

2005 SUMMARY OF ENGINEERING RESEARCH

A Report of Activities during 2004

This .pdf is part of the larger *2005 Summary of Engineering Research*, available on the Web at www.engr.uiuc.edu/research and on CD-ROM. The *Summary of Engineering Research* represents the extensive engineering research program conducted in 2004 at the University of Illinois at Urbana-Champaign. Detailed statistics about research in the College of Engineering are included in the *Directory of Engineering and Engineering Technology Programs and Research*, published by the American Society for Engineering Education, Washington, D.C.

How to Use the *Summary of Engineering Research*: Research projects are listed by title, followed by the names of the investigators and the sponsoring agencies. Projects are sorted by major topic areas. Project descriptions are brief. Additional information on each project may be obtained from the investigator in charge (denoted by an asterisk). Mailing addresses are provided on the introductory page.

How to Obtain Publications: Please consult academic and public libraries for the journal articles, papers, and books listed in this report. Information about technical reports is available from the Engineering Documents Center, Grainger Engineering Library Information Center, 1301 West Springfield Avenue, Urbana, IL 61801, USA. To search the center's collection on the Internet, please visit the website at <http://g118.grainger.uiuc.edu/engdoc/opent1.asp>. Copies of theses can be found at the University of Illinois Library, www.library.uiuc.edu, or may be purchased from University Microfilms, 300 Zeeb Road, Ann Arbor, MI 48106, USA, www.umi.com.

The *2005 Summary of Engineering Research* is produced by the Office of Engineering Communications, University of Illinois at Urbana-Champaign.

Tina M. Prow: Editor and Coordinator

Peggy Currid: Freelance Editor, Publications Sections

Jim Vattano: Graphic Designer

Thomas Habing: Research Programmer, Grainger Engineering Library Information Center

Bill Mischo: Engineering Librarian, Grainger Engineering Library Information Center

Please send queries and comments about the *2005 Summary of Engineering Research* to the Engineering Communications Office, 303 Engineering Hall, MC-266, 1308 West Green Street, Urbana, IL 61801, USA, or email research@engr.uiuc.edu.



Faculty and Their Research Interests

Aerospace Engineering

Joanna M. Austin

Fluid mechanics, high-speed flow, combustion

Lawrence A. Bergman

Structural dynamics and control, stochastic dynamics, system identification, smart structures

Michael B. Bragg

Aerodynamics, flight mechanics, aircraft icing, unsteady aerodynamics

John D. Buckmaster

Fluid mechanics, applied mathematics, combustion

Rodney L. Burton

Electric and advanced chemical rocket propulsion, space exploration, hypersonic flows, hypervelocity accelerators

Bruce A. Conway

Celestial mechanics, optimal control, numerical optimization

Victoria Coverstone

Space mission design, optimal spacecraft trajectories

Gregory S. Elliott

Thermal and fluid sciences, laser diagnostic techniques, experimental supersonic and subsonic fluid mechanics, propulsion, combustion, plasmas

Philippe Geubelle

Aerospace system design, robotics, spacecraft control

Harry H. Hilton, Professor Emeritus

Solid mechanics, viscoelasticity, composites, structures, dynamics, numerical analysis, computer-aided engineering, aeroelasticity, structural control

John Lambros

Static and dynamic fracture mechanics

Ki D. Lee

Computational fluid dynamics, aerodynamics, transonic flows, design optimization

Eric Loth

Two-phase flow and compressible flow, fluid mechanics, micro-vehicles

N. Sri Namachchivaya

Nonlinear dynamical systems, including bifurcation theory, stability analysis, stochastic processes, structural dynamics

Natasha Neogi

Aerospace software, hazard elimination using backwards reachability techniques in discrete and hybrid models

John E. Prussing

Orbital mechanics, spacecraft trajectories, optimal control systems

Michael S. Selig

Applied computational and experimental aerodynamics; airfoil design and analysis; aircraft design, performance, stability, and control; flight simulation; wind energy

Lee H. Sentman, Emeritus

Chemical lasers, nonequilibrium flow modeling, molecular energy transfer, kinetic theory and statistical mechanics, fluid dynamics, space environmental effects on satellite motion

Wayne C. Solomon, Emeritus

Gas-phase kinetics, space systems, high-energy lasers

Petros G. Voulgaris

Robust control of time-varying and nonlinear systems, general systems theory, estimation and identification of complex systems, emphases on aerospace applications

Scott R. White

Manufacturing of composites, solid mechanics, composite materials, smart structures and materials

Agricultural and Biological Engineering

Robert A. Aherin

Agricultural safety and health, safety behavior analysis, confined space safety, using sensors in safety systems

Loren E. Bode

Spray atomization, transport, and deposition; spray nozzle design, spray drift reduction

Philip Buriak

Technical systems management, learning theory, implications to college teaching

Leslie L. Christianson

New product development; engineering design; agricultural buildings; heating, ventilation, and air-conditioning; air quality; swine facilities

Richard A. Cooke

Subsurface drainage, vadose zone water and contaminant transport, modeling of watershed-scale drainage systems

Steven R. Eckhoff

Corn fractionation, wet milling, dry milling, ethanol production, hybrid specific processing

Bruce Elliott-Litchfield

Food engineering

Ted L. Funk

Livestock confinement structures, indoor climate control systems for livestock, manure management systems, residential housing structures, indoor air quality

Tony E. Grift

Sensors and controls in biosystems automation, machine vision systems, electronic sensor development and agricultural data acquisition systems, mathematical modeling and control

Alan C. Hansen

Biofuels for diesel engines, simulation modeling of material handling systems, off-road machinery systems, precision agriculture

Joe G. Harper

Technical systems management

Michael C. Hirschi

Water quality, erosion and sediment control

Prasanta K. Kalita

Hydrology, watershed-water quality modeling, pathogen transport, erosion and sediment control

Marvin R. Paulsen

Food and bioprocess applications, grain quality measurements, near-infrared and FT-NIR spectroscopy

Kent D. Rausch

Recovery of nutrients from bioprocesses, corn quality effect on co-product value, variability of co-product quality, co-product quality for human and animal consumption

Vijay Singh

Engineering economic analysis and modeling of bioprocesses, design of processes for corn fractionation, recovery and concentration of nutraceuticals and biobased products

Lei Tian

Sensors and information systems for precision agriculture, applied machine vision, remote sensing, variable-rate technology

K. C. Ting

Automation, systems analysis, alternative energy and thermal control; computerized simulation, optimization, and decision support for bioproduction and bioprocessing systems.

Xinlei Wang

Heating, ventilation, and air-conditioning controls; indoor air quality; waste management; environmental engineering

Qin Zhang

Off-road vehicle mechatronics, machinery systems for bioproduction, electrohydraulic systems control, computer-integrated agricultural systems, sensors and instrumentation

Yuanhui Zhang

Indoor air quality; effect of indoor air quality on occupants; sensor technology for bioenvironmental systems; heating, ventilation, and air-conditioning control; waste treatment

Bioengineering

Narayan R. Aluru

Bioengineering, computational science and engineering, engineering mechanics, fluid dynamics, nano-, micro-, and meso-technology

Thomas J. Anastasio

Computational neuroscience

Philip M. Best

Ion channels

Stephen Boppart

Optical biomedical imaging, molecular imaging, lasers in medicine and biology, optical coherence tomography, image-guided surgery, medical engineering, optical diagnostics of cancer

Richard D. Braatz

Multiscale systems and control

Yoram Bresler

Biomedical imaging systems; statistical signal and image processing; inverse problems; statistical pattern recognition; sensor-array processing

Bertram C. Bruce

Science education

Sahraoui Chaïeb

Biological mechanics, experimental fluid mechanics, experimental solid mechanics, microfluidics, micromechanics, multiphase flows, particulate flows, phase transitions, smart materials

John C. Chato, Emeritus

Bioengineering, energy systems and thermodynamics, heat transfer

Robert B. Clarkson

Imaging and magnetic resonance

Robert Clegg

Experimental biophysics, including nucleic acid (DNA/RNA) structures and conformational changes

Brian Cunningham

Nanotechnology, photonic crystals, biosensors, micro/nanofabrication methods and materials detection instrumentation

