STANFORD ENGINEERING

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Stanford University

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Executive Editor
Jamie Beckett

Content and Production Manager
Rick Nobles

Copy Editing
Heidi Beck
Aubrey Hanson
Kate Kimelman

Photography
Norbert von der Groeben
John Todd

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AERONAUTICS AND ASTRONAUTICS

The course offerings and research activities in the Department of Aeronautics and Astronautics cover most aspects of aircraft and spacecraft design, structures, fluid mechanics, dynamics and control, and navigation, with strong emphasis on fundamental principles as well as on systems engineering.

Chair: Charbel Farhat
Information: 650-723-1139

Juan Alonso
Associate Professor
AERONAUTICS AND ASTRONAUTICS

Alonso's work is focused on research and development of new high-fidelity, multidisciplinary methods and techniques for the analysis and design of complex aerospace systems. He is interested in the development of these methods and their use in realistic test cases. Past and current research includes transonic, supersonic and hypersonic vehicles; rotorcraft; turbomachinery; and launch vehicles. Specific current interests include advanced methods for design, multifidelity optimization, environmentally friendly aircraft, uncertainty quantification and robust design, and system-level challenges for NextGen. PhD 1997 Princeton

Phone: 650-723-9954; Email: jjalonso@stanford.edu
URL: http://adl.stanford.edu/people/jjalonso.html

Brian Cantwell
Professor; Edward C. Wells Professor in the School of Engineering
AERONAUTICS AND ASTRONAUTICS, MECHANICAL ENGINEERING

Cantwell's research interests are in the area of turbulent flow. Recent work has centered on three areas: the direct numerical simulation of turbulent shear flows, theoretical studies of the fine-scale structure of turbulence and experimental measurements of turbulent structure in flames. Experimental studies include the development of particle-tracking methods for measuring velocity fields in unsteady flames and variable density jets. Research in turbulence simulation includes the development of spectral methods for simulating vortex rings, the development of topological methods for interpreting complex fields of data, and simulations of high Reynolds number compressible and incompressible wakes. Theoretical studies include predictions of the asymptotic behavior of drifting vortex pairs and vortex rings, and use of group theoretical methods to study the nonlinear dynamics of turbulent fine-scale motions. Current projects include studies of fast-burning fuels for hybrid propulsion and decomposition of nitrous oxide for space propulsion. PhD 1976 Caltech

Phone: 650-723-4825; Email: cantwell@stanford.edu
URL: http://www.stanford.edu/~cantwell/

Fu-Kuo Chang
Professor
AERONAUTICS AND ASTRONAUTICS, MECHANICAL ENGINEERING
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Chang's primary research interest is in the areas of multifunctional materials and intelligent structures with particular emphases on structural health monitoring, intelligent self-sensing diagnostics, and integrated health management for space and aircraft structures as well as safety-critical assets and medical devices. His specialties include sensors and sensor network development, built-in self-diagnostics, integrated diagnostics and prognostics, damage tolerance and failure analysis for composite materials, and advanced multiphysics computational methods for multifunctional structures. Recent research topics include

integrated health management for aircraft structures, bio-inspired intelligent sensory materials for fly-by-feel autonomous vehicles, active sensing diagnostics for composite structures and self-diagnostics for high-temperature materials. PhD 1983 Michigan

Phone: 650-723-3466; Email: fkchang@stanford.edu
URL: http://structure.stanford.edu/people/chang.html

Sigrid Close
Assistant Professor
AERONAUTICS AND ASTRONAUTICS, ELECTRICAL ENGINEERING BY COURTESY

Close's research involves space weather detection and modeling for improved spacecraft designs, and advanced signal processing and electromagnetic wave interactions with plasma for ground-to-satellite communication systems. These topics fall under the Space Situational Awareness (SSA) umbrella, which includes environmental remote sensing using satellite systems and ground-based radar. Her current efforts are the MEDUSSA (Meteoroid, Energetics and Debris Understanding for Space Situational Awareness) program, which uses dust accelerators to understand the effects of hypervelocity particle impacts on spacecraft along with Particle-In-Cell simulations, and using ground-based radars to characterize the space debris and meteoroid population remotely. She also has active programs in hypersonic plasmas and plasma propulsion techniques for interplanetary travel. Her research through the Department of Electrical Engineering focuses on understanding the interaction of lightning with the ionosphere. PhD 2005 Boston University

Phone: 650-725-2863; Email: sigridc@stanford.edu

Simone D'Amico
Assistant Professor
AERONAUTICS AND ASTRONAUTICS

D'Amico is founder and director of Stanford's Space Rendezvous Lab (SLAB). From 2003 to 2013, he worked as a researcher at the German Aerospace Center (DLR) in the fields of space flight dynamics, autonomous satellite navigation and control, spacecraft formation-flying and on-orbit servicing. He has made key contributions to the design, development and operations of spacecraft formation-flying and rendezvous missions such as GRACE, TanDEM-X and PRISMA. He developed the Spaceborne Autonomous Formation Flying Experiment (SAFE), the Advanced Rendezvous demonstration using GPS and Optical Navigation (ARGON) on PRISMA and the TanDEM-X Autonomous Formation Flying (TAFF) system. More recently, he has been working on the design of the GPS-based navigation system for the DEOS and PROBA-3 formation-flying missions. He acted as principal investigator of the Autonomous Vision Approach-Navigation and Target Identification (AVANTI) experiment on board the FireBIRD mission.
PhD 2010 Technical University of Delft, Netherlands

Phone: 650-272-9968, 650-497-4682; Email: damicos@stanford.edu
URL: https://people.stanford.edu/damicos/

Per Enge
Professor; Vance D. and Arlene C. Coffman Professor
AERONAUTICS AND ASTRONAUTICS, ELECTRICAL ENGINEERING BY COURTESY

Enge designs navigation systems that are safe and secure. He has worked on such systems for maritime and air applications. Two of these navigation systems have been deployed worldwide. He directs the Stanford Center for Position Navigation and Time. PhD 1983 University of Illinois

Phone: 650-723-2853; Email: per.enge@stanford.edu
URL: http://waas.stanford.edu/people/enge.htm

Charbel Farhat
Professor and Chair; Vivian Church Hoff Professor in Aircraft Structures; Director, Army High-Performance Computing Research Center
AERONAUTICS AND ASTRONAUTICS, MECHANICAL ENGINEERING

Farhat and his research group develop mathematical models, advanced computational algorithms and high-performance software for the design and analysis of complex systems in aerospace, marine, mechanical and naval engineering. They contribute major advances to simulation-based engineering science. Current engineering focus in research is on the aerodynamics of micro aerial vehicles and Formula 1 cars, ballistic fabric for lightweight shields, nonlinear aeroelasticity of fighter jets and high-altitude long-endurance aircraft, thermal management of hypersonic vehicles, underwater acoustics and imaging, and underwater implosion. Current theoretical and computational emphases in research are on high-performance, multiscale modeling for the high-fidelity analysis of multiphysics problems, and efficient reduced-order modeling for time-critical applications such as design and active control. PhD 1987 UC Berkeley

Phone: 650-723-3840; Email: cfarhat@stanford.edu; URL: http://www.stanford.edu/group/frg

Antony Jameson
Professor (Research), Thomas V. Jones Professor in the School of Engineering
AERONAUTICS AND ASTRONAUTICS

Jameson's research focuses on the numerical solution of partial differential equations with applications to subsonic, transonic and supersonic flow past complex configurations as well as aerodynamic shape optimization. PhD 1963 Cambridge, England

Phone: 650-725-6208; Email: antony.jameson@stanford.edu

Mykel Kochenderfer
Assistant Professor
AERONAUTICS AND ASTRONAUTICS, COMPUTER SCIENCE BY COURTESY

Before joining the Stanford faculty, Kochenderfer was a member of the technical staff for seven years at Lincoln Laboratory, where he worked on aircraft collision avoidance for manned and unmanned aircraft. He has worked for Microsoft Research, the Honda Research Institute and Rockwell Scientific. He is a third-generation pilot.
PhD 2006 University of Edinburgh, Scotland

Phone: 650-497-3574; Email: mykel@stanford.edu
URL: http://www.stanford.edu/people/mykel

Ilan Kroo
Professor (Research)
AERONAUTICS AND ASTRONAUTICS

Kroo's research involves work in multidisciplinary optimization and aircraft synthesis, unconventional aircraft, and low-speed aerodynamics. Current research in the field of aircraft synthesis includes the development of a new computational architecture for aircraft design and its integration with numerical optimization. Recent research has included investigation of configurations such as joined wings, oblique wings and tailless aircraft. Nonlinear low-speed aerodynamics studies have focused on vortex wake roll-up, refined computation of induced drag, the design of wing tips and the aerodynamics of maneuvering aircraft. PhD 1983 Stanford

Phone: 650- 723-2994; Email: KROO@stanford.edu
URL: http://aero.stanford.edu/People/kroo.html

Sanjay Lall
Professor
AERONAUTICS AND ASTRONAUTICS, ELECTRICAL ENGINEERING

Lall's research group focuses on the development of advanced engineering methodologies for the design of control, optimization and signal processing algorithms that occur in a wide variety of electrical, mechanical and aerospace systems. He has significant industrial experience applying advanced algorithms to problems including satellite systems at Lockheed Martin, advanced audio systems at Sennheiser, Formula 1 racing and integrated circuit diagnostic systems, in addition to several startup companies. He has served as associate editor for the journal *Automatica*, on the steering and program committees of several international conferences and as a reviewer for the National Science Foundation, DARPA and the Air Force Office of Scientific Research. PhD 1995 Cambridge

Phone: 650-723-1343; Email: lall@stanford.edu; URL: http://lall.stanford.edu

Sanjiva Lele
Professor
AERONAUTICS AND ASTRONAUTICS, MECHANICAL ENGINEERING

Lele's research combines numerical simulations with analytical modeling to study fundamental unsteady flow phenomena, turbulence, flow instabilities and flow-generated sound. Recent projects include shock-turbulence interaction, exploitation of flow instabilities for enhanced mixing and for reducing the vortex-wake hazard from an airplane, new approaches for active noise control, and the development of high-fidelity prediction methods for engineering applications. PhD 1985 Cornell

Phone: 650-723-7721; Email: lele@stanford.edu

Marco Pavone
Assistant Professor
AERONAUTICS AND ASTRONAUTICS, ELECTRICAL ENGINEERING
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Pavone is the director of the Autonomous Systems Laboratory (ASL). The goal of ASL is the development of methodologies for the analysis, design and control of autonomous systems, with a particular emphasis on large-scale robotic networks and autonomous aerospace vehicles. The lab combines expertise from control theory, robotics, optimization and operations research to develop the theoretical foundations for networked autonomous systems operating in uncertain, rapidly changing and potentially adversarial environments. Theoretical insights are then used to devise practical, computationally efficient and provably correct algorithms for field deployment. Applications include robotic transportation networks, sensor networks, agile control of spacecraft during proximity operations and mobility platforms for extreme planetary environments. Collaborations with NASA centers are a key component of the research portfolio. Pavone is a research affiliate at the NASA Jet Propulsion Laboratory, California Institute of Technology. PhD 2010 MIT

Phone: 650-723-4432; Email: pavone@stanford.edu

Stephen Rock
Professor
AERONAUTICS AND ASTRONAUTICS

Rock's research interests include the application of advanced control and modeling techniques for robotic and vehicle systems (aerospace and underwater). He directs the Aerospace Robotics Laboratory, where students are involved in experimental programs designed to extend the state of the art in robotic control. Areas of emphasis include planning and navigation techniques (GPS and vision-based) for autonomous vehicles; aerodynamic modeling and control for aggressive flight systems;

underwater remotely operated vehicle control; precision end-point control of manipulators in the presence of flexibility and uncertainty; and cooperative control of multiple manipulators and multiple robots. He teaches several courses in dynamics and control. PhD 1978 Stanford

Phone: 650-723-3343; Email: rock@stanford.edu

Debbie Senesky
Assistant Professor
AERONAUTICS AND ASTRONAUTICS, ELECTRICAL ENGINEERING
BY COURTESY

Senesky's research is centered on the development of micro- and nanosystems for operation within extreme harsh environments. Her laboratory (EXtreme Environment Microsystems Laboratory, XLab) is researching the synthesis of temperature tolerant, chemically resistant and radiation-hardened wide bandgap semiconductor thin films and nanostructures. These new material sets serve as a platform for the realization of sensor, actuator and electronic components that can operate and collect data under the most hostile conditions. More specifically, smart and adaptable structures for extreme environments are enabled through the technology developed in her laboratory. Her research efforts support a variety of applications, including deep space systems, hypersonic aircrafts, combustion monitoring and subsurface monitoring. PhD 2007 UC Berkeley

Phone: 650-723-2844; Email: dsenesky@stanford.edu

BIOENGINEERING

The Department of Bioengineering is a fusion of engineering and the life sciences to promote biomedical discovery and the development of new technologies and therapies. Bioengineering at Stanford embraces biology as a new engineering paradigm and applies engineering principles to medical problems and biological systems.

Chair: Norbert Pelc; Co-chair: Stephen Quake
Information: 650-725-7665

Russ Altman
Professor; Kenneth Fong Professor
BIOENGINEERING, GENETICS, MEDICINE, COMPUTER SCIENCE BY COURTESY

Altman's primary interests are in the application of computing technologies to basic molecular biological problems, now referred to as bioinformatics. He is particularly interested in the analysis of protein and RNA structure and function, both in an individual problem-centered manner and on a functional genomic scale. He has an interest in applying systems biology concepts to pharmacology and personalized medicine. His current efforts are in three areas. First, he is interested in techniques for representing biological knowledge (not just data) for automatic scientific computation. Second, he is interested in the analysis of microenvironments within macromolecules. Finally, he is interested in physics-based simulation of biological structures, particularly RNA and proteins. PhD 1989 Stanford, MD 1990 Stanford

Phone: 650-725-0659, 650-725-3394; Email: russ.altman@stanford.edu
URL: http://www-helix.stanford.edu/people/altman/

Annelise E. Barron
Associate Professor
BIOENGINEERING

Current research: Molecular and cellular biophysics of human innate immunity, with a focus on the pleiotropic roles of host defense peptides and amyloidogenic peptides in human health and disease. Previous research: Design, synthesis and biophysical studies of sequence-controlled, biomimetic oligomers (synthetic peptide mimics) with helical structures for biomedical and biomaterial applications (mimicry of lung surfactant proteins and antimicrobial peptides). Also in previous work: Design and synthesis of novel polymeric materials and strategies for capillary and microchip electrophoresis (DNA sequencing and genotyping); polymer-biomolecule conjugates. PhD 1995 UC Berkeley

Phone: 650-946-8039; Email: aebarron@stanford.edu
URL: http://www.stanford.edu/group/barronlab/

Kwabena Boahen
Professor
BIOENGINEERING, ELECTRICAL ENGINEERING BY COURTESY

Boahen's research interests include mixed-mode multichip VLSI models of biological sensory and perceptual systems, their epigenetic development and asynchronous digital communication for reconfigurable connectivity. PhD 1997 Caltech

Phone: 650-725-6615; Email: boahen@stanford.edu
URL: http://bioengineering.stanford.edu/faculty/boahen.html

Zev Bryant
Assistant Professor
BIOENGINEERING, STRUCTURAL BIOLOGY BY COURTESY

Molecular motors lie at the heart of biological processes from DNA replication to vesicle transport. Bryant's laboratory seeks to understand the physical mechanisms by which these nanoscale machines convert chemical energy into mechanical work. His team uses single molecule

tracking and manipulation techniques to observe and perturb substeps in the mechanochemical cycles of individual motors. Protein engineering helps to explore relationships between molecular structures and mechanical functions. Broad topics of current interest include torque generation by DNA-associated ATPases and mechanical adaptations of unconventional myosins. PhD 2003 UC Berkeley

Phone: 650-724-3090; Email: zevry@stanford.edu
URL: http://www.stanford.edu/group/bryant/

David Camarillo
Assistant Professor
BIOENGINEERING, MECHANICAL ENGINEERING BY COURTESY

The Camarillo Lab is currently providing Stanford athletes with inertial sensors to investigate the mechanism of concussion. The lab is also characterizing the response of head blows through imaging, blood and other neurophysiological measurements. Understanding the mechanism of concussion will allow for change of rules or technique, or the development of preventive equipment and diagnostics to reduce brain injuries. Additionally, the lab is researching cell mechanics for regenerative medicine. The lab is developing a quantitative, noninvasive and early (day 1) measure of viability in order to allow clinicians to transfer the single most viable embryo to reduce the incidence of multiple gestations while preserving the pregnancy and birth rate of IVF. Another area of research is in medical instrumentation as it pertains to robotic catheterization for curing cardiac arrhythmia. The aim is to improve the usability and improve the safety of the process of cardiac catheter ablation through robotic control. PhD 2008 Stanford

Phone: 650-725-2590; Email: dcamarillo@stanford.edu

Jennifer R. Cochran
Associate Professor
BIOENGINEERING, CHEMICAL ENGINEERING BY COURTESY

Cochran's research group uses interdisciplinary approaches in chemistry, engineering and biophysics to study complex biological systems and develop new technologies for basic science and biomedical applications. The group's research is driven by the philosophy that in order to effectively control physiological processes, it is necessary to understand the molecular mechanisms that drive these processes. Her group is interested in elucidating molecular details of receptor-mediated cell signaling events and at the same time developing protein and peptide-based tools that will allow manipulation of cellular processes on a molecular level. For biomedical applications, rational design and combinatorial methods are used to create designer protein therapeutics and diagnostic agents for applications such as regenerative medicine and cancer imaging and therapy. PhD 2001 MIT

Email: jennifer.cochran@stanford.edu; URL: http://www.stanford.edu/group/cochrangroup/

Markus Covert
Associate Professor
BIOENGINEERING, CHEMICAL AND SYSTEMS BIOLOGY BY COURTESY

Covert's research focuses on building computational models of complex biological processes and using these models to guide an experimental program. Such an approach leads to a relatively rapid identification and validation of previously unknown components and interactions. Biological systems of interest include metabolic, regulatory and signaling networks as well as cell-cell interactions. Current research involves the dynamic behavior of NF-kappaB, an important family of transcription factors whose aberrant activity has been linked to oncogenesis, tumor progression and resistance to chemotherapy. PhD 2003 UC San Diego

Phone: 650-725-6615; Email: mcovert@stanford.edu
URL: http://www.stanford.edu/group/covert/

Karl Deisseroth
Professor; D.H. Chen Professor
BIOENGINEERING, PSYCHIATRY AND BEHAVIORAL SCIENCES

Deisseroth focuses on developing molecular and cellular tools to observe, perturb and re-engineer brain circuits. His laboratory is based in the James H. Clark Center at Stanford and employs a range of techniques including neural stem cell and tissue engineering methods, electrophysiology, molecular biology, neural activity imaging, animal behavior and computational neural network modeling. As a clinician in the psychiatry department, he employs novel electromagnetic brain stimulation techniques in human patients for therapeutic purposes. PhD 1998 Stanford

Phone: 650-725-8524; Email: deissero@stanford.edu
URL: http://www.stanford.edu/group/dlab/

Scott L. Delp
Professor; James H. Clark Professor in the School of Engineering
BIOENGINEERING, MECHANICAL ENGINEERING, ORTHOPAEDIC SURGERY BY COURTESY

Delp is the founding chairman of the Department of Bioengineering at Stanford and director of the National Center for Simulation in Rehabilitation Research. He transformed the field of biomechanics by creating highly accurate computer models of musculoskeletal structures and providing them to researchers worldwide using a software system (OpenSim) that he and his team developed. Delp invented fundamental technology for surgical navigation that is now in wide clinical use. Together with Mark Schnitzer and their students, Delp developed novel microendoscopes that allow real time in vivo imaging of human muscle microstructure. Together with Karl Deisseroth and their students, Delp pioneered the use of optogenetics to control activity in the peripheral nervous system; the work has led to important inventions for treating paralysis, spasticity and pain. PhD 1990 Stanford

Phone: 650-723-1230; Email: delp@stanford.edu; URL: http://www.stanford.edu/group/nmbl/

Drew Endy
Associate Professor
BIOENGINEERING

Endy developed the world's first "fabless" genetic engineering teaching lab in the bioengineering program at Stanford and previously helped start the biological engineering major at MIT. His Stanford research team develops genetically encoded computers and redesigns genomes. He cofounded the BioBricks Foundation (BioBricks.org) as a public-benefit charity supporting free-to-use standards and technology that enable the engineering of biology. He co-organized the International Genetically Engineered Machines (iGEM.org) competition, the BIOFAB International Open Facility Advancing Biotechnology (BIOFAB.org) and Gen9 Inc. (Gen9bio.com). PhD 1998 Dartmouth

Email: endy@stanford.edu; URL: http://endy.web.stanford.edu/

KC Huang
Assistant Professor
BIOENGINEERING, MICROBIOLOGY AND IMMUNOLOGY

Huang's laboratory employs diverse interdisciplinary methods of inquiry to understand the relationships among cell shape detection, determination and maintenance in bacteria. Cell shape plays a critical role in regulating many physiological functions, yet little is known about how the wide variety of cell shapes are determined and maintained. Inside the cell, many proteins organize and segregate, but how they detect and respond to the cellular morphology to end up at the right place at the right time is also largely mysterious. The group uses a combination of analytical, computational and experimental approaches to probe physi-

cal mechanisms of shape-related self-organization in protein networks, membranes and the cell wall. Current topics of interest are cell-wall biosynthesis; the regulation and mechanics of cell division; membrane organization; and membrane-mediated protein interactions. Ultimately, the manipulation of cell shape may provide a direct tool for engineering complex cellular behaviors. PhD 2004 MIT

Phone: 650-721-2483; Email: kchuang@stanford.edu; URL: http://whatislife.stanford.edu/

Jin Hyung Lee
Assistant Professor
BIOENGINEERING, NEUROLOGY, NEUROSURGERY, ELECTRICAL ENGINEERING BY COURTESY

The Lee Lab uses interdisciplinary approaches from biology and engineering to analyze, debug and manipulate systems-level brain circuits. The group seeks to understand the connectivity and function of these large-scale networks in order to drive the development of new therapies for neurological diseases. This research finds its basic building blocks in areas ranging from medical imaging and signal processing to genetics and molecular biology. PhD 2004 Stanford

Phone: 650-736-2069; Email: ljinhy@stanford.edu
URL: http://bioengineering.stanford.edu/faculty/

Michael Lin
Assistant Professor
BIOENGINEERING, PEDIATRICS, CHEMICAL AND SYSTEMS BIOLOGY BY COURTESY

Lin's lab applies biochemical and engineering principles to the development of protein-based tools for imaging and control of biochemical processes. Topics of investigation include fluorescent protein structure and biophysics, fluorescent protein-based biosensors, neuronal activity sensors, spatiotemporal analysis of protein translation pathways, chemical control of protein translation and light-responsive proteins. PhD 2002 Harvard

Phone: 650-721-1681; Email: mzlin@stanford.edu; URL: http://www.stanford.edu/~mzlin/

Jan Liphardt
Associate Professor
BIOENGINEERING

The Liphardt Lab investigates biological spatial organization on the mesoscale and the role of mechanical cues in cellular decision-making. Current research directions include studies of the mechanobiology of tumor progression, super-resolution imaging of protein clustering in membranes, and single-molecule measurements of transport through biological pores and channels. The lab also invents and refines tools for precision control and characterization of cells and tissues. Control technologies include light-powered proton pumps, which allow the optical manipulate of the proton-motive-force within living cells. Characterization technologies include super-resolution light microscopy. PhD 1999 Cambridge

Phone: 650-736-8483; Email: jan.liphardt@stanford.edu; URL: http://liphardtlab.stanford.edu/

Norbert Pelc
Professor and Chair; Boston Scientific Applied Biomedical Engineering Professor
BIOENGINEERING, RADIOLOGY, ELECTRICAL ENGINEERING BY COURTESY

Pelc's primary research interests are in the physics, engineering and mathematics of diagnostic imaging and the development of applications of this imaging technology. His current work focuses on computed tomography, specifically in methods to improve the information content and image quality and to reduce the radiation dose from these examinations. ScD 1979 Harvard

Phone: 650-723-0435; Email: pelc@stanford.edu
URL: http://med.stanford.edu/profiles/bioengineering/faculty/Norbert_Pelc/

Manu Prakash
Assistant Professor
BIOENGINEERING

The Prakash research group works in the field of physical biology. The group's curiosity-driven approach brings together experimental and theoretical techniques from soft-condensed matter physics, fluid dynamics, theory of computation and unconventional micro- and nanofabrication to open problems in biology from organismal to cellular and molecular scale. The group designs and builds precision instrumentation, including droplet microfluidic tools to probe and perturb biological machines and their synthetic analogues. In the course of their work, the researchers invent novel technologies in a global health context with clinical applications in extremely resource-poor settings. PhD 2008 MIT

Phone: 650-725-3731; Email: manup@stanford.edu; URL: http://www.stanford.edu/~manup

Stephen Quake
Professor; Lee Otterson Professor in the School of Engineering
BIOENGINEERING, APPLIED PHYSICS, PHYSICS BY COURTESY

Quake's interests lie at the nexus of physics, biology and biotechnology. His group pioneered the development of microfluidic large-scale integration (mLSI), demonstrating the first integrated microfluidic devices with thousands of mechanical valves. This technology is helping to pave the way for large-scale automation of biology at the nanoliter scale, and Quake and his students have been exploring applications of lab-on-a-chip technology in functional genomics, genetic analysis and structural biology. Quake is also active in the field of single molecule biophysics. PhD 1994 Oxford

Phone: 650-736-7890; Email: quake@stanford.edu; URL: http://thebigone.stanford.edu/

Ingmar H. Riedel-Kruse
Assistant Professor
BIOENGINEERING

The Riedel-Kruse Lab combines basic research and engineering approaches by working on the biophysics of development and biotic games. The lab investigates how genetic networks orchestrate the dynamics and mechanics of developing embryos with a focus on oscillatory processes and molecular forces, with the long-term motivation to advance the understanding of human disease and tissue engineering. Biotic games require biological process to run and could have a similar impact on society as conventional video games based on electronics. The lab designs and engineers biotic games specifically targeted at educational challenges and to support biomedical research. It uses theoretical/computational as well as experimental approaches based on molecular, cellular and developmental biology; zebrafish; imaging; physics; informatics/computer sciences; microfluidics; and engineering. PhD 2005 Max Planck Institute

Phone: 650-723-2380; Email: ingmar@stanford.edu
URL: http://www.stanford.edu/group/riedel-kruse/

Matthew Scott
Professor, Howard H. and Jessie T. Watkins University Professor
BIOENGINEERING, GENETICS, BIOLOGY BY COURTESY

The Scott lab's research is aimed at learning fundamental molecular mechanisms of development, including gene regulation and cell-cell signaling. He also studies the formation and function of brain circuitry. He works with cultured cells, Drosophila and mice to investigate how normal embryos grow and what goes wrong in birth defects, cancer and neurodegenerative disease. A major goal is to identify and explore new genes and proteins that control development. The lab investigates the development of the nervous system, especially the cerebellum. PhD 1980 MIT

Phone: 650-725-7656, 650-725-7680; Email: mscott@stanford.edu
URL: http://scottlab.stanford.edu/

Christina Smolke
Associate Professor
BIOENGINEERING, CHEMICAL ENGINEERING BY COURTESY

Smolke's research program focuses on developing modular genetic platforms for programming information processing and control functions in living systems, resulting in transformative technologies for engineering, manipulating and probing biological systems. She has pioneered the design and application of a broad class of RNA molecules, called RNA devices, that process and transmit user-specified input signals to targeted protein outputs, thereby linking molecular computation to gene expression. This technology has been extended to efficiently construct multi-input devices exhibiting various higher-order information processing functions, demonstrating combinatorial assembly of many information processing, transduction and control devices from a smaller number of components. Her laboratory is applying these technologies to addressing key challenges in cellular therapeutics, targeted molecular therapies and green biosynthesis strategies.
PhD 2001 UC Berkeley

Phone: 650-721-6371; Email: csmolke@stanford.edu
URL: http://openwetware.org/wiki/Smolke

James Swartz
Professor; James H. Clark Professor in the School of Engineering
BIOENGINEERING, CHEMICAL ENGINEERING

Current and projected research in the Swartz lab balances basic research in microbial metabolism, protein expression and protein folding with a strong emphasis on compelling applications. The lab performs fundamental research on the mechanisms and kinetics of ribosomal function, fundamental bioenergetics, basic mechanisms of protein folding, functional genomics and metabolic pathway analysis. The work is motivated by a variety of near- and medium-term applications spanning medicine, energy and environmental needs. In the medical area, current research addresses the need for patient-specific vaccines to treat cancer, particularly for lymphomas. To address pressing needs for a new and cleaner energy source, the lab is working toward an organism that can efficiently capture solar energy and convert it into hydrogen. To address environmental needs, the lab is developing improved water filters using the membrane protein Aquaporin Z. PhD 1978 MIT

Phone: 650-723-5398; Email: jswartz@stanford.edu

Fan Yang
Assistant Professor
BIOENGINEERING, ORTHOPAEDIC SURGERY

In fundamental research, Yang seeks to understand how microenvironmental cues regulate stem cell fate. She is interested in understanding the effects of interactive signaling on stem cell in 3D; results from such studies would help predict stem cell phenotype in vivo and direct rational design of stem cell niche for tissue engineering applications. Technological research seeks to develop a controlled delivery system for synergistic genetic signals to direct stem cell differentiation in situ. Translational research focuses on stem cells for targeting and delivery of therapeutic factors. Many disease processes are associated with abnormal blood supply, cell death and eventual loss of tissue structure and function. Yang is interested in engineering stem cells for targeting and delivery of therapeutic factors to restore normal vascularization and promote tissue regeneration. Findings from such studies may benefit patients in the future. PhD 2006 Johns Hopkins

Phone: 650-725-7128; Email: fanyang@stanford.edu
URL: http://www.fanyanggroup.com

Paul Yock
Professor; Martha Meier Weiland Professor in the School of Medicine
BIOENGINEERING, MECHANICAL ENGINEERING BY COURTESY

Yock began his faculty career as an interventional cardiologist at UC San Francisco, then moved to Stanford in 1994. He is known for his work in inventing, developing and testing new devices, including the Rapid Exchange angioplasty and stenting system, which is the primary approach used worldwide. Yock also authored the fundamental patents for intravascular ultrasound imaging, conducted the initial clinical trials and established the Stanford Center for Research in Cardiovascular Interventions as a core laboratory for analysis of intravascular ultrasound clinical studies. He also invented the Smart Needle and is a co-inventor of the strain-reduction patch for wound healing. Yock was founding co-chair of the Department of Bioengineering and continues research related to new device technologies. He also founded and is the director of the Program in Biodesign, a unit of Bio-X dedicated to advanced training in medical technology innovation. MD 1979 Harvard

Phone: 650-736-1161; Email: yock@stanford.edu

CHEMICAL ENGINEERING

The Department of Chemical Engineering uses knowledge of mathematics, chemistry and other natural sciences to develop economical means of using materials and energy to benefit society.

