BBC) and a member of Pfizer’s executive leadership team, where he built a federation of biotechnology sites (including Rnat and CovX); collaborated broadly with the biomedical and biotechnology communities; and focused on biotherapeutics including antibodies, proteins, peptides, nucleic acids, and stem cells. Dr. Goodman was also the co-founder of Exelixis and Renovis, and was chief executive officer of Renovis until its acquisition by Evotec. A former professor at Stanford University and the University of California, Berkeley, he currently is an adjunct professor at UCSF. He is an elected member of the National Academy of Sciences and the winner of the Alan T. Waterman Award, the Canada Gairdner International Award, and the March of Dimes Prize in Developmental Biology. Dr. Goodman attended Stanford University as a Searle Scholar and earned a BS in biology with distinction and honors. He was a National Science Foundation Fellow at the University of California, Berkeley, and earned his PhD there in neurobiology. He was then a Helen Hay Whitney Postdoctoral Fellow at the University of California, San Diego.

**Su Guo**, PhD, is an associate professor in the UCSF Department of Bioengineering and Therapeutic Sciences. Using zebrafish as a model organism, Dr. Guo investigates the behavior of pluripotent embryonic stem cells in vivo and the control that genes and the brain have over the behavior of an organism. Dr. Guo earned a BS from Fudan University in Shanghai and a PhD from Cornell University and was subsequently a research fellow in medicine at Harvard Medical School and a postdoctoral fellow at Genentech.

**Sam Hawgood**, MBBS, is a professor in the UCSF School of Medicine’s Department of Pediatrics and dean of the UCSF School of Medicine. Dr. Hawgood is a neonatologist by training. He is the former physician-in-chief of UCSF Children’s Hospital, former chief of neonatology and former chair of pediatrics. As a neonatologist, he is an expert in caring for newborns with birth defects, in particular disorders related to lung development. As a researcher, Hawgood directed...
several studies to better understand the mechanisms and disorders of lung growth and stability, and he has a special interest in the biology of the surfactant apoproteins. Dr. Hawgood earned an MBBS medical degree from the University of Queensland in Australia and completed a residency in pediatrics at the Royal Children’s Hospital in Brisbane.

Leroy Hood, MD, PhD, is co-founder and president of the Institute for Systems Biology in Seattle, Washington, which is a non-profit research institute dedicated to applying systems biology to identify strategies for predicting and preventing diseases. His professional career began at the California Institute of Technology where he and his colleagues pioneered four instruments: the DNA gene sequencer and synthesizer, and the protein synthesizer and sequencer. These instruments comprise the technological foundation for contemporary molecular biology. In 2000, Dr. Hood co-founded the Institute for Systems Biology to pioneer systems approaches to biology and medicine. He has published more than 600 peer-reviewed papers, received 14 patents, and has co-authored textbooks in biochemistry, immunology, molecular and systems biology, and genetics. He earned an MD from Johns Hopkins School of Medicine and a PhD in biochemistry from the California Institute of Technology.

Regis Kelly, PhD, is director of the University of California's (UC's) California Institute for Quantitative Biosciences (QB3). Established in 2000 under California Governor Gray Davis, QB3 is one of four Institutes for Science and Innovation, which focus public/private resources and expertise on research areas critical to sustaining California's economic growth and its competitiveness in the global marketplace. QB3’s particular mission is to harness the quantitative sciences of physics and engineering to unify our understanding of biological systems at all levels of complexity and to drive the development of new technologies, products, and industries. Three UC campuses—those at Berkeley, San Francisco, and Santa Cruz—are QB3 affiliates as are more than 200 UC faculty members. Dr. Kelly is a former executive vice chancellor of UCSF. In this role he oversaw the UCSF research enterprise and forged new research ties between the campus and private industry. At UCSF he also served as chair of the Department of Biochemistry and Biophysics and director of the Hormone Research Institute. Dr. Kelly earned an undergraduate degree in physics from the University of Edinburgh and a PhD in biophysics from the California Institute of Technology. He then completed a postdoctoral fellowship at Stanford University.

Mary Anne Koda-Kimble, PharmD, is a professor of clinical pharmacy in the UCSF School of Pharmacy’s Department of Clinical Pharmacy and dean of the School. She is also the author of many scholarly publications, and co-editor of the first clinical pharmacy textbook based on patient case histories, Applied Therapeutics: The Clinical Use of Drugs. She is member of the Institute of Medicine of the National Academies, a member and past president of the United States Pharmacopoeia Board of Trustees, and a past president of the American Association of Colleges of Pharmacy. She has served on the California State Board of Pharmacy, the United States Food and Drug Administration’s Nonprescription Drugs Advisory Committee, and the Board of Directors of the American Council of Pharmaceutical Education. Among her many awards, Dr. Koda-Kimble was designated a Founding Member and Distinguished Practitioner of the National Academy of Practice in Pharmacy. She is a recipient of the 2007 Paul F. Parker Medal from the American Colleges of Clinical Pharmacy, which honors distinguished service to the profession. In 2008, she received the Outstanding Dean Award from the American Pharmacists Association-Academy of Student Pharmacists. She earned a PharmD from UCSF, then joined the School’s faculty and subsequently taught pharmacy students, nurses, and physicians and practiced in the UCSF Medical Center.