M. Joan Dawson

NMR spectroscopy and spectroscopic imaging

Howard S. Ducoff, Emeritus

Radiation biophysics

Albert S. Feng

Sound information processing

Leon A. Frizzell

Ultrasonic biophysics, ultrasonic bioengineering

John G. Georgiadis

Bioengineering, computational science and engineering, energy systems and thermodynamics, fluid dynamics, heat transfer, nano-, micro-, and meso-technology

William T. Greenough

Neuronal pattern analysis

David R. Gross

Cardiovascular physiology, physiological fluid mechanics

Bruce M. Hannon

Biological modeling

Elizabeth Hsiao-Wecksler

Bioengineering, control systems, dynamic systems, engineering mechanics

Michael Insana

Development of novel ultrasonic instrumentation and methods for imaging soft tissue microstructure, elasticity and blood flow

Eric G. Jakobsson

Biomolecular and biophysical theory and computation

Russell Jamison

Biomaterials, tissue engineering scaffolds, bioactive polymers and ceramics, bone and cartilage replacements

Neil L. Kelleher

Bioanalytical chemistry, mass spectrometry

Kyekyoon (Kevin) Kim

Growth of GaN-based compound semiconductors and fabrication of optoelectronic and electronic devices using plasma-assisted MBE; plasma-arc-driven electromagnetic railgun for fueling of plasma devices; charged liquid cluster beam generation and application to thin film deposition, micropattern generation, and nanoparticle fabrication; generation of solid and hollow, charged and neutral, monodisperse, micro- and nanospheres for biomedical and other applications; plasma display panels; development of novel thin film deposition techniques using plasmas, charged particles, electrostatic spraying, and their combinations with other techniques; MEMS and sensors; ionized source (cluster) beam deposition for low-temperature growth of high-quality films; inertial confinement fusion targets

Paul C. Lauterbur

Chemical origin of life

Deborah E. Leckband

Bioengineering and biophysics

Zhi-Pei Liang

Magnetic resonance imaging, pattern recognition, statistical learning, bioinformatics

Manssour H. Moeinzadeh

Biomechanics, dynamic modeling, experimental mechanics

Mark E. Nelson

Computational neuroscience

William D. O'Brien, Jr.

Ultrasonic biophysics and bioeffects, acoustic microscopy, ultrasonic bioengineering, ultrasonic dosimetry, ultrasonic tissue characterization, acoustic imaging techniques

Daniel W. Pack

Biotechnology and gene therapy

Marvin R. Paulsen

Food and bioprocess applications, grain quality measurements, near-infrared and FT-NIR spectroscopy

Adrienne L. Perlman

Normal and disordered deglutition

Gerald J. Pijanowski

Orthopedic biomechanics

Nikolaos V. Sahinidis

Optimization and process systems engineering

Mark A. Shannon

Bioengineering, combustion and propulsion, computational science and engineering, energy systems and thermodynamics, heat transfer, materials processing, nano-, micro-, and meso-technology

Jonathan V. Sweedler

Neurotransmitter distribution and release

Andrew Webb

RF coil design, functional imaging agents, magnetic resonance microcoils, thermal mapping using MRI, functional magnetic resonance imaging

Bruce C. Wheeler

Analysis of multichannel neural signals, microminiature sensors for neural recording, algorithms for enhanced hearing aids, patterned growth of neurons

Matthew B. Wheeler

Tissue engineering, microfluidics, nanometer-scale integrated systems, biology of single mammalian embryos, embryonic and adult stem cells, drug delivery, remote sensing of embryo metabolism and embryonic health, NMR imaging, microcalorimetry and MEMS actuators

Gerard C. L. Wong

Biopolymers, biomolecular materials, biological and biomimetic self-assembly, gene therapy, synchrotron x-ray probes

James F. Zachary

Ultrasound-induced bioeffects, contrast-agent induced bioeffects, and acoustic imaging of tumors

Xudong Zhang

Bioengineering, computational science and engineering, human factors and ergonomics

Yuanhui Zhang

Indoor air quality; effect of indoor air quality on occupants; sensor technology for bioenvironmental systems; heating, ventilation, and air-conditioning control; waste treatment

Huimin Zhao

Biomolecular engineering

Charles F. Zukoski

Colloid and interfacial science

Chemical and Biomolecular Engineering

Richard C. Alkire

Electrochemical engineering

Richard D. Braatz

Multiscale systems and control

Thomas J. Hanratty, Emeritus

Fluid dynamics

Jonathan J. L. Higdon

Fluid mechanics and computational algorithms

Paul J. A. Kenis

Microfuel cells, microreactors, microfluidic tools, and microfabrication

Deborah E. Leckband

Bioengineering and biophysics

Richard I. Masel

Kinetics, catalysis, microfuel cells, and microchemical systems

Walter G. May, Emeritus

Separation processes

Anthony J. McHugh, Emeritus

Polymer science and engineering

Daniel W. Pack

Biotechnology and gene therapy

Nikolaos V. Sahinidis

Optimization and process systems engineering

Edmund G. Seebauer

Microelectronics processing and nanotechnology

Michael S. Strano

Carbon nanotechnology, 1-D charge transfer, nanobiotechnology, nanoparticle separations

James W. Westwater, Emeritus

Heat transfer in boiling and condensation

Huimin Zhao

Biomolecular engineering

Charles F. Zukoski

Colloid and interfacial science

Civil and Environmental Engineering

Daniel P. Abrams

Reinforced concrete, masonry, earthquake engineering

Imad L. Al-Qadi

Pavement material characterization, modeling, and performance prediction, nondestructive testing and evaluation, instrumentation, full-scale accelerated testing, geosynthetics in pavements, pavement fracture and reinforcement, modeling of pavement interlayer system, tire-pavement interaction

Christopher P. L. Barkan

Transportation safety and risk analysis, with particular emphasis on topics related to railroad train accidents, tank cars, and hazardous materials; railroad transportation energy efficiency and environmental impact; railway signaling, traffic control systems, and capacity

Rahim Benekohal

Traffic flow modeling and simulation, traffic flow theory and control, capacity analysis, traffic safety

Tami C. Bond

Aerosol chemistry, physics, and optics that govern the environmental impacts of particles from combustion

William G. Buttlar

Mechanics of transportation facilities and materials, micromechanical simulation of creep and fracture in particulate composites, asphaltic materials

Samuel H. Carpenter

Bituminous materials, pavement evaluation, climatic factors

Mark M. Clark

Membrane, colloid, and interfacial science; flocculation and mixing

Barry J. Dempsey

Climatic effects on pavements and materials, drainage, geosynthetic materials

Robert H. Dodds, Jr.

Fracture mechanics, computational solid mechanics, structural analysis

C. Armando Duarte

Computational mechanics, three-dimensional computational fracture mechanics, multiscale modeling, computational micromechanics of materials

Amr Elnashai

Testing, analysis, and field observations and study of the effects of earthquakes on complex multiphysics civil engineering systems

Khaled El-Rayes

Optimization and information technology in construction, including optimal construction planning and control, multiobjective optimization, distributed computing, parallel computing, optimal lighting design for nighttime construction, optimal construction site layout planning, optimizing recovery efforts of critical infrastructure systems after major disasters, impact of weather on construction

Douglas A. Foutch

Dynamic characteristics of full-scale structures, analysis and design of earthquake-resistant bridge and steel buildings, wind effects

William L. Gamble, Emeritus

Structural concrete, prestressed concrete bridges, creep and shrinkage of concrete, reinforced concrete slabs, fire-resistant structures

Jamshid Ghaboussi

Structural and geomechanical computational mechanics, earthquake engineering, computational intelligence and soft computing, information technology in civil engineering

German R. Gurfinkel, Emeritus

Structural design, failure investigations and retrofitting of wood, reinforced concrete, prestressed concrete and steel structures including silos, tanks, tall buildings

William J. Hall, Emeritus

Structural engineering, structural dynamics, earthquake engineering

Yousef Hashash

Numerical modeling, static and dynamic soil-structure interaction, deep excavations and tunnels, underground structures, geotechnical engineering, discrete element modeling, visualization, virtual reality and information technology

Neil M. Hawkins, Emeritus

Reinforced, prestressed, and composite steel and concrete structures, fracture mechanics