Chair: Eric Shaqfeh
Information: 650-498-5275

Zhenan Bao
Professor; Senior Fellow, Precourt Institute for Energy; Senior Fellow, Stanford Woods Institute for the Environment
CHEMICAL ENGINEERING, MATERIALS SCIENCE AND ENGINEERING BY COURTESY, CHEMISTRY BY COURTESY

Research areas in the Bao Group include synthesis of functional organic and polymer materials, organic electronic device design and fabrication, and applications development for organic electronics. The multidisciplinary approach involves concepts and expertise from chemistry, chemical engineering, biomedical engineering, materials science and engineering, physics and electrical engineering. The devices of current interest are organic and carbon nanotube thin-film transistors, organic photovoltaic cells, chemical/biological sensors and molecular switches. These devices are used as characterization tools for fundamental charge transport and photophysics studies. They are also of practical interest for nanoscale electronics, alternative energy sources, low-cost and large-area flexible plastic circuits, displays and disposable sensors. PhD 1995 University of Chicago

Phone: 650-723-2419; Email: zbao@stanford.edu; URL: http://baogroup.stanford.edu

Stacey Bent
Professor; Jagdeep and Roshni Singh Professor in the School of Engineering; Senior Fellow, Precourt Institute for Energy; Bert and Candace Forbes University Fellow in Undergraduate Education
CHEMICAL ENGINEERING, MATERIALS SCIENCE AND ENGINEERING BY COURTESY, ELECTRICAL ENGINEERING BY COURTESY, CHEMISTRY BY COURTESY

Research in the Bent laboratory is focused on understanding and controlling surface and interfacial chemistry and applying this knowledge to a range of problems in semiconductor processing, micro- and nanoelectronics, nanotechnology, and sustainable and renewable energy. Much of the research aims to develop a molecular-level understanding in these systems, and hence the group uses of a variety of molecular probes. Systems currently under study in the group include functionalization of semiconductor surfaces, mechanisms and control of atomic layer deposition, molecular layer deposition, nanoscale materials for light absorption, interface engineering in photovoltaics, and catalyst and electrocatalyst deposition. PhD 1992 Stanford

Phone: 650-723-0385; Email: sbent@stanford.edu; URL: http://bentgroup.stanford.edu

Alexander Dunn
Assistant Professor
CHEMICAL ENGINEERING

Research focus is the generation of force and motion inside living cells. Almost all the work in understanding how motor proteins work has been done under highly artificial conditions, abstracted from the cellular milieu in which the proteins actually work. Recent results demonstrate that the internal structure of the cell is pre-tensioned and that generating, releasing and sensing this tension is a key element in controlling how the cell reacts to its environment. The research group observes single motors at work inside living cells, with the goal to understand how the cell generates, detects and manages tension at the molecular level. The results from this project will be highly relevant to

many aspects of human health, including heart disease, cancer metastasis and the development of stem cell therapies. PhD 2003 Caltech

Email: alex.dunn@stanford.edu; URL: http://openwetware.org/wiki/Dunn

Curtis Frank

Professor; W.M. Keck Professor in Engineering

CHEMICAL ENGINEERING, MATERIALS SCIENCE AND ENGINEERING BY COURTESY, CHEMISTRY BY COURTESY

Frank's group studies the properties of ultrathin polymer films. His lab uses spin casting, Langmuir-Blodgett deposition and surface grafting to fabricate ultrathin films in the range of 100 to 1,000 Angstroms thick. Macromolecular amphiphiles are examined at the air-water interface by surface pressure, Brewster angle microscopy and interfacial shear measurements and on solid substrates by atomic force microscopy, FTIR and ellipsometry. A vapor-deposition-polymerization process has been developed for covalent grafting of poly (amino acids) from solid substrates. FTIR measurements permit study of secondary structures (right and left-handed alpha helices, parallel and anti-parallel beta sheets) as a function of temperature and environment. In collaboration with the Department of Ophthalmology in the Stanford School of Medicine, the group has designed and synthesized a fully interpenetrating network of two different hydrogel materials that have properties consistent with application as a substitute for the human cornea. The researchers have developed a technique for surface modification with adhesion peptides that allows binding of collagen and subsequent growth of epithelial cells and are pursuing broad questions on the relationships among molecular structure and processing protocol. Biomedical device applications are being pursued. PhD 1972 University of Illinois

Phone: 650-723-4573; Email: curt.frank@stanford.edu

Gerald Fuller

Professor; Fletcher Jones Professor in the School of Engineering

CHEMICAL ENGINEERING

Research in the Fuller laboratory has resulted in a number of techniques in optical rheometry, such as high-speed polarimetry (birefringence and dichroism) and various microscopy methods (fluorescence, phase contrast and atomic force microscopy). The lab is equipped with instruments such as shear rheometer, capillary breakup extensional rheometer and 2D extensional rheometer that are able to characterize the microstructure of polymeric and other complex materials. The response of these materials to different flow conditions can be visualized and analyzed in detail using high-speed imaging devices at up to 2,000 frames per second. The lab also performs fundamental research to understand the orientation and deformation of monolayers at the molecular level. These experiments employ state-of-the-art optical methods such as polarization modulated dichroism, fluorescence microscopy and Brewster angle microscopy to obtain in situ measurements of polymer films and small molecule amphiphile monolayers subject to flow. Langmuir troughs are used as the experimental platform so that the thermodynamic state of the monolayers can be systematically controlled. For the first time, well-characterized, homogeneous surface flows have been developed, and real-time measurements of molecular and microdomain orientation have been obtained. These microstructural experiments are complemented by measurements of the macroscopic, mechanical properties of the films. PhD 1980 Caltech

Phone: 650-723-9243; Email: ggf@stanford.edu

Thomas Jaramillo

Associate Professor

CHEMICAL ENGINEERING

The Jaramillo laboratory focuses on fundamental catalytic processes occurring on solid-state surfaces in both the production and consump-

tion of energy. Chemical-to-electrical and electrical-to-chemical energy conversion are at the core of the research. Nanoparticles, metals, alloys, sulfides, nitrides, carbides, phosphides, oxides and biomimetic organo-metallic complexes compose the toolkit of materials that can help change the energy landscape. Tailoring catalyst surfaces to fit the chemistry is the primary challenge. PhD 2004 UC Santa Barbara

Phone: 650-498-6879; Email: jaramillo@stanford.edu
URL: http://jaramillogroup.stanford.edu

Chaitan Khosla
Professor; Wells H. Rauser and Harold M. Petiprin Professor
CHEMICAL ENGINEERING, CHEMISTRY, BIOCHEMISTRY BY COURTESY

Research interests in Khosla's laboratory lie at the interface of enzyme chemistry and medicine. For the past several years, the lab has investigated the catalytic mechanisms of modular megasynthases such as polyketide synthases, with the concomitant goal of harnessing their programmable chemistry for preparing pharmaceutically relevant natural products. Recent accomplishments include methods for heterologous production of polyketides; genetically reprogrammed biosynthesis of anthraquinones and polypropionates; and chemo-biosynthesis of new polyketides not readily affordable by synthetic or biological methods alone. More recently, the lab has investigated the pathogenesis of celiac sprue and has explored three potential therapeutic strategies for this widespread but overlooked disease. PhD 1990 Caltech

Phone: 650-723-6538; Email: khosla@stanford.edu
URL: http://www.stanford.edu/dept/chemistry/faculty/khosla/

Jens Nørskov
Professor; Leland T. Edwards Professor in the School of Engineering
CHEMICAL ENGINEERING, PHOTON SCIENCE (SLAC)

The Nørskov group focuses on the development of electronic structure methods to describe interface phenomena including adsorption, surface chemical reactions, heterogeneous catalysis, electrocatalysis and photocatalysis. The aim is to develop concepts to understand which surface properties, electronic and geometrical, determine their chemical activity. An additional aim is to use the insight in combination with large-scale computations to design new catalytic surfaces and nanostructures. Applications are primarily in energy transformations including (photo-) electrochemical water splitting, CO2 reduction, N2 reduction and syngas reactions. PhD 1979 Aarhus University, Denmark

Phone: 650-926-3647, 650-723-8487; Email: norskov@stanford.edu
URL: http://suncat.slac.stanford.edu/

Elizabeth Sattely
Assistant Professor
CHEMICAL ENGINEERING

Plants have an extraordinary capacity to harvest atmospheric carbon dioxide and sunlight for the production of energy-rich biopolymers, clinically used drugs and other biologically active small molecules. The metabolic pathways that produce these compounds are key to developing sustainable biofuel feedstocks, protecting crops from pathogens and discovering new natural-product–based therapeutics for human disease. These applications motivate us to find new ways to elucidate and engineer plant metabolism. Satelly's group uses a multidisciplinary approach combining chemistry, enzymology, genetics and metabolomics to tackle problems that include new methods for delignification of lignocellulosic biomass and the engineering of plant antibiotic biosynthesis. PhD 2007 Boston College

Phone: 650-724-5928; Email: sattely@stanford.edu

Eric Shaqfeh
Professor and Chair; Lester Levi Carter Professor
CHEMICAL ENGINEERING, MECHANICAL ENGINEERING

Shaqfeh's current research interests include non-Newtonian fluid mechanics, especially in the area of elastic instabilities and turbulent drag reduction; nonequilibrium polymer statistical dynamics, focusing on single molecule studies of DNA; and suspension mechanics, particularly of fiber suspensions and particles/vesicles in microfluidics. PhD 1986 Stanford

Phone: 650-723-3764; Email: esgs@stanford.edu

Andrew Spakowitz
Associate Professor
CHEMICAL ENGINEERING, MATERIALS SCIENCE AND ENGINEERING BY COURTESY, APPLIED PHYSICS BY COURTESY

The Spakowitz lab is engaged in projects that address fundamental chemical and physical processes that underlie a range of key biological mysteries and cutting-edge materials applications. Current research focuses on three main themes: DNA biophysics, protein self-assembly and charge transport in conjugated polymers. These broad research areas offer complementary perspectives on chemical and physical processes. The lab's work draws from a diverse range of theoretical and computational methods, including analytical theory of semiflexible polymers, polymer field theory, continuum elastic mechanics, Brownian dynamics simulation, equilibrium and dynamic Monte Carlo simulations, and analytical theory and numerical simulations of reaction-diffusion phenomena. PhD 2004 Caltech

Phone: 650-736-8733; Email: ajspakow@stanford.edu

Alfred Spormann
Professor
CHEMICAL ENGINEERING, CIVIL AND ENVIRONMENTAL ENGINEERING, BIOLOGY BY COURTESY

The Spormann group investigates molecular microbial metabolism and its linkage to ecological and evolutionary processes; explores the distinguishing features of novel microbial metabolism and how molecular and biochemical differences in metabolism shape microbial fitness; and studies novel microbial metabolism with relevance to bioremediation, bioenergy and intestinal microbiology. Current research includes microbial reductive dehalogenation; microbial electrosynthesis and electron transport between microbes and surfaces; and microbial metabolic processes in the large intestine. PhD 1989 Philipps University, Marburg, Germany

Phone: 650-723-3668, 650-724-4927; Email: spormann@stanford.edu

James Swartz
Professor; James H. Clark Professor in the School of Engineering
CHEMICAL ENGINEERING, BIOENGINEERING

Current and projected research in the Swartz lab balances basic research in microbial metabolism, protein expression and protein folding with a strong emphasis on compelling applications. The lab performs fundamental research on the mechanisms and kinetics of ribosomal function, fundamental bioenergetics, basic mechanisms of protein folding, functional genomics and metabolic pathway analysis. The work is motivated by a variety of near- and medium-term applications spanning medicine, energy and environmental needs. In the medical area, current research addresses the need for patient-specific vaccines to treat cancer, particularly for lymphomas. To address pressing needs for a new and cleaner energy source, the lab is working toward an organism that can efficiently capture solar energy and convert it into hydrogen. To address

environmental needs, the lab is developing improved water filters using the membrane protein Aquaporin Z. PhD 1978 MIT

Phone: 650-723-5398; Email: jswartz@stanford.edu

Clifford Wang
Assistant Professor
CHEMICAL ENGINEERING

Wang's research aspires to understand and quantify genetic principles involved in cancer, aging and cell culture engineering. Specifically, he studies how co-expression of multiple genes over a range of expression levels determines cell proliferation, survival and other phenotypic outcomes. His lab plots genetic europhase diagrams that describe cell fates determined by combinatorial gene expression. To achieve these objectives, he is developing genetic tools that allow him to control gene expression and quantify phenotypic outcome. PhD 2000 UC Berkeley

Phone: 650-736-1807; Email: cliff.wang@stanford.edu

CIVIL AND ENVIRONMENTAL ENGINEERING

The Department of Civil and Environmental Engineering comprises seven programs: Construction Engineering and Management, Structural Engineering and Geomechanics, Environmental Engineering and Science, Environmental Fluid Mechanics and Hydrology, Atmosphere and Energy, Design and Construction Integration, and Architectural Design. The department also offers a degree specialization in Design-Construction Integration.

Chair: Stephen Monismith
Information: 650-723-3922

Jack Baker
Associate Professor
CIVIL AND ENVIRONMENTAL ENGINEERING

Baker's research focuses on the use of probabilistic and statistical tools for modeling of extreme loads on structures. He has investigated probabilistic modeling of seismic hazards, improved characterization of earthquake ground motions, dynamic analysis of structures, prediction of the spatial extent of soil failures from earthquakes and tools for modeling loads on spatially distributed infrastructure systems. He joined Stanford from the Swiss Federal Institute of Technology (ETH Zurich), where he was a visiting researcher in the Department of Structural Engineering. He has industry experience in seismic hazard assessment, ground motion selection, construction management and modeling of catastrophe losses for insurance companies. PhD 2005 Stanford

Phone: 650-725-2573; Email: bakerjw@stanford.edu; URL: http://www.stanford.edu/~bakerjw/

Sarah Billington
Professor; Senior Fellow, Stanford Woods Institute for the Environment; Milligan Family University Fellow in Undergraduate Education
CIVIL AND ENVIRONMENTAL ENGINEERING

Billington's group conducts research on sustainable, durable construction materials and their application to structures and construction. Two current areas of focus are damage-tolerant, high-performance fiber-reinforced cementitious composite materials and bio-based fiber-reinforced polymeric composites that have a closed loop life-cycle. Billington is developing methodologies for performance-based durability engineering with a focus on reducing the impacts of corrosion in structural concrete bridges and assessing the impact of climate change on the vulnerability of bridges to damage or collapse caused by scour. She also is studying the impact of web-based activities on mechanics self-efficacy and achievement in an introductory course on solid mechanics.
PhD 1998 University of Texas, Austin

Phone: 650-723-4125; Email: billington@stanford.edu
URL: https://billington-group.stanford.edu/

Alexandria Boehm
Associate Professor; Senior Fellow, Stanford Woods Institute for the Environment
CIVIL AND ENVIRONMENTAL ENGINEERING

Boehm's primary research areas are coastal water quality and sanitation. The work on coastal water quality is focused on understanding the sources, transformation, transport and ecology of biocolloids; specifically, fecal indicator organisms, pathogens and phytoplankton, as well as sources and fate of nitrogen and phosphorus. This knowledge is crucial to directing new policies, and management and engineering practices that protect human and ecosystem health along the coasts. The work on sanitation aims to develop microbial risk assessment models to gain a better understanding of how pathogens are transmitted to humans through their contact with water, feces and contaminated surfaces. Research is focused

on key problems in developed and developing countries. The goal is to design and test effective interventions and technologies for reducing the burden of infectious disease. PhD 2000 UC-Irvine

Phone: 650-724-9128; Email: aboehm@stanford.edu; URL: http://www.stanford.edu/~aboehm

Ronaldo Borja
Professor
CIVIL AND ENVIRONMENTAL ENGINEERING

Borja works in computational mechanics, geomechanics and geosciences. His research includes developing strain localization and failure models for soils and rocks, modeling coupled solid deformation/fluid flow phenomena in porous materials, and finite element modeling of faulting, cracking and fracturing in quasi-brittle materials. PhD 1984 Stanford

Phone: 650-723-3664; Email: borja@stanford.edu; URL: http://www.stanford.edu/~borja

Craig Criddle
Professor; Senior Fellow, Stanford Woods Institute for the Environment by courtesy
CIVIL AND ENVIRONMENTAL ENGINEERING

Criddle's research focuses on biotechnology and microbial ecology for clean water, clean energy and healthy ecosystems. PhD 1990 Stanford

Phone: 650-723-9032; Email: criddle@stanford.edu
URL: http://www.stanford.edu/group/evpilot

Jenna Davis
Associate Professor; Higgins-Magid Senior Fellow, Stanford Woods Institute for the Environment
CIVIL AND ENVIRONMENTAL ENGINEERING

Davis' research and teaching is focused at the interface of engineered water supply and sanitation systems and their users in developing countries. With a background in public health, infrastructure planning, and environmental science and engineering, she explores questions related to interventions that trigger household investment in water, sanitation and hygiene improvements; the features of water and sanitation services that users value and why; and the health and economic impacts of improvements in water supply and sanitation. She has conducted field research in more than a dozen countries, including Kenya, Mozambique and Bangladesh. PhD 1998 UNC-Chapel Hill

Phone: 650-725-9170; Email: jennadavis@stanford.edu
URL: http://jennadavis.stanford.edu

Gregory Deierlein
Professor; John A. Blume Professor in the School of Engineering
CIVIL AND ENVIRONMENTAL ENGINEERING

Deierlein's research focuses on improving limit state design of constructed facilities through the development and application of nonlinear structural analysis methods and performance-based design criteria. Recent projects include the development and application of strength and stiffness degrading models to simulate steel and reinforced concrete structures, seismic design and behavior of composite steel-concrete buildings, analysis of inelastic torsional-flexural instability of steel members and a fracture mechanics investigation of seismically designed welded steel connections. PhD 1988 University of Texas, Austin

Phone: 650-723-0453, 650-723-4150; Email: ggd@stanford.edu

Martin Fischer
Professor; Senior Fellow, Precourt Institute for Energy
CIVIL AND ENVIRONMENTAL ENGINEERING, COMPUTER SCIENCE BY COURTESY

Fischer's research goals are to improve the productivity of project teams involved in designing, building and operating facilities, and to enhance the sustainability of the built environment. His work develops the theoretical foundations and applications for virtual design and con-

struction (VDC). VDC methods support the design of a facility and its delivery process and help reduce the costs and maximize the value over its lifecycle. His research has been used by many small and large industrial government organizations around the world. PhD 1991 Stanford

Phone: 650-725-4649; Email: fischer@stanford.edu; URL: http://www.stanford.edu/~fischer

David Freyberg
Associate Professor; Senior Fellow, Stanford Woods Institute for the Environment
CIVIL AND ENVIRONMENTAL ENGINEERING

A hydrologist and water resources specialist, Freyberg studies reservoir sedimentation and hydrology, hydrologic ecosystem services, summer drying of Pacific coast intermittent streams, tropical rainfall and throughfall, surface water–ground water interactions, especially in reservoir/sediment systems, and scaling and spatial distribution of recycled water systems. PhD 1981 Stanford

Phone: 650-723-3234; Email: freyberg@stanford.edu
URL: http://www-ce.stanford.edu/faculty/freyberg/

Oliver Fringer
Associate Professor
CIVIL AND ENVIRONMENTAL ENGINEERING

Fringer's research focuses on the development and application of numerical models and high-performance computational techniques to the study of fundamental processes that influence the dynamics of the coastal ocean, rivers, lakes and estuaries. PhD 2003 Stanford

Phone: 650-450-1137; Email: fringer@stanford.edu; URL: http://www.stanford.edu/~fringer/

Lynn Hildemann
Professor
CIVIL AND ENVIRONMENTAL ENGINEERING

Hildemann's research areas include the sources and dispersion of indoor aerosols, the physicochemical properties of organic aerosols and assessment of human exposure to particulate matter. She has served on advisory committees for the Bay Area Air Quality Management District and for the California Air Resources Board, and as associate editor for *Environmental Science & Technology and for Aerosol Science & Technology*.
PhD 1989 Caltech

Phone: 650-723-0819; Email: hildemann@stanford.edu
URL: http://profiles.stanford.edu/lynn-hildemann

Mark Jacobson
Professor; Senior Fellow, Precourt Institute for Energy; Senior Fellow, Stanford Woods Institute for the Environment
CIVIL AND ENVIRONMENTAL ENGINEERING

Jacobson's research seeks to understand physical, chemical and dynamical processes in the atmosphere in order to solve atmospheric problems, such as global warming and urban air pollution, with improved scientific insight and more accurate predictive tools. He also evaluates the atmospheric and health effects of proposed energy and transportation solutions to global warming and air pollution, maps renewable energy resources and studies optimal methods of integrating renewable electricity into the grid. PhD 1994 UCLA

Phone: 650-723-6836; Email: jacobson@stanford.edu
URL: http://www.stanford.edu/group/efmh/jacobson/

Anne Kiremidjian
Professor
CIVIL AND ENVIRONMENTAL ENGINEERING

Kiremidjian's current research focuses on the design and implementation of wireless sensor networks for structural damage and health monitoring and the development of robust algorithms for structural damage diagnosis that can be embedded in wireless sensing units. She works on structural

component and systems reliability methods; structural damage evaluation models; and regional damage, loss and casualty estimation methods utilizing geographic information and database management systems for portfolios of buildings or spatially distributed lifeline systems assessment with ground motion and structure correlations. PhD 1977 Stanford

Phone: 650-723-4121, 650-723-4164; Email: ask@stanford.edu

Peter K. Kitanidis
Professor
CIVIL AND ENVIRONMENTAL ENGINEERING

Kitanidis develops methods for the solution of interpolation and inverse problems utilizing observations and mathematical models of flow and transport. He studies dilution and mixing of soluble substances in heterogeneous geologic formations, issues of scale in mass transport in heterogeneous porous media and techniques to speed up the decay of pollutants in situ. He also develops methods for hydrologic forecasting and the optimization of sampling and control strategies. PhD 1978 MIT

Phone: 650-723-8321; Email: peterk@stanford.edu
URL: http://www.stanford.edu/~peterk

Jeffrey Koseff
Professor; William Alden Campbell and Martha Campbell Professor in the School of Engineering; Perry L. McCarty Director of the Stanford Woods Institute for the Environment; Michael Forman University Fellow in Undergraduate Education
CIVIL AND ENVIRONMENTAL ENGINEERING

Koseff, founding co-director of the Stanford Woods Institute, is an expert in the emerging interdisciplinary domain of environmental fluid mechanics. His research focuses on the interaction between physical and biological systems in natural aquatic environments, and in particular on turbulence and internal wave dynamics; transport, mixing and phytoplankton dynamics in estuarine systems; and coral reef, kelp forest and sea-grass hydrodynamics. Long-term research projects include understanding the transport of mass and energy in estuarine systems such as San Francisco Bay, and understanding how water flow affects the functioning of California kelp forests and coral reef systems of the Great Barrier Reef, the Red Sea and Hawaii. PhD 1983 Stanford

Phone: 650-736-2363; Email: koseff@stanford.edu

Kincho Law
Professor
CIVIL AND ENVIRONMENTAL ENGINEERING

Law studies the application of advanced computing principles and techniques for structural engineering analysis and design. His research interests include computational mechanics, numerical methods, and analysis and simulation of large-scale systems using distributed workstations and high-performance parallel computers. His work has also dealt with sensing, monitoring and control of structures as well as various aspects of computer-aided design, including application of information technology to facilitate regulatory compliance assistance, to facilitate analysis and design of building structures and to coordinate concurrent engineering design activities. PhD 1981 Carnegie Mellon

Phone: 650-725-3154; Email: law@stanford.edu
URL: http://eil.stanford.edu/law

James Leckie
Professor; C. L. Peck, Class of 1906, Professor in Engineering
CIVIL AND ENVIRONMENTAL ENGINEERING, GEOLOGICAL AND ENVIRONMENTAL SCIENCES BY COURTESY

Leckie investigates chemical pollutant behavior in natural aquatic systems and engineered processes, specifically the environmental aspects of surface and colloid chemistry and the geochemistry of

trace elements. New research efforts are focused on the development of techniques and models for assessment of exposure of humans to toxic chemicals. Specific attention has been paid to the evaluation of exposure of young children to toxic chemicals. Other interests include technology transfer and the development of environmental science programs in developing nations. PhD 1970 Harvard

Phone: 650-723-2524; Email: leckie@stanford.edu; URL: http://www.stanford.edu/~jleckie

Michael Lepech
Assistant Professor
CIVIL AND ENVIRONMENTAL ENGINEERING

Lepech's research focuses on the integration of sustainability indicators into engineering design, ranging from materials design, structural design and system design to operations management. Such sustainability indicators include a comprehensive set of environmental, economic and social costs. Recently his research has focused on the design of sustainable high-performance fiber-reinforced cementitious composites and fiber-reinforced polymers, the impacts of sustainable materials on building and infrastructure design and operation, and the development of new life-cycle assessment applications for building systems, transportation systems, water systems and consumer products. He also studies the effects that slowly diffusing sustainable civil engineering innovations, and the social networks they diffuse through, can have on achieving long-term sustainability goals. PhD 2006 Michigan

Phone: 650-724-9459; Email: mlepech@stanford.edu

Raymond Levitt
Professor; Kumagai Professor in the School of Engineering; Senior Fellow, Stanford Woods Institute for the Environment
CIVIL AND ENVIRONMENTAL ENGINEERING

Levitt's research program develops theory, methods and tools to design organization structures and governance regimes for project and matrix organization structures in construction and other project-based industries. He is founder and director of the Global Projects Center, which conducts research aimed at developing new financing, governance and organizational approaches to enhance the long-term financial, environmental and social sustainability of critically needed, but institutionally challenging, civil infrastructure projects. He is also the founder and academic director of the Stanford Advanced Project Management executive education certificate program. PhD 1975 Stanford

Phone: 650-723-2677; Email: rel@stanford.edu; URL: http://stanford.edu/people/~rel

Christian Linder
Assistant Professor
CIVIL AND ENVIRONMENTAL ENGINEERING

Linder studies the development of advanced computational methods and mathematical frameworks to predict the mechanical response of new materials. Relying on a detailed representation of the actual material microstructure, his models allow researchers to understand microscopic mechanisms in biological materials and subsequently to mimic and adapt those to new human-made sustainable materials with unprecedented mechanical properties used in large-scale civil and environmental engineering applications. He is particularly interested in soft matter materials such as elastomers, nonwoven fabrics, hydrogels and cellular foams, and his numerical methods range from macroscopic continuum-based finite element simulations to highly parallelized nanoscale electronic structure calculations. PhD 2007 UC Berkeley

Phone: 650-723-2918; Email: linder@stanford.edu

Richard Luthy
Professor; Silas H. Palmer Professor in Civil Engineering; Senior Fellow, Stanford Woods Institute for the Environment by courtesy
CIVIL AND ENVIRONMENTAL ENGINEERING

Luthy is the director of the NSF Engineering Research Center for Re-inventing the Nation's Urban Water Infrastructure (ReNUWIt), a four-university consortium that seeks more sustainable solutions to urban water challenges in the arid West. His area of teaching and research is environmental engineering and water quality with applications to water reuse, stormwater use and systems-level analysis of urban water challenges. His research addresses management of persistent organic contaminants and contaminants of emerging concern in natural systems that are engineered to improve water quality and protect the environment and human health. PhD 1976 UC Berkeley

Phone: 650-721-2615; Email: luthy@stanford.edu; URL: http://www.renuwit.org

Eduardo Miranda
Associate Professor
CIVIL AND ENVIRONMENTAL ENGINEERING

Miranda's research involves development of knowledge and tools to integrate structural engineering with construction and management engineering in order to design projects that perform better, are faster to build and are more economical to design, build and maintain. Other areas of research include performance-based engineering and earthquake engineering. PhD 1991 UC Berkeley

Phone: 650-723-4450; Email: emiranda@stanford.edu

William Mitch
Associate Professor
CIVIL AND ENVIRONMENTAL ENGINEERING

Mitch's laboratory focuses on understanding the fundamental reaction pathways associated with the formation and destruction of organic contaminants in freshwater and saline systems; prevention of the formation of nitrogen-based disinfection byproducts; and treating byproducts of carbon sequestration. PhD 2003 UC Berkeley

Email: wamitch@stanford.edu

Stephen Monismith
Professor and Chair; Obayashi Professor in the School of Engineering; Senior Fellow, Stanford Woods Institute for the Environment
CIVIL AND ENVIRONMENTAL ENGINEERING

Monismith is director of the Environmental Fluid Mechanics Laboratory. His research in environmental and geophysical fluid dynamics involves the application of fluid mechanics principles to the analysis of flow processes operating in rivers, lakes, estuaries and the oceans, with a particular interest in the ecological impacts of those flows. His current research includes studies of estuarine hydrodynamics and mixing processes, flows over coral reefs and on the inner shelf, turbulence in density stratified fluids, and physical-biological interactions in phytoplankton and benthic systems. Current projects include field and computational work on wave-driven flows over coral reefs, stratified turbulence caused by shoaling internal waves, benthic grazing on coral reefs and in kelp forests, dispersion in complex estuarine tidal flows, and lab and computational studies of flows through coral colonies. PhD 1983 UC Berkeley

Phone: 650-723-3921; Email: monismith@stanford.edu

Leonard Ortolano
Professor; UPS Foundation Professor of Civil Engineering in Urban and Regional Planning
CIVIL AND ENVIRONMENTAL ENGINEERING

Ortolano is concerned with environmental and water resources policy and planning. His research stresses environmental policy implementation in developing countries and the role of non-governmental organizations in environmental management. His recent interests center on corporate environmental management. PhD 1969 Harvard

Phone: 650-723-2937, 650-723-4662; Email: ortolano@stanford.edu

Ram Rajagopal
Assistant Professor
CIVIL AND ENVIRONMENTAL ENGINEERING, ELECTRICAL ENGINEERING BY COURTESY

Rajagopal works on renewable energy, the smart grid, algorithms for load forecasting, dynamic response and energy policy.
PhD 2009 UC Berkeley

Phone: 650-725-4268; Email: ram.rajagopal@stanford.edu

Alfred Spormann
Professor
CIVIL AND ENVIRONMENTAL ENGINEERING, CHEMICAL ENGINEERING, BIOLOGY BY COURTESY

The Spormann group investigates molecular microbial metabolism and its linkage to ecological and evolutionary processes; explores the distinguishing features of novel microbial metabolism and how molecular and biochemical differences in metabolism shape microbial fitness; and studies novel microbial metabolism with relevance to bioremediation, bioenergy and intestinal microbiology. Current research includes microbial reductive dehalogenation; microbial electrosynthesis and electron transport between microbes and surfaces; and microbial metabolic processes in the large intestine. PhD 1989 Philipps University, Marburg, Germany

Phone: 650-723-3668, 650-724-4927; Email: spormann@stanford.edu

COMPUTER SCIENCE

Strong research exists in the areas of systems, software, networking, databases, security, graphics, foundations of computer science, artificial intelligence, robotics and scientific computing. In addition to basic research, interdisciplinary work on applications that stimulate basic research has been undertaken in fields of genetics, biology, linguistics, physics, medicine and various branches of engineering.