Tanja Kortemme, PhD, is an assistant professor in the UCSF Department of Bioengineering and Therapeutic Sciences. She is also a faculty affiliate of the California Institute for Quantitative Biosciences at UCSF. Her research interests range from the details of atomic and molecular interactions to complex biological systems architecture and evolution. She earned BSc and MSc degrees in chemistry, biochemistry, and biophysics from the University of Hannover, Germany, and a PhD in structural and computational biology from the European Molecular Biology Laboratory (EMBL) Heidelberg under the supervision of Tom Creighton. After postdoctoral work with Luis Serrano at EMBL, she went to the University of Washington as a European Molecular Biology Organization (EMBO) and Human Frontiers Science Program postdoctoral fellow, working with David Baker. She was an Alfred P. Sloan Research Fellow and is a recipient of a Faculty Early Career Development (CAREER) award from the National Science Foundation.

Deanna Kroetz, PhD, is a professor in the UCSF Department of Bioengineering and Therapeutic Sciences. Her research interests are in the areas of drug metabolism, drug transport, and pharmacogenetics. Dr. Kroetz is the recipient of the American Association of Pharmaceutical Scientists New Investigator Award in Pharmacokinetics, Pharmacodynamics and Drug Metabolism, the Josephine Failer Award from The Ohio State University Alumni Association, and the Leon Goldberg Young Investigator Award from the American Society for Clinical Pharmacology and Therapeutics. She is an elected fellow of the American Association of Pharmaceutical Scientists. She earned a BS degree in pharmacy from The Ohio State University and a PhD in pharmaceutics from the University of Washington, Seattle. Dr. Kroetz was a Pharmacology Research Associate (PRAT) Program Fellow in the
Douglas Lauffenburger, PhD, is the Whitaker Professor of Bioengineering and head of the Department of Biological Engineering at the Massachusetts Institute of Technology. He also holds appointments in the Department of Biology and the Department of Chemical Engineering. He is a member of the Biotechnology Process Engineering Center, Center for Biomedical Engineering, Center for Cancer Research, and Center for Environmental Health Sciences, and is director of the Computational and Systems Biology Initiative. He has served as a consultant or scientific advisory board member for Astra-Zeneca, Beyond Genomics, CellPro, Eli Lilly, Entelos, Genstruct, Insert Therapeutics, Johnson & Johnson, Merri-mack Pharmaceuticals, Pfizer, Precision Therapeutics, SyStemix, the Burroughs-Wellcome Fund, and the Whitaker Foundation. His awards include the Pierre Galletti Award from the American Institute for Medical & Biological Engineering; the A.P. Colburn Award, Bioengineering Division Award, and W.H. Walker Award from the American Institute of Chemical Engineers; the Distinguished Lecture Award from the Biomedical Engineering Society; the C.W. McGraw Award from the American Society of Engineering Education; the A.P. Colburn Award, Bioengineering Division Award, and a number of named lectures at academic institutions. Dr. Lauffenburger earned BS and PhD degrees in chemical engineering from the University of Illinois and the University of Minnesota, respectively.

Sarah Nelson, PhD, is a professor in and co-chair of the UCSF Department of Bioengineering and Therapeutic Sciences, a UCSF professor of radiology and biomedical imaging, and a faculty affiliate of the California Institute for Quantitative Biosciences at UCSF. Her research focuses on developing and evaluating novel techniques for the quantification of response to therapy for individual patients with cancer and neurological diseases using serial magnetic resonance examinations. Dr. Nelson is also a member of the UCSF/UCB Joint Graduate Group in Bioengineering and a professor in bioengineering at the University of California, Berkeley. She directs the Surbeck Laboratory for Advanced Imaging at UCSF. Dr. Nelson earned a PhD from the University of Heidelberg.