Edwin E. Herricks

Aquatic ecology, ecosystem management, water quality management standards and legislation

Keith D. Hjelmstad

Structural mechanics, nondestructive evaluation of large structures, fluid/structure interaction

Nicholas P. Jones

Structural dynamics, flow-induced vibration, and wind engineering

Praveen Kumar

Hydroclimatology, hydrogeomorphology, hydrologic information systems, knowledge discovery in databases, ecohydrology

James M. LaFave

Reinforced concrete building and bridge structures, light-frame construction, innovative structural framing systems

David A. Lange

Construction materials, microstructure and properties of cement and concrete, airport pavement performance

Susan M. Larson

Air quality monitoring and modeling, aerosol physics

Jon C. Liebman, Emeritus

Water resource and water quality systems, solid waste management and disposal

Liang Y. Liu

Construction project controls, productivity analysis and improvements, information technology, sensors and field data collection, construction modeling and simulation

Gholamreza Mesri

Engineering properties, construction problems, and ground modification technology in relation to soft clays and silts, stiff clays and soft rocks, expansive soils and swelling shales, as well as granular materials

Barbara S. Minsker

Environmental systems analysis and management, machine learning applications to remediation and monitoring

Eberhard Morgenroth

Influence of dynamic reactor operation on the performance of biological treatment processes using activated sludge, biofilms, or membrane bioreactors

Scott M. Olson

Geotechnical earthquake engineering, soil liquefaction, seismic stability of sloping ground, paleoseismology, *in situ* testing, field instrumentation

Stanley L. Paul, Emeritus

Experimental and analytical studies of reinforced concrete

David A. Pecknold, Emeritus

Structural mechanics and dynamics, shell structures, composite materials, neural network material modeling

John S. Popovics

Nondestructive evaluation and sensing for civil engineering materials and structures; corrosion; mechanical and dynamic properties of concrete

Shaoying (Shawn) Qi

Water and wastewater treatment: PAC/GAC adsorption theories and applications for organic removal; packed-bed filtration/ultrafiltration for particle removal; chemical and biological reactions related to water quality control

Lutgarde Raskin

Biological treatment of water and wastewater, molecular microbial ecology, environmental microbiology

Chris R. Rehmann

Environmental fluid mechanics, turbulence in stratified fluids; double diffusion, zebra mussel transport in rivers, environmental multiphase flows

Arthur R. Robinson, Emeritus

Structural mechanics, dynamic elasticity, numerical methods applied to nonlinear structural problems

Jeffrey Roesler

Concrete pavement analysis, design, and large-scale testing; fatigue and fracture of concrete materials; concrete slab curling; fiber reinforced concrete materials; continuously reinforced concrete pavements

Mark J. Rood

Environmental air quality: aerosol chemistry and physics, development of methods to separate and remove contaminants from gas streams, development of aerosol sampling instrumentation

A. R. Schmidt

Surface-water hydraulics and hydrology; hydrology and hydraulics related to urban stormwater drainage systems, including best management practices, risk-based design and real-time control; and reliability-analysis applications for in water-resources and environmental engineering

Vernon L. Snoeyink, Emeritus

Environmental chemistry, drinking water treatment, water reclamation

Lucio Soibelman

Construction management, civil engineering information systems, distributed artificial intelligence, data mining, design rationale, KDD, lean construction, text mining, image reasoning

B. F. Spencer, Jr.

Smart structures, pseudo-dynamic substructure testing, structural health monitoring, vibration testing and theory, fatigue and fracture reliability, stochastic and robust structural control and system identification, earthquake engineering, deterministic and stochastic structural dynamics, computational probabilistic methods, structural reliability.

Timothy D. Stark

Foundation engineering, static and seismic stability of natural and constructed slopes, soil liquefaction, geosynthetics

Timothy J. Strathmann

Environmental chemistry, catalysis of contaminant degradation, sorption and speciation at mineral-water interfaces, metal microbe interactions, photocatalysis

Leslie J. Struble

Materials, chemical, microstructural and physical properties of cement and concrete, rheology of fresh cement and concrete

Marshall R. Thompson, Emeritus

Flexible pavements, transportation, railroad track structure analysis and design, soil stabilization, paving materials, subgrade soils

Erol Tutumluer

Pavement materials, aggregates and soils, flexible pavements, mechanistic based pavement design, image analysis, geosynthetics, artificial neural networks, full-scale pavement testing, railroad ballast, stabilization and recycling

Albert J. Valocchi

Transport processes in porous media, groundwater contamination, numerical methods

William H. Walker, Emeritus

Structural mechanics, structural dynamics, highway bridge dynamics, fatigue and fracture

Y. K. Wen

Vulnerability functions, systematic treatment of uncertainty, effect of redundancy in buildings under seismic loads, Hilbert Spectral Representation and simulation of nonstationary random processes, optimal seismic design based on lifecycle cost consideration

Charles J. Werth

Transport and fate of organic chemicals in soils, sediments, and groundwater, sorption, mass transfer, soil and sediment characterization

Jian Zhang

Seismic analysis and design of bridges and reinforced concrete structures, soil-structure interaction, earthquake engineering, structural dynamics and seismic protective devices

Computer Science

Sarita Adve

Computer architecture, low-power design, adaptive systems, real-time and network processing, performance evaluation methods, parallel

Vikram Adve

Compilers, software reliability, performance analysis, computer architecture computing

Gul A. Agha

Developing new abstractions for building open distributed systems and reasoning about their behavior, parallelism, coordination, real-time behavior

Eyal Amir

Automated reasoning and machine learning

Brian P. Bailey

User interface tools that better support early design tasks, systems and environments that help users maintain information awareness, tools for multimedia authoring and design, interfaces that foster social interaction, human-computer interaction

Geneva G. Belford, Emeritus

Databases and information systems, distributed systems

Stephen Bond

Numerical analysis and scientific computing, with applications in statistical mechanics, and biochemistry; understanding methods that bridge the temporal and spatial scales in multiscale biomolecular modeling using techniques from geometric integration and adaptive finite element methods

Marco Caccamo

Real-time operating systems, real-time scheduling and resource management, wireless sensor networks, quality of service control in next-generation digital infrastructures

Roy H. Campbell

Security, distributed operating systems, ubiquitous computing

Kevin C.-C. Chang

Databases, Internet information access, and digital libraries, with focuses on information integration of heterogeneous sources, Internet query processing, web databases, and ranked top-k query processing

Gerald DeJong

Artificial intelligence

AnHai Doan

Databases, data integration and sharing, data mining, information discovery on the Web, efficient use and maintenance of meta-data, schema matching, machine learning

Jeffrey G. Erickson

Algorithms, data structures, and lower bounds; computational and discrete geometry

Margaret Fleck

Automated reasoning and machine learning

David Forsyth

Artificial intelligence, computer vision, machine learning

Michael Garland

Computer graphics, geometric modeling, human-computer interaction, visualization

Elsa Gunter

Formal systems

Carl A. Gunter

Security, networks, software engineering, programming languages

Indranil Gupta

Distributed systems, distributed protocols, probabilistic protocols, design methodologies, sensor networks

Jiawei Han

Database systems, data mining, data warehousing, stream data mining, Web mining, spatiotemporal data mining, bio-data mining

Mehdi T. Harandi

Artificial intelligence, information systems, HCI, software engineering

Sariel Har-Peled

Algorithms, data structures, computational geometry, clustering, learning, computer graphics

Luddy Harrison

System architecture

John C. Hart

Computer graphics, computational topology

Michael T. Heath

Scientific computing, parallel computing

Jennifer C. J. Hou

Multicast routing and multicast, protocol design and implementation for Quality-of-Service (QoS) control, wireless QoS, network modeling and simulation, distributed systems and applications, real-time computing

Laxmikant V. Kale

Numerical, parallel, and scientific computing, operating systems

Samuel N. Kamin

Programming languages, software components, functional programming applied to scientific computation, denotational semantics, program specification and verification, domain-specific languages

Karrie Karahalios

Human-computer interfaces

Thomas Kerkhoven

Numerical and scientific computing

Robin H. Kravets

Mobile computing and communication, location management, power management, transport protocols, ad hoc networks, personal area networks

Steven M. LaValle

Robotics, motion planning, computational geometry, artificial intelligence, computational biology, computer vision, computer graphics, control theory