Chair: Alex Aiken

Information: 650-723-5396

Alex Aiken
Professor and Chair; Alcatel-Lucent Professor in Communications and Networking
COMPUTER SCIENCE

Aiken's research focuses on developing techniques for the construction of reliable software systems. His interests include both static and dynamic methods of analyzing programs, and span both detecting errors and verifying the absence of errors in software. Most of his research combines a theoretical component (for example, proving the soundness of an analysis technique) and a practical component, which often involves the implementation and measurement of advanced program analysis algorithms. His research also extends to the design of new programming languages and programming techniques in which it is easier to write software that can be checked for a wide variety of errors. PhD 1988 Cornell

Phone: 650-725-3359; Email: aiken@cs.stanford.edu; URL: http://theory.stanford.edu/~aiken

Serafim Batzoglou
Associate Professor
COMPUTER SCIENCE

Batzoglou's research has focused on the development of algorithms and systems for genomics. Some of the topics he is working on include sequence alignment algorithms, hidden Markov models, whole-genome comparison, annotation of biological features in genomes, microarray analysis, gene regulation and DNA sequencing. PhD 2000 MIT

Phone: 650-723-3334; Email: serafim.batzoglou@stanford.edu

URL: http://ai.stanford.edu/~serafim

Gill Bejerano
Associate Professor
COMPUTER SCIENCE, DEVELOPMENTAL BIOLOGY, PEDIATRICS

The Bejerano Lab studies genome function in human and related species. This involves mapping genome sequence (variation) to phenotype (differences) and extracting specific genetic insights from deep sequencing measurements. A particular interest is gene cis regulation. The researchers collect large scale experimental data, write computational analysis tools and run them massively to discover the most exciting testable hypotheses, which they proceed to experimentally validate. Members of the lab work in small teams, in house or with close collaborators of experimentalists and computational tool users who interact directly with computational tool builders. PhD 2004 Hebrew University of Jerusalem, Israel

Phone: 650-723-7666; Email: bejerano@stanford.edu; URL: http://bejerano.stanford.edu

Michael Bernstein
Assistant Professor
COMPUTER SCIENCE

Bernstein combines computation with crowds, creating systems that enable people to connect and coordinate online. His group's research in human-computer interaction embeds crowd work into interactive systems, designs social computing systems and mines crowd data for interactive applications. PhD 2012 MIT

Phone: 650-724-1248; Email: msb@cs.stanford.edu; URL: http://hci.stanford.edu/msb/

Dan Boneh
Professor
COMPUTER SCIENCE, ELECTRICAL ENGINEERING

Boneh's main research area is applied cryptography and network security. His focus is on building security mechanisms that are easy to use and deploy. He has developed new mechanisms for improving web security, file system security and copyright protection. He contributed to the security and performance of the RSA cryptosystem and contributed to the study of cryptographic watermarking. PhD 1996 Princeton

Phone: 650-725-3897; Email: dabo@cs.stanford.edu
URL: http://crypto.stanford.edu/~dabo

David Cheriton
Professor
COMPUTER SCIENCE

Cheriton's research includes the areas of high-performance distributed systems and high-speed computer communication with a particular interest in protocol design. He leads the Distributed Systems Group in the TRIAD project, focused on understanding and solving problems with the Internet architecture. He has also been teaching and writing about object-oriented programming, building on his experience with OOP in systems building. PhD 1978 Waterloo

Phone: 650-723-1131; Email: cheriton@cs.stanford.edu
URL: http://www.stanford.edu/~cheriton

Stephen Cooper
Professor (Teaching)
COMPUTER SCIENCE

Cooper's research focuses on program visualization and computer science education. Current research projects include the creation of a serious game to teach secure coding practices to novice programmers, incorporation of an intelligent tutoring system into Alice (www.alice.org), and a new Google-like approach toward digital libraries to make them more usable when searching for curricular materials. He is also interested in information security education. PhD 1997 Syracuse

Phone: 650- 723-9798; Email: coopers@stanford.edu
URL: http://web.stanford.edu/~coopers/

William Dally
Professor (Research)
ELECTRICAL ENGINEERING, COMPUTER SCIENCE

Dally investigates methods for applying VLSI technology to solve information processing problems. Current projects include network architecture, multicomputer architecture, media-processor architecture and high-speed (4Gb/s) CMOS signaling. His group has pioneered techniques including fast capability-based addressing, processor coupling, virtual channel flow control, wormhole routing, link-level retry, message-driven processing and deadlock-free routing. PhD 1986 Caltech

Phone: 650-725-8945; Email: dally@stanford.edu
URL: http://cva.stanford.edu/billd_webpage_new.html

David Dill
Professor
COMPUTER SCIENCE, ELECTRICAL ENGINEERING BY COURTESY

Dill has interests in computational systems biology as well as the theory and application of formal verification techniques to system designs, which encompass hardware, protocols and software. He has also done research in asynchronous circuit verification and synthesis, and in verification methods for hard real-time systems. PhD 1987 Carnegie Mellon

Phone: 650-725-3642; Email: dill@cs.stanford.edu
URL: http://verify.stanford.edu/dill

Ron Dror
Associate Professor
COMPUTER SCIENCE, MOLECULAR AND CELLULAR PHYSIOLOGY BY COURTESY

Dror's primary research interests are in computational biology, with an emphasis on spatial structure and dynamics at the molecular and cellular levels. His work, usually carried out in close collaboration with experimentalists, spans fields ranging from biochemistry and cell biology to parallel computing, image processing and machine learning. PhD 2003 MIT

Phone: 650-497-8586; Email: ron.dror@stanford.edu

Dawson Engler
Associate Professor
COMPUTER SCIENCE, ELECTRICAL ENGINEERING

Engler's research focuses both on building interesting software systems and on discovering and exploring the underlying principles of all systems. PhD 1998 MIT

Phone: 650-723-0762; Email: engler@stanford.edu
URL: http://www.stanford.edu/~engler

Ron Fedkiw
Professor
COMPUTER SCIENCE, ELECTRICAL ENGINEERING BY COURTESY

Fedkiw's research is focused on the design of new computational algorithms for a variety of applications including computational fluid dynamics, computer graphics and biomechanics. PhD 1996 UCLA

Email: fedkiw@cs.stanford.edu
URL: http://graphics.stanford.edu/~fedkiw

Hector Garcia-Molina
Professor; Leonard Bosack and Sandra K. Lerner Professor in Engineering
COMPUTER SCIENCE, ELECTRICAL ENGINEERING

Garcia-Molina's research interests include distributed computing systems, database systems and digital libraries. PhD 1979 Stanford

Phone: 650-723-0685; Email: hector@cs.stanford.edu
URL: http://www-db.stanford.edu/people/hector.html

Michael Genesereth
Associate Professor
COMPUTER SCIENCE, LAW BY COURTESY

Genesereth is best known for his work on computational logic and applications of that work in enterprise management and electronic commerce. Basic research interests include knowledge representation, automated reasoning and rational action. Current projects include logical spreadsheets, data and service integration on the World Wide Web, and computational law. PhD 1978 Harvard

Phone: 650-723-0934; Email: genesereth@stanford.edu
URL: http://logic.stanford.edu/people/genesereth

Leonidas Guibas
Professor; Paul Pigott Professor in Engineering
COMPUTER SCIENCE, ELECTRICAL ENGINEERING BY COURTESY

Guibas leads the Geometric Computation group in the Computer Science department and is a member of the Computer Graphics and Artificial Intelligence laboratories. He works on algorithms for sensing, modeling, reasoning, rendering and acting on the physical world. His interests span computational geometry, geometric modeling, computer graphics, computer vision, sensor networks, robotics and discrete algorithms. His current interests include geometric modeling with point cloud data, deformations and contacts, organizing and searching libraries of 3D shapes and images, sensor networks for lightweight distributed estimation/reasoning, analysis

of GPS traces and other mobility data, and modeling the shape and motion of biological macromolecules and other biological structures. More theoretical work is aimed at investigating fundamental computational issues and limits in geometric computing and modeling. PhD 1976 Stanford

Phone: 650-723-0304; Email: guibas@cs.stanford.edu
URL: http://graphics.stanford.edu/~guibas

Pat Hanrahan
Professor; Canon USA Professor in the School of Engineering
COMPUTER SCIENCE, ELECTRICAL ENGINEERING

Hanrahan's current research involves rendering algorithms, high-performance graphics architectures and systems support for graphical interaction. He also has worked on raster graphics systems, computer animation, and modeling and scientific visualization, in particular, volume rendering. PhD 1986 Wisconsin

Phone: 650-723-8530; Email: hanrahan@cs.stanford.edu
URL: http://www-graphics.stanford.edu/~hanrahan

John Hennessy
Professor; President of Stanford University; Bing Presidential Professor
COMPUTER SCIENCE, ELECTRICAL ENGINEERING

Hennessy's research is in the area of computer architecture. His early research was centered on the development of MIPS, one of the first RISC microprocessors. His recent research involves the architecture and effective use of large-scale parallel machines. His group developed DASH, the first scalable cache-coherent multiprocessor, which is now the base for a number of commercial developments. In addition to his research activities, Hennessy is a coauthor of leading graduate and undergraduate texts in computer architecture. PhD 1977 SUNY-Stony Brook

Phone: 650-724-8960; Email: president@stanford.edu
URL: http://president.stanford.edu/

Mark Horowitz
Professor; Yahoo! Founders Professor in the School of Engineering
COMPUTER SCIENCE, ELECTRICAL ENGINEERING

Horowitz's current research interests include updating both analog and digital design methods, low energy multiprocessor designs, computational photography and applying engineering to biology. PhD 1984 Stanford

Phone: 650-725-3707; Email: horowitz@ee.stanford.edu
URL: http://www-vlsi.stanford.edu/~horowitz

Daniel Jurafsky
Professor; Chair, Department of Linguistics
COMPUTER SCIENCE, LINGUISTICS

Jurafsky's research ranges widely across computational linguistics. Special interests include natural language understanding, machine translation, spoken language and conversation, the relationship between human and machine processing, and the application of natural language processing to the social and behavioral sciences. He also works on the linguistics of food and the linguistics of Chinese. PhD 1992 UC Berkeley

Email: jurafsky@stanford.edu; URL: http://web.stanford.edu/~jurafsky/

Sachin Katti
Assistant Professor
COMPUTER SCIENCE, ELECTRICAL ENGINEERING

Katti's research focuses on designing and building next-generation high-capacity wireless networks using techniques from information and coding theory. His research interests are in networks, wireless communications, applied coding theory and security. PhD 2009 MIT

Phone: 650-724-8960; Email: skatti@stanford.edu
URL: http://stanford.edu/~skatti

Oussama Khatib
Professor
COMPUTER SCIENCE, MECHANICAL ENGINEERING BY COURTESY

Khatib's research is in autonomous robots, human-centered robotics, human-friendly robot design, dynamic simulations and haptic interactions. His exploration in this research ranges from the autonomous ability of a robot to cooperate with a human to the haptic interaction of a user with an animated character, virtual prototype or surgical instrument. PhD 1980 Sup-Aero, France

Phone: 650-723-9753; Email: khatib@cs.stanford.edu; URL: http://robotics.stanford.edu/~ok

Christoforos Kozyrakis
Associate Professor
COMPUTER SCIENCE, ELECTRICAL ENGINEERING

Kozyrakis' research focuses on making computer systems of any size faster, cheaper and greener. His current work focuses on the hardware architecture, runtime environment, programming models and security infrastructure for warehouse-scale data centers and many-core chips with thousands of general purpose cores and fixed-function accelerators. PhD 2002 UC Berkeley

Email: christos@ee.stanford.edu; URL: http://csl.stanford.edu/~christos

Anshul Kundaje
Assistant Professor
COMPUTER SCIENCE, GENETICS

Kundaje's research focus is the development of machine learning and computational frameworks to learn integrative models of transcriptional and post-transcriptional gene regulation from massive amounts of diverse sequence, genetic and functional genomic datasets. PhD 2008 Columbia

Phone: 650-723-2353; Email: akundaje@stanford.edu; URL: http://anshul.kundaje.net

Monica Lam
Professor
COMPUTER SCIENCE, ELECTRICAL ENGINEERING BY COURTESY

Lam is the faculty director of the Stanford MobiSocial Laboratory, whose goal is to create disruptive mobile and social computing technology that serves consumers' interests and benefits the economy in the long term. Released software prototypes and further information can be found at http://mobisocial.stanford.edu. PhD 1987 Carnegie Mellon

Phone: 650-725-3714; Email: lam@stanford.edu
URL: http://cs.stanford.edu/~lam

James Landay
Professor
COMPUTER SCIENCE

Landay's current research interests include technology to support behavior change, demonstrational interfaces, mobile and ubiquitous computing, and user interface design tools. PhD 1996 Carnegie Mellon

Phone: 650-498-0533; Email: landay@stanford.edu

Jure Leskovec
Assistant Professor
COMPUTER SCIENCE

Leskovec's research focuses on the analyzing and modeling of large social and information networks as the study of phenomena across the social, technological and natural worlds. He focuses on statistical modeling of network structure; network evolution; and spread of information, influence and viruses over networks. Problems he investigates are motivated by large-scale data, the web and other online media. He also does work on text mining and applications of machine learning. PhD 2008 Carnegie Mellon

Phone: 650-725-3711; Email: jure@stanford.edu
URL: http://cs.stanford.edu/~jure/

Philip Levis
Associate Professor
COMPUTER SCIENCE, ELECTRICAL ENGINEERING

Levis' research focuses on the design and implementation of efficient software systems for embedded wireless sensor networks; embedded network sensor architecture and design; systems programming; and software engineering. PhD 2005 UC Berkeley

Phone: 650-725-9046; Email: plevis@stanford.edu

Fei-Fei Li
Associate Professor
COMPUTER SCIENCE

Li's main research interest is in vision, particularly high-level visual recognition. In computer vision, her interests include image and video classification, retrieval and understanding. Recent work in her Vision Lab relates to fundamental technological problems related to large-scale Internet data, mobile computing, machine learning and artificial intelligence. In human vision, she has studied the interaction of attention and natural scene and object recognition, and decoding the human brain fMRI activities that are known as "mind reading" of the brain. PhD 2005 Caltech

Phone: 650-725-3860; Email: feifeili@stanford.edu
URL: http://vision.stanford.edu

Percy Liang
Assistant Professor
COMPUTER SCIENCE, STATISTICS BY COURTESY

Liang studies machine learning and natural language processing, with particular interest in unsupervised learning, structured prediction, statistical learning theory, grounded language acquisition, compositional semantics and program induction. PhD 2011 UC Berkeley

Phone: 650-725-8797; Email: pliang@stanford.edu

Christopher Manning
Professor
COMPUTER SCIENCE, LINGUISTICS

Manning works on systems that can intelligently process and produce human languages. Particular research interests include probabilistic models of language, statistical natural language processing, information extraction, text mining, robust textual inference, statistical parsing, grammar induction, constraint-based theories of grammar and computational lexicography. PhD 1994 Stanford

Phone: 650-723-7683; Email: manning@cs.stanford.edu

David Mazières
Associate Professor
COMPUTER SCIENCE

Mazières investigates ways to improve the security of operating systems, file systems and distributed systems. He also has worked on large-scale peer-to-peer systems and email privacy. PhD 2000 MIT

Phone: 415-490-9451

Nick McKeown
Professor; Kleiner Perkins, Mayfield, Sequoia Capital Professor in the School of Engineering
COMPUTER SCIENCE, ELECTRICAL ENGINEERING

McKeown researches techniques to improve the Internet. Most of this work has focused on the architecture, design, analysis and implementation of high-performance Internet switches and routers. More recently, his interests have broadened to include network architecture, backbone network design, congestion control and how the Internet might be redesigned if we were to start with a clean slate. PhD 1995 UC Berkeley

Phone: 650-725-3641; Email: nickm@stanford.edu

John Mitchell
Professor; Mary and Gordon Crary Family Professor in the School of Engineering; Vice Provost for Online Learning
COMPUTER SCIENCE, ELECTRICAL ENGINEERING BY COURTESY, EDUCATION BY COURTESY

Mitchell's interests lie in computer security, including access control, network protocols and software system security; programming languages, type systems, object systems and formal methods; and applications of mathematical logic to computer science. PhD 1984 MIT

Phone: 650-723-8634; Email: mitchell@cs.stanford.edu

Subhasish Mitra
Associate Professor
COMPUTER SCIENCE, ELECTRICAL ENGINEERING

Mitra's research focuses on ways to design robust computer systems and information appliances, and covers various aspects of very-large-scale integration design and testing, computer-aided design, computer architecture and design in future nanotechnologies. PhD 2000 Stanford

Phone: 650-724-1915; Email: subh@stanford.edu

Andrew Ng
Associate Professor
COMPUTER SCIENCE, ELECTRICAL ENGINEERING BY COURTESY

Ng's research is in the areas of machine learning and artificial intelligence. He leads the STAIR (STanford Artificial Intelligence Robot) project, whose goal is to develop a home assistant robot that can perform tasks such as tidy up a room, load/unload a dishwasher, fetch and deliver items, and prepare meals using a kitchen. Ng also works on machine learning algorithms for robotic control, in which rather than relying on months of human hand-engineering to design a controller, a robot instead learns automatically how best to control itself. Ng's group also has developed algorithms that can take a single image and turn the picture into a 3D model that one can fly through and see from different angles. PhD 2002 UC Berkeley

Phone: 650-725-2593; Email: ang@cs.stanford.edu

Oyekunle Olukotun
Professor
COMPUTER SCIENCE, ELECTRICAL ENGINEERING

Olukotun's research interests are in the design, performance analysis and verification of computers. He is currently leading the Hydra single-chip multiprocessor project and is developing novel simulation, estimation and verification techniques for system-level design. PhD 1991 Michigan

Phone: 650-725-3713; Email: kunle@stanford.edu

John Ousterhout
Professor
COMPUTER SCIENCE, ELECTRICAL ENGINEERING BY COURTESY

Ousterhout's current research focuses on storage systems for large-scale datacenter applications. His previous positions include 14 years in industry, where he founded two companies (Scriptics and Electric Cloud), preceded by 14 years as professor of computer science at UC Berkeley. He is the creator of the Tcl scripting language and is also well known for his work in distributed operating systems and file systems. PhD 1980 Carnegie Mellon

Phone: 650-721-6325; Email: ouster@cs.stanford.edu
URL: http://www.stanford.edu/~ouster

Balaji Prabhakar
Professor
COMPUTER SCIENCE, ELECTRICAL ENGINEERING, MANAGEMENT SCIENCE AND ENGINEERING BY COURTESY, OPERATIONS, INFORMATION AND TECHNOLOGY AT THE GRADUATE SCHOOL OF BUSINESS BY COURTESY

Prabhakar's research focuses on the design, analysis and implementation of data networks, both wireline and wireless. He has been interested in designing network algorithms, problems in ad hoc wireless networks and designing incentive mechanisms. He has a long-standing interest in stochastic network theory, information theory, algorithms and probability theory. PhD 1994 UCLA

Phone: 650-723-6579; Email: balaji@stanford.edu

Christopher Re
Assistant Professor
COMPUTER SCIENCE

Re aims to enable users and developers to build applications that more deeply understand and exploit data. He helped discover the first join algorithm with worst-case optimal running time, which won the best paper at PODS 2012. He also helped develop a framework for feature engineering that won the best paper at SIGMOD 2014. Work from his group has been incorporated into scientific efforts including the IceCube neutrino detector and PaleoDeepDive, and into Cloudera's Impala and products from Oracle, Pivotal and Microsoft's Adam. PhD 2009 University of Washington

Phone: 650-725-3331; Email: chrismre@stanford.edu

Eric Roberts
Professor, the Charles Simonyi Professor in the School of Engineering
COMPUTER SCIENCE

From 1990-2002, Roberts served as associate chair and director of undergraduate studies for the Computer Science Department before being appointed as Senior Associate Dean in the School of Engineering and later moving on to become Faculty Director for Interdisciplinary Science Education in the office of the VPUE. PhD 1980 Harvard

Phone: 650-723-3642; Email: eroberts@cs.stanford.edu

Mendel Rosenblum
Professor
COMPUTER SCIENCE, ELECTRICAL ENGINEERING

Rosenblum's research interests include system software, distributed systems and computer architecture. He has published research in the area of disk storage management, computer simulation techniques, scalable operating system structure, virtualization computer security and mobility. PhD 1991 UC Berkeley

Phone: 650-723-0474; Email: mendel@cs.stanford.edu
URL: http://sedcl.stanford.edu

Tim Roughgarden
Associate Professor
COMPUTER SCIENCE, MANAGEMENT SCIENCE AND ENGINEERING BY COURTESY

Roughgarden's research interests lie on the interface of computer science and game theory, and he is currently investigating a wide range of game-theoretic issues in networks and auctions. PhD 2002 Cornell

Phone: 650-724-9147; Email: tim@cs.stanford.edu

Mehran Sahami
Professor (Teaching)
COMPUTER SCIENCE

Sahami's research interests include computer science education, artificial intelligence and web search. PhD 1999 Stanford
Email: sahami@cs.stanford.edu

Kenneth Salisbury
Professor (Research)
COMPUTER SCIENCE, SURGERY, MECHANICAL ENGINEERING
BY COURTESY

Salisbury's current research focuses on human-machine interaction, cooperative haptics, medical robotics and surgical simulation.
PhD 1982 Stanford
Phone: 650-721-6625; Email: jks@robotics.stanford.edu

Silvio Savarese
Assistant Professor
COMPUTER SCIENCE

Savarese directs the Computational Vision and Geometry Lab. His group's research addresses the theoretical foundations and practical applications of computational vision. His interest lies in discovering and proposing the fundamental principles, algorithms and implementations for solving high-level visual recognition and reconstruction problems such as object and scene understanding as well as human behavior recognition in the complex 3D world. PhD 2005 Caltech
Phone: 650-497-0360; Email: ssilvio@stanford.edu

Yoav Shoham
Professor
COMPUTER SCIENCE

Shoham's artificial intelligence work includes formalizing common sense (including notions such as time, causation and mental state) and multi-agent systems (including agent-oriented programming and coordination mechanisms). His current interests concern game theory pragmatics and formal models of intention. PhD 1986 Yale
Phone: 650-723-3432; Email: shoham@stanford.edu

Sebastian Thrun
Professor (Research)
COMPUTER SCIENCE

Thrun pursues research on artificial intelligence, robotics and machine learning. He also works on distributed systems, human robot interaction and programming language design. On the basic research level, he has pursued research on robust statistical programming techniques that scale to complex environments and to large decentralized robot systems. PhD 1995 University of Bonn, Germany
Phone: 650-723-2797; Email: thrun@stanford.edu

Gregory Valiant
Assistant Professor
COMPUTER SCIENCE

Valiant's primary research interests lie at the intersection of algorithms, learning, applied probability and statistics. He is particularly interested in understanding the algorithmic and information theoretic possibilities and limitations for many fundamental information extraction tasks that underly real-world machine learning and data-centric applications. He is also interested in evolution and game theory. PhD 2012 UC Berkeley
Email: gvaliant@stanford.edu

Jennifer Widom
Professor; Fletcher Jones Professor in Computer Science; Senior Associate Dean for Faculty and Academic Affairs, School of Engineering
COMPUTER SCIENCE, ELECTRICAL ENGINEERING

Widom's research interests span many aspects of nontraditional data management. PhD 1987 Cornell
Phone: 650-725-1289; Email: widom@cs.stanford.edu

Richard Ryan Williams
Assistant Professor
COMPUTER SCIENCE

Williams works in the design and analysis of efficient algorithms and computational complexity theory. A major interest is to understand how the art of finding good algorithms for solving problems relates to the art of proving lower bounds, which are limitations on solving problems via good algorithms. He also is interested in theoretical topics that help give scientific explanations for computational phenomena, such as the unreasonable effectiveness of satisfiability solvers in practice.
PhD 2007 Carnegie Mellon
Phone: 650-723-6690; Email: rrwill@stanford.edu

Virginia Vassilevska Williams
Assistant Professor
COMPUTER SCIENCE

Williams works primarily in theoretical computer science. Her research on the theory of matrix multiplication algorithms has received world-wide recognition. PhD 2008 Carnegie Mellon
Email: virgi@stanford.edu

ELECTRICAL ENGINEERING

The Department of Electrical Engineering incorporates mathematics and science in the study of signals and systems, solid-state and photonic devices, complex information processing and communications systems, digital and analog electronics, electromagnetics and materials across a broad spectrum of applications.

Chair: Abbas El Gamal
Information: 650-723-4607

Amin Arbabian
Assistant Professor
ELECTRICAL ENGINEERING

Arbabian's work covers circuit/system design in three general areas: mm-Wave and THz; biomedical; and ultra-low-power electronic sensors. In the high-frequency domain, he designs systems that handle information flow. On the biomedical front, he explores system design for emerging and hybrid medical imaging modalities, applies advanced electrical/electromagnetic interface solutions to bio-sensing applications and investigates new technologies for wireless implants. In the sensors area, he focuses on architectural solutions that enable radically miniaturized sensors. Other topics of interest include power delivery, energy storage, ultra-low-power circuit design, asymmetric communication systems and antenna interfaces. PhD 2011 UC Berkeley

Email: arbabian@stanford.edu; URL: http://www.stanford.edu/~arbabian

Nicholas Bambos
Professor
ELECTRICAL ENGINEERING, MANAGEMENT SCIENCE AND ENGINEERING

Bambos leads the Network Architecture and Performance Engineering research group, conducting research in wireless network architectures, Internet infrastructure, packet switching, network management and information service engineering. The group is engaged in various projects of his Network Architecture Laboratory (NetLab). Current technology research interests include high-performance networking, autonomic computing and service engineering. Methodological interests are in network control, online task scheduling, queuing systems and stochastic processing networks. He also leads a new research initiative on networked information service engineering. PhD 1989 UC Berkeley

Phone: 650-430-4954; Email: bambos@stanford.edu
URL: http://www.stanford.edu/dept/MSandE/people/faculty/bambos/index.html

Dan Boneh
Professor
ELECTRICAL ENGINEERING, COMPUTER SCIENCE

Boneh's main research area is applied cryptography and network security. His focus is on building security mechanisms that are easy to use and deploy. He has developed new mechanisms for improving web security, file system security and copyright protection. He contributed to the security and performance of the RSA cryptosystem and contributed to the study of cryptographic watermarking. PhD 1996 Princeton

Phone: 650-725-3897; Email: dabo@cs.stanford.edu
URL: http://crypto.stanford.edu/~dabo

Stephen Boyd
Professor; Samsung Professor in the School of Engineering
ELECTRICAL ENGINEERING, COMPUTER SCIENCE BY COURTESY, MANAGEMENT SCIENCE AND ENGINEERING BY COURTESY

Boyd's research interests include convex optimization, especially applications to engineering problems. PhD 1985 UC Berkeley

Phone: 650-723-0002; Email: stephen.boyd@stanford.edu
URL: http://www.stanford.edu/~boyd

William Dally
Professor (Research)
ELECTRICAL ENGINEERING

Dally investigates methods for applying VLSI technology to solve information processing problems. Current projects include network architecture, multicomputer architecture, media-processor architecture and high-speed (4Gb/s) CMOS signaling. His group has pioneered techniques including fast capability-based addressing, processor coupling, virtual channel flow control, wormhole routing, link-level retry, message-driven processing and deadlock-free routing. PhD 1986 Caltech

Phone: 650-725-8945; Email: dally@stanford.edu
URL: http://cva.stanford.edu/billd_webpage_new.html

John Duchi
Assistant Professor
ELECTRICAL ENGINEERING, STATISTICS

Duchi's research interests span statistics, computation, optimization and machine learning. PhD 2014 UC Berkeley

Phone: 650-498-5224; Email: jduchi@stanford.edu
URL: http://web.stanford.edu/~jduchi/

Robert Dutton
Professor; Robert and Barbara Kleist Professor in the School of Engineering
ELECTRICAL ENGINEERING

Dutton's group develops and applies computer aids to process modeling and device analysis. His circuit design activities emphasize layout-related issues of parameter extraction and electrical behavior for devices that affect system performance. Activities include primarily silicon technology modeling both for digital and analog circuits, including OE/RF applications. An emerging area of interest includes biosensors and the development of computer-aided biosensor design.
PhD 1970 UC Berkeley

Phone: 650-723-4138; Email: robert.dutton@stanford.edu
URL: http://www-tcad.stanford.edu/tcad/bios/dutton.html

Abbas El Gamal
Professor and Chair; Hitachi America Professor in the School of Engineering
ELECTRICAL ENGINEERING

El Gamal applies statistical tools, signal processing and system-on-chip design techniques to problems in imaging and configurable circuits. He also investigates theoretical problems arising in communications and networks. PhD 1978 Stanford

Phone: 650-723-5782; Email: abbas@ee.stanford.edu
URL: http://www-isl.stanford.edu/~abbas/

Audrey Ellerbee
Assistant Professor
ELECTRICAL ENGINEERING

Ellerbee's lab seeks to develop and deploy novel tools for optical imaging and sensing at the microscale and nanoscale, with applications both in the clinic and for basic science research, and with particular interest in the development of low-cost, portable technologies suited for use in poorly resourced environments. PhD 2007 Duke

Phone: 650-725-4842; Email: ellerbee@stanford.edu; URL: http://sbo.stanford.edu

Dawson Engler
Associate Professor
ELECTRICAL ENGINEERING, COMPUTER SCIENCE

Engler's research focuses both on building interesting software systems and on discovering and exploring the underlying principles of all systems. PhD 1998 MIT

Phone: 650-723-0762; Email: engler@stanford.edu; URL: http://www.stanford.edu/~engler

Jonathan Fan
Assistant Professor
ELECTRICAL ENGINEERING

Fan leads the Applied Nanophotonics Laboratory. His research focus is the engineering of "soft" optical and optoelectronic materials and devices; that is, materials and devices with unique mechanical, chemical and electrochemical properties achieved with combinations of bottom-up and top-down processing. Applications of these systems include metamaterials, optical beam shaping, detectors, displays and biomedical diagnostics. PhD 2010 Harvard

Phone: 650-723-0278; Email: jonfan@stanford.edu; URL: https://fanlab.stanford.edu/

Shanhui Fan
Professor
ELECTRICAL ENGINEERING, APPLIED PHYSICS BY COURTESY

Fan's research involves the theory and simulation of photonic and solid-state materials and devices; photonic crystals; nanoscale photonic devices and plasmonics; quantum optics; computational electromagnetics; and parallel scientific computing. PhD 1997 MIT

Phone: 650-724-4759; Email: shanhui.fan@stanford.edu
URL: http://www.stanford.edu/~shanhui

Hector Garcia-Molina
Professor; Leonard Bosack and Sandra K. Lerner Professor in Engineering
ELECTRICAL ENGINEERING, COMPUTER SCIENCE

Garcia-Molina's research interests include distributed computing systems, database systems and digital libraries. PhD 1979 Stanford

Phone: 650-723-0685; Email: hector@cs.stanford.edu
URL: http://www-db.stanford.edu/people/hector.html

James Gibbons
Professor (Research)
ELECTRICAL ENGINEERING

A pioneer in the use of ion implantation and rapid thermal process techniques for solid-state physics, Gibbons also conducts research into semiconductor device analysis, fabrication and process physics. Current research is focused on the growth and processing of thin semiconductor films and nanostructures that offer potential for advanced semiconductor and optical device development. PhD 1956 Stanford