Carl Peck, MD, PhD, is an adjunct professor in the UCSF Department of Bioengineering and Therapeutic Sciences and its Center for Drug Development Sciences (CDDS) located in Washington, DC. Early in his career, Dr. Peck worked at the Letterman Army Institute of Research, San Francisco, California, as chief of the Army Blood Preservation Research Program. He then became director of the Division of Clinical Pharmacology and professor in the Departments of Medicine and Pharmacology, Uniformed Services University, Bethesda, Maryland. He subsequently joined the United States Food and Drug Administration (FDA) as director for the Center for Drug Evaluation and Research and was promoted to assistant surgeon general in the Public Health Service. Upon retiring from the FDA in late 1993, he was appointed “Boerhaave” professor of clinical drug research at Leiden University in The Netherlands. He founded NDA Partners LLC in 2003. In 1994 he joined the faculty of the Georgetown University Medical Center as the founding director of the CDDS, which is now part of the UCSF Department of Bioengineering and Therapeutic Sciences and is located at the UC Washington Center. Dr. Peck is a recipient of the FDA Distinguished Alumnus Award. Sweden’s University of Uppsala awarded him an honorary doctorate degree in recognition of “outstanding contributions to the science of drug development.” Dr. Peck earned an MD from the University of Kansas.

Shuvo Roy, PhD, is an associate professor in the UCSF Department of Bioengineering and Therapeutic Sciences. He is also a faculty affiliate of the California Institute for Quantitative Biosciences at UCSF. He came to UCSF from the Cleveland Clinic in Ohio where he was co-director of the BioMEMS Laboratory in the Department of Biomedical Engineering. His research focuses on the application of MEMS (microelectromechanical systems) and associated nanotechnology to the development of medical devices and tools for biological investigation. Dr. Roy earned a BS, Magna Cum Laude with general honors, for triple majors in physics, mathematics (special honors), and computer science from Ohio’s Mount Union College in Alliance. He earned an MS in electrical engineering and applied physics and a PhD in electrical engineering and computer science from Case Western Reserve University.

Andrej Sali, PhD, is a professor in the UCSF Department of Bioengineering and Therapeutic Sciences and a faculty affiliate and director of the California Institute for Quantitative Biosciences at UCSF. His work focuses on the development of methods for comparative modeling of protein three-dimensional structures and their implementation in the program MODELLER. Dr. Sali earned a BSc degree in chemistry from the University of Ljubljana. He was awarded the Research Council of Slovenia Scholarship, the Overseas Research Students Award, and the Merck Sharp and Dohrn Academic Scholarship at Birkbeck College, University of London, where he earned a PhD in biophysics under the supervision of Tom L. Blundell. He then went on to the Department of Chemistry at Harvard University as a Jane Coffin Childs Memorial Fund Postdoctoral Fellow, working with Martin Karplus. He was a Sinsheimer Scholar, an Alfred P. Sloan Research Fellow, an Irma T. Hirschl Trust Career Scientist, and the recipient of the Zois Award of Science Ambassador of Republic of Slovenia.
George Scangos, PhD, is president and chief executive officer of Exelixis, Inc. Dr. Scangos has served as president of biotechnology at Bayer Corporation and was responsible for research, business and process development, manufacturing, engineering, and quality assurance. He is chair of the board of directors of Anadys Pharmaceuticals, Inc., and he is a member of the board of directors of Entelo, Inc. and TaconicArtemis GmbH. He also serves as the vice chair of the California Healthcare Institute, a member of the Board of the Global Alliance for TB Drug Development, and a director of Fondation Santé. Dr. Scangos is a member of the Dean’s Board of Advisors of the UCSF School of Pharmacy and the Board of Overseers of the University of California, Davis School of Medicine. He was a Jane Coffin Childs Memorial Fund Postdoctoral Fellow at Yale University and a faculty member at Johns Hopkins University. He currently holds an appointment as adjunct professor of biology at Johns Hopkins University. He earned a BA in biology from Cornell University and a PhD in microbiology from the University of Massachusetts.

Francis Szoka, PhD, is a professor in the UCSF Department of Bioengineering and Therapeutic Sciences. His lab studies biochemical and biophysical approaches to macromolecular drug delivery. He co-founded Sequus Pharmaceuticals, a drug company that developed cancer treatments using novel drug-delivery technologies, now owned by Johnson & Johnson. He also founded GeneMedicine, a gene therapy products developer that was acquired by Valentis. Dr. Szoka earned a PhD in biochemistry from the State University of New York, Buffalo, and an MS in microbiology from the University of Maryland.

Chao Tang, PhD, is a professor in the UCSF Department of Bioengineering and Therapeutic Sciences. He is also a faculty affiliate of the California Institute for Quantitative Biosciences at UCSF. Before joining the UCSF faculty, Dr. Tang was a senior research scientist at the NEC Research Institute in Princeton, New Jersey. His work has mainly been in the area of statistical physics and more recently at the interface between physical and biological sciences, which includes self-organized criticality, protein folding and design, and biomolecular networks. He has a joint appointment at Peking University where he is a Chang Jiang Professor and the director of the Center for Theoretical Biology. Dr. Tang earned a BS in mechanics from the University of Science and Technology of China and a PhD in physics from the University of Chicago.