Haiyun Luo

Networking and distributed systems

Jose Meseguer

Formal executable specification and verification; software composition, reflection, and metaprogramming; object-oriented specification and software architecture; concurrent, distributed, and mobile computing; logical frameworks and formal interoperability; logical and semantic foundations

M. Dennis Mickunas, Emeritus

Operating systems, parallel computing, programming languages

Saburo Muroga, Emeritus

Computer-aided design of digital systems

Klara Nahrstedt

Quality-of-Service (QoS) management, integration of guaranteed and best effort services for audio/video/DATA traffic, QoS-aware resource management, QoS routing, multimedia security, soft real-time scheduling, middleware support for distributed multimedia applications

David A. Padua

Computer architecture and systems, parallel computing, compilers

Lenny Pitt

Artificial intelligence, theoretical computing

Jean A. Ponce

Computer vision, robotics, computer graphics

Edgar A. Ramos

Computational geometry: randomized algorithms and derandomization, optimization and approximation algorithms, triangulation and mesh generation, topological methods and algorithms, parallel algorithms

Sylvian Ray, Emeritus

Artificial intelligence

Larry Rendell

Artificial intelligence

Grigore Rosu

Software and software related aspects; design, semantics, and implementation of programming and specification languages; automated software engineering and formal methods, especially “push-button” techniques for certification, monitoring, synthesis, and modularization; automated reasoning about computer systems, applications of logics, theorem proving; algorithms, (co)algebra, category theory

Dan Roth

Artificial intelligence, theoretical computing

Lui Sha

Distributed real-time computing systems, dynamic real-time architecture, Quality-of-Service (QoS) driven resource management, security and fault tolerance in networked embedded systems

Robert D. Skeel, Emeritus

Numerical analysis and scientific computing, computational methods for biomolecular simulation

Marc Snir

Large-scale parallel and distributed systems, parallel computer architecture, grid computing, parallel programming

Eric de Sturler

Iterative methods, eigenvalue problems, large-scale optimization

Josep Torrellas

Parallel and sequential computer architecture, processor-memory integration, thread-level speculation, low power design, reliability

Mahesh Viswanathan

Analysis and validation of software systems, including design of efficient algorithms, characterization of computational limitations, development of formal models for system specification, and implementation of software tools for program analysis

Marianne S. Winslett

Databases, security, parallel computation

Yizhou Yu

Appearance modeling, animation, computer graphics and vision, image and video processing

ChengXiang Zhai

Text processing and management, statistical natural language processing, machine learning, bioinformatics

Yuanyuan Zhou

Operating systems, file and storage systems, architecture, distributed systems, parallel systems, system support for database

Craig Zilles

Computer architecture, dynamic optimization, compiler construction, simulation methodologies, software engineering

Electrical and Computer Engineering

Ilesanmi Adesida

Electronic and transport properties of ultra-low dimensional semiconductor structures, advanced processing methods for electronic devices, high-speed optoelectronic devices and integrated circuits, radiation effects

Narendra Ahuja

Computer vision, robotics, image processing, sensors, pattern recognition, virtual environments, intelligent interfaces

Jont Allen

Speech recognition based on the articulation index and aspects of information theory

Tamer Basar

Information technology research; control over wired and wireless networks; robust identification and control; dynamic games and stochastic teams; nonlinear and adaptive robust control; decentralized detection and estimation; routing, pricing, and congestion control; modeling and control of communication networks; mobile computing; incentive mechanisms through pricing; neural networks-based identification and control; applications of control and game theory in economics

Tangul Basar

Optimum transmitter-receiver design in communication systems, spread spectrum communication system, jamming problems in information transmission, minima stochastic optimization problems with applications in communication systems, mobile radio systems

James Beauchamp, Emeritus

Use of computers for music synthesis, determination of sound synthesis models based on spectral analysis of musical instrument sounds, musical timbre perception, detection of musical pitch, musical sound source separation, and automatic transcription from acoustic recordings

Jennifer Bernhard

Reconfigurable active and passive antennas, phased array antennas, wireless sensor systems

Stephen G. Bishop

Optical and electrical characterization of crystalline and amorphous semiconductors and semiconductor nanostructures, compound semiconductors: GaAs, InP, AlGaAs, ZnSe, SiC, defects in semiconductors, isoelectronic defects, rare earth-doped chalcogenide glasses and GaN. Experimental techniques: photoluminescence, nuclear magnetic resonance, electron spin resonance, magneto-optics, photoemission, infrared spectroscopy

Richard Blahut

Communications, signal processing, information theory, optical recording

Stephen Boppart

Optical biomedical imaging, molecular imaging, lasers in medicine and biology, optical coherence tomography, image-guided surgery, medical engineering, optical diagnostics of cancer

Yoram Bresler

Biomedical imaging systems; statistical signal and image processing; inverse problems; statistical pattern recognition; sensor-array processing

Donna J. Brown

Asynchronous learning technologies and environments; WWW-based education; VLSI placement and routing; parallel and distributed algorithms and architectures; analysis and design of algorithms, with a particular interest in approximation algorithms; graph theory

Marie-Christine Brunet

Numerical algorithms, parallel computing

Andreas Cangelaris

Numerical techniques for electromagnetic modeling and simulation, microwave circuit design, speed VLSI interconnects, electronic packaging, electromagnetic computer-aided design for high-speed digital and RF/microwave electronics, antenna modeling, optoelectronic interconnects, electromagnetic modeling for nonlinear optics

Scott Carney

Optical physics, including imaging, near-field microscopy, classical and quantum coherence theory, beam propagation, fundamental issues of energy conservation, mathematical methods in inverse scattering and the propagation of light

Nicholas Carter

Architectures that combine programmable processors and reconfigurable logic, computing using nanotech devices, design techniques to integrate computation and sensing

Patrick Chapman

Power electronics, electric drives, vibrations in electromechanical systems, monolithic integrated power circuits, numerical magnetic modeling, biomechanical energy conversion

Keh-Yung Cheng

Molecular beam epitaxy technology, optoelectronic integrated circuits, high speed devices, *in situ* fabrication of nanostructures, quantum wire lasers, vertical cavity surface emitting lasers, Sb-based IR detectors and electronic devices

Weng Cho Chew

Electromagnetics: wave propagation in inhomogeneous media, microwave integrated circuits, microstrip antennas, and fast algorithms for radiation scattering, low frequency electromagnetics, and layered media; parallelization of fast algorithms; inverse scattering, imaging, and physics-based signal processing

Yun Chiu

Integrated circuits, VLSI signal processing, device modeling and CAD, wire-line and wireless communications

Hyungsoo Choi

Precursors for nanoscale materials synthesis, including syntheses and development of tailored organometallic, inorganic, and polymeric precursors; thin film and nanoparticle fabrication, including thin films, micro- and nanoparticles, and nanowires/tubes via sol-gel processing, charged liquid cluster beam (CLCB) deposition, chemical vapor deposition (CVD), chemical solution deposition (CSD), and precision particle fabrication (PPF) technology; electronic and optical materials, including fabrication of electronic, optical, and magnetic materials for various devices involving thin films, micro- and nanoparticles, nanowires/tubes of metals, metal nitrides and oxides utilizing their electronic, optical, optoelectronic, and magnetic properties; bimaternal, including fabrication of micro- and nanospheres/capsules of biodegradable/compatible materials for advances drug delivery and tissue engineering

Kent Choquette

Vertical cavity surface emitting lasers (VCSELs), micro- and nanocavity lasers, optoelectronic devices, selective oxidation of compound semiconductors, hybrid heterogenous integration, nanoprocessing fabrication, photonic crystal materials, Si-based optoelectronics

Shun Lien Chuang

Optoelectronics, semiconductor lasers, modulators, photodetectors, photonics, quantum electronics, fiber optical sensors, electromagnetics

James J. Coleman

Semiconductor lasers, optoelectronics, epitaxial growth

Brian Cunningham

Nanotechnology, photonic crystals, biosensors, micro/nanofabrication methods and materials detection instrumentation

Minh Do

Image and multidimensional signal processing, wavelets, multiscale geometric analysis, visual information representation