Phone: 650-723-4677; Email: gibbons@cis.stanford.edu; URL: http://cis.stanford.edu/~gibbons/

John Gill
Associate Professor
ELECTRICAL ENGINEERING

Gill's research interests are in the areas of computational complexity theory and information theory, including probabilistic computation, lossless data compression and error-correcting codes. PhD 1972 UC Berkeley

Phone: 650-723-4715; Email: gill@stanford.edu; URL: http://ee.stanford.edu/~gill/

Bernd Girod
Professor; Robert L. and Audrey S. Hancock Professor in the School of Engineering; Senior Associate Dean for Online Learning and Professional Development, School of Engineering
ELECTRICAL ENGINEERING

Girod's research interests are in the area of networked media systems. As an entrepreneur, he has been involved in several startup ventures, among them Polycom, Vivo Software, 8x8 and RealNetworks. Engineering Doctorate 1987 University of Hannover, Germany

Phone: 650-724-6354; Email: bgirod@stanford.edu
URL: http://www.stanford.edu/~bgirod/

Andrea Goldsmith
Professor; Stephen Harris Professor in the School of Engineering
ELECTRICAL ENGINEERING

Goldsmith's research develops novel techniques, protocols and designs for future wireless systems and networks. Her specific research areas include the design and capacity analysis of wireless systems and networks, multiple-antenna wireless networks, cognitive radios, sensor and networks, cross-layer wireless network design, and applications of communications and signal processing to health and neuroscience. PhD 1994 UC Berkeley

Phone: 650-725-6932; Email: andrea@ee.stanford.edu
URL: http://ee.stanford.edu/~andrea

Pat Hanrahan
Professor; Canon USA Professor in the School of Engineering
ELECTRICAL ENGINEERING, COMPUTER SCIENCE

Hanrahan's current research involves rendering algorithms, high-performance graphics architectures and systems support for graphical interaction. He also has worked on raster graphics systems, computer animation, and modeling and scientific visualization, in particular, volume rendering. PhD 1986 Wisconsin

Phone: 650-723-8530; Email: hanrahan@cs.stanford.edu
URL: http://www-graphics.stanford.edu/~hanrahan

James Harris
Professor; James and Ellenor Chesebrough Professor in the School of Engineering
ELECTRICAL ENGINEERING, MATERIALS SCIENCE AND ENGINEERING BY COURTESY, APPLIED PHYSICS BY COURTESY

Harris utilizes molecular beam epitaxy of III-V compound semiconductor materials to investigate new materials for electronic and optoelectronic devices. He utilizes heterojunctions, superlattices, quantum wells and three-dimensional self-assembled quantum dots to create metastable engineered materials with novel or improved properties for electronic and optoelectronic devices. He has recently focused on integration of photonic devices and micro-optics for creation of new minimally invasive bio and medical systems for micro-array and neural imaging. PhD 1969 Stanford

Phone: 650-723-9775; Email: jharris@stanford.edu
URL: http://www-ee.stanford.edu/~harris

John Hennessy
Professor; President of Stanford University; Bing Presidential Professor
ELECTRICAL ENGINEERING, COMPUTER SCIENCE

Hennessy's research is in the area of computer architecture. His early research was centered on the development of MIPS, one of the first RISC microprocessors. His recent research involves the architecture and effective use of large-scale parallel machines. His group developed DASH, the first scalable cache-coherent multiprocessor, which is now the base for a number of commercial developments. In addition to his research activities, Hennessy is a coauthor of leading graduate and undergraduate texts in computer architecture. PhD 1977 SUNY-Stony Brook

Phone: 650-724-8960; Email: president@stanford.edu; URL: http://president.stanford.edu/

Lambertus Hesselink
Professor
ELECTRICAL ENGINEERING, APPLIED PHYSICS BY COURTESY

Hesselink's research encompasses nanophotonics, ultra-high-density optical data storage, nonlinear optics, optical super-resolution, materials science, three-dimensional image processing and graphics, and Internet technologies. PhD 1977 Caltech

Phone: 650-723-4850; Email: bert@kaos.stanford.edu
URL: http://kaos.stanford.edu/hesselink.htm

Mark Horowitz
Professor; Yahoo! Founders Professor in the School of Engineering
ELECTRICAL ENGINEERING, COMPUTER SCIENCE

Horowitz's current research interests include updating both analog and digital design methods, low-energy multiprocessor designs, computational photography and applying engineering to biology. PhD 1984 Stanford

Phone: 650-725-3707; Email: horowitz@ee.stanford.edu
URL: http://www-vlsi.stanford.edu/~horowitz

Roger Howe
Professor; William E. Ayer Professor in Electrical Engineering
ELECTRICAL ENGINEERING

Howe's research interests include design and fabrication of sensors and actuators using micro- and nanotechnologies, with applications to information processing and energy conversion. PhD 1984 UC Berkeley

Phone: 650-723-8030; Email: rthowe@stanford.edu; URL: http://www.stanford.edu/~rthowe/

Joseph Kahn
Professor
ELECTRICAL ENGINEERING

Kahn's research addresses communication and imaging through optical fibers, including modulation, detection, signal processing and spatial multiplexing. PhD 1986 UC Berkeley

Phone: 650-724-9584; Email: jmk@ee.stanford.edu; URL: http://ee.stanford.edu/~jmk

Sachin Katti
Assistant Professor
ELECTRICAL ENGINEERING, COMPUTER SCIENCE

Katti's research focuses on designing and building next-generation high-capacity wireless networks using techniques from information and coding theory. His research interests are in networks, wireless communications, applied coding theory and security. PhD 2009 MIT

Phone: 650-724-8960; Email: skatti@stanford.edu; URL: http://stanford.edu/~skatti

Leonid Kazovsky
Professor (Research)
ELECTRICAL ENGINEERING

Kazovsky and his research group are investigating green energy-efficient networks. They focus on in-building networks and hybrid optical/wireless networks. They also conduct research on next-generation Internet architectures and novel zero-energy photonic components. PhD 1972 St. Petersburg, Russia

Phone: 650-725-3818; Email: l.kazovsky@stanford.edu
URL: http://pnrl.stanford.edu/users/leonid-g-kazovsky

Butrus Khuri-Yakub
Professor (Research)
ELECTRICAL ENGINEERING

Khuri-Yakub's research interests include medical ultrasound imaging and therapy, ultrasound neurostimulation, chemical/biological sensors, gas flow and energy flow sensing, micromachined ultrasonic transducers and ultrasonic fluid ejectors. PhD 1975 Stanford

Phone: 650-723-0718; Email: khuri-yakub@stanford.edu
URL: http://www-kyg.stanford.edu/khuriyakub/opencms/en/home/

Gregory Kovacs
Professor
ELECTRICAL ENGINEERING, MEDICINE BY COURTESY

Kovacs' research interests include the development of noninvasive instruments for cardiovascular medicine; sensors for prediction of epileptic seizures; cell-based systems for drug discovery and testing

of stem-cell cardiac therapies; titration of medical care via embedded systems; and remote delivery of laboratory electronics education. PhD 1990 Stanford, MD 1992 Stanford

Phone: 650-725-3637; Email: kovacs@cis.stanford.edu
URL: http://www.stanford.edu/group/kovacslab/cgi-bin/

Christoforos Kozyrakis
Associate Professor
ELECTRICAL ENGINEERING, COMPUTER SCIENCE

Kozyrakis' research focuses on making computer systems of any size faster, cheaper and greener. His current work focuses on the hardware architecture, runtime environment, programming models and security infrastructure for warehouse-scale data centers and many-core chips with thousands of general purpose cores and fixed-function accelerators. PhD 2002 UC Berkeley

Phone: 650-804-0548, 650-725-3716; Email: christos@ee.stanford.edu
URL: http://csl.stanford.edu/~christos

Sanjay Lall
Professor
ELECTRICAL ENGINEERING, AERONAUTICS AND ASTRONAUTICS

Lall's research group focuses on the development of advanced engineering methodologies for the design of control, optimization and signal processing algorithms that occur in a wide variety of electrical, mechanical and aerospace systems. PhD 1995 Cambridge

Phone: 650-723-1343; Email: lall@stanford.edu; URL: http://lall.stanford.edu

Thomas Lee
Professor
ELECTRICAL ENGINEERING

Lee's principal areas of professional interest include analog circuitry of all types, ranging from low-level DC instrumentation to high-speed RF communications systems. His present research focus is on CMOS RF integrated circuit design and on extending operation into the terahertz realm. ScD 1990 MIT

Phone: 650-725-3709; Email: tomlee@ee.stanford.edu
URL: http://smirc.stanford.edu/tom.html

Philip Levis
Associate Professor
ELECTRICAL ENGINEERING, COMPUTER SCIENCE

Levis' research focuses on the design and implementation of efficient software systems for embedded wireless sensor networks; embedded network sensor architecture and design; systems programming; and software engineering. PhD 2005 UC Berkeley

Phone: 650-725-9046; Email: plevis@stanford.edu

Nick McKeown
Professor; Kleiner Perkins, Mayfield, Sequoia Capital Professor in the School of Engineering
ELECTRICAL ENGINEERING, COMPUTER SCIENCE

McKeown researches techniques to improve the Internet. Most of this work has focused on the architecture, design, analysis and implementation of high-performance Internet switches and routers. More recently, his interests have broadened to include network architecture, backbone network design, congestion control and how the Internet might be redesigned if we were to start with a clean slate. PhD 1995 UC Berkeley

Phone: 650-725-3641; Email: nickm@stanford.edu

David Miller
Professor; W.M. Keck Foundation Professor of Electrical Engineering
ELECTRICAL ENGINEERING, APPLIED PHYSICS BY COURTESY

Miller works primarily in novel devices and device physics in optics and optoelectronics for information processing. He also investigates the basic physical limits of optics and optical components.
PhD 1979 Heriot-Watt University, Scotland
Phone: 650-723-0111; Email: dabm@ee.stanford.edu; URL: http://ee.stanford.edu/~dabm/

Subhasish Mitra
Associate Professor
ELECTRICAL ENGINEERING, COMPUTER SCIENCE

Mitra's research focuses on ways to design robust computer systems and information appliances, and covers various aspects of very-large-scale integration design and testing, computer-aided design, computer architecture and design in future nanotechnologies. PhD 2000 Stanford
Phone: 650-724-1915; Email: subh@stanford.edu

Andrea Montanari
Associate Professor
ELECTRICAL ENGINEERING, STATISTICS

Montanari's interests lie in developing efficient algorithms to make sense of large amounts of noisy data, extract information from observations and estimate signals from measurements. This effort spans several disciplines including statistics, computer science, information theory and machine learning. He is also working on applications of these techniques to healthcare data analytics. PhD 2001 Scuola Normale Superiore, Italy
Phone: 650-736-7422; Email: montanari@stanford.edu

Boris Murmann
Associate Professor
ELECTRICAL ENGINEERING

Murmann's research is concerned with the design of analog-to-digital interface circuits. His work spans the design of signal conditioning circuits for sensors, building blocks and data converters for high-speed communication systems as well as proof-of-concept work for neuro-inspired and information-centric signal processing paradigms. PhD 2003 UC Berkeley
Phone: 650-725-7042; Email: murmann@stanford.edu

Yoshio Nishi
Professor (Research)
ELECTRICAL ENGINEERING, MATERIALS SCIENCE AND ENGINEERING BY COURTESY

Nishi's research interest is in new device structures with new materials in the nanoelectronics era, resistive switching memory, metal gate work function engineering, flexible electronics and graphene band engineering. PhD 1973 University of Tokyo
Phone: 650-723-9508; Email: yoshio.nishi@stanford.edu

Dwight Nishimura
Professor; Addie and Al Macovski Professor
ELECTRICAL ENGINEERING

Nishimura develops new acquisition and processing techniques for improved medical imaging. PhD 1984 Stanford
Phone: 650-723-4533; Email: dwight@stanford.edu
URL: http://www-mrsrl.stanford.edu

Oyekunle Olukotun
Professor
ELECTRICAL ENGINEERING, COMPUTER SCIENCE

Olukotun's research interests are in the design, performance analysis and verification of computers. He is currently leading the Hydra single-chip

multiprocessor project and is developing novel simulation, estimation and verification techniques for system-level design. PhD 1991 Michigan

Phone: 650-725-3713; Email: kunle@stanford.edu

Brad Osgood
Professor; Senior Associate Dean for Student Affairs, School of Engineering; Paul Davies Family University Fellow in Undergraduate Education
ELECTRICAL ENGINEERING, EDUCATION BY COURTESY

Osgood is a mathematician by training and applies techniques from analysis and geometry to various engineering problems. He is interested in problems in imaging, pattern recognition and signal processing. PhD 1980 Michigan

Phone: 650-723-4002; Email: osgood@stanford.edu

Ayfer Özgür Aydin
Assistant Professor
ELECTRICAL ENGINEERING

Özgür's research focuses on understanding the fundamental limits of communication in wireless networks and designing strategies that can approach these limits in practice. Her research combines tools and ideas from disciplines including information and coding theory, wireless communication, random matrix theory, graph theory, and combinatorial and convex optimization. PhD 2009 Ecole Polytechnique Federale de Lausanne, Switzerland

Email: aozgur@stanford.edu

John M. Pauly
Professor
ELECTRICAL ENGINEERING

Pauly's interests include medical imaging generally and magnetic resonance imaging (MRI) in particular. Current efforts are focused on medical applications of MRI where real-time interactive imaging is important. Two examples are cardiac imaging and the interactive guidance of interventional procedures. Specific interests include rapid methods for the excitation and acquisition of the MR signal, and the reconstruction of images from the data acquired using these approaches. PhD 1990 Stanford

Phone: 650-723-4569; Email: pauly@stanford.edu; URL: http://www-mrsrl.stanford.edu

Piero Pianetta
Professor (Research)
ELECTRICAL ENGINEERING, PHOTON SCIENCE (SLAC)

Pianetta's research is directed toward understanding how the atomic and electronic structure of semiconductor interfaces impacts device technology. His research includes the development of new analytical tools based on the use of synchrotron radiation. Recent projects include the development of ultrasensitive methods to analyze trace impurities on the surface of silicon wafers at levels as low as 1e-6 monolayer (~1e8 atoms/cm2) and the use of various photoelectron spectroscopies (X-ray photoemission, NEXAFS, X-ray standing waves and photoelectron diffraction) to determine the bonding and atomic structure at the interface between silicon and different passivating layers. PhD 1976 Stanford

Phone: 650-926-3484; Email: pianetta@stanford.edu

Jim Plummer
Professor; John M. Fluke Professor of Electrical Engineering
ELECTRICAL ENGINEERING, MATERIALS SCIENCE AND ENGINEERING BY COURTESY

Plummer has worked in a variety of areas in the broad field of silicon devices and technology. His recent work has focused on nanoscale silicon devices for logic and memory and has demonstrated new device concepts such as the TRAM thyristor-based memory cell and the IMOS device, which achieves <kT/q subthreshold slopes. PhD 1971 Stanford

Phone: 650-725-3606; Email: plummer@stanford.edu

Ada Poon
Assistant Professor
ELECTRICAL ENGINEERING

Poon's research focuses on providing theoretical foundations and engineering platforms for realizing electronics that seamlessly integrate with the body to allow precise recording or modulation of physiological activity. Such systems can be used for advancing basic scientific discovery and for restoring or augmenting biological functions for clinical applications. Her group's research program emphasizes a vertical integration of diverse fields, including physics, wireless technologies and low-power integrated circuits. PhD 2004 UC Berkeley
Phone: 650-721-2438; Email: adapoon@stanford.edu

Eric Pop
Associate Professor
ELECTRICAL ENGINEERING

Pop's research spans energy conversion systems, nanomaterials and nanoelectronics. PhD 2005 Stanford
Phone: 650-725-8768; Email: epop@stanford.edu; URL: http://poplab.stanford.edu

Balaji Prabhakar
Professor
ELECTRICAL ENGINEERING, COMPUTER SCIENCE, MANAGEMENT SCIENCE AND ENGINEERING BY COURTESY, OPERATIONS, INFORMATION AND TECHNOLOGY AT THE GRADUATE SCHOOL OF BUSINESS BY COURTESY

Prabhakar's research focuses on the design, analysis and implementation of data networks, both wireline and wireless. He has been interested in designing network algorithms, problems in ad hoc wireless networks and designing incentive mechanisms. He has a long-standing interest in stochastic network theory, information theory, algorithms and probability theory. PhD 1994 UCLA
Phone: 650-723-5896; Email: balaji@stanford.edu

Juan Rivas-Davila
Assistant Professor
ELECTRICAL ENGINEERING

Rivas' research interests are in power electronics, radio frequency power amplifiers, resonant converters, soft switching topologies and design of power converters for operation in harsh environments.
ScD 2006 MIT
Phone: 650-497-6312; Email: jmrivas@stanford.edu

Mendel Rosenblum
Professor
ELECTRICAL ENGINEERING, COMPUTER SCIENCE

Rosenblum's research interests include system software, distributed systems and computer architecture. He has published research in the area of disk storage management, computer simulation techniques, scalable operating system structure, virtualization computer security and mobility. PhD 1991 UC Berkeley
Phone: 650-723-0474; Email: mendel@cs.stanford.edu; URL: http://sedcl.stanford.edu

Krishna Saraswat
Professor; Rickey/Nielsen Professor in the School of Engineering
ELECTRICAL ENGINEERING, MATERIALS SCIENCE AND ENGINEERING BY COURTESY

Saraswat is working on a variety of problems related to new and innovative materials, structures and process technology of silicon, germanium and III-V devices and interconnects for VLSI and nanoelectronics. Areas of current interest are new device structures to continue scaling MOS transistors, DRAMs and flash memories to nanometer regime, three-dimensional integrated circuits with multiple layers of heteroge-

neous devices, metal and optical interconnections, and high-efficiency and low-cost solar cells. PhD 1974 Stanford

Phone: 650-725-3610; Email: saraswat@stanford.edu

Krishna Shenoy
Professor
ELECTRICAL ENGINEERING, NEUROBIOLOGY BY COURTESY

Shenoy conducts basic and applied research on neural prosthetic systems. Basic studies include investigating sensory-motor and cognitive functions in the primate cortex using a combination of behavioral, electrophysiological and computational techniques to discover how populations of neurons represent movement plans. Applied studies include designing algorithms to read out these representations and developing prosthetic systems controlled by neural activity, with the ultimate goal to assist disabled patients. PhD 1995 MIT

Phone: 650-723-4789; Email: shenoy@stanford.edu
URL: http://web.stanford.edu/~shenoy/Group.htm

Olav Solgaard
Professor
ELECTRICAL ENGINEERING

The Solgaard group focuses on design and fabrication of nanophotonics and micro-optical systems. Photonic crystals, optical metamaterials, silicon photonics and MEMS are combined to create efficient and reliable systems for communication, sensing, imaging and optical manipulation. PhD 1992 Stanford

Phone: 650-724-2765; Email: solgaard@stanford.edu

Fouad Tobagi
Professor
ELECTRICAL ENGINEERING, COMPUTER SCIENCE BY COURTESY

Tobagi works on network control mechanisms for handling multimedia traffic (voice, video and TCP-based applications) and on the performance assessment of networked multimedia applications using user-perceived quality measures. He investigates the design of wireless networks, including QoS-based media access control and network resource management, as well as network architectures and infrastructures for the support of mobile users. He also investigates the design of metropolitan and wide area networks combining optical and electronic networking technologies, including topological design, capacity provisioning and adaptive routing. PhD 1974 UCLA

Phone: 650-723-1708; Email: tobagi@stanford.edu

David Tse
Professor
ELECTRICAL ENGINEERING

Tse's research interests are in information theory and its applications in various fields, including wireless communication, energy and computational biology. PhD 1994 MIT

Phone: 650-723-4505; Email: dntse@stanford.edu
URL: http://web.stanford.edu/~dntse/index.html

Benjamin Van Roy
Professor
ELECTRICAL ENGINEERING, MANAGEMENT SCIENCE AND ENGINEERING, COMPUTER SCIENCE BY COURTESY

Van Roy is broadly interested in the formulation and analysis of mathematical models that address problems in information technology, business and public policy. PhD 1998 MIT

Phone: 650-721-6508; Email: bvr@stanford.edu

Jelena Vuckovic
Professor
ELECTRICAL ENGINEERING, APPLIED PHYSICS BY COURTESY

Vuckovic leads the Nanoscale and Quantum Photonics Lab. Her research interests include nanophotonics, quantum optics, nonlinear optics, quantum information technologies, optoelectronics and cavity quantum electrodynamics. PhD 2002 Caltech

Phone: 650-725-2288; Email: jela@stanford.edu; URL: http://web.stanford.edu/~jela/

Shan Wang
Professor
ELECTRICAL ENGINEERING, MATERIALS SCIENCE AND ENGINEERING, RADIOLOGY BY COURTESY

Wang is engaged in the research of nanotechnology and information storage, including magnetic/spintronic biochips, in vitro diagnostics, cell sorting, magnetic nanoparticles, nanopatterning, spin electronic materials and sensors, as well as magnetic integrated inductors and transformers. His research group utilizes modern thin-film techniques, lithography and nanoengineering to devise tailorable materials and devices with novel properties and desirable performances for practical applications. PhD 1993 Carnegie Mellon

Phone: 650-723-8671; Email: sxwang@stanford.edu
URL: http://www.stanford.edu/group/wang_group/

Tsachy Weissman
Associate Professor
ELECTRICAL ENGINEERING

Weissman's research interests span information theory and its applications to data compression and communications, and statistical signal processing. PhD 2001 Technion, Israel

Phone: 650-736-1418; Email: tsachy@stanford.edu

Gordon Wetzstein
Assistant Professor
ELECTRICAL ENGINEERING

Wetzstein's research focuses on computational imaging and display systems, as well as computational light transport. At the intersection of computer graphics, machine vision, optics, scientific computing and perception, this research has a wide range of applications in next-generation consumer electronics, scientific imaging, human-computer interaction, remote sensing and many other areas. PhD 2011 University of British Columbia, Canada

Phone: 650-497-7953; Email: gordon.wetzstein@stanford.edu

Jennifer Widom
Professor; Fletcher Jones Professor in Computer Science; Senior Associate Dean for Faculty and Academic Affairs, School of Engineering
ELECTRICAL ENGINEERING, COMPUTER SCIENCE

Widom's research interests span many aspects of nontraditional data management. PhD 1987 Cornell

Phone: 650-725-1289; Email: widom@cs.stanford.edu

H.-S. Philip Wong
Professor; Willard R. and Inez Kerr Bell Professor in the School of Engineering
ELECTRICAL ENGINEERING

Wong's interests are in nanoscale science and technology, semiconductor technology, solid-state devices and electronic imaging. Current research covers a broad range of topics, including carbon electronics, 2D layered materials, wireless implantable biosensors, directed self-assembly, nanoelectromechanical relays, device modeling, brain-inspired

computing and non-volatile memory devices such as phase change memory and metal oxide resistance change memory. PhD 1988 Lehigh

Phone: 650-725-0982; Email: hspwong@stanford.edu; URL: http://nano.stanford.edu

Simon Wong
Professor
ELECTRICAL ENGINEERING

Wong studies the fabrication and design of high-performance integrated circuits. His work focuses on understanding and overcoming the limitations of circuit performance imposed by device, interconnect and on-chip components. PhD 1983 UC Berkeley

Phone: 650-725-3706; Email: wong@ee.stanford.edu

Howard Zebker
Professor
ELECTRICAL ENGINEERING, GEOPHYSICS

Zebker develops spaceborne radar systems and applies remote sensing data to problems in geophysics. His current emphasis is on interferometric radar for natural hazards, water resources and global environmental problems. He is also active in planetary science, particularly research supporting the NASA Cassini mission to Saturn and Titan. PhD 1984 Stanford

Phone: 650-723-8067; Email: zebker@stanford.edu; URL: http://ee.stanford.edu/~zebker/

MANAGEMENT SCIENCE AND ENGINEERING

The Department of Management Science and Engineering aims to promote research and education related to the information-intensive, technology-based economy. The department has great breadth, covering the knowledge, tools and methods required to make decisions and shape policies, configure organizational structures, design engineering systems and solve operational problems. It covers eight areas: systems modeling and optimization; probability and stochastic systems; information science and technology; economics and finance; decision analysis and risk analysis; production operations and management; organization, technology and entrepreneurship; and policy and strategy.

Chair: Peter Glynn
Phone: 650-723-4169

Nicholas Bambos
Professor
MANAGEMENT SCIENCE AND ENGINEERING, ELECTRICAL ENGINEERING

Bambos leads the Network Architecture and Performance Engineering research group, conducting research in wireless network architectures, the Internet infrastructure, packet switching, network management and information service engineering. The group is engaged in various projects of his Network Architecture Laboratory (NetLab). Current technology research interests include high-performance networking, autonomic computing and service engineering. Methodological interests are in network control, online task scheduling, queueing systems and stochastic processing networks. He also leads a new research initiative on networked information service engineering. PhD 1989 UC Berkeley

Phone: 650-430-4954; Email: bambos@stanford.edu
URL: http://www.stanford.edu/dept/MSandE/people/faculty/bambos/index.html

Stephen R. Barley
Professor; Richard W. Weiland Professor in the School of Engineering; Associate Chair, Department of Management Science and Engineering
MANAGEMENT SCIENCE AND ENGINEERING, EDUCATION BY COURTESY

Barley's research interests include corporate power in the United States, the rhetorical history of telecommuting and how sophisticated mathematical modeling tools are altering the work of engineers who design automobiles. PhD 1984 MIT

Phone: 650-723-9477; Email: sbarley@stanford.edu

Margaret Brandeau
Professor; Coleman F. Fung Professor in the School of Engineering
MANAGEMENT SCIENCE AND ENGINEERING, MEDICINE BY COURTESY

Brandeau is an operations researcher and policy analyst with extensive background in the development of applied mathematical and economic models, and a distinguished investigator in HIV. Her HIV research focuses on using mathematical and economic models to assess the value of different HIV and drug abuse interventions, both in the United States and abroad. Recently she has studied policies for control of hepatitis B both in the United States and abroad, and preparedness planning for potential bioterror attacks. PhD 1985 Stanford

Phone: 650-725-1623; Email: brandeau@stanford.edu
URL: http://engineering.stanford.edu/profile/brandeau

Thomas Byers
Professor (Teaching)
MANAGEMENT SCIENCE AND ENGINEERING

Byers focuses on education regarding high-growth entrepreneurship and technology innovation. He has been a faculty director since the inception of the Stanford Technology Ventures Program, which serves as the entrepreneurship center for the engineering school. PhD 1982 UC Berkeley

Phone: 650-725-8271; Email: tbyers@stanford.edu

Samuel Chiu
Associate Professor
MANAGEMENT SCIENCE AND ENGINEERING

PhD 1981 MIT
Phone: 650-723-3674, 650-723-4173; Email: samchiu@stanford.edu

Chuck Eesley
Assistant Professor
MANAGEMENT SCIENCE AND ENGINEERING

Eesley's research focuses on the influence of the external environment on entrepreneurship. He investigates the types of environments that encourage the founding of high-growth, technology-based firms. His research has three streams: how formal institutions (policies, legal structures and regulations) influence entrepreneurship; how informal institutions (accepted practices and norms) shape entrepreneurial opportunities; and how the environments of particular industries influence the success of entrepreneurial teams. PhD 2009 MIT
Phone: 650-723-3821; Email: cee@stanford.edu; URL: http://www.stanford.edu/~cee

Kathleen Eisenhardt
Professor; Stanford W. Ascherman, M.D. Professor in the School of Engineering
MANAGEMENT SCIENCE AND ENGINEERING

Eisenhardt's work centers on strategy and organization, especially in technology-based companies and high-velocity industries, with emphasis on complexity and power theories. She is currently studying the use of heuristics in strategies, creation of synergies in multi-business corporations, building alliance portfolios by entrepreneurial firms and strategic interaction. PhD 1982 Stanford
Phone: 650-723-1887; Email: kme@stanford.edu

Kay Giesecke
Associate Professor
MANAGEMENT SCIENCE AND ENGINEERING

Giesecke's research addresses the quantification and management of financial risks, with particular interest in the stochastic modeling, valuation and hedging of financial risks; the development of statistical tools to estimate and predict these risks; and the methods for solving the significant computational problems that arise in this context.
PhD 2001 Humboldt University, Berlin, Germany
Phone: 650-723-9265; Email: giesecke@stanford.edu
URL: http://www.stanford.edu/~giesecke/

Peter Glynn
Professor and Chair; Thomas W. Ford Professor in the School of Engineering
MANAGEMENT SCIENCE AND ENGINEERING, ELECTRICAL ENGINEERING BY COURTESY

Glynn's research interests lie in simulation, computational probability, queueing theory, statistical inference for stochastic processes and stochastic modeling. PhD 1982 Stanford
Phone: 650-725-0554; Email: glynn@stanford.edu; URL: http://www.stanford.edu/~glynn/

Ashish Goel
Professor
MANAGEMENT SCIENCE AND ENGINEERING

Goel's research interests lie in the design, analysis and applications of algorithms. PhD 1999 Stanford
Phone: 650-814-1478; Email: ashish.goel@stanford.edu
URL: http://www.stanford.edu/~ashishg/ashishg.html

Sharad Goel
Assistant Professor
MANAGEMENT SCIENCE AND ENGINEERING

Goel's primary area of research is computational social science. He is particularly interested in applying modern computational and statistical techniques to study social and political policies, such as stop-and-frisk, swing voting, filter bubbles, do-not-track and media bias. PhD 2005 Cornell
Phone: 607-339-9903; Email: scgoel@stanford.edu; URL: http://5harad.com/

Warren Hausman
Professor
MANAGEMENT SCIENCE AND ENGINEERING, OPERATIONS, INFORMATION AND TECHNOLOGY AT THE GRADUATE SCHOOL OF BUSINESS BY COURTESY

Hausman performs research in operations planning and control, with specific interests in supply chain management. Most of his contributions are based on quantitative modeling techniques and emphasize relevance and real-world applicability. He has investigated the value of RFID applications in retail environments, in logistics and in manufacturing and assembly operations. He has also studied how operational improvements in retail supply chains affect a company's financial performance and market capitalization. PhD 1966 MIT
Phone: 650-723-9279; Email: hausman@stanford.edu

Siegfried Hecker
Professor (Research), Senior Fellow, Freeman Spogli Institute for International Studies
MANAGEMENT SCIENCE AND ENGINEERING

Hecker's research interests include plutonium science, nuclear weapons policy and international security, nuclear security (including nonproliferation and counter terrorism), and cooperative nuclear threat reduction. His current research activities focus on the challenges of nuclear India, Pakistan and North Korea, and the nuclear aspirations of Iran.
PhD 1968 Case Western Reserve
Phone: 650- 725-6468; Email: shecker@stanford.edu

Pamela Hinds
Associate Professor
MANAGEMENT SCIENCE AND ENGINEERING

Hinds explores issues of culture, language, identity and conflict, and the role of site visits in promoting knowledge sharing and collaboration. Most recently, she has been exploring the relationship between national culture and work practices, particularly of designers. She also has been exploring the relationship between national culture and technology use, with a special interest in the design of collaborative technologies for use across national boundaries. PhD 1997 Carnegie Mellon
Phone: 650-723-3843; Email: phinds@stanford.edu
URL: http://www.stanford.edu/~phinds/index.html