Matthew Tirrell, PhD, is a professor in and chair of the Department of Bioengineering at the University of California, Berkeley. In addition he is a core member of the UCB/UCSF Joint Graduate Group in Bioengineering. Prior to spending a decade as the dean of University of California, Santa Barbara’s College of Engineering, he was at the University of Minnesota where he served as head of the Department of Chemical Engineering and Materials Science and director of the Biomedical Engineering Institute. Dr. Tirrell is an eminent polymer scientist who leads the evolving field of soft materials, especially in adhesion and biomolecular materials. He is a member of the National Academy of Engineering, the American Academy of Arts & Sciences, and the Indian National Academy of Engineering. And he is a fellow of the American Institute of Medical and Biological Engineers, the American Association for the Advancement of Science, and the American Physical Society. Dr. Tirrell earned a PhD in polymer science from the University of Massachusetts.

Paul Yock, MD, is the Martha Meier Weiland Professor of Medicine and Mechanical Engineering (by courtesy); director of the Center for Research in Cardiovascular Interventions; and director of the Stanford Biodesign Program, Stanford University. The main focus of Dr. Yock’s research program has been in the field of intravascular ultrasound. Dr. Yock is internationally known for his work in inventing, developing, and testing new devices, involving the Rapid Exchange™ balloon angioplasty system, which is now the dominant system in use worldwide. He developed a Doppler-guided hypodermic needle system and the Smart Needle™ and P-D Access™. Dr. Yock earned an MD from the Harvard University School of Medicine.
# Posters Representing Research in Bioengineering and Therapeutic Sciences at UCSF

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Research in the UCSF Department of Bioengineering and Therapeutic Sciences aims to drive the innovation of sophisticated, targeted, intelligent diagnostics and therapeutics to effectively diagnose and treat disease.

**Areas of Faculty Expertise**

Our research expertise includes:

- Bioengineering
- Bioinformatics
- Biomaterials
- Computational chemistry
- Computational biology
- Drug delivery systems including nanotechnology
- Drug discovery and design
- Drug metabolism and transport
- Gene delivery and therapy
- Micro-electromechanical systems (MEMs)
- Personalized medicines
- Pharmaceutical technology
- Pharmacokinetics and pharmacodynamics
- Pharmacogenomics, toxicogenomics, and genetics of human disease
- Systems biology
- Systems pharmacology
- Tissue and cell engineering
- Toxicology

**Department Research Foci**

We are focusing on five areas of investigation with the shared goal of driving the innovation of intelligent therapeutics:

- Drug Development Sciences
- Pharmacogenomics
- Therapeutic Bioengineering
- Computation and Systems Biology
- Cellular and Molecular Engineering

**Work Under Way**

Here is a snapshot of the work under way by our faculty—both inside and outside the lab.

Nadav Ahituv, PhD, Assistant Professor
nadav.ahituv@ucsf.edu
Pharmacogenomics

“Research in my lab focuses on understanding the role of regulatory sequences in human biology and disease. Through a combination of comparative genomic strategies, regulatory element analysis, human patient samples, and mouse and fish genetic engineering technologies, we are working to elucidate mechanisms whereby genetic variation within these sequences lead to changes in human phenotypes. The research focuses on three clinically relevant phenotypic categories. The first is monogenic disease, using limb malformations, the second most common form of human congenital abnormalities (prevalence of 1 in every 500 births), as a model. The second is complex disease, analyzing how nucleotide changes in regulatory sequences contribute to obesity. The third is pharmacogenomics, characterizing how genetic differences in regulatory sequences, with a focus on regions surrounding membrane transport proteins, lead to clinical variation in response to drugs. In addition, using a combination of computational and functional studies, we are attempting to gain an increased understanding of the gene regulatory code.”
**Patricia Babbitt**, PhD, Professor  
babbitt@cgl.ucsf.edu  
**Computation and Systems Biology**  
**Cellular and Molecular Engineering**

“Our laboratory uses computational and experimental methods to improve our understanding of how protein structures mediate protein function. We develop and use the tools of bioinformatics and computational structural biology to integrate the information coming out of the genome projects with available tertiary structural information. The results are used in predicting the functions of proteins identified in genome projects and to improve our abilities to re-engineer enzymes to catalyze new reactions.”