J. Gary Eden

Ultraviolet and visible lasers and laser spectroscopy, microcavity plasma and microresonator devices, optical physics, including femtosecond laser spectroscopy and technology, and the interaction of intense optical fields with matter, laser magnetometry

Milton Feng

High-speed devices and ICs for wireless and light emitting transistors for optoelectronics (optoelectronic IC), monolithic microwave and millimeter-wave IC, digital IC, high field transport properties, RF-MEMS for wireless communications, advanced Si-CMOS device physics

Matthew Frank

Computer system architecture, parallel computing, program analysis, concurrency control, online algorithms

Patricia Franke

Atmospheric dynamics, including the dynamics and thermodynamics of the upper atmosphere through data analysis of radar and lidar data and through the numerical simulations of different types of flow; radar and optical remote sensing of the upper atmosphere; computational electromagnetics, application of finite difference time domain techniques to the problems of radar backscatter from turbulent regions of the neutral atmosphere and the ionosphere and application of different numerical methods and parallel computing for computationally demanding problems; computational fluid dynamics

Steven J. Franke

Development and application of radar and signal processing techniques for remote sensing in the middle and upper atmosphere; application of tomographic imaging to the middle and upper atmosphere using arrays of ground-based sensors and low-earth orbit satellites; low-power wireless RF communications; high efficiency linear power amplifiers for RF communications and radar applications

Leon A. Frizzell

Ultrasonic biophysics, ultrasonic bioengineering

Chester S. Gardner

Optical communication, laser altimetry, laser remote sensing and ranging, laser guide stars, adaptive optics

George Gross

Electricity planning and analysis, power system operations, competitive electricity markets and auction mechanisms, transmission services and pricing, ancillary services, congestions management, reliability and security, energy policy and economics, restructuring of the electricity business

Christoforos Hadjicostis

Systems and control, error control coding, fault diagnosis and tolerance in dynamic systems, testing and verification, discrete event systems, algebraic systems, coding and graph theory

Bruce E. Hajek

Communication networks information theory, computer networks stochastic analysis, optimization wireless communication

Mark Hasegawa-Johnson

Acoustic phonetics, audio signal processing and speech recognition, speech and auditory physiology

Karl Hess

Hot carriers in semiconductors, electronic transport in heterojunction structures and superlattices, numerical simulation of semiconductor devices (supercomputing applications), quantum transport in mesoscopic systems, laser diode simulation, molecular and electron nanostructures, theory and simulation, deuterium processing and MOS reliability, quantum computing, theorem of Bell

Nick Holonyak, Jr.

Semiconductors, semiconductor device physics, semiconductor crystal growth and junction formation, diffused Si devices, SCRs, TRIACs, double injection, luminescence, light emitting diodes (LEDs), heterojunctions, lasers, tunnel diodes, compound semiconductors, quantum well heterostructures, superlattices, quantum well lasers, impurity-induced layer disordering, Al-based III-V native oxides and their use in heterostructures devices

Kuang C. Hsieh

Semiconductor materials/devices processing and characterization

Thomas S. Huang

Image processing, image compression, computer vision, human computer interaction, image and video databases

Seth Hutchinson

Robotics, computer vision, artificial intelligence

Wen-Mei Hwu

Architecture, compilation and microarchitecture of high performance parallel computer systems

Ravishankar K. Iyer

Design and evaluation of reliable and secure networks and systems, computer measurement and modeling, dependability and security validation and benchmarking

Jianming Jin

Computational electromagnetics, finite element methods, electromagnetic analysis and design in magnetic resonance imaging, wave scattering and propagation, electromagnetic interference and compatibility, microwave and millimeter wave circuits, antennas and electromagnetic theory

Douglas L. Jones

Digital signal processing, time-varying and time-frequency analysis, signal processing for communications, binaural hearing aids, signal processing for MEMS

Farzad Kamalabadi

Remote sensing and imaging, multidimensional signal and image processing, signal reconstruction and tomography, ionospheric and space physics

Kyekyoon (Kevin) Kim

Growth of GaN-based compound semiconductors and fabrication of optoelectronic and electronic devices using plasma-assisted MBE; plasma-arc-driven electromagnetic railgun for fueling of plasma devices; charged liquid cluster beam generation and application to thin film deposition, micropattern generation, and nanoparticle fabrication; generation of solid and hollow, charged and neutral, monodisperse, micro- and nanospheres for biomedical and other applications; plasma display panels; development of novel thin film deposition techniques using plasmas, charged particles, electrostatic spraying, and their combinations with other techniques; MEMS and sensors; ionized source (cluster) beam deposition for low-temperature growth of high-quality films; inertial confinement fusion targets

Ralf Koetter

Practical and theoretical aspects of coding theory, complexity, algorithms, communication systems, networks

Philip T. Krein

Power electronics, electric machinery and electromechanics, electric and hybrid vehicle systems

Erhan Kudeki

Radar remote sensing; atmospheric winds, waves, and turbulence; ionospheric plasma instabilities; incoherent scatter electric field measurements; midlatitude field aligned irregularities and meteor trails

P. R. Kumar

Wireless networks, sensor networks, convergence of control, communication and computation, semiconductor manufacturing, manufacturing systems, machine learning, adaptive systems, control, stochastic systems

Jean-Pierre Leburton

Theory of semiconductor devices, modeling and simulation of nanostructures, electronic and optical properties of heterostructures and low dimensional systems, transport in quantum structures, electronic properties, charging effects in quantum dots and nanocrystals, spin effects in nanostructures, quantum computation and quantum information processing, nano-bio-electronics

Stephen Levinson

Speech processing, language acquisition, natural language understanding, speech synthesis

Zhi-Pei Liang

Magnetic resonance imaging, pattern recognition, statistical learning, bioinformatics

Daniel Liberzon

Nonlinear control theory, analysis and synthesis of hybrid dynamical systems, systems with imprecise measurements and/or modeling uncertainty, stochastic differential equations and control

Chang Liu

MEMS, microsensors, microintegrated fluidics systems, MEMS for nanotechnology, wireless interface for sensors, sensitive skin

Michael C. Loui

Computational complexity theory, ethics in engineering and computing, scholarship of teaching and learning

Steven Lumetta

Optical network architecture, computer architecture, cluster computing, parallel computing, user-level communication, validation and reliability

Joseph W. Lyding

Scanning tunneling microscopy and spectroscopy, STM-based nanolithography and nanofabrication, silicon-based molecular electronics, carbon nanotubes and carbon-based nanotechnology merged with silicon, growth of 3-D silicon nanostructures, deuterium processing and hot electron degradation in semiconductor devices, atomically precise dopant mapping, cross-sectional STM of semiconductor heterostructures, oxide silicon interface mapping, carbon nanotube purification

Yi Ma

Computer vision, including multiple view geometry, structure from motion, dynamic vision, real-time tracking, and active vision; systems theory, including geometric nonlinear control, hybrid systems, vision-based robotic control and navigation

Jonathan Makela

Ionospheric physics, especially irregularities at low- and mid-latitudes and their effects on trans-ionospheric satellite signals, response of the Earth's ionosphere to geomagnetic storms; optical and radio remote sensing techniques from ground- and satellite-based platforms

Sean Meyn

Optimal control, Markov processes (with or without control), stochastic approximation and adaptive control, reinforcement learning and simulation, spectral theory and large deviations, information theory, stochastic networks

Eric Michielssen

Computational electromagnetics, fast integral equation-based solvers algorithms in both the frequency and time domains, and robust design paradigms; analysis and design of electromagnetic and optical systems (antennas, filters, interconnects, platform, terrain, plasmonic devices, and so forth)

Pierre Moulin

Image and video processing, compression, statistical signal processing, information hiding

David Nicol

Cyber-security, modeling and analysis of computer and communications systems, high performance simulation, parallel processing

Burks Oakley II

Applications of computer-aided learning in the undergraduate engineering curriculum

William D. O'Brien, Jr.