Ronald Howard
Professor
MANAGEMENT SCIENCE AND ENGINEERING, MANAGEMENT SCIENCE AT THE GRADUATE SCHOOL OF BUSINESS BY COURTESY

Howard is one of the founders of the decision analysis discipline. His books on probabilistic modeling, decision analysis, dynamic programming and Markov processes serve as major references for courses and research in these fields. He directs teaching and research in the Decision Analysis Program, and is the director of the Decisions and Ethics Center, which examines the efficacy and ethics of social arrangements. ScD 1958 MIT
Phone: 650-723-4176; Email: rhoward@stanford.edu
URL: http://www.stanford.edu/dept/MSandE/people/faculty/howard/index.html

Ramesh Johari
Associate Professor
MANAGEMENT SCIENCE AND ENGINEERING, COMPUTER SCIENCE BY COURTESY, ELECTRICAL ENGINEERING BY COURTESY

Johari is interested in the design and management of large-scale complex networks, such as the Internet. Using tools from operations research, engineering and economics, he has developed models to analyze efficient market mechanisms for resource allocation in networks. PhD 2004 MIT

Phone: 650-723-0937; Email: ramesh.johari@stanford.edu
URL: http://www.stanford.edu/people/ramesh.johari

Riitta Katila
Professor
MANAGEMENT SCIENCE AND ENGINEERING

Katila's research is in the intersection of technology strategy and organizational learning. She is an expert on innovation, competitive dynamics, and organic and interorganizational growth strategies. Her recent work examines how firms create new products successfully. Focusing on the robotics industry, she investigates how different search approaches, such as the exploitation of existing knowledge and the exploration for new knowledge, influence the kinds of new products that technology-intensive firms introduce. PhD 2000 University of Texas

Phone: 650-725-1632; Email: rkatila@stanford.edu
URL: http://engineering.stanford.edu/profile/rkatila/publications

Robert McGinn
Professor (Teaching)
MANAGEMENT SCIENCE AND ENGINEERING; SCIENCE, TECHNOLOGY AND SOCIETY

McGinn's general research area is technology and society; his specific research area is ethics, science and technology, a specialty within applied ethics devoted to study of ethical issues in the practice of contemporary engineering and science, and ethical issues raised by the diffusion of technical innovations into society. PhD 1970 Stanford

Phone: 650-725-0117; Email: mcginn@stanford.edu

Walter Murray
Professor (Research)
MANAGEMENT SCIENCE AND ENGINEERING

Murray's research interests include numerical optimization, numerical linear algebra, sparse matrix methods, optimization software and applications of optimization. PhD 1969 London University

Phone: 650-380-2430; Email: walter@stanford.edu

M. Elisabeth Paté-Cornell
Professor; Burton J. and Deedee McMurtry Professor in the School of Engineering
MANAGEMENT SCIENCE AND ENGINEERING

Paté-Cornell's specialty is engineering risk analysis with application to complex systems (space, medical, etc.). Her research has focused on explicit inclusion of human and organizational factors in the analysis of systems' failure risks. Her recent work is on the use of game theory in risk analysis with applications that have included counterterrorism and nuclear counterproliferation problems. PhD 1978 Stanford

Phone: 650-723-3823; Email: mep@stanford.edu

Amin Saberi
Associate Professor
MANAGEMENT SCIENCE AND ENGINEERING, ELECTRICAL ENGINEERING BY COURTESY

Saberi's research interests include algorithms, approximation algorithms and algorithmic aspects of games, markets and networks. PhD 2004 Georgia Tech
Phone: 650-704-7857; Email: saberi@stanford.edu

Michael Saunders
Professor (Research)
MANAGEMENT SCIENCE AND ENGINEERING

Saunders develops mathematical methods for solving large-scale constrained optimization problems and large systems of equations. He also implements such methods as general-purpose software to allow their use in many areas of engineering, science and business. He is co-developer of the large-scale optimizers MINOS, SNOPT, SQOPT and PDCO; the dense QP and NLP solvers LSSOL, QPOPT and NPSOL; and the linear equation solvers SYMMLQ, MINRES, MINRES-QLP, LSQR, LSMR, LSRN and LUSOL. PhD 1972 Stanford
Phone: 650-723-1875; Email: saunders@stanford.edu

Tina Seelig
Professor of the Practice; Director, Stanford Technology Ventures Program
MANAGEMENT SCIENCE AND ENGINEERING

Seelig teaches courses on creativity, innovation and entrepreneurship. PhD 1985 Stanford
Email: tseelig@stanford.edu

Ross Shachter
Associate Professor
MANAGEMENT SCIENCE AND ENGINEERING

Shachter's interests include influence diagram knowledge representation and solution; intelligent decision systems; medical decision analysis; decision analysis fundamentals; and planning under uncertainty. PhD 1982 UC Berkeley
Phone: 650-353-7456, 650-723-4173; Email: shachter@stanford.edu
URL: http://www.stanford.edu/dept/MSandE/people/faculty/shachter/index.html

Robert Sutton
Professor
MANAGEMENT SCIENCE AND ENGINEERING, ORGANIZATIONAL BEHAVIOR AT THE GRADUATE SCHOOL OF BUSINESS BY COURTESY

Sutton studies innovation, leadership, the links between managerial knowledge and organization action, scaling excellence and workplace dynamics. PhD 1984 Michigan
Phone: 650-723-0480; Email: bobsut@stanford.edu; URL: http:// www.bobsutton.net

James Sweeney
Professor; Director and Senior Fellow, Precourt Energy Efficiency Center; Senior Fellow, Hoover Institution by courtesy
MANAGEMENT SCIENCE AND ENGINEERING

Sweeney's research interests include depletable and renewable resource use, electricity market analysis, environmental economics, global climate change policy, gasoline market dynamics, energy demand, energy price dynamics and housing market dynamics. PhD 1971 Stanford
Phone: 650-723-2847; Email: jim.sweeney@stanford.edu; URL: http://peec.stanford.edu

Edison Tse
Associate Professor
MANAGEMENT SCIENCE AND ENGINEERING

Tse is currently conducting research on building core competence within an enterprise to gain competitive advantage. His recent interests include dynamic competition in the network economy, regional technology center development and applying the theory of dynamic strategies to the wireless, airport, real estate and financial industries in China. PhD 1970 MIT

Phone: 650-723-4173, 650-723-4777; Email: etse@stanford.edu

Melissa Valentine
Assistant Professor
MANAGEMENT SCIENCE AND ENGINEERING

Valentine's research focuses on organizational structures and designs that support collaboration and coordination in fast-paced, highly dynamic work environments. She has conducted multimethod field research in a variety of organizational settings, including pharmaceutical R&D, software development and emergency medical care.
PhD 2013 Harvard

Phone: 650-725-5676; Email: mav@stanford.edu

Benjamin Van Roy
Professor
MANAGEMENT SCIENCE AND ENGINEERING, ELECTRICAL ENGINEERING, COMPUTER SCIENCE BY COURTESY

Van Roy is broadly interested in the formulation and analysis of mathematical models that address problems in information technology, business and public policy. PhD 1998 MIT

Phone: 650-721-6508; Email: bvr@stanford.edu

John Weyant
Professor (Research); Senior Fellow, Precourt Institute for Energy
MANAGEMENT SCIENCE AND ENGINEERING

Weyant's research focuses on analysis of global climate change policy options, energy efficiency analysis, energy security analysis, energy technology assessment and models for strategic planning.
PhD 1976 UC Berkeley

Phone: 650-723-0645, 650-723-3506; Email: weyant@stanford.edu

Yinyu Ye
Professor; Kwoh-Ting Li Professor in the School of Engineering
MANAGEMENT SCIENCE AND ENGINEERING, ELECTRICAL ENGINEERING BY COURTESY

Ye's research interests lie in the areas of optimization, complexity theory, algorithm design and analysis, and applications of mathematical programming, operations research and system engineering. He is also interested in developing optimization software for various real-world applications. Current research topics include linear programming algorithms, Markov decision processes, computational game/market equilibrium, metric distance geometry, dynamic resource allocation, and stochastic and robust decision making. PhD 1988 Stanford

Phone: 650-723-7262; Email: yinyu-ye@stanford.edu

MATERIALS SCIENCE AND ENGINEERING

The Department of Materials Science and Engineering is concerned with the relation between processing, structure and properties of materials, with the goal of developing new materials and processes through fundamental understanding. It brings together in a unified discipline materials-related developments in physical metallurgy, polymer science, ceramics, biology, and the physics and chemistry of solids.

Chair: Paul McIntyre

Information: 650.723.2534

David Barnett

Professor

MATERIALS SCIENCE AND ENGINEERING, MECHANICAL ENGINEERING

Barnett's research interests include dislocations in elastic solids; bulk, surface and interfacial waves in anisotropic elastic media; mechanics of piezoelectric and piezomagnetic materials; and modeling of transport in fuel cell materials and of AFM usage to characterize charge distributions and impedance of fuel cell media. PhD 1967 Stanford

Phone: 650-723-4143; Email: barnett@stanford.edu

Mark Brongersma

Professor

MATERIALS SCIENCE AND ENGINEERING, APPLIED PHYSICS BY COURTESY

Brongersma's current research is directed toward the development and physical analysis of nanostructured materials that find application in nanoscale electronic and photonic devices. PhD 1998 FOM Institute for Atomic and Molecular Physics, Netherlands

Phone: 650-723-0698; Email: brongersma@stanford.edu

URL: http://soe.stanford.edu/research/layout.php?sunetid=markb29

William Chueh

Assistant Professor

MATERIALS SCIENCE AND ENGINEERING; CENTER FELLOW, PRECOURT INSTITUTE FOR ENERGY

The Chueh Group explores efficient electrochemical routes for converting solar energy to chemical fuels and subsequently to electricity. The group also develops next-generation electrochemical energy storage materials. PhD 2010 Caltech

Phone: 650-725-7515; Email: wchueh@stanford.edu

URL: http://chuehlab.stanford.edu/Chueh_Lab/Home.html

Bruce Clemens

Professor; Walter B. Reinhold Professor in the School of Engineering

MATERIALS SCIENCE AND ENGINEERING, PHOTON SCIENCE (SLAC), APPLIED PHYSICS BY COURTESY

Clemens studies the growth, structure, magnetic properties and mechanical properties of thin films and nanostructured materials. He is currently investigating materials for metallization, magnetic recording, electronic device and hydrogen storage applications. PhD 1983 Caltech

Phone: 650-725-7455; Email: bmc@stanford.edu

URL: http://stanford.edu/group/clemensgroup

Yi Cui

Associate Professor

MATERIALS SCIENCE AND ENGINEERING, PHOTON SCIENCE (SLAC), CHEMISTRY BY COURTESY

Cui studies nanoscale phenomena and their applications broadly defined. Research interests include nanocrystal and nanowire synthesis and self-assembly; electron transfer and transport in nanomaterials and at the nanointerface; and nanoscale electronic and photonic devices,

batteries, solar cells, microbial fuel cells, water filters, and chemical and biological sensors. PhD 2002 Harvard

Phone: 650-723-0698; Email: yicui@stanford.edu
URL: http://www.stanford.edu/group/cui_group/

Reinhold Dauskardt
Professor; Ruth G. and William K. Bowes Professor in the School of Engineering
MATERIALS SCIENCE AND ENGINEERING, MECHANICAL ENGINEERING BY COURTESY, SURGERY BY COURTESY

Dauskardt and his group have worked extensively on integrating new materials into emerging technologies, including thin-film structures for nanoscience and energy technologies, high-performance composite and laminates for aerospace, and biomaterials and soft tissues in bioengineering. PhD 1988 UC Berkeley/Witwatersrand

Phone: 650-725-0679; Email: dauskardt@stanford.edu; URL: http://dauskardt.stanford.edu/

Jennifer Dionne
Assistant Professor
MATERIALS SCIENCE AND ENGINEERING

Dionne investigates metamaterials—engineered materials with optical and electrical properties not found in nature. She is especially interested in plasmonic and colloidal nanocrystal-based metamaterials, including their fundamental electrodynamic properties and applications to solar energy and bioimaging. Active research areas in her group include visible-frequency metamaterials for subwavelength light manipulation, enhanced photovoltaics and photocatalysis, and active neuronal imaging. PhD 2009 Caltech

Phone: 650-736-2286; Email: jdionne@stanford.edu; URL: http://dionne.stanford.edu

Persis Drell
Professor; Frederick Emmons Terman Dean of the School of Engineering; James and Anna Marie Spilker Professor
MATERIALS SCIENCE AND ENGINEERING, PHYSICS

Drell assumed her current post as dean in September 2014. She has been on the faculty at Stanford since 2002 and was director of the 1,600-employee U.S. Department of Energy SLAC National Accelerator Laboratory from 2007 to 2012. Her research interests are in technology development for free electron lasers and particle astrophysics. PhD 1983 UC Berkeley

Phone: 650-723-3938; Email: persis@stanford.edu
URL: https://engineering.stanford.edu/about/dean-persis-s-drell

Sarah Heilshorn
Associate Professor
MATERIALS SCIENCE AND ENGINEERING, CHEMICAL ENGINEERING BY COURTESY, BIOENGINEERING BY COURTESY

Heilshorn's interests include biomaterials in regenerative medicine, engineered proteins with novel assembly properties, microfluidics and photolithography of proteins, and synthesis of materials to influence stem cell differentiation. Current projects include tissue engineering for spinal cord and blood vessel regeneration, designing injectable materials for use in stem cell therapies, and the design of microfluidic devices to study the directed migration of cells (i.e., chemotaxis). PhD 2004 Caltech

Phone: 650-725-5090; Email: heilshorn@stanford.edu
URL: http://www.stanford.edu/group/heilshorn/

Aaron Lindenberg
Assistant Professor
MATERIALS SCIENCE AND ENGINEERING, PHOTON SCIENCE (SLAC)

Lindenberg's research is focused on probing the ultrafast dynamics and atomic-scale structure of materials on femtosecond and picosecond time-scales. X-ray techniques are combined with ultrafast laser techniques to provide a new way of taking snapshots of materials in motion. Current research is focused on the dynamics of phase transitions, ultrafast properties of nanoscale materials, photoelectrochemical charge transfer dynamics and THz nonlinear spectroscopy.
PhD 2001 UC Berkeley
Phone: 650-725-2640, 650-926-4558; Email: aaronl@stanford.edu
URL: http://www.stanford.edu/group/lindenberg/cgi-bin/drupal/

Michael McGehee
Professor; Senior Fellow, Precourt Institute for Energy by courtesy
MATERIALS SCIENCE AND ENGINEERING

McGehee's research group studies organic semiconductors, nanostructured materials and solar cells. PhD 1999 UC Santa Barbara
Phone: 650-725-5090; Email: mmcgehee@stanford.edu
URL: http://web.stanford.edu/group/mcgehee/

Paul McIntyre
Professor and Chair; Senior Fellow, Precourt Institute for Energy by courtesy
MATERIALS SCIENCE AND ENGINEERING

McIntyre's group performs research on nanostructured inorganic materials for applications in electronics, energy technologies and sensors. He is best known for his work on metal oxide/semiconductor interfaces, ultrathin dielectrics, defects in complex metal oxide thin films and nanostructured Si-Ge single crystals. His research team synthesizes materials, characterizes their structures and compositions with a variety of advanced microscopies and spectroscopies, studies the passivation of their interfaces and measures functional properties of devices.
ScD 1993 MIT
Phone: 650-723-1925; Email: pcm1@stanford.edu
URL: http://web.stanford.edu/group/mcintyre/

Nicholas Melosh
Associate Professor
MATERIALS SCIENCE AND ENGINEERING, PHOTON SCIENCE (SLAC)

Melosh's research interests include molecular materials at interfaces; directed dynamic self-assembly; controlling molecular or biomolecular assembly and behavior; and influence of local electronic, optical or thermal stimuli. PhD 2001 UC Santa Barbara
Phone: 650-725-5090; Email: nmelosh@stanford.edu
URL: http://web.stanford.edu/group/melosh/nick.html

Friedrich Prinz
Professor; Finmeccanica Professor; Senior Fellow, Precourt Institute for Energy
MATERIALS SCIENCE AND ENGINEERING, MECHANICAL ENGINEERING

Prinz's group models and prototypes nanoscale structures to understand the physics of electrical energy conversion and storage. To build and evaluate prototype structures, the team employs a wide range of nanofabrication technologies, including atomic layer deposition, scanning probe microscopy and impedance spectroscopy. The group also uses molecular scale modeling to gain insights into the nature of charge separation and recombination processes. PhD 1975 University of Vienna, Austria
Phone: 650-723-4023; Email: fbp@cdr.stanford.edu

Evan Reed
Assistant Professor
MATERIALS SCIENCE AND ENGINEERING

Reed is engaged in theory and modeling of materials using atom-based methods such as density functional theory and molecular dynamics. His work has two primary directions: monolayer and few layer materials (i.e., graphene, MoS2) for electronics, NEMS and energy applications; and materials at conditions of high temperatures, electromagnetic fields and pressures, including shock compression. PhD 2003 MIT

Phone: 650-723-2971; Email: evanreed@stanford.edu

Alberto Salleo
Associate Professor
MATERIALS SCIENCE AND ENGINEERING

Salleo's research interests include novel materials and processing techniques for large-area and flexible electronic/photonic devices; ultra-fast laser processing for electronics, photonics and biotechnology; and defects and structure/property studies of polymeric semiconductors, and nanostructured and amorphous materials in thin films.
PhD 2001 UC Berkeley

Phone: 650-725-5090; Email: asalleo@stanford.edu; URL: http://salleo.stanford.edu/

Bob Sinclair
Professor; Charles M. Pigott Professor in the School of Engineering
MATERIALS SCIENCE AND ENGINEERING

Using high-resolution transmission electron microscopy, Sinclair studies microelectronic and magnetic thin film microstructure.
PhD 1972 Cambridge

Phone: 650-723-1102; Email: bobsinc@stanford.edu; URL: http://sinclair.stanford.edu/

Shan X. Wang
Professor
MATERIALS SCIENCE AND ENGINEERING, ELECTRICAL ENGINEERING, RADIOLOGY BY COURTESY

Wang is engaged in the research of nanotechnology and information storage, including magnetic/spintronic biochips, in vitro diagnostics, cell sorting, magnetic nanoparticles, nanopatterning, spin electronic materials and sensors, as well as magnetic integrated inductors and transformers. His research group utilizes modern thin film techniques, lithography and nanoengineering to devise tailorable materials and devices with novel properties and desirable performances for practical applications. PhD 1993 Carnegie Mellon

Phone: 650-723-8671; Email: sxwang@stanford.edu
URL: http://www.stanford.edu/group/wang_group/

MECHANICAL ENGINEERING

The programs in the Department of Mechanical Engineering are designed to provide background for a variety of careers. The discipline is very broad, but it is generally understood to include energy and thermal sciences; propulsion; solid mechanics, fluid mechanics and biomechanics; design and manufacturing; sensing, control and robotics; and computational and simulation-based engineering.

Chair: Kenneth Goodson
Information: 650-725-2073

Thomas P. Andriacchi
Professor
MECHANICAL ENGINEERING, ORTHOPAEDIC SURGERY

Andriacchi's research focuses on the biomechanics of human locomotion and its biomedical applications to artificial joints, sports injury, osteoarthritis and neuromuscular disorders. PhD 1974 University of Illinois, Chicago

Phone: 650-723-8024; Email: tandriac@stanford.edu
URL: http://www.stanford.edu/group/biomotion/

David Barnett
Professor
MECHANICAL ENGINEERING, MATERIALS SCIENCE AND ENGINEERING

Barnett's research interests include dislocations in elastic solids; bulk, surface and interfacial waves in anisotropic elastic media; mechanics of piezoelectric and piezomagnetic materials; and modeling of transport in fuel cell materials and of AFM usage to characterize charge distributions and impedance of fuel cell media. PhD 1967 Stanford

Phone: 650-723-4143; Email: barnett@stanford.edu

David Beach
Professor (Teaching); Sugden Family University Fellow in Undergraduate Education
MECHANICAL ENGINEERING

Beach teaches courses in the areas of design and manufacturing and is co-director of the Product Realization Laboratory, which provides 1,700 students annually with hands-on experiences in product definition, conceptual design, detail design and prototype creation. MS 1972 Stanford

Phone: 650-724-3586; Email: dbeach@stanford.edu

Tom Bowman
Professor
MECHANICAL ENGINEERING

Bowman studies reacting flows, primarily through experimental means, and the processes by which pollutants are formed and destroyed in flames. He also is interested in the environmental impact of energy use, specifically greenhouse gas emissions from use of fossil fuels. PhD 1966 Princeton

Phone: 650-723-1745; Email: ctbowman@stanford.edu

Wei Cai
Associate Professor
MECHANICAL ENGINEERING, MATERIALS SCIENCE AND ENGINEERING BY COURTESY

Cai's research interests include predicting mechanical strength of materials through theory and simulations of defect microstructures across atomic, mesoscopic and continuum scales; developing new atomistic simulation methods for long time-scale processes such as crystal growth and self-assembly; and introducing magnetic field in quantum simulations of electronic structure and transport. PhD 2001 MIT

Phone: 650-736-1671; Email: caiwei@stanford.edu
URL: http://www.stanford.edu/~caiwei

Brian Cantwell
Professor; Edward C. Wells Professor in the School of Engineering
MECHANICAL ENGINEERING, AERONAUTICS AND ASTRONAUTICS

Cantwell's research interests are in the area of turbulent flow. Recent work has centered in three areas: the direct numerical simulation of turbulent shear flows, theoretical studies of the fine-scale structure of turbulence, and experimental measurements of turbulent structure in flames. Current projects include studies of fast-burning fuels for hybrid propulsion and decomposition of nitrous oxide for space propulsion. PhD 1976 Caltech

Phone: 650-723-4825; Email: cantwell@stanford.edu
URL: http://www.stanford.edu/~cantwell/

Mark A. Cappelli
Professor
MECHANICAL ENGINEERING

Cappelli leads the Plasma Physics Lab. With his group, he has been advancing the theoretical and experimental understanding of plasmas. PhD 1987 University of Toronto, Canada

Phone: 650-723-1745; Email: cap@stanford.edu

Dennis Carter
Professor
MECHANICAL ENGINEERING, BIOENGINEERING

Carter studies the influence of mechanical loading on the growth, development, regeneration and aging of skeletal tissues. Basic information from these studies is used to understand skeletal diseases and treatments. PhD 1976 Stanford

Phone: 650-723-4133; Email: dcarter@stanford.edu
URL: http://scholar.google.com/citations?hl=en&user=zI6PxocAAAAJ

Ovijit Chaudhuri
Assistant Professor
MECHANICAL ENGINEERING

Research in Chaudhuri's group is focused at the intersection of mechanics and biology. The researchers' interest is in elucidating the underlying molecular mechanisms that give rise to the complex mechanical properties of cells, extracellular matrices and tissues. They also investigate how complex mechanical cues influence important biological processes such as cell division, differentiation or cancer progression. PhD 2009 UC Berkeley/UC San Francisco

Phone: 650-497-0315; Email: chaudhuri@stanford.edu
URL: http://chaudhurilab.stanford.edu/People.html

Mark Cutkosky
Professor; Fletcher Jones Chair II in the School of Engineering
MECHANICAL ENGINEERING

Cutkosky applies analyses, simulations and experiments to the design and control of robotic hands, tactile sensors and devices for human/computer interaction. In manufacturing, his work focuses on design tools for rapid prototyping. PhD 1985 Carnegie Mellon

Phone: 650-721-9433, 650-723-1644; Email: cutkosky@stanford.edu
URL: http://www-cdr.stanford.edu/~cutkosky

Eric Darve
Associate Professor
MECHANICAL ENGINEERING

Darve's research is focused on the development of numerical methods for large-scale scientific computing, with applications in biomolecular simulations, acoustics, electromagnetics and microfluidics. He is developing innovative numerical techniques to reduce computational expense and enable the simulation of complex systems over realistic

time scales. He also uses processors with novel architectures, such as GPUs and the Cell processor, for scientific computing. Applications range from particle simulation to fluid dynamics and solving partial differential equations. PhD 1999 Paris VI University

Phone: 650-918-6407; Email: darve@stanford.edu
URL: http://mc.stanford.edu/Eric_Darve

Scott Delp
Professor; James H. Clark Professor in the School of Engineering
MECHANICAL ENGINEERING, BIOENGINEERING, ORTHOPAEDIC SURGERY BY COURTESY

Delp has transformed the field of biomechanics by creating highly accurate computer models of musculoskeletal structures and providing them to researchers worldwide using a software system (OpenSim) that he and his team developed. Delp invented fundamental technology for surgical navigation that is now in wide clinical use. Together with Mark Schnitzer and their students, Delp developed novel microendoscopes that allow realtime in vivo imaging of human muscle microstructure. Together with Karl Deisseroth and their students, Delp pioneered the use of optogenetics to control activity in the peripheral nervous system leading to important inventions for treating paralysis, spasticity and pain. PhD 1990 Stanford

Phone: 650-723-1230; Email: delp@stanford.edu; URL: http://www.stanford.edu/group/nmbl/

John Eaton
Professor; Charles Lee Powell Professor in the School of Engineering; Martin Family University Fellow in Undergraduate Education
MECHANICAL ENGINEERING

Eaton uses experiments and computational simulations to study flow and heat transfer in complex turbulent flows, especially those relevant to turbomachinery, particle-laden flows and separated flows, and to develop new techniques for precise control of gas and surface temperature during manufacturing processes. PhD 1980 Stanford

Phone: 650-723-1971; Email: eatonj@stanford.edu

Christopher Edwards
Professor; Senior Fellow, Precourt Institute for Energy
MECHANICAL ENGINEERING

Edwards' group is focused on fundamental research for advanced energy technologies. The group performs theoretical and experimental studies of energy transformations with a goal to make the conversion process cleaner, more efficient and more controllable. Applications include advanced transportation engines (piston and turbine) and advanced electric power generation with carbon mitigation. PhD 1985 UC Berkeley

Phone: 650-723-1745; Email: christopher.edwards@stanford.edu

Charbel Farhat
Professor; Vivian Church Hoff Professor in Aircraft Structures; Chair, Department of Aeronautics and Astronautics; Director of the Army High Performance Computing Research Center
MECHANICAL ENGINEERING, AERONAUTICS AND ASTRONAUTICS

Farhat and his research group develop mathematical models, advanced computational algorithms and high-performance software for the design and analysis of complex systems in aerospace, marine, mechanical and naval engineering. They contribute major advances to simulation-based engineering science. Current engineering focus in research is on the aerodynamics of micro aerial vehicles and Formula 1 cars, ballistic fabric for lightweight shields, nonlinear aeroelasticity of fighter jets and high-altitude long-endurance aircraft, thermal management of hypersonic vehicles, underwater acoustics and imaging, and underwater implosion. Current theoretical and computational emphases in research are on high-performance, multiscale modeling for the high-fidelity

analysis of multiphysics problems, and efficient reduced-order modeling for time-critical applications such as design and active control. PhD 1987 UC Berkeley

Phone: 650-723-3840; Email: cfarhat@stanford.edu
URL: http://www.stanford.edu/group/frg

J. Christian Gerdes
Associate Professor; Senior Fellow, Precourt Institute for Energy
MECHANICAL ENGINEERING, AERONAUTICS AND ASTRONAUTICS BY COURTESY

Gerdes' research centers on the application of dynamic modeling to problems in nonlinear control, estimation and diagnostics. Specific areas of interest include the development of driver assistance systems for lane keeping and collision avoidance, modeling and control of novel combustion processes for internal combustion engines and diagnostics for automotive drive-by-wire systems. PhD 1996 UC Berkeley

Phone: 650-723-4287; Email: cgerdes@stanford.edu; URL: http://ddl.stanford.edu/

Kenneth Goodson
Professor; Robert Bosch Chair of the Department of Mechanical Engineering; Davies Family Provostial Professor
MECHANICAL ENGINEERING

Goodson is a heat transfer specialist with interests ranging from electronics cooling to vehicle waste heat recovery. His lab pioneered phonon free path measurements using silicon nanolayers and has highly cited papers on diamonds, carbon nanotubes, phase change memory and two-phase microfluidics. PhD 1993 MIT

Phone: 650-725-2086; Email: goodson@stanford.edu; URL: http://nanoheat.stanford.edu

Ronald Hanson
Professor; Clarence J. and Patricia R. Woodard Professor of Mechanical Engineering
MECHANICAL ENGINEERING

Hanson's research interests are laser diagnostics and sensors, shock wave physics and chemistry, laser spectroscopy, chemical kinetics and combustion, and propulsion science. PhD 1968 Stanford

Phone: 650-723-1745; Email: rkhanson@stanford.edu; URL: http://hanson.stanford.edu/

Gianluca Iaccarino
Associate Professor
MECHANICAL ENGINEERING

Iaccarino's research themes include numerical methods for fluid mechanics, physical models for laminar/turbulent flows and uncertainty quantification in computational science. PhD 2005 Politecnico di Bari, Italy

Phone: 650-723-5616; Email: jops@stanford.edu; URL: http://www.stanford.edu/~jops

Werner Ihme
Assistant Professor
MECHANICAL ENGINEERING

Ihme studies large-eddy simulation and modeling of turbulent reacting flows, non-premixed flame, aeroacoustics and combustion generated noise, turbulence and fluid dynamics, numerical methods, and high-order schemes. PhD 2007 Stanford

Phone: 650-723-2177; Email: mihme@stanford.edu

David Kelley
Professor; Donald W. Whittier Professor in Mechanical Engineering
MECHANICAL ENGINEERING

Kelley's work is dedicated to helping people gain confidence in their creative abilities. He employs a project-based methodology called Design Thinking within both the Product Design Program and the Hasso Plattner Institute of Design, also known as the d.school. Design

Thinking is based on building empathy for user needs, developing solutions with iterative prototyping and inspiring ideas for the future through storytelling. MS 1978 Stanford

Phone: 650-289-3444; Email: david.kelley@stanford.edu
URL: http://www.stanford.edu/group/dschool/people/team_david_kelley.html

Thomas Kenny
Professor; Richard W. Weiland Professor in the School of Engineering
MECHANICAL ENGINEERING

Kenny's group is researching fundamental issues and applications of micromechanical structures. This research has many applications, including integrated packaging, inertial navigation, fundamental force measurements, experiments on biomolecules, device cooling, bioanalytical instruments and small robots. PhD 1989 UC Berkeley

Phone: 650-725-9210; Email: kenny@cdr.stanford.edu; URL: http://mems.stanford.edu

Ellen Kuhl
Associate Professor
MECHANICAL ENGINEERING, BIOENGINEERING BY COURTESY, CARDIOTHORACIC SURGERY BY COURTESY

Kuhl's area of expertise is computational biomechanics, the creation of theoretical and computational models to predict the acute and chronic response of living biological tissue to environmental changes during development and disease progression. Her specific interest is the multiscale modeling of growth and remodeling, the study of how biological tissues adapt their form and function to changes in mechanical loading, and how this adaptation could be traced back to structural alterations on the cellular or molecular levels. PhD 2000 University of Stuttgart, Germany