**Leslie Benet**, PhD, Professor  
leslie.benet@ucsf.edu  
**Drug Development Sciences**

“My lab focuses on the development of the correlation of pharmacokinetics and pharmacodynamics, and the impact of pharmacogenetics, for drugs in various patient populations, with an emphasis on the relevance of specific metabolic isozymes and drug transporters. We have hypothesized that, in many cases, a metabolic enzyme and one or more drug transporters may work in concert as a protective mechanism. It is this interactive nature that confounds in vivo prediction of drug metabolism from in vitro microsomal studies. We are also interested in the development and characterization of immunologic measures for immunosuppressive activity and toxicity. Finally, numerous drugs containing carboxylic acid functional groups are metabolized in humans by conjugation with glucuronic acid and/or formation of acyl CoA intermediates. We wish to determine whether acyl glucuronides and acyl CoA intermediates react with proteins and nucleic acids in vitro and in vivo forming covalent adducts, and to describe the mechanism for these reactions.”

**Frances Brodsky**, PhD, Professor  
frances.brodsky@ucsf.edu  
**Cellular and Molecular Engineering**

“My lab focuses on molecular mechanisms of intracellular membrane traffic that influence how proteins are selectively transported between the external and internal membranes of a eukaryotic cell. This selective transport affects cellular uptake of macromolecules by receptor-mediated endocytosis and the processing and presentation of antigens to the immune system. One of the major pathways by which proteins are selectively trafficked through intracellular membrane compartments is controlled by the formation of clathrin-coated vesicles (CCVs). We are analyzing CCV formation at the molecular level, and the role of clathrin in cell migration, oncogenesis and immune cell function. We are also characterizing a novel isoform of clathrin that is expressed in human muscle and fat. This specialized clathrin controls transport of a glucose transporter that plays a key role in the metabolic response to insulin. Defects in this transport pathway are associated with type 2 diabetes. Notably, mice are missing the specialized clathrin, so its function defines a unique aspect of human glucose metabolism. Our goal for this particular project is to understand the function and variation of the specialized clathrin to elucidate pathways that are relevant to human metabolic disease.”
Esteban González Burchard, MD, MPH, Associate Professor
esteban@sfgh.ucsf.edu
Pharmacogenomics

“Asthma is a common but complex respiratory ailment; current data indicate that interaction of genetic and environmental factors lead to its clinical expression. In the US, asthma prevalence, morbidity and mortality are highest in Puerto Ricans, intermediate in Dominicans, and lowest in Mexicans. This is paradoxical since these groups are considered “Hispanic or Latino.” Moreover, among children, response to commonly prescribed asthma medications varies by racial and ethnic background. My research team is investigating how genetic ancestry influences risk of disease and response to drug therapies. Recently, we demonstrated that there are population-specific differences in genetic factors that are associated with asthma and drug response. We have also demonstrated that locus-specific ancestry influences risk of asthma. Our results suggest that differences in the distribution of genetic risk factors, which are associated with ancestry, may, in part, explain differences in the burden of asthma and variation in drug response.”

Xin Chen, PhD, Associate Adjunct Professor
chenx@pharmacy.ucsf.edu
Pharmacogenomics

“Our lab uses functional genomics approaches to study the molecular genetics and signaling pathways in gastrointestinal tumors, including colon cancer and liver cancer. Specifically, through genomic experiments, including expression arrays and array CGH, we are exploring the genetic alterations during gastrointestinal cancer pathogenesis. We have identified several candidate oncogenes and tumor suppressor genes that play critical roles during tumor initiation, progression, and maintenance, and may be used as targets for cancer therapeutics. We are establishing mouse models for these candidate genes to study how the combination of different genetic events can induce tumor formation in vivo. In addition, we are using these mouse lines as pre-clinical models to test the efficacy for chemotherapeutic drugs, such as MEK inhibitors and mTOR inhibitors. Altogether, the goals of our laboratory research are to better understand molecular mechanisms underlying gastrointestinal carcinogenesis, and develop novel diagnostic and therapeutic strategies for these malignancies.”

Tejal Desai, PhD, Professor
tejal.desai@ucsf.edu
Therapeutic Bioengineering
Cellular and Molecular Engineering

“Studies in my lab, the Laboratory of Therapeutic Micro/Nanotechnology, focus on three areas in which the advances enabled by nanoscience and microtechnology can have significant impact in biomedical sciences and applications. First, we are interested in the design of novel micro and nanoscale architectures that can allow for immunosilation and delivery of cellular components into the body for regulated hormonal delivery and/or tissue regeneration. Such platforms can be ultimately used for the treatment of diabetes and Parkinson’s disease and for gaining a better understanding of transplant immunology at the molecular scale. Second, we combine novel micro and nanofabrication approaches with the targeting of biological systems. Such nanoscale control of surfaces and biological interfaces allow for the creation of tailored biological delivery vehicles that are biocompatible, biofunctional, and biomimetic. Specifically, we are interested in devices that can be used in targeted mucosal delivery and vascular delivery. Finally, we are interested in how topographic...”
Ellen Feigal, MD, Adjunct Professor  
elen.feigal@ucsf.edu  
Drug Development Sciences  

“I am the director of the American Course on Drug Development and Regulatory Sciences (ACDRS), which is a nonprofit educational course established in 2006 by the Department of Bioengineering and Therapeutic Sciences and its Center for Drug Development Science (CDDS), along with the FDA, professional societies, a network of universities, biopharmaceutical companies, and the European Course in Pharmaceutical Medicine (ECPM), University of Basel, Switzerland. ACDRS is managed by an executive office and collaborates with a science-driven and highly experienced international faculty with a network of experts in pharmaceutical medicine and medical product development science.”