Ultrasonic biophysics and bioeffects, acoustic microscopy, ultrasonic bioengineering, ultrasonic dosimetry, ultrasonic tissue characterization, acoustic imaging techniques

Thomas Overbye

Power systems operation and control, power system stability, power system analysis by computer methods, power system visualization

Mangalore A. Pai

Power system stability, dynamic security of power systems, model reduction in power systems, iterative solver techniques in power system computations, voltage stability, robust stability, power system computation, impact of distributed generation in power systems

Janak H. Patel

VLSI testing and testability, VLSI design automation

Sanjay Patel

Computer architecture, microarchitecture, high-performance and reliable computer systems, the implications of future generation applications and implementation technologies on systems design

William R. Perkins

Control systems, system theory, sensitivity theory and robust control, large-scale dynamic systems

Constantine D. Polychronopoulos

Parallelizing/optimizing compilers for multithreaded architectures, program restructuring and optimization; code generation and optimization for superscalar processors; parallel programming languages; environments for parallel programming; partitioning, scheduling, and run-time environments for parallel computers; multiprocessor operating systems with multithreading support; parallel computer architectures; performance evaluation of parallel architectures

N. Narayana Rao

Ionospheric propagation, radiolocation

Umberto Ravaioli

Monte Carlo simulation of high speed electronic devices; numerical methods for semiconductor device simulation; quantum devices; supercomputation and visualization; reliability of MOS devices; micro- and nano-electro-mechanical systems (MEMS and NEMS); charge transport in biological systems (ionic channels); properties of carbon nanotubes

Elyse Rosenbaum

Design of ESD-protected RFICs, modeling and simulation of ESD protection circuits, analysis of substrate noise coupling, silicon-on-insulator, ESD protection for very high speed I/Os, gate oxide reliability

William Sanders

Dependability, security, and performance evaluation; intrusion- and fault-tolerant systems; reliable and secure distributed systems

Dilip V. Sarwate

Communications, coding theory, spread-spectrum communications, design of algorithms

Peter W. Sauer

Electric machinery modeling, analysis and control, power system dynamic modeling and simulation, power system stability

Jose Schutt-Aine

Electronic packaging, microwave theory and measurements, and digital circuit modeling, including integration of modeling and simulation tools, high-performance computation for simulation of packages, applications of V-shaped transmission lines

Naresh Shanbhag

Design and VLSI implementation of low-power, high-performance multimedia digital signal processing and communications systems, noise-tolerant deep submicron VLSI systems, fundamental bounds on efficiency of VLSI information processing systems, power-aware reconfigurable DSP systems, low-power DSP and circuits, DSP and communication system design, digital ASIC design

Yoshihisa Shinagawa

Computer graphics, vision, and its applications

Andrew Singer

Statistical signal processing, communications, machine learning, data compression, sonar/lidar/optical signal processing

Gary Swenson

Remote sensing of the atmosphere from ground-based, aircraft, and spacecraft using optical methods; space environment issues with a particular emphasis on spacecraft glows

Gregory Timp

Fabrication, development, and characterization of the performance of silicon MOS nanotransistors to discover the fundamental limitations of the silicon MOSFET; atomic physics and light pressure forces on single atoms for lithography applications; mesoscopic and nanostructure physics, including measurement of the low temperature transport characteristics of high electron mobility transistors that resemble electron waveguides Hopping (thermally-assisted tunneling) conductivity of localized electrons in a two dimensional impurity band formed in the inversion layer of a silicon metal-oxide-semiconductor field effect transistor (MOSFET); the effect of superlattices on lattice-dynamical properties of graphite intercalation compounds using Raman scattering, extremely high field magnetoresistors, Schubinkov-deHaas effect (using high resolution microscopy), high resolution x-ray scattering; nanometer-scale lithography to probe biological function

Timothy N. Trick, Emeritus

Computer-aided analysis and design of circuits, computer-based education

John Tucker

Metal silicide source/drain MOS transistors at ~10nm gate length, atom-scale electron devices made by STM patterning of donors in silicon, nanoscale architectures

Nitin Vaidya

Wireless networking, mobile computing, fault-tolerant computing

Venu Veeravalli

Distributed wireless sensor systems, wireless packet data networks, channel modeling for wideband multiantenna wireless systems, information theory for wireless communications, wireless code division multiple access (CDMA) systems, radio resource management for wireless networks, decentralized dynamic decision making, sequential multihypothesis testing and change-point detection

Pramod Viswanath

Communication theory, wireless communication, information theory, communication networks

Benjamin W. Wah

Nonlinear optimization, parallel processing, distributed processing, artificial intelligence, computer networks, multimedia signal processing

Andrew Webb

RF coil design, functional imaging agents, magnetic resonance microcoils, thermal mapping using MRI, functional magnetic resonance imaging

Bruce C. Wheeler

Analysis of multichannel neural signals, microminiature sensors for neural recording, algorithms for enhanced hearing aids, patterned growth of neurons

Martin Wong

Computer-aided design of VLSI, field-programmable systems, design and analysis of algorithms, combinatorial optimization

Jianhua (David) Zhang

Lasers and laser spectroscopy, electromagnetics, plasma diagnostics, optics, cryogenics, electric and electronic circuits

General Engineering

Ali Abbas

Decision theory and analysis

Carolyn L. Beck

Control systems, modeling and model reduction for the purposes of control, systems theory

Scott A. Burns

Engineering design optimization, structural analysis

James V. Carnahan

Probabilistic methods, applied statistics, simulation

Thomas F. Conry

Tribology, mechanical design, mechanical systems

Wayne J. Davis, Emeritus

Hierarchical systems and programming for planning and control, advanced simulation of manufacturing systems

David E. Goldberg

Genetic algorithms and evolutionary computation in search, optimization and machine learning, innovation

W. Brent Hall

Reliability engineering, conditional reliability and decision making, structural optimization, cold-formed steel design

Harrison Kim

Optimization, large-scale systems, product planning and management

Juraj V. Medanic

Systems theory, control systems, systems analysis

Manssour H. Moeinzadeh

Biomechanics, dynamic modeling, experimental mechanics

Raymond L. Price

Engineering management, time to market, business and technology strategy

Henrique L. M. dos Reis

Nondestructive testing and evaluation, structural analysis and design, composite materials

Ikhlaz Sidhu

Technology management, with a focus on the technology areas of networking, image processing, hardware development, software development, and communications

Mark W. Spong

Control theory, robotics, mechatronics

R. S. Sreenivas

Discrete-event systems, automatic control simulation

Dušan Stipanović

Controls, differential games, large-scale systems

Deborah L. Thurston

Multiattribute decision making under uncertainty and risk, environmentally conscious design and manufacturing

Louis Wozniak

Control theory, systems identification and simulation, speed control, power systems

Ali Yassine

Product development models, design theory and methodology, concurrent engineering, project management

Materials Science and Engineering

John R. Abelson

Plasma-assisted deposition of semiconductor, dielectric, and conductive thin-films for electronic applications; the physics and chemistry of film growth; fabrication of photovoltaic cells and thin-film transistors for macroelectronics

Leslie H. Allen

Thin-film physics, microelectronic processing, interfaces, nanoscale, size-dependent material properties, nanocalorimetry

Robert S. Averback

Ion beam modifications of materials, ion beam analysis, radiation damage, nanophase materials

Pascal Bellon

Far from equilibrium materials, simulations and modeling of materials processing (energetic beams, plastic deformation), electron microscopy

Paul V. Braun

Materials chemistry, polymers, biomaterials, organic and inorganic self-assembly, electronic materials and photonics

David Cahill

Epitaxial growth, scanning tunneling microscopy, ion-surface interactions, thermal properties of thin films, strained layer heterostructures

James Economy

Synthesis and characterization of advanced composites thermosets and high surface area adsorption systems

Gert Ehrlich, Emeritus

Surface studies including crystal growth on the atomic level, atomic interactions and clusters

Phillip H. Geil

Processing-morphology-property relationships in polymers, blends, and composites

Steve Granick

Polymers and biopolymers, nanorheology/tribology, surface spectroscopies

Joseph Greene, Emeritus

Thin-film physics, surface science, crystal growth, electronic properties

Russell Jamison

Biomaterials, tissue engineering scaffolds, bioactive polymers and ceramics, bone and cartilage replacements

Duane D. Johnson

Materials theory and computation materials science to calculate physical properties and processes in materials, especially those tied directly to characterization experiments

Waltraud M. Kriven

Phase transformations in oxide ceramics (TEM, high-temp XRD, and synchrotron), processing-microstructure-property relations in structural ceramics and composites, synthesis of oxide fibers, bioceramics, electron microscopy