Phone: 650-450-0855; Email: ekuhl@stanford.edu; URL: http://biomechanics.stanford.edu

Larry Leifer
Professor
MECHANICAL ENGINEERING

Leifer's research in design thinking is focused on equipping design teams to understand, support and improve design practice and theory. Specific issues include design-team research methodology, global team dynamics, innovation leadership, interaction design, design-for-wellbeing and adaptive mechatronic systems. PhD 1969 Stanford

Phone: 650-723-3521, 650-521-3964; Email: larry.leifer@stanford.edu

Sanjiva Lele
Professor
MECHANICAL ENGINEERING, AERONAUTICS AND ASTRONAUTICS

Lele's research combines numerical simulations with analytical modeling to study fundamental unsteady flow phenomena, turbulence, flow instabilities and flow-generated sound. Recent projects include shock-turbulence interaction, exploitation of flow instabilities for enhanced mixing and for reducing the vortex-wake hazard from an airplane, new approaches for active noise control, and the development of high-fidelity prediction methods for engineering applications. PhD 1985 Cornell

Phone: 650-723-7721; Email: lele@stanford.edu

David Lentink
Assistant Professor
MECHANICAL ENGINEERING

Lentink's group studies biological flight as an inspiration for engineering robots designed to fly in complex cluttered environments under realistic atmospheric conditions. Comparative biological flight research ranges from maple seeds and insects to birds; in-depth biomechanics research focuses on bird flight. Fluid mechanics research of dynamically morphing wings ranges from studying vortex dynamics to fluid-structure interaction. PhD 2008 Wageningen University, Netherlands

Phone: 650-721-9433; Email: dlentink@stanford.edu; URL: http://lentinklab.stanford.edu/

Marc Levenston
Associate Professor
MECHANICAL ENGINEERING, BIOENGINEERING BY COURTESY

Levenston's primary research relates to the function, degeneration and repair of articular cartilage and fibrocartilage, with an emphasis on understanding the complex interactions between biophysical and biochemical cues in controlling cell behavior. Current interests include the mechanisms and functional implications of cell-mediated tissue degeneration in cartilage and meniscus; novel imaging techniques for nondestructive assessment of cartilage composition; and interactions between mechanical, chemical and matrix-supplied cues in controlling the development of engineered tissues. PhD 1995 Stanford

Phone: 650-723-9464; Email: levenston@stanford.edu

Adrian Lew
Associate Professor
MECHANICAL ENGINEERING

Lew's interests lie in the broad area of computational solid mechanics. He is concerned with the fundamental design and mathematical analysis of material models and numerical algorithms. Currently his group is focused on the design of algorithms to simulate hydraulic fracturing. PhD 2003 Caltech

Phone: 650-723-4133; Email: lewa@stanford.edu

Erin MacDonald
Assistant Professor
MECHANICAL ENGINEERING

MacDonald's research is focused on modeling the role of the public's decisions in effective large-scale sustainability implementation; improving engineering designers' abilities to address complex customer preference for sustainability; and using data on how consumers perceive products, especially visually, to understand how products are evaluated and subsequently improve those evaluations. PhD 2008 Michigan

Email: erinmacd@stanford.edu

Arun Majumdar
Professor; Jay Precourt Professor and Senior Fellow, Precourt Institute for Energy
MECHANICAL ENGINEERING

Majumdar's research interests include the science and engineering of nanoscale materials and devices as well as large engineered systems. PhD 1989 UC Berkeley

Email: amajumdar@stanford.edu

Ali Mani
Assistant Professor
MECHANICAL ENGINEERING

Mani's research interests lie in multiphysics problems in fluid dynamics and transport engineering. Specific topics include electroconvection and microscale chaos near electrochemical interfaces; particle-laden flows with applications in solar receivers; applications of superhydrophobic surfaces for drag reduction of turbulent flows; microbubble generation by breaking waves; and electrokinetics of micropores and nanopores. PhD 2009 Stanford

Phone: 650-725-1325; Email: alimani@stanford.edu; URL: http://www.stanford.edu/~alimani

Reginald Mitchell
Professor
MECHANICAL ENGINEERING

Mitchell's primary area of research is concerned with characterizing the physical and chemical processes that occur during the combustion and gasification of pulverized coal and biomass. His most recent research has been

focused on topics that will enable the development of coal and biomass conversion technologies that facilitate carbon capture. ScD 1975 MIT

Phone: 650-725-2012; Email: remitche@stanford.edu

Parviz Moin
Professor; Franklin P. and Caroline M. Johnson Professor in the School of Engineering
MECHANICAL ENGINEERING

Moin's current interests include interaction of turbulent flows and shock waves, aerodynamic noise and hydroacoustics, aero-optics, combustion, numerical analysis, turbulence control, large eddy simulation and parallel computing. PhD 1978 Stanford

Phone: 650-723-9713; Email: moin@stanford.edu; URL: http://ctr.stanford.edu

Drew Nelson
Professor
MECHANICAL ENGINEERING

Nelson's research involves development of improved methods for predicting the fatigue life of engineering materials, including the effects of manufacturing processes, and investigation of new approaches in the field of experimental mechanics, such as determination of residual stresses using optical methods. PhD 1978 Stanford

Phone: 650-723-2123; Email: dnelson@stanford.edu

Allison Okamura
Associate Professor
MECHANICAL ENGINEERING, COMPUTER SCIENCE BY COURTESY

Okamura's interests include haptics, teleoperation, virtual environments and simulators, medical robotics, neuromechanics and rehabilitation, prosthetics, and engineering education. PhD 2000 Stanford

Phone: 650-721-1700; Email: aokamura@stanford.edu
URL: http://charm.stanford.edu/Main/AllisonOkamura/

Peter Pinsky
Professor
MECHANICAL ENGINEERING, CIVIL ENGINEERING BY COURTESY

Pinsky works in the theory and practice of computational mechanics with a particular interest in multiphysics problems in biomechanics. Areas of current interest include the mechanics of human vision (ocular mechanics) and the mechanics of hearing. PhD 1981 UC Berkeley

Phone: 650-723-4121, 650-723-9327; Email: pinsky@stanford.edu

Friedrich Prinz
Professor; Finmeccanica Professor; Senior Fellow, Precourt Institute for Energy
MECHANICAL ENGINEERING, MATERIALS SCIENCE AND ENGINEERING

Prinz's group models and prototypes nanoscale structures to understand the physics of electrical energy conversion and storage. To build and evaluate prototype structures, the team employs a wide range of nanofabrication technologies, including atomic layer deposition, scanning probe microscopy and impedance spectroscopy. The group also uses molecular scale modeling to gain insights into the nature of charge separation and recombination processes. PhD 1975 University of Vienna, Austria

Phone: 650-723-4023; Email: fbp@cdr.stanford.edu

Beth L. Pruitt
Associate Professor
MECHANICAL ENGINEERING, MOLECULAR AND CELLULAR PHYSIOLOGY BY COURTESY

Pruitt's Microsystems Lab works on custom measurements and analysis systems for small-scale metrologies including scanning probe

microscopy, biomechanics and mechanotransduction assays. The researchers study the mechanics and biology of the sense of touch in C. elegans, the mechanisms and forces of cell adhesion, and the development and response of stem cells and cardiac myocytes to mechanical loading. They design and fabricate most of their own tools and sensors and are interested in the reliable manufacture and operation of micromachined sensors and actuators in harsh environments; measuring nanoscale mechanical behavior; and the analysis, design and control of integrated electromechanical systems. PhD 2002 Stanford

Phone: 650-723-4133; Email: pruitt@stanford.edu; URL: http://microsystems.stanford.edu

Bernard Roth
Professor; Rodney H. Adams Professor in the School of Engineering
MECHANICAL ENGINEERING

Roth is academic director of the Hasso Plattner Institute of Design, also known as the d.school, where he organizes and presents workshops on creativity, group interactions and the problem-solving process. Formerly, he researched the kinematics, dynamics, control and design of computer-controlled mechanical devices. PhD 1963 Columbia

Phone: 650-725-9131, 650-736-1025; Email: broth@stanford.edu

Juan Santiago
Professor
MECHANICAL ENGINEERING

Santiago's research focuses on the study of microscale transport phenomena, including electrokinetic flow, electrohydrodynamic instabilities and general convective-diffusion-electromigration processes. His research includes the optimization and development of novel micro- and nanodevices for pumping liquids, on-chip electrophoresis, sample preconcentration methods and miniature fuel cells. Applications of this work include microfabricated bioanalytical systems for genetic analysis, drug discovery, bioweapon detection, drug delivery and power generation. PhD 1995 University of Illinois, Urbana-Champaign

Phone: 650-736-1283; Email: juan.santiago@stanford.edu

Eric Shaqfeh
Professor; Lester Levi Carter Professor
MECHANICAL ENGINEERING, CHEMICAL ENGINEERING

Shaqfeh's current research interests include non-Newtonian fluid mechanics, especially in the area of elastic instabilities and turbulent drag reduction; nonequilibrium polymer statistical dynamics, focusing on single-molecule studies of DNA; and suspension mechanics, particularly of fiber suspensions and particles/vesicles in microfluidics. PhD 1986 Stanford

Phone: 650-723-3764; Email: esgs@stanford.edu
URL: http://antares.stanford.edu/index.php/EricShaqfeh/HomePage

Sheri Sheppard
Professor; Burton J. and Deedee McMurtry University Fellow in Undergraduate Education
MECHANICAL ENGINEERING

Sheppard conducts research on engineering education. More specifically, she studies students' decisions to study and practice engineering, along with new pedagogies that bring more practice into the classroom. Additional areas of expertise include weld fatigue and impact failures, fracture mechanics and applied finite element analysis. She is particularly concerned with the development of effective engineering tools to allow designers to make more informed decisions regarding structural integrity. PhD 1985 Michigan

Phone: 650-725-9131; Email: sheppard@stanford.edu

Sindy Tang
Assistant Professor
MECHANICAL ENGINEERING

Tang's research interests include microfluidics, optofluidics, nanophotonics and bioengineering. PhD 2010 Harvard

Email: sindy@stanford.edu; URL: http://stanford.edu/group/tanglab/

Hai Wang
Professor
MECHANICAL ENGINEERING

Wang's interests are in renewable energy conversion, catalysis and combustion. His current research focuses on theories and applications of nanoparticles and nanostructures for rechargeable batteries and supercapacitors, combustion simulations and nanocatalysis.
PhD 1992 Penn State

Phone: 650-497-0433; Email: haiwang@stanford.edu; URL: http://www.stanford.edu/~haiwang

Xiaolin Zheng
Associate Professor
MECHANICAL ENGINEERING

The Zheng group studies the interfacial science among combustion, nanomaterials and energy conversion. The goal is to bridge combustion science with scalable synthesis and applications of high-dimensional nanomaterials to provide innovative and revolutionary solutions to solve some of today's most challenging problems, such as energy and the environment. The group is also interested in creating new manufacturing methods for flexible and attachable inorganic electronics.
PhD 2006 Princeton

Phone: 650-725-2012; Email: xlzheng@stanford.edu
URL: http://www.stanford.edu/group/zheng/

AFFILIATES PROGRAMS

Advances in Biomedical Measurement Science

Director: Thomas Baer; Administrator: Sara Lefort

Location: Center for Nanoscale Science and Engineering, Rm 107 B; Phone: 650-723-5627
Email: saracl@stanford.edu; URL: http://sites.stanford.edu/abms/

The Advances in Biomedical Measurement Science (ABMS) program supports research to provide significant improvements in the accuracy and comparability of vital data used to make important research, regulatory, clinical and manufacturing quality control decisions. The program is co-led by Stanford University and the National Institute for Standards and Technology. The goals of the ABMS program are to greatly reduce the time for translation of new technology and new drugs into clinical practice; increase safety and efficacy of new pharmaceuticals; and greatly decrease the regulatory burden of introducing the next generation of innovative instruments, standardized reagents, protocols and computational tools needed to improve patient outcomes and reduce healthcare costs.

Aeronautics & Astronautics Industrial Affiliates Program

Director: Juan Alonso; Administrator: Carolyn Edwards

Location: Durand 252; Mail Code: 4035; Phone: 650-723-2867; Fax: 650-723-3018
Email: jjalonso@stanford.edu; URL: http://aa.stanford.edu/affiliates/index.php

The Aeronautics & Astronautics Industrial Affiliates Program facilitates interactions between the department and industry members interested in the research conducted in the Aeronautics & Astronautics Department, including guidance, navigation and control (including GPS and robotics); composite materials and smart structures; smart sensors and actuators; air-traffic management; unmanned aircraft systems; fluid mechanics, supersonics and hypersonics; rocket propulsion systems; aircraft and satellite design; decision-making algorithms and safety-critical systems; and multidisciplinary design optimization. Membership in the affiliates program promotes direct contact with faculty, visitor exchanges, contact with graduating students and access to the latest trends in research and development.

Bio-X Corporate Forum

Executive Director: Heideh Fattaey; Corporate Liaison: Hanwei Li

Location: Clark Center, 318 Campus Dr, 1st Floor South S1.1; Mail Code: 5446
Phone: 650-725-1523; Email: lhanwei1@stanford.edu
URL: http://www.stanford.edu/group/biox/forum/index.html

The Bio-X Corporate Forum provides a unique opportunity for corporations and organizations to engage on a more meaningful level in innovative and interdisciplinary research, and develop meaningful, sustained scientific relationships with world-class Stanford faculty and students. Through Bio-X, the union of academic and corporate research in basic, applied, clinical and translational sciences enables leading-edge, novel discoveries and technological advances across the life bioscience spectrum, from the molecular level to the living organism. Through the forum, corporations and organizations are invited to participate in symposiums and seminars, meet with faculty who are leading experts in their fields, and cultivate stronger and lasting relationships over leading-edge discoveries as they happen.

Blume Center: Earthquake Engineering Affiliates

Director: Gregory Deierlein; Administrator: Racquel Hagen

Location: Bldg 540, Rm 118; Mail Code: 4020; Phone: 650-723-4150; Fax: 650-725-9755
Email: racquelh@stanford.edu; URL: http://blume.stanford.edu/affiliates-sponsors

The John A. Blume Earthquake Engineering Center is devoted to the advancement of research, education and practice in the field of earthquake engineering. Affiliates are invited to visit the Blume Center and participate in various activities. Affiliates have facilitated access to the Blume Center's faculty and staff, and are encouraged to discuss

with them critical issues of mutual concern. Affiliates provide a very valuable perspective to the research and development conducted at the Blume Center, and their participation in these activities is essential to the program's goals. Affiliates also receive copies of publications and other material that is available from the Blume Center.

Center for Advanced Molecular Photovoltaics

Director: Michael McGehee; Associate Director: Eric Hoke
Deputy Director: Reinhold Dauskardt; Administrator: Erin Temel

Location: McCullough 250; Mail Code: 4045; Phone: 650-723-3183
Email: camp@stanford.edu; URL: http://camp.stanford.edu/

CAMP, the Center for Advanced Molecular Photovoltaics at Stanford University, is a research center with the goal of revolutionizing the global energy landscape by developing the science and technology for stable, efficient molecular photovoltaic cells that can compete with fossil fuels in cost per kilowatt-hour produced. While today's best molecular solar cells have efficiencies exceeding 10 percent and last approximately six years in sunlight, CAMP's vision is to increase the efficiency to 20 percent through the development of hybrid molecular-inorganic tandem photovoltaic devices that can be printed through roll-to-roll processing and are stable for 15 years or more. CAMP's activities span polymer, small-molecule and dye-sensitized solar cells with research activities in molecular design, advanced quantum mechanical calculations, molecular synthesis, nanostructure engineering and characterization, device physics, light management, transparent contacts, and the engineering of durable molecular solar cells.

Center for Automotive Research at Stanford

Executive Director: Sven Beiker; Director: J. Christian Gerdes

Location: Bldg 550, Rm 131; Mail Code: 2203; Phone: 650-736-1504; Fax: 650-723-3521
Email: beiker@stanford.edu; URL: http://cars.stanford.edu

The Center for Automotive Research at Stanford (CARS) links industry and academia around the future of the automobile and personal mobility. CARS has a forward-looking focus and provides a portal for automotive companies and other industrial partners into auto-mobility research at Stanford. CARS handles the infrastructure of our community and links to the solar car team as well as other on-campus groups in the mobility space.

Center for Design Research

Director: Larry Leifer; Co-Directors: Mark Cutkosky, Sheri Sheppard
Deputy Director: Martin Steinert; Consultant: George Toye
Administrator: Anneliese Tunison

Location: Bldg 560; Mail Code: 2232; Phone: 650-723-9233; Fax: 650-725-8475
Email: leifer@cdr.stanford.edu; URL: http://www-cdr.stanford.edu/

The mission of the Center for Design Research (CDR) is to support engineering design. Field studies of professional product development teams and laboratory studies of advanced graduate student teams lead to innovations in design process management and supporting collaboration technology. New design and prototyping tools are applied to problems in bio-inspired robotics, human-computer interaction and dynamic vehicle systems. Based on observations, insights, behavior models and professional design experience, PhD candidates develop design process instrumentation, metrics and theoretic frameworks to improve performance. Theory and methods are developed incrementally through iterative interaction analysis. Product-based learning curricula such as ME310, Team-Based Product Design Development with Corporate Partners, serve as simulation environments for real-world product innovation. Approximately 30 PhD students are associated with CDR at any given time.

Center for Integrated Facility Engineering
Director: Martin Fischer; Executive Director: John Kunz
Staff: Calvin Kam; Programs & Administration Manager: Teddie Guenzer
Location: Y2E2 292; Mail Code: 4020; Phone: 650-723-4945; Fax: 650-723-4806
Email: cife-email@stanford.edu; URL: http://cife.stanford.edu

CIFE, the Center for Integrated Facility Engineering, is a collaborative research effort between the departments of Civil and Environmental Engineering and Computer Science at Stanford, and practitioners who are leaders as facility owners and managers, architects, engineers, builders, software firms and construction information providers. In partnership with its industrial members, the mission of CIFE is to be the world's premier academic research center for Virtual Design and Construction (VDC) for capital facility projects. VDC is the use of multidisciplinary performance models of design-construction projects, including the product (i.e., facilities), work processes and organization of the design-construction-operation team to support business objectives.

Center for Magnetic Nanotechnology
Director: Shan Wang; Executive Director: Robert White
Administrator: Nuvia Pacheco
Location: Geballe Lab for Advanced Materials; Mail Code: 4045
Phone: 650-723-8671; Fax: 650-725-1984; Email: sxwang@ee.stanford.edu
URL: http://web.stanford.edu/group/nanomag_center/

The mission of the Center for Magnetic Nanotechnology is to stimulate research in the area of magnetic nanotechnology, magnetic sensing, spintronics, information storage, energy conversion and other related emerging technologies; to facilitate collaboration between Stanford scientists and their industrial colleagues; to train well-rounded and highly skilled graduate students; and to develop curricular offerings in the relevant subjects. The center operates Frontier of Magnetic Nanotechnology and Spintronics: annual reviews, workshops, short courses and conferences on magnetics-related technologies, including nanotechnology, spintronics, energy and information storage. The center's Nanomagnetics Facility provides processing and characterization capabilities for magnetic and other novel materials.

Center for Sustainable Development and Global Competitiveness
Director: James Leckie; Executive Director: Jie Wang
Location: Y2E2 251; Mail Code: 4020; Phone: 650-725-6627; Fax: 650-725-3164
Email: sdgcprogram@stanford.edu; URL: http://www.stanford.edu/group/sdgc/index.html

Future economic and business development and competition will be conducted in the context of increasing environmental concerns and limited natural and human resources. Building competitive advantage in a global economy will require addressing the needs of smart business development and innovation in a rapidly changing business ecosystem while fulfilling social and environmental responsibilities and building a long-lasting foundation for sustainable development. The center will provide a platform for Stanford's research and educational communities to collaborate with affiliated global business community members to promote sustainable development while maintaining competitiveness.

Center for Work, Technology & Organization
Co-Directors: Stephen Barley, Pamela Hinds
Program Coordinator: Lorrie Papadakis
Location: Huang 208; Phone: 650-725-0535; Fax: 650-723-1614
Email: lorriep@stanford.edu; URL: http://wto.stanford.edu

WTO, the Center for Work, Technology & Organization, is a research center within the Department of Management Science and Engineering. WTO's faculty, graduate students and industrial research partners are committed to basic and applied research on how work is changing and to designing more effective organizations and technologies. WTO sponsors research projects, colloquia, workshops and conferences that bring together social scientists, engineers, designers and managers within the context of an engineering school to address crucial social, organizational and technical problems in an interdisciplinary manner. The center often

studies technical settings and the organizational issues that arise at the intersection of work and technology. Its bias is toward field-based research, and its researchers are experts in using ethnography to understand work practices in situ. In some cases, they use a combination of qualitative and quantitative methods to investigate phenomena of interest. Their research projects actively involve students at all levels (PhD, master's and undergraduate) and often include our research partners from industry as investigators. As they engage with new students and partners, their projects evolve in unanticipated and exciting directions.

Energy and Environment Affiliates Program

Program Manager: Marjorie Alfs

Location: Y2E2 206; Mail Code: 4240; Phone: 650-498-4088

Email: mmalfs@stanford.edu; URL: http://eeap.stanford.edu

The Energy and Environment Affiliates Program facilitates interactions between companies and other organizations with Stanford faculty and graduate students across the full range of energy-related and environmental topics. The list of focus areas evolves over time in response to the interests of affiliates and Stanford faculty. Current focus areas include solar photovoltaic, advanced materials for energy applications, smart grid, freshwater, oceans, natural capital and the built environment. The Energy and Environment Affiliates Program works closely with the Precourt Institute for Energy, the Stanford Woods Institute for the Environment, the Geballe Laboratory for Advanced Materials and many other organizations at Stanford.

Energy Modeling Forum

Director: John Weyant; Executive Director: Hillard Huntington
Administrator: Pamela McCroskey

Location: Huang Engineering Center; Phone: 650-723-0645; Fax: 650-725-5362

Email: weyant@stanford.edu; URL: http://www.stanford.edu/group/EMF

The Energy Modeling Forum seeks to improve the use and usefulness of energy and environmental analysis to the public and private sectors by organizing comparative tests of available models and complementary analyses. These studies are designed to enhance the ability of international, federal, state and local agencies, energy producing and consuming corporations, and households to plan for market shifts in the energy sector and the introduction of new energy and environmental policies. Current studies focus on global climate change and international natural gas markets and trade.

Global Projects Center

Executive Director: Ashby Monk

Location: Y2E2 242; Mail Code: 4020; Phone: 650-723-6486

Email: stanfordgpc@stanford.edu; URL: http://gpc.stanford.edu

GPC, the Global Projects Center, serves as Stanford's primary forum for research on the development and management of global projects – infrastructure, industrial, commercial, telecommunication, information technology and other projects involving sponsors, financiers and developers. GPC is a collaborative undertaking between Stanford University, partner universities, private firms and government affiliates to advance the science and practice of planning and implementing global projects. The aim of GPC's research program is to enhance understanding of legal, social, political, financial and institutional processes that interact in complex ways to affect global project outcomes. Membership in the center provides public and private sector organizations engaged in sponsoring, investing in, financing, regulating or developing global projects a range of opportunities for interaction with GPC faculty and students in all phases of defining and conducting its research on global projects. GPC offers a three-tier membership structure in order to meet the needs of smaller, more focused industry members as well as large organizations.

Initiative for Nanoscale Materials and Processes (Phase 4)

Director: Yoshio Nishi; Administrator: Sandra Eisensee

Location: CISX 204; Mail Code: 4075; Phone: 650-723-9508; Fax: 650-725-0991
Email: nishiy@stanford.edu; URL: http://sites.stanford.edu/INMP/

This research initiative is focused on metal gate/high k dielectrics/high mobility channel MOSFETs research for the ITRS 22nm and beyond. Both theoretical and experimental study for such devices, device physics, materials science and innovative new processes have been explored. Included are bilayer metal gate for work function engineering and science, high k dielectrics synthesis and structural analysis, Ge and III-V channel with high mobility n-channel and p-channel MOSFETs. Interfaces for metal-high k dielectrics-substrate are being studied comprehensively by both physical and electrical characterizations as well as interfaces with channel and highly doped source and drain regions.

Management Science and Engineering Industry Affiliates Program

Director: Yinyu Ye; Program Manager: Lorrie Papadakis

Location: Huang 308; Mail Code: 4026; Phone: 650-725-0535; Fax: 650-723-1614
Email: lorriep@stanford.edu
URL: http://www.stanford.edu/dept/MSandE/cgi-bin/corporate/index.php

The Management Science and Engineering Industry Affiliates Program directly connects corporations with the department's vast resources: renowned faculty, cutting-edge research centers and a thriving student community. It is a partnership with industry designed to assist organizations in meeting their challenges while expanding educational and employment opportunities for students.

MobiSocial Computing Laboratory

Faculty Director: Monica Lam; Program Manager: Darlene Hadding

Location: Gates 307; Mail Code: 9030; Phone: 650-723-1430; Email: darlene@csl.stanford.edu; URL: http://mobisocial.stanford.edu

The goal of the MobiSocial Computing Laboratory is to create disruptive mobile and social computing technology that serves consumers' interests and benefits the economy in the long term. The lab's current focus is to let everyone interact socially with each other without having to join the same proprietary social network. The success of the project lies in making it fun for the users and easy for software developers.

National Performance of Dams Project

Director: Martin McCann

Location: Bldg 540, Rm 124; Phone: 650-723-9323; Fax: 650-725-9755
Email: npdp_email@lists.stanford.edu; URL: http://npdp.stanford.edu

The National Performance of Dams Project (NPDP) is a cooperative effort of engineers and dam safety professionals in the United States to create an information resource on dams and their performance. The objectives of the NPDP are to retrieve, archive and disseminate information on the performance of dams. The NPDP creates an information track that facilitates the evaluation and use of dam performance data to improve methods of design and rehabilitation, and the development of effective public policy. The NPDP will provide policy makers with information on the performance of dams that is comparable to data available to professionals and the public in other fields involving public health and safety. Information on public health, such as the rise in tuberculosis cases or the increase in the number of HIV-positive individuals, provides lawmakers and administrators with valuable input to public policy decisions. A goal of the NPDP is to develop resources that will elevate dam safety to a similar level.

Nonvolatile Memory Technology Research Initiative (Phase 2)

Director: Yoshio Nishi; Director: Sandra Eisensee

Location: CISX 204; Mail Code: 4075; Phone: 650-724-0068; Fax: 650-725-8044
Email: nishiy@stanford.edu; URL: http://nmtri.stanford.edu

The Nonvolatile Memory Technology Research Initiative (NMTRI) aims at dealing with challenges of increasing needs for embedded

memory with high density and low cost with power minimization. NMTRI does this by forming an interdisciplinary team of faculty, staff and students to look into technical feasibility at the device level and circuit/system level as well as to develop a fundamental understanding for a variety of new nonvolatile memory phenomena, materials and processes. NMTRI covers many areas of research: how scalable the various resistance switch materials would be and studying switching mechanisms from macroscopic model to atomistic model; how selection devices can be integrated with resistive switches in crosspoint arrays; how cell and circuit innovations can improve performance; and how bulk and interface effects control switching reliability, data retention and endurance. The scope of the initiative is for five years and aims at possible infusion into 15nm ITRS nodes and beyond.

Open Networking Research Center

Faculty Director: Nick McKeown; Executive Director: Guru Parulkar
Administrator: Chris Hartung

Phone: 650-725-3623; Email: hartung@stanford.edu; URL: http://onrc.stanford.edu

The mission of the Open Networking Research Center is to create a comprehensive intellectual framework for software-designed networking (SDN) and to develop, deploy and support open source SDN tools and platforms to open the Internet infrastructure for innovations and enable the larger network industry to build networks that offer increasingly sophisticated functionality yet are cheaper and simpler to manage than current networks. The effects of SDN will be felt in the data center, the enterprise wiring closet, the wide area network, cellular networks and the home. SDN originated from research at Stanford and the University of California-Berkeley, and has been endorsed by more than 65 companies through their membership in the Open Networking Foundation.

Pervasive Parallelism Lab

Director: Oyekunle Olukotun; Program Manager: Darlene Hadding

Location: Gates 302; Mail Code: 9030; Phone: 650-723-1430; Fax: 650-725-6949
Email: kunle@stanford.edu; URL: http://ppl.stanford.edu

The Pervasive Parallelism Lab pools the efforts of many leading Stanford computer scientists and electrical engineers with support from industry partners. The center researches and develops a top-to-bottom parallel computing system, stretching from fundamental hardware to new user-friendly programming languages that will allow developers to exploit parallelism automatically. In other words, game programmers who already understand artificial intelligence, graphics rendering and physics would be able to implement their algorithms in accessible "domain-specific" languages. At deeper, more fundamental levels of software – "under the hood," so to speak – the system would do all the work for them to optimize their code for parallel processing.

Re-inventing the Nation's Urban Water Infrastructure

Academic Director: Richard Luthy; Administrative Director: Laura Burns-Wood; Education & Outreach Director: Pamela McLeod
Research & Industrial Liaison Officer: Christian Nilsen

Location: Y2E2 191; Phone: 650-422-0622; Email: cnilsen@stanford.edu
URL: http://www.renuwit.org

The vision of the Engineering Research Center on Re-inventing the Nation's Urban Water Infrastructure (ReNUWIt) is to harness new knowledge to facilitate the smooth transition of water systems to a new state in which they consume less energy and fewer resources while continuing to meet the needs of urban users and aquatic ecosystems. The center's four overarching goals are to: advance urban water reinvention; develop valued technologies and concepts to support urban water reinvention; obtain recognition as a global leader in the field of urban water reinvention; and prepare students to lead efforts to reinvent urban water infrastructure.

Secure Internet of Things Project

Director: Philip Levis; Executive Director: Steve Eglash

Location: Gates 4A; Phone: 650-721-1637; Email: seglash@stanford.edu
URL: http://iot.stanford.edu

The Secure Internet of Things Project researches fundamentally new, better ways to secure the Internet of Things and make them easy to use. The project seeks to answer three principal questions: Analytics: How will we integrate these enormous streams of physical world instrumentation with all of our existing data? Security: How can pervasive sensing and analytics systems preserve and protect user security? Hardware and software systems: What hardware and software systems will make developing new intelligent and secure Internet of Things applications as easy as a modern web application? These three efforts are tightly connected. Internet of Things applications will need novel cryptographic protocols that are able to work on tiny, low-power devices yet also scale up to enormous stores of data in the cloud.

Stanford Center for Image Systems Engineering

Faculty Director: Bernd Girod; Executive Director: Joyce Farrell

Location: Packard 328; Mail Code: 9510; Phone: 650-725-6345; Fax: 650-725-8286
Email: bgirod@stanford.edu; URL: http://scien.stanford.edu

The Stanford Center for Image Systems Engineering (SCIEN) is a partnership between Stanford School of Engineering and technology companies developing imaging systems for the enhancement of human communication. SCIEN supports multidisciplinary training, research and collaboration on the design of imaging systems, including methods for acquiring, processing, analyzing, communicating, rendering and displaying visual information. SCIEN includes faculty from the Stanford schools of Engineering, Medicine, and Humanities and Sciences who are working on the mathematical, computational and experimental aspects of imaging systems. Faculty members jointly advise graduate students and collaborate with industry partners on research projects. SCIEN also organizes seminars and workshops that focus on new developments and applications of imaging technologies.