Michael Fischbach, PhD, Assistant Professor  
michael.fischbach@ucsf.edu  
Computation and Systems Biology  
Cellular and Molecular Engineering  

“Natural products—small molecules from microbes—are used widely in the clinic as antibiotics, anticancer agents, immunosuppressants, and cholesterol-lowering drugs. My lab focuses on three emerging principles that are changing our understanding of which microbes make natural products, what roles they play in the biology of their producers, and how best to discover them:

1) Natural products are produced by the human microbiome. We are currently mining gut- and skin-associated bacteria for natural products that play important roles in human physiology and disease.

2) Natural products mediate interactions among microbial species and between microbes and multicellular organisms. We are particularly interested in the mechanisms by which natural products from the human microbiome mediate interspecies interactions.

3) Connecting natural products to the genes that encode them accelerates discovery. We are developing a bioinformatic algorithm that automatically identifies clusters of small-molecule-producing genes in bacterial genomes.”

Leslie Floren, PharmD, Academic Coordinator,  
Assistant Adjunct Professor  
leslie.floren@ucsf.edu  
Drug Development Sciences  

“I am director of the PK/PD/PG Core for the Cancer Center, and I co-direct the Clinical Pharmacology Fellowship. The goal of the CPPPT program is to develop clinical scientists who will be experts in clinical pharmacology research. The program trains PharmD, MD, and PhD scholars in laboratory and clinical investigations focused on therapeutics. This NIH-supported training program is a cornerstone for the development of future clinical and translational scientists.”
“Research in my laboratory focuses on the roles of membrane transporters in drug absorption, disposition, targeting, and in clinical drug response. Recent studies have centered on the role of genetic variation in membrane transporters in therapeutic and adverse drug reactions. The laboratory was the first to clone and describe the human liver specific organic cation transporter, OCT1, which mediates hepatic uptake of many clinically used drugs, environmental toxins and chemical carcinogens. A key aspect of our research is to discover naturally occurring genetic variants in OCT1 and other transporter genes in ethnically diverse human populations. We have established a local cohort of 1,000 healthy volunteers of broad ethnicity, who are stratified by their respective genotypes and then undergo pharmacologic testing with conventional therapies. The overall goal of these studies is to better understand the genetic factors that contribute to the substantial disparities in treatment outcomes among ethnically diverse populations.”

Yong Huang, PhD, Associate Adjunct Professor yong.huang@ucsf.edu
and
Emil Lin, PhD, Professor, Recall Professor emil.lin@ucsf.edu

Drug Development Sciences

“We, the Drug Studies Unit, Analytical Division, specialize in the development of methods needed to detect and quantify drug substances in biological fluids. Our methodologies are applied to the testing of drug treatments and therapies of major importance in human health and well-being. We strive to secure and succeed in a variety of educational, pharmaceutical industry and governmental projects, for it is these projects that offer our staff and academic personnel the opportunity to develop their abilities and apply their expertise to advance our understanding of problems in drug research. To meet our fullest potential as individuals and as an organization, the DSU must recognize and nurture an environment of togetherness and harmony, cherishing the contributions of each member and celebrating diversity.”
C. Anthony Hunt, PhD, Professor
a.hunt@ucsf.edu
Drug Development Sciences
Computation and Systems Biology
Cellular and Molecular Engineering

“My lab—the BioSystems Group—develops and uses advanced modeling and simulation methods that enable gaining new and deeper insight into the networked micro-mechanisms that link molecular level events with higher level phenomena and operating principles at cell, tissue, organ, and organism levels, and vice versa, in the presence and absence of therapeutic interventions. The work contributes to larger, longer-term, international efforts to achieve scientifically useful, fully observable virtual tissues, organs and organisms suitable for experimentation. The phenomena on which we currently focus include epithelial cell morphogenesis in vitro; early glandular epithelial cancer progression; the coupled influence of transport, metabolism, and intracellular heterogeneity on drug transport across cellular barriers; mechanisms linking active cellular processes with different levels of tissue heterogeneity during hepatic drug disposition in normal and diseased livers; the linkage of hepatic zonation and xenobiotic toxicity; drug-drug interactions within and across levels; and leukocyte rolling, activation, and adhesion. We use advanced discrete event and object oriented software methods and tools to construct transparent, multilevel, multicomponent analogues of referent biological systems.”