Jennifer A. Lewis

Colloidal assembly, phase behavior of complex fluids, direct-write assembly, rheology, drying, film formation

Erik Luijten

Theoretical and computational statistical mechanics and thermodynamics of materials, phase behavior of complex fluids (polymers, ionic liquids, colloidal systems), development of computational methods

David A. Payne

Electrical ceramics, dielectric materials, microstructure-property relations, processing, characterization, ferroics, crystal growth, materials chemistry, sol-gel, magneto resistance

Ian M. Robertson

Radiation effects in materials, micromechanics and micromechanisms of fracture in aggressive and nonaggressive environments, electron microscopy

Angus A. Rockett

IV, III-V, and chalcogenide semiconductors, materials for solar cells, theory of crystal growth, defects in semiconductors, contact metallurgies, solid phase reaction kinetics, surface science, microelectromechanical systems

John A. Rogers

Electroactive polymers, plastic electronics, microfluidics, elastomers, soft lithography

Kenneth S. Schweizer

Statistical mechanical theories of structure, self-assembly, thermodynamics, phase transitions, rheology and dynamical phenomena in macromolecular solutions, melts and alloys, colloidal and nanoparticle suspensions, and other complex fluids and soft materials

Jian-Ku Shang

Solid interfaces, composite materials adhesion, structural ceramics, layered materials

Moosub Shim

Nanoscale materials, chemistry and physics of low-dimensional systems, nanomaterial/biomolecule interfaces and hybrid structures, semiconductor nanocrystals, carbon nanotubes

John H. Weaver

Nanostructured materials; surface and interface phenomena for metals, semiconductors, superconductors, and insulators; ordered and disordered solids; clusters and fullerene-based systems

Gerard C. L. Wong

Biopolymers, biomolecular materials, biological and biomimetic self-assembly, gene therapy, synchrotron x-ray probes

Jian-Min Zuo

Direct observation of chemical bonds in crystals; surface, interface structures, and bonding and their effects on the mechanic and electronic properties of advanced materials; charge states, charge fluctuations, and low-dimensional charged phases in complex oxides; advanced electron microscopy and nanocrystallography

Mechanical and Industrial Engineering

Andrew G. Alleyne

Automotive systems, control systems

Narayan R. Aluru

Bioengineering, computational science and engineering, engineering mechanics, fluid dynamics, nano-, micro-, and meso-technology

Armand J. Beaudoin

Bioengineering, materials behavior, materials processing

Joseph Bentsman

Control systems, dynamic systems

Lawrence A. Bergman

Dynamic systems

M. Quinn Brewster

Combustion and propulsion, heat transfer

Richard O. Buckius

Combustion and propulsion, fluid dynamics, heat transfer

Clark W. Bullard, Emeritus

Energy systems and thermodynamics, environmental engineering, heat transfer

Bei Tse Chao, Emeritus

Heat transfer, fluid dynamics

John C. Chato, Emeritus

Bioengineering, energy systems and thermodynamics, heat transfer

Xin Chen

Computational science and engineering, operations research, production management

Thomas F. Conry

Nano-, micro-, and meso-technology, tribology

Jonathan A. Dantzig

Computational science and engineering, engineering mechanics, fluid dynamics, heat transfer, materials behavior, materials processing

Richard E. DeVor

Engineering statistics and quality control, environmental engineering, manufacturing systems, nano-, micro-, and meso-technology

Geir E. Dullerud

Control systems, dynamic systems

William E. Dunn

Computational science and engineering, control systems, energy systems and thermodynamics, fluid dynamics, heat transfer

J. Craig Dutton

Combustion and propulsion, energy systems and thermodynamics, fluid dynamics, heat transfer

Placid M. Ferreira

Design methodology and tribology, manufacturing systems, nano-, micro-, and meso-technology, production management

John G. Georgiadis

Bioengineering, computational science and engineering, energy systems and thermodynamics, fluid dynamics, heat transfer, nano-, micro-, and meso-technology

Nick G. Glumac

Combustion and propulsion, energy systems and thermodynamics, materials processing

Pega S. Hrnjak

Energy systems and thermodynamics, fluid dynamics, heat transfer

Elizabeth Hsiao-Wecksler

Bioengineering, control systems, dynamic systems, engineering mechanics

Yonggang Huang

Computational science and engineering, engineering mechanics, materials behavior, nano-, micro-, and meso-technology

Anthony M. Jacobi

Energy systems and thermodynamics, fluid dynamics, heat transfer, nano-, micro-, and meso-technology

Sheldon H. Jacobson

Operations research

Harley Johnson

Computational science and engineering, engineering mechanics, materials behavior, nano-, micro-, and meso-technology

Shiv G. Kapoor

Engineering statistics and quality control, environmental engineering, manufacturing systems, nano-, micro-, and meso-technology

Scott D. Kelly

Bioengineering, computational science and engineering, control systems, dynamic systems, engineering mechanics

Diego Klabjan

Operations research, production management

Helmut H. Korst, Emeritus

Fluid dynamics, combustion and propulsion

Herman Krier

Combustion and propulsion, fluid dynamics, heat transfer, energy systems and thermodynamics

Peter Kurath

Design methodology and tribology, engineering mechanics, materials behavior

Dimitrios Kyritsis

Automotive systems, combustion and propulsion, energy systems and thermodynamics, fluid dynamics, nano-, micro-, and meso-technology

Carl S. Larson, Emeritus

Design methodology and tribology

Chia-Fon Lee

Automotive systems, combustion and propulsion, computational science and engineering, energy systems and thermodynamics, environmental engineering, fluid dynamics, heat transfer

Chang Liu

Microfabrication, microfluidics, MEMS for nanotechnology (M4N), nano-, micro-, and meso-technology, sensors, wireless networks

Thomas J. Mackin

Bioengineering, design methodology and tribology, engineering mechanics, materials behavior, nano-, micro-, and meso-technology, operations research

Norman R. Miller

Control systems, design methodology and tribology, dynamic systems, nano-, micro-, and meso-technology

Ty A. Newell

Energy systems and thermodynamics, environmental engineering, fluid dynamics, heat transfer

Udatta S. Palekar

Engineering statistics and quality control, operations research, production management

Arne J. Pearlstein

Computational science and engineering, fluid dynamics, materials processing

Curtis O. Pedersen, Emeritus

Energy systems and thermodynamics

Michael L. Philpott

Design methodology and tribology, manufacturing systems, nano-, micro-, and meso-technology

Leslie M. Phinney

Energy systems and thermodynamics, heat transfer, nano-, micro-, and meso-technology

Andreas A. Polycarpou

Design methodology and tribology, dynamic systems, engineering mechanics, materials behavior, nano-, micro-, and meso-technology

M. Taher A. Saif

Bioengineering, engineering mechanics, materials behavior, nano-, micro-, and meso-technology

Huseyin Sehitoglu

Engineering mechanics, materials behavior

Peter Seiler

Computational science and engineering, control systems, dynamic systems

Mark A. Shannon

Bioengineering, combustion and propulsion, computational science and engineering, energy systems and thermodynamics, heat transfer, materials processing, nano-, micro-, and meso-technology

Darrell F. Socie, Emeritus

Design methodology and tribology, materials behavior

Wilbert F. Stoecker, Emeritus

Energy systems and thermodynamics

James A. Stori

Manufacturing systems, operations research

Brian G. Thomas

Computational science and engineering, engineering mechanics, fluid dynamics, heat transfer, materials behavior, materials processing

Daniel A. Tortorelli

Computational science and engineering, design methodology and tribology, engineering mechanics

Charles L. Tucker

Computational science and engineering, engineering mechanics, fluid dynamics, heat transfer, materials behavior, materials processing

Alexander F. Vakakis

Dynamic systems

Dieter Vandenbussche

Operations research, production management

S. Pratap Vanka

Combustion and propulsion, computational science and engineering, energy systems and thermodynamics, fluid dynamics, heat transfer, materials processing, nano-, micro-, and meso-technology

John S. Walker, Emeritus

Fluid dynamics, materials processing

Robert A. White, Emeritus

Automotive systems, combustion and propulsion, fluid mechanics, fluid dynamics

Xudong Zhang

Bioengineering, computational science and engineering, human factors and ergonomics