Stanford Center for Position Navigation and Time

Director: Per Enge; Executive Director: Tom Langenstein

Location: Durand; Mail Code: 4035; Phone: 650-725-4108; Fax: 650-723-8833
Email: tom.langenstein@stanford.edu; URL: http://scpnt.stanford.edu

Research at the Stanford Center for Position Navigation and Time is aimed at vastly extending and expanding the benefits of GPS in society. Researchers are exploring several techniques for supplementing the Global Positioning System's reach, accuracy and resistance to radio frequency interference to make possible diverse new applications. Technologies include smart antennas, MEMS and atom-based sensors such as accelerometers, gyroscopes and oscillators, and low-power GPS integrated circuits. A related focus is on utilizing signals from other satellite navigation systems including GLONASS, Galileo, Compass and QZSS.

Stanford Center for Societal Networks

Director: Balaji Prabhakar; Program Manager: Jennifer Kuo

Location: Packard 275; Phone: 650-725-1606; Email: jpkuo@stanford.edu
URL: http://scsn.stanford.edu/index.php

Many challenges faced by modern society, from overcrowded roads to polluted environments, can be reduced when many individuals make small changes. The stakes for society as a whole are great, but often the stakes per person are too small for people to change their behavior. How can we encourage individuals to do the right thing? The Stanford Center for Societal Networks has been running a series of research projects to study whether incentives that induce small changes in user behavior increase efficiency in societal networks.

The center is studying how randomization, reward size, payout intervals, user interfaces and social networking might influence the behavior of users in a particular network.

Stanford Computer Forum Affiliates Program

Faculty Director: Mendel Rosenblum; Executive Director: Connie Chan
Location: Gates 274; Mail Code: 9025; Phone: 650-723-9689
Email: forumstaff@cs.stanford.edu; URL: http://forum.stanford.edu

The Stanford Computer Forum is a cooperative venture of the Computer Science and Electrical Engineering departments and more than 100 companies in Silicon Valley and beyond. The Forum provides a mechanism for developing interaction with industrial researchers and their academic counterparts to promote the exchange of the most advanced technological ideas in fields of computer science and electrical engineering. The Forum offers industry the opportunity to become familiar with the professional abilities and interests of Stanford students through its active recruiting program.

Stanford Construction Institute

Director: Raymond Levitt; Administrator: Evelyn (Eve) Martinez-Santayana
Location:Y2E2 242; Mail Code: 4020; Phone: 650-723-4447; Fax: 650-725-6014
Email: emarsant@stanford.edu
URL: http://cee.stanford.edu/programs/construction/industry/clnstitute.html

The Stanford Construction Institute was launched in 1960 as one of Stanford's first industrial affiliate programs to support enrichment of the construction master's educational program by allowing the institute to engage practicing professionals from industry as consulting professors. A key strength of the MS Construction Program since its inception is that it has always offered a unique blend of cutting-edge insights from the ongoing research of the full time academic faculty together with strong coverage of current and evolving industry best practices presented by a superb group of dedicated lecturers and consulting professors from industry. The Construction Program's budget from the School of Engineering and the Civil and Environmental Engineering Department covers only the costs of the full-time academic faculty and program administrator. The institute values the practitioner input into its MS programs very highly, so it has always raised funds from the industry to support the ongoing inclusion of the consulting faculty from industry who help to provide the broad-based range of topics that enable it to attract the best students nationwide, maintain the relevance to industry of its academic programs and provide its students with knowledge that they can put to use immediately upon graduating. The industry faculty round out the degree program by teaching classes ranging from construction law and accounting to real estate development, building energy systems and labor relations.

Stanford Data Science Initiative

Director: Hector Garcia-Molina; Executive Director: Steve Eglash
Programs & Administration Manager: Marianne Siroker
Location: Gates 4A-435; Phone: 650-723-0872; Email: siroker@cs.stanford.edu
URL: http://sdsi.stanford.edu

The Stanford Data Science Initiative is a universitywide multidisciplinary organization with multiple goals: to conduct fundamental research on novel data management and analytical techniques; to develop complete data-based solutions for pressing scientific and engineering problems that face society; to support teaching and education; and to provide a resource of data and algorithms to the Stanford data science research community.

Stanford Experimental Data Center Lab Affiliates Program

Faculty Director: Mendel Rosenblum; Administrator: Jennifer Kuo
Location: Packard 269; Mail Code: 9510; Phone: 650-723-6579
Email: jpkuo@stanford.edu; URL: http://sedcl.stanford.edu

The Stanford Experimental Data Center Lab Affiliates Program welcomes industry partners interested in developing and deploying

networking, computing and storage technologies. Our group focuses on the architecture of future data center networks, scalable DRAM-based storage, massive server virtualization and cloud computing.

Stanford Photonics Research Center

Executive Director: Thomas Baer
Co-Directors: Robert Byer, Martin Fejer, David Miller

Location: 348 Via Pueblo Mall, Suite 107; Mail Code: 4088
Phone: 650-723-5627; Fax: 650-725-1822; Email: photonics@stanford.edu
URL: http://stanfordphotonics.stanford.edu

SPRC, the Stanford Photonics Research Center, is an affiliates program for companies interested in interacting with Stanford's photonics students, faculty, research and teaching. SPRC's goal is to support photonics for the mutual, sustained benefit of both Stanford's teaching and research and SPRC's corporate members. SPRC aims to connect members to the fullest possible range of photonics activities across multiple departments at Stanford, such as Electrical Engineering, Applied Physics, Materials Science and Engineering, Chemistry, and Mechanical Engineering. This breadth of connection offers members a broad perspective on current and emerging areas in photonics, including the fields of lasers, optics, optoelectronics, nanophotonics and photonic crystals, integration with electronics, nonlinear optics, optical networks, micro-optomechanics, biophotonic sensing, quantum optics, quantum encryption and computing, and nonlinear optical and optoelectronic materials, including semiconductors and organics.

Stanford System X Alliance

Faculty Directors: Yoshio Nishi, Chair; Boris Murmann, H.-S. Philip Wong
Executive Director: Richard Dasher

Location: Paul G. Allen Building, 420 Via Palou Mall; Mail Code 4070; Phone: 650-725-3617
FAX: 650-725-0991; Email: rdasher@stanford.edu; URL: http://systemx.stanford.edu

The Stanford SystemX Alliance is a partnership between Stanford University and member industrial firms to produce world-class research and Ph.D. graduates with a view to enabling truly ubiquitous sensing, computing and communication with embedded intelligence. Previously known as the Center for Integrated Systems, SystemX emphasizes application-driven, system-oriented research. Its areas of interest include hardware and software at all levels of the system stack from materials and devices to systems and applications in electronics, networks, energy, mobility, bio-interfaces, sensors and other real-world domains. SystemX focus areas, Ph.D. fellowships and knowledge exchange programs draw on the unique strengths of the university and industry to enhance the productivity and competitiveness of both.

SUNCAT Center for Interface Science and Catalysis

Director: Jens Nørskov

Location: Shriram Center, 443 Via Ortega, Rm 311; Mail Code: 4300; Phone: 650-498-1395
Email: norskov@stanford.edu; URL: http://suncat.slac.stanford.edu

The SUNCAT (SUstainable eNergy through CATalysis) Center for Interface Science and Catalysis is a partnership between SLAC National Accelerator Laboratory and the Department of Chemical Engineering at Stanford University. The center explores challenges associated with the atomic-scale design of catalysts for chemical transformations of interest for energy conversion and storage. By combining experimental and theoretical methods, the center aims to develop a quantitative description of chemical processes at the solid-gas and solid-liquid interface. The goal is to identify the factors controlling the catalytic properties of solid surfaces and to be able to use theoretical and computational methods to tailor new catalysts.

Thermal & Fluid Sciences Affiliates

Director: Gianluca Iaccarino; Administrator: Marlene Lomuljo-Bautista
Location: Bldg 500, Rm 500A; Mail Code: 3035; Phone: 650-723-5616; Fax: 650-725-3525
Email: jops@stanford.edu; URL: http://tfsa.stanford.edu

The Thermal & Fluid Sciences Affiliates program is the industrial liaison program of the Flow Physics & Computational Engineering and Thermosciences groups of the Mechanical Engineering Department. The program is administered at the faculty level and emphasizes person-to-person communications between Stanford faculty and the industrial representatives. This is the first point of contact for many companies that develop more extensive research collaborations with the faculty.

LABORATORIES, CENTERS, INSTITUTES

Aero Fluid Mechanics Laboratory

Faculty: Brian Cantwell

Location: Durand 051; Mail Code: 4035; Phone: 650-725-3290; Fax: 650-725-3377
Email: cantwell@stanford.edu; URL: http://aa.stanford.edu/research/index.php#afm

For basic studies of fluid flows and combustion, facilities at the Aero Fluid Mechanics Laboratory include a low-speed wind tunnel, a high-pressure shock tube and a small hybrid rocket motor. Instrumentation includes optics and electronics for velocity- and laser-induced fluorescence measurements and local workstations for data analysis. Current research involves the study of combustion at a liquid-gas interface.

Aerospace Robotics Laboratory

Director: Stephen Rock; Emeritus: Robert Cannon
Administrator: Dana Parga

Location: Durand 17; Mail Code: 4035; Phone: 650-723-3343; Email: rock@stanford.edu
URL: http://www.stanford.edu/group/arl/

The Aerospace Robotics Laboratory (ARL) is a research group in the Department of Aeronautics and Astronautics. Research in the ARL focuses on improving robotic performance through the application of feedback control, integrated sensing systems and task-level autonomy. All of the research is developed and validated on experimental hardware systems. These systems include both mobile robots (land, sea, sky and space) and a variety of fixed manipulators for space and factory applications.

The interaction of the human-robot team is the core focus of the ARL. The lab is developing techniques that enable operators to interact with robots at a highly intuitive "task level," in which the human has full strategic control and commands tasks or objectives, and the robot autonomously performs lower-level duties such as path planning and precision task execution. Other research in the ARL supports this goal by providing robots with the tools needed to successfully complete their objective tasks. This includes extending the capabilities of global sensing systems such as computer vision and GPS to provide robots with an awareness of the world around them and control techniques to allow more effective task execution.

Aircraft Aerodynamics and Design Group

Director: Ilan Kroo

Location: Durand 165; Mail Code: 4035; Phone: 650-723-1640; Fax: 650-725-3314
Email: kroo@stanford.edu; URL: http://aero.stanford.edu/ADG.html

The Aircraft Aerodynamics and Design Group is involved with research in applied aerodynamics and aircraft design. The work ranges from the development of computational and experimental methods for aerodynamic analysis to studies of unconventional aircraft concepts and new architectures for multidisciplinary design optimization.

Army High-Performance Computing Research Center

Director: Charbel Farhat

Location: Durand 257; Mail Code: 4035; Phone: 650-723-3840; Fax: 650-725-3525
Email: cfarhat@stanford.edu; URL: http://ahpcrc.stanford.edu

Led by Stanford University in partnership with the University of Texas-El Paso, New Mexico State University-Las Cruces and Morgan State University, the Army High-Performance Computing Research Center focuses on advancing the state of the art of computational-based engineering sciences and high-performance computing. The center's research program focuses on fundamental problems associated with multi-scale and multi-physics modeling, scalable numerical algorithms, computer architecture, parallel programming tools, and the education of the next generation of scientists and engineers in these areas. Current applications include under body blasts, blood transfusion on the battlefield, inhalation of toxic agents in the lungs, nano-electromechanical devices, scalable computational geometry and exascale computing.

Bio-Inspired Flight Lab

Director: David Lentink; Administrator: Heather Robinson

Location: Bldg 550, Rm 115; Phone: 650-721-9433; Email: dlentink@stanford.edu
URL: http://lentinklab.stanford.edu/welcome/biological_questions

The Bio-Inspired Flight Lab is focused on unraveling the aeromechanics of bird flight to build better flying robots. Individual bird development and evolution as a species are shaped by the physical interaction with air. While wing morphology is rigid in flying robots, it is extremely fluid in birds. We study how such wing morphing and flapping significantly expands the performance envelope of birds during maneuvers. We apply the scientific and engineering design principles we unravel from studying nature to develop innovative hand-size flying robots.

Biomotion Research Group

Director: Thomas Andriacchi; Lab Manager: Jessica Asay

Location: Durand 061; Mail Code: 4038; Phone: 650-723-5793; Fax: 650-725-1587
Email: tandriac@stanford.edu; URL: http://www.stanford.edu/group/biomotion

Researchers in the Biomotion Research Group study normal and pathological function that can ultimately be applied to the improved evaluation and treatment of musculoskeletal disease and injury. The goals are addressed by studying normal subjects and patients with injury or disease that influences the function of the musculoskeletal system. In addition, the biomotion group is committed to the development of improved methods for the measurement and analysis of human movement. The biomotion laboratory is an important component in the overall biomechanics research within the Department of Mechanical Engineering.

Bob and Norma Street Environmental Fluid Mechanics Laboratory

Director: Stephen Monismith; Sr. Research Associate: Derek Fong
Administrator: Yusong Rogers

Location: Y2E2 126; Mail Code: 4020; Phone: 650-723-4372; Fax: 650-725-9720
Email: ysrogers@stanford.edu; URL: http://cee.stanford.edu/programs/efml/index.html

The Bob and Norma Street Environmental Fluid Mechanics Laboratory (EFML) is home to research conducted in the Environmental Fluid Mechanics and Hydrology program. The EFML was formerly known as the Hydraulics Laboratory and was renamed the EFML in 1986 to more accurately reflect the research interests of the faculty. In 2013, the lab was renamed the Bob and Norma Street Environmental Fluid Mechanics Laboratory in honor of the contributions and support of the laboratory by founding director Robert Street and his wife, Norma. Research in the lab is focused on turbulence and mixing in natural water bodies and particularly the near-coastal environment, stratified flows in lakes, reservoirs, estuaries and coastal seas, physical-biological interactions in coastal and estuarine flows, sedimentation in reservoirs, and sediment transport in watersheds, lakes and estuaries.

The EFML currently has three major experimental research facilities, and a set of smaller facilities. The major facilities include two large wave-current flumes and a stratified flow tank for studying internal gravity waves. The EFML is also home to state-of-the-art field instrumentation used to understand numerous complex environmental flows, such as waves breaking over coral reefs, mixing and transport in kelp forests and sea grass canopies, internal gravity waves in lakes and coastal seas, and sediment transport in lakes and estuaries. The EFML is also home to an autonomous underwater vehicle, which is used to obtain spatial distributions of currents and temperature to augment the instrumentation that measures time series of fluid properties at fixed points in space.

Brown Institute for Media Innovation

Director: Bernd Girod; Associate Director: Ann Grimes
Program Manager: Kelly Yilmaz; Deputy Director: Tania Aitamurto

Email: kelly.yilmaz@stanford.edu; URL: http://brown.stanford.edu

Established in 2012, the David and Helen Gurley Brown Institute is a collaboration between Columbia University and Stanford University, designed

to encourage and support new endeavors in media innovation. At Stanford, the primary focus is on media technology, and the institute is anchored in the School of Engineering. At Columbia, the primary focus is on content, and the institute is anchored in the Graduate School of Journalism.

The Brown Institute operates as an academic venture forum. Once a year, we invite the Columbia and Stanford communities to submit proposals for Magic Grants. Typically, a Magic Grant supports a small team of graduate or postgraduate students who are expected to demonstrate the relevance and viability of their ideas by implementing a prototype or creating an innovative media product. Successful projects might continue as business ventures outside the universities. The institute also awards fellowships. Brown Fellows are postgraduate or graduate students who support the institute together with their peers and the directors while working toward engineering prototypes, creating innovative media products or carrying out related research.

Center for Financial and Risk Analytics

Director: Kay Giesecke

Phone: 650-723-9265; Email: cfra-email@stanford.edu; URL: http://cfra.stanford.edu

Financial institutions face significant analytical demands in areas such as securities trading, portfolio management, risk management and regulatory compliance. The agencies overseeing the financial system are charged with monitoring a complex network of thousands of interacting institutions. Expanding regulatory initiatives; the growing complexity of financial products, markets and institutions; and the availability of massive amounts of data are driving increased demand for innovative analytics at organizations and supervisory agencies. The Center for Financial and Risk Analytics pioneers models, algorithms and numerical tools to address the challenging and important problems arising in this context. The center's faculty and doctoral students combine expertise in core areas such as stochastics, optimization, networks and algorithms with a deep understanding of financial markets to make fundamental advances of broad relevance.

Center for Turbulence Research

Director: Parviz Moin; Programs & Administration Manager: Rika Bosmans

Location: Bldg 500, Rm 500B; Mail Code: 3035; Phone: 650-736-0766; Fax: 650-725-3525
Email: turbulence@stanford.edu; URL: http://ctr.stanford.edu

At the Center for Turbulence Research, faculty, postdoctoral fellows, graduate students and visiting fellows use computer simulation methodology to conduct studies of turbulent flows aimed at improving prediction methods and developing concepts for turbulence control for engineering applications. Specific areas of interest include external and internal aerodynamics, distributed control, reacting flows and combustion, heat transfer, parallel computing, numerical methods for partial differential equations, stochastic differential equations, aeroacoustics and hydroacoustics, plasmas, planetary formation and molecular dynamics.

Center on Nanostructuring for Efficient Energy Conversion

Co-Directors: Stacey Bent, Friedrich Prinz; Administrator: Anne B. Hare

Location: Bldg 530, Rm 226; Phone: 650-497-0411; Fax: 650-723-5034
Email: abhare@stanford.edu; URL: http://cneec.stanford.edu

The world's growing energy needs will require a collection of extremely efficient energy technologies that will work in concert to produce, store and use the large amounts of energy that humans will soon demand. To provide a scientific foundation for breakout high-efficiency, cost-effective energy technologies, Center on Nanostructuring for Efficient Energy Conversion research activities are focused on the following goals: employ nanostructuring to generate high gradients, high surface-to-volume ratios and low dimensionality leading to improved energy conversion efficiency; manipulate materials at the nanometer scale to increase efficiency of energy conversion devices; exploit fundamental advances in charge transport, optical absorption and equilibrium control to improve performance and efficiency in energy conversion devices.

Collaborative Haptics and Robotics in Medicine (CHARM) Lab

Principal Investigator: Allison Okamura; Administrator: Anneliese Tunison

Location: MERL 126; Mail Code: 2232; Phone: 650-736-3458; Email: aokamura@stanford.edu
URL: http://charm.stanford.edu/

Research at the CHARM Lab focuses on developing the principles and tools needed to realize advanced robotic and human-machine systems capable of haptic (touch) interaction, particularly for biomedical applications. Haptic systems are designed and studied using both analytical and experimental approaches. Topics of particular interest are:

Teleoperation: devices, models and control systems that allow human operators to manipulate environments that are remote in scale and/or distance;

Virtual environments: models, control systems and devices that enable compelling touch-based interaction with computers;

Robotic manipulation: robots that physically manipulate their environment or their own shape, incorporating novel designs, sensors and control systems. Application areas include surgery, simulation and training, rehabilitation, prosthetics, neuromechanics, exploration of hazardous and remote environments, design and education.

Computer Systems Laboratory

Director: Mendel Rosenblum

Location: Gates 351; Mail Code: 9040; Phone: 650-723-1440; Fax: 650-725-7398
Email: mendel@cs.stanford.edu; URL: http://csl.stanford.edu

The Computer Systems Laboratory is a joint research and teaching laboratory sponsored by the departments of Electrical Engineering and Computer Science. Research spans all areas of computer systems, from programming language theory and verification to integrated circuit design and special computer architectures. The systems area encompasses both experimental and theoretical work involving topics in operating systems, computer networking, architecture, compilers, programming languages, information management, database systems, graphics, reliability and fault tolerance, system specification and verification, and user interfaces.

Edward L. Ginzton Laboratory

Director: Shanhui Fan; Managing Director: Miguel S. Hernandez
Deputy Director: Butrus "Pierre" Khuri-Yakub

Location: Spilker Bldg; Mail Code: 4088; Phone: 650-723-0111; Fax: 650-725-9355
URL: http://www.stanford.edu/group/ginzton/

The Ginzton Laboratory is an interdisciplinary research lab that explores the most exciting and productive areas at the overlap between engineering and the sciences. The combination of science and engineering gives new concepts, understanding and rigor from science, the stimulus of challenging and important problems from engineering, and the depth of engineering technology to enable advanced scientific experiments. Strong opportunities come from the overlap of three scientific and engineering fields: quantum science and engineering, photonic science and engineering, and nanoscience and engineering. These are embedded in an environment that encourages and explores applications from other fields, such as sensing, communications, information processing, biology and medicine, energy and the environment.

Engineering Risk Research Group

Director: M. Elisabeth Paté-Cornell

Location: Huang Engineering Center; Mail Code: 4027; Phone: 650-725-1624
Fax: 650-723-1614; URL: http://www.stanford.edu/group/ERRG

The mission of the Engineering Risk Research Group (ERRG) is the analysis, mathematical modeling and management of the safety of engineered systems using probabilistic methods and systems analysis. The objective is to identify the most cost-effective risk reduction measures, including both technical and organizational solutions, in complex systems. Decision analysis is often used to make the final choice among a

spectrum of risk mitigation options. Fields of application studied in the ERRG include space systems, medical procedures and devices, offshore oil platforms, counterterrorism and national security, financial problems of the insurance industry, and software risk analysis.

Flow Physics and Computational Engineering Group

Director: Parviz Moin; Emeritus: Andreas Acrivos
Faculty: Eric Darve, John Eaton, Gianluca Iaccarino

Location: Bldg 500; Mail Code: 3035; Phone: 650-736-0766; Fax: 650-735-3525
Email: turbulence@stanford.edu; URL: http://www.stanford.edu/group/fpc/cgi-bin/fpcwiki/

The Flow Physics and Computational Engineering (FPCE) Group is contributing new theories, models and computational tools for accurate engineering design analysis and control of complex flows, including acoustics, chemical reactions, interactions with electromagnetic waves, plasmas and other phenomena of interest in aerodynamics, electronics cooling, environmental engineering, materials processing, planetary entry, propulsion and power systems, and other areas. A significant emphasis of FPCE research is on physical modeling and analysis of physical phenomena in engineering systems. FPCE students and research staff are developing new methods and tools for generation, access, display, interpretation and post-processing of large databases resulting from numerical simulations of physical systems. Research in FPCE ranges from advanced simulation of complex turbulent flows to active flow control. The FPCE faculty teach graduate and undergraduate courses in acoustics, aerodynamics, computational fluid mechanics, computational mathematics, fluid mechanics, combustion, thermodynamics and propulsion. FPCE is closely connected with the Center for Turbulence Research, an internationally recognized institution for fundamental research on turbulence.

Geballe Laboratory for Advanced Materials

Director: Ian Fisher; Deputy Director: Mark Brongersma
Associate Director: Cynthia Sanchez

Location: McCullough 119; Mail Code: 4045; Phone: 650-723-3183; Fax: 650-723-3044
Email: irfisher@stanford.edu; URL: http://www-lam.stanford.edu

The Geballe Laboratory for Advanced Materials (GLAM) is an independent laboratory under the Dean of Research that supports research programs on advanced materials, and fosters research and education for undergraduate, graduate and postdoctoral students. Its mission is to support interdisciplinary materials research programs and to manage materials characterization facilities for the Stanford materials research community. GLAM is not an academic department, nor does it grant degrees. GLAM consists of about 30 faculty members principally from applied physics, physics, and materials science and engineering, with additional faculty from chemistry, electrical engineering and mechanical engineering. Current research programs include work on dielectric, magnetic, optical, organic, semiconducting and superconducting materials. There are strong programs in materials synthesis, materials characterization, physical study and theory. GLAM is also the home for the Center for Research on Information Storage Materials, the Stanford/IBM NSF NSEC Center for Probing the Nanoscale and the IBM/Stanford Center for Spintronics. Located in GLAM is the Stanford Nanocharacterization Laboratory, which houses state-of-the-art facilities for the characterization of materials. Key instruments include a focused ion beam, scanning and transmission electron microscopy, x-ray diffraction, x-ray photoemission spectroscopy, scanning probe microscopy and electron microprobe. These facilities are open to the entire Stanford materials research community.

Global Climate and Energy Project

Director: Sally Benson; Managing Director: Richard Sassoon

Location: Y2E2 324; Mail Code: 4230; Phone: 650-725-3230; Fax: 650-725-9190
Email: gcep@stanford.edu; URL: http://gcep.stanford.edu

GCEP, the Global Climate and Energy Project, was established to perform fundamental, pre-commercial research on technologies that would foster the development of a global energy system with low greenhouse emissions. GCEP develops and manages a portfolio of innovative research activities, publishes reports, and conducts workshops and seminars related to energy supply, transformation and use with low emissions of greenhouse gases. The project's energy-related research is being conducted by a number of Stanford professors, postdoctoral researchers and graduate students.

Gravity Probe B Project

Principal Investigator: C.W.F. Everitt; Co-Principal Investigators: Bradford Parkinson, John Turneaure, Daniel DeBra

Phone: 650-725-4103; Fax: 650-725-8312; Email: francis@relgyro.stanford.edu
URL: http://einstein.stanford.edu

Gravity Probe B (GP-B) was a mission testing Einstein's General Theory of Relativity by means of cryogenic gyroscopes in polar orbit around Earth. Launched from Vandenberg Air Force Base on April 20, 2004, it went through a 17-month, 9-day on-orbit cryogenic operation followed by a fascinating process of data analysis, culminating in a major NASA HQ Public Announcement on May 4, 2011. GP-B provided accurate measurements of two essentially untested aspects of Einstein's theory: the geodetic effect on a mass moving through curved space-time and frame-dragging caused by Earth's rotation, both with far-reaching implications. As a test of Einstein, it was almost unique in being a controlled physics experiment, compared with more conventional astrophysical observations. The program has produced 86 PhDs at Stanford and 14 elsewhere. During its history, 353 undergraduates from 11 different Stanford departments and 59 high school students have also participated; their work yielded a considerable number of undergraduate honors theses, and university and national awards. Work is in progress on a *Classical & Quantum Gravity* special volume to provide full accounts of the unique technologies that made the mission happen. The texts will be submitted to the journal in November 2014. The publisher's plan is to release the 600-page *Special Volume* on July 8, 2015, two months before the 100th anniversary of the publication of Einstein's General Relativity paper in September 1915.

Hansen Experimental Physics Laboratory

Managing Director: Nancy Christiansen; Deputy Director: Mark Kasevich
Faculty Director: Sarah Church

Location: Physics & Astrophysics, 452 Lomita Mall; ; Phone: 650-724-7667
Email: nchristiansen@stanford.edu; URL: http://www.stanford.edu/group/hepl/

HEPL, the Hansen Experimental Physics Laboratory, is an independent laboratory supporting interdisciplinary research programs in fundamental science and engineering. HEPL, in partnership with departments, provides unique research and educational opportunities for undergraduate, graduate and postdoctoral students.

Hasso Plattner Institute of Design at Stanford

Executive Director: Sarah Stein Greenberg
Faculty Directors: David Kelley, Bernard Roth

Location: Bldg 550, Rm 169; Phone: 650-736-1025; Email: info@dschool.stanford.edu
URL: http://dschool.stanford.edu

The Hasso Plattner Institute of Design, widely known as the d.school, is a place for students and faculty of many disciplines to learn and engage in design thinking and to work together to solve big problems in a human-centered way. It is a place where people from big companies, startups, schools, nonprofits and government, and anyone else who

realizes the power of design thinking, can join in multidisciplinary teaching, prototyping and research. The d.school brings multidisciplinary teams of faculty and students together with public and private organizations to tackle complex problems. They start by understanding how those problems affect people and then address them by iteratively designing solutions such as products, environments and services.

High Temperature Gasdynamics Laboratory

Director: Reginald Mitchell; Administrator: Perry Thoorsell

Location: Bldg 520; Mail Code: 3032; Phone: 650-723-1745; Fax: 650-723-1748
Email: remitche@stanford.edu; URL: http://navier.stanford.edu/thermosciences/htgl.html

The High Temperature Gasdynamics Laboratory houses experimental research in the areas of energy science, combustion science, propulsion, pollution science, fluid mechanics, spray dynamics, plasma science, materials synthesis and laser-based optical diagnostics. Typical topics include fundamental aspects of spray combustion, coal and biomass combustion and gasification, synthetic fuels, plasma-assisted materials processing, plasma propulsion, mixing and reaction of gases at subsonic and supersonic speeds, advanced air-breathing propulsion, pulse detonation engines, chemistry of pollutant formation, reactive gasdynamics, and plasma chemistry. Research activities include determination of spectroscopic parameters in high temperature gases, measurement of reaction rate parameters in combustion gases, development of laser-based diagnostic methods for probing various properties of gaseous flows, and use of diode laser sensors for process monitoring and control.

Information Systems Laboratory

Director: Stephen Boyd

Location: Packard Bldg; Fax: 650-723-8473; Email: boyd@stanford.edu
URL: http://isl.stanford.edu/

The Information Systems Laboratory (ISL) in the Department of Electrical Engineering includes about 30 faculty members, 150 doctoral students and 150 master's students. Research in ISL focuses on algorithms for information processing, their mathematical underpinnings and a broad range of applications. Core topics include information theory and coding, control and optimization, signal processing, and learning and statistical inference. ISL has active interdisciplinary programs with colleagues in electrical engineering, computer science, statistics, management science, aeronautics and astronautics, computational and mathematical engineering, biological sciences, psychology, medicine, and business. ISL research is sponsored by U.S. government agencies, including the National Science Foundation, National Institutes of Health and the Defense Advanced Research Projects Agency; by industry; and by university centers such as the Center for Integrated Systems, TomKat Center for Sustainable Energy, Stanford Center for Image Systems Engineering and the Brown Institute for Media Innovation.

Institute for Computational and Mathematical Engineering

Director: Margot Gerritsen

Programs & Administration Manager: Emily Roberts

Location: Huang 060; Mail Code: 4042; Phone: 650-724-3313; Fax: 650-497-8040
Email: icme-contact@stanford.edu; URL: http://icme.stanford.edu

The Institute for Computational and Mathematical Engineering (ICME) is a degree-granting (MS/PhD) interdisciplinary institute at the intersection of mathematics, computing, engineering and applied sciences. ICME was founded in 2004, building on the Scientific Computing and Computational Mathematics Program, which was established in 1989. At ICME, we design state-of-the-art mathematical and computational models, methods and algorithms for engineering and science applications. We collaborate closely with engineers and scientists in academia and industry to develop improved computational approaches and advance disciplinary fields. In particular, we leverage Stanford's

strength in engineering applications in the physical, biological, mathematical and information sciences, and we have established connections with nearly 20 departments across six schools at Stanford University. We identify research areas that would benefit from a multidisciplinary approach in which computational mathematics plays a role. This multidisciplinary intellectual environment is a core strength of ICME, with interaction among students and faculty with diverse backgrounds and expertise. Our students and faculty are active in many research areas: financial mathematics; fluid dynamics; protein folding; data science, including machine learning and recommender systems; ocean dynamics; climate modeling; reservoir engineering; aerodynamics and space applications; and computer graphics.