Ajay Jain, PhD, Professor
ajain@jainlab.org
Computation and Systems Biology

“My lab focuses on predictive computational modeling, primarily in algorithmic approaches for drug discovery. The primary areas of research are: 1) methods for docking small molecules to proteins using empirically derived scoring functions, 2) methods for inducing the shape of a protein binding pocket given the structures and affinities of ligands that bind the pocket competitively, 3) generalized surface-based approaches to computing molecular similarity, both among small molecules and proteins, 4) approaches for modeling and prediction of polypharmacology based on molecular structure, and 5) applications of such methods for cancer drug discovery.”

Brian Jerksky, PhD, Adjunct Professor
bnj1@stmarys-ca.edu
Computation and Systems Biology

“A statistician by training, I hold a joint appointment with the Departments of Bioengineering and Therapeutic Sciences and the Department of Epidemiology and Biostatistics. I am an adjunct associate professor here at UCSF, where I teach graduate-level biostatistics on an occasional basis. My most recent grant is from the National Science Foundation, and
involves the communication of modern methods of teaching statistics to faculty and students nationwide. I have also been the Dean of the School of Science at Saint Mary’s College since July 2006.”

Tanja Kortemme, PhD, Assistant Professor
kortemme@cgl.ucsf.edu
Computation and Systems Biology
Cellular and Molecular Engineering

“We aim to link details of interactions between biological macromolecules to the functional behavior of entire cellular systems, with two complementary motivations: to advance quantitative understanding of biological processes and to enable systematic cellular engineering. Towards these long-term goals, my lab pursues three related main research thrusts at the all-atom, molecular and systems-scale:

1) We develop foundational atom-level computational methods to predict and design protein structures and protein interactions. Most recently, we have shown that a new approach, borrowing mathematical formulations from the field of robotics, predicts the conformations of variable segments in proteins with high accuracy.

2) We apply protein modeling and design methods to create molecules that can be used as probes to characterize existing cellular processes and as molecular “parts” to engineer biological systems to perform new and useful functions. Methodological developments in computational protein design include the ability to optimize proteins to satisfy multiple functional constraints, for example to model hub proteins to function correctly in complex interaction networks, improved models of protein flexibility and design of computational libraries for difficult engineering goals and synthetic biology applications. Most recently, we have designed new interactions of Rho-type GTPase signaling circuits that we can specifically activate using small molecules to control changes in cell morphology in mammalian cells.

3) We combine computation and experiment to dissect protein networks. We systematically modulate protein interactions and determine genome-wide changes in quantitative genetic interaction patterns resulting from these perturbations, with the goal to map the system-level functions of specific interactions in model organisms at single-residue resolution.”

Deanna Kroetz, PhD, Professor
deanna.kroetz@ucsf.edu
Pharmacogenomics

“My laboratory has broad research interests in molecular and clinical pharmacology. On the clinical side, our efforts are focused on understanding the functional and clinical significance of genetic variation in the ABC transporters. These membrane transporters are critical efflux pumps for a wide variety of drugs and other xenobiotics. Functional characterization of coding, UTR, promoter and conserved noncoding variants uses a variety of cellular and model organism systems. Functionally significant variants are then tested for clinical significance using a genotype to phenotype approach in healthy volunteers or patient populations. We are also leading large pharmacogenetic studies of toxicity associated with drug therapy in breast cancer and HIV/AIDS. Whole genome scans are used to identify novel candidate genes with important roles in drug toxicity and/or response. Clinical findings are then brought back to the bench where the molecular basis for genetic associations is investigated. On the molecular side, we are pursuing long standing interests in understanding the physiological role of cytochrome P450 eicosanoids. Cytochrome P450 eicosanoids are formed from arachidonic acid in pathways that are parallel to the drug-gable targets cyclooxygenase and lipoxygenase. We and others have proposed that the cytochrome P450 pathway of arachidonic acid metabolism plays a critical role in renal and vascular function, and more recently in inflammation. Soluble epoxide hydrolase has emerged as a novel therapeutic target
based on its critical role in controlling intracellular levels of cytochrome P450 eicosanoids. Complementary approaches using specific inhibitors and knockout mice lacking functional soluble epoxide hydrolase support a renoprotective role for cytochrome P450 eicosanoids. Understanding the molecular mechanisms for these protective effects is critical for the design of novel and effective strategies for renoprotection."

Sarah Nelson, PhD, Professor and Department Co-chair
sarah.nelson@radiology.ucsf.edu
Therapeutic Bioengineering

“My lab’s research focuses on the development of techniques for the acquisition, reconstruction, and quantitative analysis of in vivo imaging and spectral data. This includes the interpretation of metabolic and physiological images from whole body 3T and 7T magnetic resonance scanners, which brings a number of critical challenges in terms of the design and optimization of hardware and software components. The objective of this research is to implement novel strategies for obtaining and interpreting magnetic resonance data in order to improve the understanding of normal physiology and to elucidate the underlying mechanisms of disease progression and response to therapy. Translating these needs into bioengineering problems involves the integration of the principles of magnetic resonance physics with the design of new algorithms for quantitative interpretation of multi-dimensional and multi-faceted data. Applications that form the focus for this research include the study of patients with brain tumors, prostate cancer, and neurological diseases.”
Shuvo Roy, PhD, Associate Professor
shuvo.roy@ucsf.edu
Therapeutic Bioengineering

“The primary focus of my lab is to find new ways to utilize micro-electro-mechanical-systems (MEMS) technology in medicine. This includes projects such as developing an artificial implantable kidney to improve outcomes for patients with renal failure, wireless pressure microsensors for spine fusion monitoring, and high resolution ultrasonic microtransducers for vulnerable plaque detection. Through our work with the Pediatric Devices Consortium, we are attempting to solve urgent pediatric clinical problems by designing and developing therapeutic implants and surgical tools that will enhance pediatric surgery, and help close the gap between devices available for adult and pediatric patients. We are also studying how mechanical factors influence tissue development, injury, and repair; and devising ways to use stem cell and gene therapy to regenerate tissue.”

Andrej Sali, PhD, Professor
sali@salilab.org
Computation and Systems Biology

“My lab and I are interested in using computation grounded in the laws of physics and the theory of evolution to study the structure and function of proteins. We aim to improve and apply methods for predicting the structures of proteins, determining the structures of macromolecular assemblies, and annotating the functions of proteins using their structures. This research contributes to structure-based functional annotation of proteins and thus enhances the impact of genome sequencing, structural genomics, and functional genomics on biology and medicine.”

Nancy Sambol, PharmD, Associate Clinical Professor
nancy.sambol@ucsf.edu
Drug Development Sciences

“The primary goal of my research group is to advance methods of new drug development as they relate to PK and PD, particularly population approaches (those that consider patient traits and variability). Pharmaceutical companies and other investigators provide real-life issues and challenges on which their work is based. Ongoing and future investigations include the following issues: 1) population PK-PD study design and analysis when data are censored (e.g., analgesic trials and bronchoprovocation studies); 2) population PK-PD study design and analysis for investigating genetic variables; and 3) methodologic issues of population modeling and simulations. Secondarily, my research group strives to gain specific knowledge about drugs that contribute to their improved clinical usage. They use a variety of PK-PD and statistical software including NONMEM, S-Plus and WinNonlin.”
Francis Szoka, PhD, Professor
szoka@cgl.ucsf.edu
Therapeutic Bioengineering
Cellular and Molecular Engineering

“The principle focus of our research group is to exploit biophysical, chemical, and physiological principles to devise targeted antigen, drug, and gene carriers. The systems studied include: liposomes, polymers, and peptides. We create biodegradable systems that self-assemble but can release their entrapped cargo at a defined rate or prescribed location in a cell or tumor.”

Chao Tang, PhD, Professor
chao.tang@ucsf.edu
Computation and Systems Biology

“The research interest of my group is at the interface between the physical and the biological sciences. We are interested in quantitative studies and the systems level analysis of biological networks, using both computational and experimental tools. These include specific regulatory, signaling, genetic, and metabolic networks, as well as large scale genome-wide networks. We use and develop quantitative methods and ideas to address key biological questions and try to understand the design and organization principles of biological systems at various levels. The lab is also interested in applying network analysis to disease related networks for identification of drug targets and therapeutic strategies.”

Davide Verotta, PhD, Professor in Residence
davide.verotta@ucsf.edu
Drug Development Sciences

“My main research interests are in pharmacokinetics/pharmacodynamics (PK/PD) and mathematical/statistical (M/S) modeling. In PK/PD my main areas of interest are: mechanistic modeling (where prior knowledge about parts of a PK/PD system is embedded in the model describing it); the development of empirical models (where no prior knowledge is embedded in the model) to analyze, simulate and control; population PK/PD modeling with particular regard to empirical methods for population data analysis. In M/S modeling, my main interests are in linear and non-linear system analysis, control, and experimental design. I am involved in collaborative research with scientists and different investigators in PK/PD and clinical therapy (notably HIV therapy) modeling. Future areas of investigation are the use of Bayesian methods, in particular applied to pharmacogenomics and mechanistic modeling.”

Betty-ann Hoener, PhD, Professor Emeritus
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Drug Development Sciences
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KATHY GIACOMINI, PHD
SARAH NELSON, PHD

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