John A. Blume Earthquake Engineering Center

Director: Gregory Deierlein; Administrator: Racquel Hagen

Location: Bldg. 540; Mail Code: 3037; Phone: 650-723-4150; Fax: 650-725-9755
Email: jabeec-email@stanford.edu; URL: http://blume.stanford.edu

The Blume Earthquake Engineering Center was established to promote research and education in earthquake engineering. Through its activities, our understanding of earthquakes and their effects on facilities and structures is continuously improving. Faculty and students at the center conduct research, provide instruction, publish reports and articles, and conduct seminars and conferences. The center also provides financial support for students.

Linac Coherent Light Source

Location: 2575 Sand Hill Road, Menlo Park, CA 94025
Phone: 650-926-2079; Email: useradmin@slac.stanford.edu
URL: https://portal.slac.stanford.edu/sites/lcls_public/Pages/Default.aspx

The Linac Coherent Light Source (LCLS), a directorate of the SLAC National Accelerator Laboratory, is a U.S. Department of Energy Office of Science national user facility. The LCLS produces ultra-fast pulses of extremely bright x-rays that are used to better understand the fundamental processes of physics, materials, chemistry and biology on unprecedented timescales. LCLS uses the free-electron laser (FEL) process, in which a pulse of high-energy electrons traveling through a very long periodic magnet structure creates x-rays and then coherently amplifies their intensity by many orders of magnitude. The SLAC linear accelerator is uniquely capable of producing the intense, high-energy electrons required to drive such an x-ray source. LCLS enables frontier science and is the first FEL facility in the world operating in the hard x-ray spectral range. Experimental beam time at the LCLS user facility is competitive and based on ratings of scientific merit received through an international peer review process. Each researcher completes training to operate LCLS equipment. Students and new researchers learn from and assist more senior researchers with taking measurements and analyzing data during their experiments. The personal experience received during beam time benefits each participant by providing a framework and understanding of the mechanisms and difficulties that can be encountered during FEL research experiments. LCLS provides unique educational experiences and provides training for future generations of scientists and engineers. Users disseminate their findings through talks and publications.

Magnetic Resonance Systems Research Laboratory

Directors: Dwight Nishimura, Albert Macovski, John Pauly

Location: 427 Santa Teresa Street (Bldg 02-565); Mail Code: 9510
Phone: 650-725-563; Fax: 650-723-8473; Email: dwight@mrsrl.stanford.edu
URL: http://www.stanford.edu/group/mrsrl

The Magnetic Resonance Systems Research Laboratory focuses on developing new acquisition and processing methods for improved magnetic resonance imaging (MRI). The research group pursues a wide variety of projects related to new applications and hardware for MRI. A lab housing a fully equipped GE Signa 1.5T MRI scanner is used for this research.

Manufacturing Modeling Lab

Director: Kurt Beiter

Location: Thornton 207; Mail Code: 4022; Phone: 650-723-7340; Email: kbeiter@stanford.edu

The Manufacturing Modeling Lab (MML) serves as a repository of manufacturing models as well as a focus of research on design and manufacturing integration. The laboratory has working relationships with the Graduate School of Business through Stanford's Global Supply Chain Management Forum and with the Center for Design Research, the Center for Integrated Facilities Engineering and the Work Systems Collaborative Research Lab. MML's research develops methods and tools for system design and management to improve the life-cycle quality of products and processes. The lab applies structured techniques to support "Design for X" decisions addressing robustness, reliability, serviceability, variety, flexibility and sustainability. Recent research areas include Scenario-Based Amorphous Design and Decision Analytical Scorecarding. MML is also home of Stanford's renowned graduate course Design for Manufacturability (ME317).

Max Planck Center for Visual Computing and Communication

Faculty Directors: Bernd Girod, Leonidas Guibas

Executive Director: Joyce Farrell

Location: Packard 373; Mail Code: 9510; Phone: 650-725-6345; Fax: 650-725-8286

Email: bgirod@stanford.edu; URL: http://www.mpc-vcc.org/

The Max Planck Center for Visual Computing and Communication (MPC-VCC) was established by the Max Planck Society for the Advancement of Science and Stanford University in October 2003. The MPC-VCC supports research collaborations between faculty at Stanford and researchers at the Max Planck Institute for Informatics by providing graduate and postdoctoral fellowships in the Stanford School of Engineering. The MPC-VCC also supports the professional development of a small number of selected, outstanding individuals by providing them with the opportunity to work at Stanford University as visiting assistant professors for two years and then return to Germany to continue their research as senior researchers at the Max Planck Institute for Informatics and ultimately as professors or research leaders in industry.

Nano-Photonics Laboratory

Director: Lambertus Hesselink

Location: CIS-X, B104 & B114; Mail Code: 4075; Phone: 650-723-9127

Email: bert@kaos.stanford.edu

The Nano-Photonics Laboratory studies ultra-dense digital optical data storage, optical super-resolution, nonlinear optics, nanostructures and visualization of scientific data. The lab contains facilities for digital image processing, extensive optical laboratory facilities, crystal growth facilities and state-of-the-art computing facilities, including graphics machines for efficient visualization of complex 4-D scientific data sets. A new effort in nanoscale information processing machines and telecommunications has resulted in new highly efficient nanoscale apertures for ultra high-resolution microscopy and optical tweezers for manipulation of single molecules.

Nanoscale Prototyping Laboratory

Director: Friedrich Prinz; Administrator: Anne B. Hare

Location: Bldg 530, Rm 226; Mail Code: 3030; Phone: 650-497-0411; Fax: 650-723-5034

Email: abhare@stanford.edu; URL: http://npl-web.stanford.edu/

The Nanoscale Prototyping Laboratory team creates, models and prototypes nanoscale structures to understand the physics of electrical energy conversion and storage. We are exploring the relation between size, composition and the kinetics of charge transfer. We are also interested in learning from nature, in particular by studying the electron transport chain in plant cells. We employ a wide range of nanofabrication technologies to build and evaluate prototype structures. Such technologies include atomic layer deposition, scanning probe microscopy and impedance spectroscopy. In addition, we use molecular scale modeling to gain insights into the nature of charge separation and recombination processes.

National Center for Engineering Pathways to Innovation

Director: Tom Byers; Deputy Director: Leticia Britos Cavagnaro
Principal Investigators: Kathleen Eisenhardt, Sheri Sheppard

Location: STVP, Huang 004; Email: epicenter@stanford.edu; URL: http://epicenter.stanford.edu/

The National Center for Engineering Pathways to Innovation (Epicenter) is funded by the National Science Foundation and directed by Stanford University and the National Collegiate Inventors and Innovators Alliance (NCIIA). Epicenter's mission is to empower U.S. undergraduate engineering students to bring their ideas to life for the benefit of our economy and society. To do this, Epicenter helps students combine their technical skills, their ability to develop innovative technologies that solve important problems, and an entrepreneurial mindset and skill set. Epicenter's three core initiatives are the University Innovation Fellows program for undergraduate engineering students and their peers; the Pathways to Innovation Program for institutional teams of faculty and university leaders; and a research program that contributes to national knowledge on entrepreneurship and engineering education.

Neuromuscular Biomechanics Lab

Director: Scott Delp

Location: Clark Center; Phone: 650-725-4009; Fax: 650-736-0801; Email: delp@stanford.edu
URL: http://www.stanford.edu/group/nmbl/

The Neuromuscular Biomechanics Lab combines experimental and computational approaches to study human movement. Biomechanical models are developed to analyze muscle function, study movement abnormalities, design new medical products and guide surgery. New computational models of human movement are tested extensively with medical image data and experimental measurements.

Precourt Institute for Energy

Director: Sally Benson

Location: Y2E2 324; Mail Code: 4240; Phone: 650-725-3230
Email: precourt_institute@stanford.edu; URL: https://energy.stanford.edu/

The Precourt Institute for Energy (PIE) engages in a broad-ranging, interdisciplinary program of research and education on energy: applying fundamental research to the problem of supplying energy in environmentally and economically acceptable ways, using it efficiently, and facing the behavioral, social and policy challenges of creating new energy systems for the United States and the world. PIE serves as the hub of a broad and deep network of experts from various science, technology, behavioral and policy disciplines who are working independently and collaboratively to solve the world's most pressing energy problems. PIE's mission is to advance the goal of major and rapid energy transformations. PIE provides funding and associated support for cutting-edge energy research, creates and maintains avenues for effective communication and intellectual exchange among scholars and others seeking energy solutions, and develops energy-literate leaders and communities through educational programs and the dissemination of research results.

Predictive Science Academic Alliance Program II

Director: Gianluca Iaccarino; Administrator: Marlene Lomuljo-Bautista

Location: Bldg 500, Rm 500X1; Mail Code: 3035; Email: marlenel@stanford.edu
URL: http://web.stanford.edu/group/exascale/cgi-bin/wordpress/

Stanford's PSAAP II Center will involve the Mechanical Engineering, Aeronautics and Astronautics, Computer Science and Math departments on campus, and a partnership with the University of Michigan, the University of Minnesota, the University of Colorado-Boulder, the University of Texas-Austin and the State University of New York-Stony Brook. The project, Predictive Simulations of Particle-Laden Turbulence in a Radiation Environment, will investigate the effect of radiation on particle motion in an air-turbulent environment. This is a poorly understood physical process that may open new opportunities for efficiency gains in solar energy systems, among other applications. Unlike conventional

solar receivers, in which a solid surface absorbs the solar radiation and transfers the heat to an operating fluid, particle-based receivers use fine grains suspended in the fluid to transfer heat throughout the fluid volume, enabling higher transfer rates and increasing efficiency. The center will focus on simulations at an unprecedented level of fidelity by accessing the largest supercomputers in the United States. This will help develop and demonstrate the use of such exascale systems (computers that can perform 1,018 floating-point operations per second) in both science and engineering applications. Key to this effort will be use of domain-specific languages such as Liszt and the ability of computer programs to identify and recover from faults. The project will also concentrate on uncertainty analysis, allowing researchers to quantify errors and uncertainties in the simulations, and therefore to determine how much confidence can be placed in the results. A dedicated experimental campaign will be undertaken alongside the computational work to help understand and identify these uncertainties. In parallel to the research effort, new graduate-level classes on computational science and engineering will be introduced at Stanford. Workshops and hackathons will be organized. The agreement continues a 15-year-long history of strong collaboration between National Nuclear Security Administration laboratories and Stanford, including the Advanced Simulation and Computing and PSAAP programs.

Product Realization Laboratory

Co-Directors: David Beach, Craig Milroy
Associate Director: Marlo Kohn

Location: Bldg 550, Rm 114; Mail Code: 4021; Phone: 650-724-3586; Fax: 650-723-3521
Email: francsy@stanford.edu; URL: http://prl.stanford.edu

The Product Realization Lab (PRL) is a teaching facility that has its roots in the Department of Mechanical Engineering and deep synergies with the Stanford Design Program and the Hasso Plattner Institute of Design (d.school). Each year, more than 1,700 undergraduate, graduate and professional school students work in the PRL to gain the skills and confidence required to transform the world.

Project-Based Learning Laboratory

Director: Renate Fruchter

Location: Y2E2 280; Mail Code: 4020; Phone: 650-725-1549; Fax: 650-723-4806
Email: fruchter@stanford.edu; URL: http://pbl.stanford.edu

The Project-Based Learning (PBL) Lab is a cutting-edge research and learning facility in the Department of Civil and Environmental Engineering. PBL is about teamwork in a rich information-and-collaboration technology setting. The research and development focuses on collaboration technologies in support of cross-disciplinary, geographically distributed teamwork and e-learning, such as team building, knowledge capture, sharing and re-use, project memory, corporate memory, mobile and cloud solutions, interactive workspaces, sensor-based interaction, and mixed media and mixed reality environments for remote collaboration. In addition, researchers study the impact of technology on learning, engagement, knowledge work productivity, team dynamics and assessment. Since 1993 the PBL Lab has been the home for AEC Global Teamwork, which engages students, faculty and industry mentors worldwide. The growing global network has engaged partner universities and companies worldwide.
PBL is a process of teaching and learning that focuses on problem-based, project-centered activities that produce products for clients. PBL is based on agile integrated processes that bring people from multiple disciplines together. Graduate and undergraduate students have the opportunity to engage in two quarter-long global project-based learning experiences. They develop sustainable design-construction projects to better understand the role of their discipline and develop a passion for one of the professions in the context of architecture/engineering/construction global teamwork and become change agents throughout their careers.

Security Lab

Director: Dan Boneh

URL: http://crypto.stanford.edu/seclab/

The Security Lab is a part of the Department of Computer Science. Research projects in the lab focus on all aspects of computer security, including web security, code analysis, security hardware, virtualization, security of mobile devices and cryptography. PhD students in the lab work on research projects affecting real-world systems as well as theoretical aspects of computer security. The lab offers computer security courses at all levels, from first-year undergraduate to advanced graduate. Several online and remote courses in computer security are also available. In addition, the lab runs a bi-weekly security seminar open to the public and an annual one-day security workshop on the latest Stanford research in computer security.

Simbios

Principal Investigator: Scott Delp

Co-Principal Investigators: Russ Altman, Vijay S. Pande

Location: Clark Center S271 & S241; Mail Code: 5448; Phone: 650-724-1575

Fax: 650-723-7461; Email: simbiosfeedback@stanford.edu

URL: http://simbios.stanford.edu

Simbios is a National Institutes of Health center based at Stanford for physics-based Simulation of Biological Structures. It is one of eight National Centers for Biomedical Computing. Simbios provides infrastructure, software and training to help biomedical researchers understand biological form and function as they create novel drugs, synthetic tissues, medical devices and surgical interventions.

Smart Products Design Lab

Director: Ed Carryer

Location: Thornton 201; Mail Code: 4021; Email: carryer@stanford.edu

URL: http://design.stanford.edu/spdl/

The Smart Products Design Lab is the home for mechatronics education at Stanford. Smart Products, a superset of mechatronics, are those whose functionality is increased by an embedded microprocessor. Courses taught include ME 218 A, B, C and D.

Space and Systems Development Laboratory

Sr. Research Associate: David Lauben

Location: Durand 271; Mail Code: 4035; Phone: 650-723-8651; Fax: 650-723-1685

Email: robert.twiggs@stanford.edu

The Space and Systems Development Laboratory has a major focus at the master's degree level on building CubeSat picosatellites. The CubeSat picosatellite project provides experience for students in the design, fabrication, testing and operation of a 4-inch cube, 1 kg picosatellite within a one-year period for a very low cost. The laboratory provides opportunities for quick space experimentation and feasibility demonstrations, and qualifications of space parts. The laboratory also supports doctoral research of special spacecraft components and operational methodologies of satellite constellations. The laboratory has computers for space hardware and software design testing. A student-operated ground control station provides picosatellite operational control and training. The laboratory has cooperative relationships with industry and government laboratories such as Space Systems/Loral, Lockheed Martin, Northrop Grumman, The Aerospace Corporation, JPL, NASA Ames Research Center, Goddard Space Flight Center and others.

Space, Telecommunications and Radioscience Laboratory

Director: Umran Inan; Administrator: Shaolan Min

Location: Packard 356; Mail Code: 9515; Phone: 650-723-4994; Fax: 650-723-9251

Email: inan@ee.stanford.edu; URL: http://nova.stanford.edu/

The Space, Telecommunications and Radioscience Laboratory, or STAR Lab, exploits electromagnetic wave phenomena to probe the physical environment of Earth and other planets, and to develop wireless and optical fiber communication systems.

Stanford Artificial Intelligence Laboratory

Director: Fei-Fei Li; Lab Administrator: Alex Sandra Pinedo

Location: Gates 1A & 2A; Mail Code: 9010; Phone: 650-721-6625; Fax: 650-725-1449
Email: asandra@cs.stanford.edu; URL: http://ai.stanford.edu

The Stanford Artificial Intelligence Laboratory is the intellectual home for researchers in the Department of Computer Science whose primary research focus is artificial intelligence. The lab is in the Gates Computer Science Building and the Clark Center, where at least 100 people share the space with at least 20 robots. Our mission is to change the way we understand the world. In the past decade, an abundance of data has become available, such as online data on the web, scientific data such as the transcript of the human genome and sensor data acquired by devices, robots or the buildings we inhabit. Turning data into information and knowledge pertaining to problems that people care about is the central mission of our research as is a deeper understanding of human-level cognition, perception and actuation. In short, we seek to develop the next generations of theory, algorithms and systems that help us attach meaning to bits and bytes. Members of the Stanford AI Lab have contributed to fields as diverse as bio-informatics, cognition, computational geometry, computer vision, decision theory, distributed systems, game theory, image processing, information retrieval, knowledge systems, logic, machine learning, multi-agent systems, natural language, neural networks, planning, probabilistic inference, sensor networks and robotics.

Stanford Center for Professional Development

Executive Director: Paul Marca

Location: Durand 313; Mail Code: 4036; Phone: 650-204-3984; Fax: 650-725-2868
Email: scpd-customerservice@stanford.edu
URL: http://scpd.stanford.edu/tilesPublic/organizations.jsp

Through a dynamic partnership with the Stanford Center for Professional Development, offer your employees access to unique, career-long learning opportunities. For a nominal annual fee, you will receive access to the part-time Master of Science degree program for qualified employees, tuition discounts on graduate courses, and informational events and resources to help promote your education program.

Stanford Nano Center

Director: Kathryn Moler; Associate Director: Tobi Beetz

Location: Spilker Bldg; Phone: 650-644-9541; Email: tobi@stanford.edu;
URL: http://snc.stanford.edu/

The Stanford Nano Center (SNC) is located in the Center for Nanoscale Science and Engineering. Most of the SNC laboratory space is in an extensive underground level. This seismically isolated space offers cutting-edge specifications on the control of vibration, acoustics, electromagnetic interference, light and cleanliness that are essential for the manipulation of matter down to the molecular and atomic scale. An additional 2,500 square feet on the first floor is designed as a flexible cleanroom to complement the capabilities of the Stanford Nanofabrication Facility and the nanopatterning facility in the basement. In addition to providing a home for new tools, SNC enabled space optimization elsewhere on campus by providing a home for tools from other locations: the former Ginzton microfabrication facility; the phased out Center on Polymer Interfaces and Macromolecular Assemblies in the Stauffer building; and a few tools from the SNF and Stanford Nanocharacterization Laboratory.

Stanford Nanocharacterization Laboratory

Director: Kathryn Moler; Associate Director: Tobi Beetz

Location: McCullough 114; Mail Code: 4045; Phone: 650-644-9541
Email: tobi@stanford.edu; URL: http://snl.stanford.edu/

The Stanford Nanocharacterization Laboratory (SNL) provides modern facilities for the characterization of materials. The instruments are available for all qualified users in the Stanford community, and for Stanford collaborators both locally and globally. Our mission is to assist researchers in

acquiring high-quality, useful data and insight using modern facilities for the characterization of materials. Our goals are to enhance experimental capabilities with advanced equipment, skilled personnel and effective training; to promote and enable high-quality research using nanocharacterization technology and techniques; and to disseminate knowledge to the local, national and worldwide community. Our impact areas include microelectronics, nanophotonics, biomaterials, quantum structures, MEMS devices, self-assembled molecules, micromagnetic structures, organic and nanotube devices, geological specimens and thin film materials.

Stanford Nanofabrication Facility

Faculty Director: Roger Howe

Location: Allen 158; Mail Code: 4070; Phone: 650-725-3664; Fax: 650-725-6278
Email: rthowe@stanford.edu; URL: http://snf.stanford.edu

The Stanford Nanofabrication Facility (SNF) serves academic, industrial and governmental researchers across the United States in areas ranging from optics, MEMS, biology and chemistry to traditional electronics device fabrication and process characterization. The SNF is a 10,000-square-foot Class 100 cleanroom facility that provides researchers with effective and efficient access to advanced nanofabrication equipment and expertise. The SNF is a member of the 13-university National Nanotechnology Infrastructure Network funded by the National Science Foundation and user fees to provide nanotechnology resources to users across the country. The SNF welcomes researchers from any discipline who wish to explore the uses of nanofabrication technology in their work.

Stanford Synchrotron Radiation Lightsource

Director: Piero Pianetta

Location: 2575 Sand Hill Road, Menlo Park, CA 94025; Phone: 650-926-2079
Fax: 650-926-3600; Email: useradmin@slac.stanford.edu
URL: http://www-ssrl.slac.stanford.edu/

The Stanford Synchrotron Radiation Lightsource (SSRL), a directorate of the SLAC National Accelerator Laboratory, is a U.S. Department of Energy Office of Science national user facility. SSRL produces extremely bright x-rays as a resource for researchers to study our world at the atomic and molecular level. SSRL enables and supports outstanding scientific research by a broad user community in a safe environment. SSRL operates approximately nine months each year with an extremely high reliability – delivering more than 95 percent of scheduled x-ray beam time. Access to the SSRL is competitive based on peer review. Users disseminate their findings through talks and publications. Of the approximately 1,700 scientists who annually participate in experiments at SSRL, more than 30 percent are first-time users, and more than 40 percent are postdoctoral associates or graduate and undergraduate students.

Each researcher completes training to operate SSRL equipment. Students and new researchers learn from and assist more senior researchers with taking measurements and analyzing data during their experiments. The personal experience received during beam time benefits each participant by providing a framework and understanding of the mechanisms and difficulties that can be encountered during synchrotron radiation research experiments. Scientific users also have the opportunity to participate in schools and workshops that provide in-depth, hands-on experience with specific data acquisition and analysis techniques as well as practice with sharing research findings through talks and poster presentations. SSRL research results in approximately 500 scientific papers annually; about 20 percent are theses prepared by students who relied on access to SSRL to complete their dissertations. Experiments conducted at SSRL resulted in approximately 12,000 scientific publications since 1974.

Research at SSRL benefits many sectors of the American economy and leads to major advances in energy production, environmental remediation, nanotechnology, new materials and medicine. SSRL provides unique educational experiences and serves as a vital training ground for future generations of scientists and engineers. With the knowledge

gained at SSRL, researchers have improved the design of fuel and solar cells, revealed the very nature of bacteria and viruses, exposed how genetic mutations may cause diabetes, and mapped the structures of proteins for use in biology and medicine.

Stanford Technology Ventures Program

Co-Directors: Tom Byers, Kathleen Eisenhardt

Executive Director: Tina Seelig; Managing Director: Matthew Harvey

Location: Huang 003; Mail Code: 4026; Phone: 650-723-2164; Fax: 650-723-1614

Email: tseelig@stanford.edu; URL: http://stvp.stanford.edu

As the entrepreneurship center at Stanford School of Engineering, the Stanford Technology Ventures Program (STVP) provides students with the knowledge, skills and attitudes needed to bring bold ideas to life. STVP delivers dozens of courses and extracurricular programs to Stanford students, creates leading research on high-impact technology ventures, and develops online learning tools and experiences for students, faculty and aspiring entrepreneurs around the world. STVP is hosted in the Department of Management Science & Engineering.

Stanford Woods Institute for the Environment

Faculty Directors: Jeffrey Koseff, Barton Thompson

Program Coordinator: Brenda Pascual

Location: Y2E2 221; Mail Code: 4205; Phone: 650-736-8668; Fax: 650-725-3402

Email: environment@stanford.edu; URL: http://woods.stanford.edu/

The Stanford Woods Institute for the Environment harnesses the expertise and imagination of leading academics and decision makers to create practical solutions for people and the planet. In the same spirit that inspired Stanford's role in Silicon Valley's high-tech revolution, the Woods Institute is pioneering innovative approaches to meet the environmental challenges of the 21st century – from climate change to sustainable food supplies to ocean conservation. The Stanford Woods Institute carries out its mission by sponsoring research that will lead to new solutions to global environmental sustainability issues; infusing science into policies and practices of the business, government and NGO communities; developing strong environmental leaders for today and the future; and serving as a catalyst and a hub for the university's interdisciplinary work in environmental research, education and action.

Structures and Composites Laboratory

Director: Fu-Kuo Chang

Location: Durand 054; Mail Code: 4035; Phone: 650-723-3466; Fax: 650-725-3377

Email: www@structure.stanford.edu; URL: http://structure.stanford.edu

Research at the Structures and Composites Laboratory encompasses design, manufacturing and analysis of structures with new materials and with built-in sensors, actuators, electronics and processors to enhance structural performance, functionality, durability, reliability and reparability. Topics include design of multifunctional material systems and structures for self-diagnosis, self-sensing, damage control and repair, damage tolerance and design of composite structures, and modeling and simulation of advanced structures. Target applications range from space and aircraft structures to civil infrastructures, to biomedical structural devices. The laboratory is providing new technologies, design methods, tools, data and prototypes for making high-efficiency and high-performance multifunctional structures.

Systems Optimization Laboratory

Director: Walter Murray; Administrator: Lorrie Papadakis

Location: Huang Engineering Center; Mail Code: 4026; Phone: 650-725-0535

Fax: 650-723-1614; Email: walter@stanford.edu; URL: http://www.stanford.edu/group/SOL

The Systems Optimization Laboratory (SOL) carries on a synergy program of algorithmic development, model formulation, software production and theoretical research in the area of large-scale mathematical programming and optimization. SOL software is widely distributed and is used in many application packages arising in areas such as finance, design and online control.

TomKat Center for Sustainable Energy

Director: Stacey Bent; Administrator: Danica Sarlya

Location: Shriram Center, 443 Via Ortega, Suite 377; Mail Code: 4300; Phone: 650-724-1524
Fax: 650-498-1378; Email: dsarlya@stanford.edu; URL: http://tomkat.stanford.edu/

The TomKat Center for Sustainable Energy aspires to a more sustainable global future by supporting research, education and innovation in science, technology and policy. The center fosters research through Seed Grants, awarded to Stanford faculty performing work that supports the mission to make electricity and transportation systems more sustainable. It supports education through energyCatalyst Grants, awarded to faculty and academic staff members teaching courses that introduce sustainable energy concepts and opportunities to Stanford students, and energyStartup Summer Internships, paid undergraduate internships at Stanford-affiliated sustainable energy startup companies. It promotes innovation through Innovation Transfer Grants, awarded to Stanford teams to bridge the gap between government support for basic science and private-sector and venture funding for emerging innovations, and Innovation Transfer Mentors, domain experts, including successful entrepreneurs and innovators, executives with experience in startups and venture investors, who offer guidance to Stanford researchers.

Unsteady Flow Physics and Aeroacoustics Laboratory

Director: Sanjiva Lele

Location: Durand 250; Phone: 650-723-7721; Email: lele@stanford.edu
URL: http://flowgallery.stanford.edu/index.html

The research areas of current focus at the Unsteady Flow Physics and Aeroacoustics Laboratory include turbulence simulations, compressible shear flows, transition in boundary layers, aeroacoustics, jet noise, turbine blade heat transfer, aircraft vortex wakes and condensation trails, and numerical methods. Computational techniques are developed and used to study the fluid dynamics of a variety of problems.

US-Asia Technology Management Center

Director: Richard Dasher; Assistant Director: Siejen Yin

Location: Paul Allen Bldg, Rm 106; Mail Code: 4070; Phone: 650-724-0096; Fax: 650-725-9974
Email: rdasher@stanford.edu; URL: http://asia.stanford.edu

US-ATMC, the US-Asia Technology Management Center, is a project-based education and research center with focus on practical perspectives in international technology management and analysis of international research trends in selected areas of advanced electronics and information technology. Emphasis is on education, research and outreach about high-tech industries in Asia, including Japan, and their impact on the U.S. science and technology community. Education and outreach programs include seminars and lecture series, videoconferences, and Internet-based dissemination of Asian scientific and technical information. US-ATMC supports research into topics such as technology transfer, new product development, intellectual property management, global R&D, and the impact of new technologies on industry structure and emerging market growth. Technical areas have included optoelectronics, nanoelectronics, system-on-chip integration and related software development.

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Chemical Engineering

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Electrical Engineering

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Electrical Engineering

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Computer Science, Electrical Engineering

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Professor; Clarence J. and Patricia R. Woodard Professor of Mechanical Engineering
Mechanical Engineering

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Professor; James and Ellenor Chesebrough Professor in the School of Engineering
Electrical Engineering

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Professor Emeritus; Kenneth and Barbara Oshman Professor in the School of Engineering, Emeritus
Electrical Engineering, Applied Physics

Siegfried Hecker
Professor (Research)
Management Science and Engineering

Martin Hellman
Professor Emeritus
Electrical Engineering

John Hennessy
Professor; President of Stanford University; Bing Presidential Professor
Electrical Engineering, Computer

Mark Horowitz
Professor; Yahoo! Founders Professor in the School of Engineering
Electrical Engineering, Computer Science

Ronald Howard
Professor
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SENIOR ASSOCIATE DEAN
Jennifer Widom
650-725-1289
Email: widom@cs.stanford.edu

DIRECTOR, FACULTY AND ACADEMIC AFFAIRS
Christine Eichar
650-721-6592
ceichar@stanford.edu

Administrative/Financial Affairs

SENIOR ASSOCIATE DEAN
Scott Calvert
650-736-7755
scalvert@stanford.edu

DIRECTOR, ENGINEERING RESEARCH ADMINISTRATION
Sharon Bergman
650-725-1432; Fax: 650-725-7426
sharon.bergman@stanford.edu

DIRECTOR, FACILITIES PLANNING AND MANAGEMENT
Sandy Meyer
650-996-5645
skmeyer@stanford.edu

FINANCE OFFICER
Jamie Willmes
650-723-9567; Fax: 650-725-7426
jaws@stanford.edu

DIRECTOR, HUMAN RESOURCES
Marian Naaf
650-723-8145; Fax: 650-723-3805
mnaaf@stanford.edu

DIRECTOR, INFORMATION TECHNOLOGY
Reid Sprague
650-725-7846
reedsp@stanford.edu

External Relations

SENIOR ASSOCIATE DEAN
Laura Breyfogle
650-725-1584
laura.breyfogle@stanford.edu

DIRECTOR, DEVELOPMENT
Frank Scioscia
650-724-7703
frank.scioscia@stanford.edu

DIRECTOR, CORPORATE RELATIONS
Mauricio Valencia
650-725-4219
mvalencia@stanford.edu

DIRECTOR, COMMUNICATIONS AND ALUMNI RELATIONS
Jamie Beckett
650-736-2241
jbeckett@stanford.edu

Online Learning and Professional Development

SENIOR ASSOCIATE DEAN
Bernd Girod
650-724-6354; Fax: 650-725-8286

EXECUTIVE DIRECTOR, STANFORD CENTER FOR PROFESSIONAL DEVELOPMENT
Paul Marca
650-725-3000; Fax: 650-725-2868
pmarca@stanford.edu

Student Affairs

SENIOR ASSOCIATE DEAN
Brad Osgood
650-723-4002; Fax: 650-723-8473
osgood@stanford.edu

ASSOCIATE DEAN, STUDENT & DIVERSITY AFFAIRS
Noe Lozano
650-723-7177; Fax: 650-723-5599
noe@stanford.edu

ASSISTANT DEAN, GRADUATE AFFAIRS
Sally Gressens
650-723-2117; Fax: 650-723-5599
gressens@stanford.edu

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