Nuclear, Plasma, and Radiological Engineering

Roy A. Axford

Application of the Lie Theory of Local Transformation Groups to the solution of linear and nonlinear systems of differential equations that arise in engineering science, theoretical physics, applied mathematics, computational physics of nuclear energy systems

Brent J. Heuser

Hydrogen/metal systems, defects in materials, thin-film structures, numerical simulations of spallation source systems, neutron scattering techniques

Barclay G. Jones

Thermal-hydraulics, reactor safety, multiphase flow, boiling heat transfer, turbulence measurement and modeling, flow-induced vibrations and hydroacoustics, human-machine interfaces for reactor control and simulation, food irradiation-safety

George H. Miley

Fusion systems, plasma engineering, reactor kinetics and control, nuclear pumped lasers, direct energy conversion, hydrogen energy production and fuel cells, low-energy nuclear reactions in solids

Magdi Ragheb

Computational methods, reactor theory, Monte Carlo methods, radiation protection and shielding, probabilistic risk assessment, applied artificial intelligence, supercomputing

David N. Ruzic

Experimental fusion research, modeling of edge plasma atomic physics, atomic properties of potential first-wall materials, plasma-material interaction, plasma processing of semiconductors, extreme ultraviolet (EUV) sources for lithography, physical and chemical vapor deposition

Clifford E. Singer

Energy economics, energy and security, advanced propulsion systems, nuclear proliferation, South and Northeast Asia nuclear programs

James F. Stubbins

Development, analysis, and application of materials, primarily for energy-related applications; nuclear systems design and analysis; nuclear materials, nuclear fuels, irradiation damage and effects, mechanical properties, high temperature corrosion, electron microscopy

Rizwan Uddin

Nuclear reactor theory, homogenization techniques, computational methods, reactor thermal hydraulics, virtual nuclear systems, nonlinear dynamical systems, computational biology

Physics**Gordon A. Baym**

Matter under extreme conditions, neutron stars, early universe, ultrarelativistic heavy ion collisions, condensed matter theory, Bose-Einstein condensation in trapped atomic systems

Douglas H. Beck

Medium- and high-energy nuclear physics; in particular, the structure of and electroweak interactions with the nucleon and few-nucleon systems; fundamental symmetries in particles, nuclei, and atoms; laser physics

Alexey Bezryadin

Experimental condensed matter, nanometer-scale mesoscopic physics, molecular electronics, quantum phase transitions in one-dimensional superconductors, DNA electronics

David M. Ceperley

Helium, computational condensed matter physics, electronic structure, quantum statistical mechanics, Monte Carlo methods, low-temperature physics, high-pressure physics

Yia-Chung Chang

Theoretical condensed matter physics, electronic properties of semiconductors, theoretical solid state physics

Tai-Chang Chiang

Experimental condensed matter physics, surface science, photo emission, x-ray diffraction

Robert Clegg

Experimental biophysics, including nucleic acid (DNA/RNA) structures and conformational changes

S. Lance Cooper

Experimental condensed matter physics, optical effects in solids, Raman scattering, spectroscopic studies of low carrier density magnetic systems, spectroscopic studies of the magnetic oxides

Karin Dahmen

Condensed matter physics, nonequilibrium dynamical systems, including pattern formation in homogeneous systems and inhomogeneous systems with quenched disorder

Paul T. Debevec

Experimental nuclear physics, muon physics, fundamental interactions and properties of elementary particles

Brian DeMarco

Atomic, molecular, and optical physics; quantum information science; atomic Bose–Einstein condensates and Fermi gases

James N. Eckstein

Experimental condensed matter physics, electronic and quantum electronic properties of complex oxide materials; thin-film-based devices using heterostructures of different complex oxide phases; II-V semiconductor materials grown by MBE; electro-optic devices incorporated into integrated optic circuits

Bob I. Eisenstein, Emeritus

Experimental high-energy physics, weak interactions of *B* mesons

Aida X. El-Khadra

Theory and phenomenology of fundamental particle interactions, including QCD, weak interactions, lattice field theory, heavy quark physics, standard model parameters

Steven M. Errede

Experimental high-energy physics, collider physics, electroweak interactions, strong interactions fundamental forces

C. Peter Flynn

Experimental condensed matter physics, materials physics; defects and diffusion; magnetism; low-energy electron microscopy; crystal growth

Eduardo Fradkin

Theoretical condensed matter physics, field theoretic problems of condensed matter systems; statistical mechanics of frustrated and disordered systems; electronic properties of disordered systems; phase transitions in 2-D systems; high temperature superconductors, strongly correlated systems, fractional quantum Hall effect

Hans Frauenfelder, Emeritus

Biological physics

Charles Gammie

Theoretical astrophysics, including theory of star and planet formation, accretion disks and related phenomena, galactic structure, astrophysical fluid dynamics, computational astrophysics

Russell W. Giannetta

Experimental condensed matter physics, including superconductivity, low-temperature physics, mesoscopic physics; magnetic resonance; nanostructures

Gary E. Gladding

Experimental high-energy physics, mixing of charmed mesons; physics education research

Paul Goldbart

Theoretical condensed matter physics, random systems, mesoscopic physics, superconductivity and superfluidity

Nigel Goldenfeld

Theoretical condensed matter physics, pattern formation in spatially extended systems, high-temperature superconductivity, biocomplexity, statistical mechanics, polymers, liquid crystals, disordered systems, pattern formation in nonlinear systems far from equilibrium, high-temperature superconductivity

George Gollin

Experimental high-energy physics, interactions of the electroweak gauge bosons

Andrew V. Granato, Emeritus

Experimental condensed matter physics, properties of simple liquids and glasses, amorphous materials

Enrico Gratton

Experimental biological physics, fast relaxation in enzymes, fluorescence properties, hydration of proteins, ir spectroscopy of biological substances

Laura H. Greene

Experimental condensed matter physics, highly correlated electron systems, high-temperature superconductivity, novel materials

Taekjip Ha

Experimental biological physics, DNA-protein, protein-protein interactions, protein and RNA folding, membrane biophysics, fluorescence microscopy of biological systems, single-molecule spectroscopy and manipulations

David Hertzog

Experimental nuclear physics, precision muon physics

Lillian Hoddeson

History of 20th-century science and technology, including electronics, atomic weapons, modern physics, big science, oral history

Leland E. Holloway, Emeritus

Experimental high-energy physics

Alfred Hubler

Nonlinear and complex dynamics, control of chaos, pattern formation, information flows; science education

Icko Iben, Jr., Emeritus

Structure and evolution of stars, comparisons between theoretical models of stars and observed properties of stars

E. A. Jackson, Emeritus

Dynamic lessons from nature's evolutionary processes, human creativity

Thomas Junk

Experimental high-energy physics, search for the Higgs boson

Sheldon Katz

Theoretical high-energy physics; algebraic geometry and its interaction with theoretical physics, especially string theories and supersymmetric field theories

Miles V. Klein, Emeritus

Experimental condensed matter physics; optical effects in solids; electronic, vibrational, and magnetic excitations in solids

Paul G. Kwiat

Experimental atomic, molecular, and optical physics; foundations of quantum mechanics, especially tests of nonlocality, interaction-free measurements, generation of entangled states, and the principle of complementarity (including demonstrations of quantum erasers); quantum information physics

Frederick K. Lamb

Theoretical high-energy and relativistic astrophysics; properties of strong gravitational fields and ultradense matter; neutron stars, pulsars, and black holes; x-ray and gamma-ray stars; gravitational radiation; gas and magnetofluid dynamics, electromagnetic radiation processes, and radiation transport; nuclear and space weapons, missile defense, arms control, space policy

Susan A. Lamb

Theoretical astrophysics; galaxy collisions and star formation

Anthony J. Leggett

Theoretical condensed matter physics, macroscopic manifestations of quantum mechanics, foundations of QM, superfluid ^3He , thermal and acoustic properties of glass, high-temperature superconductivity, Bose-condensed alkali gases, formation of topological defects in quenching

Robert G. Leigh

Theoretical high-energy physics, quantum field theory, supersymmetric gauge theory, superstring theory

Tony M. Liss

Experimental high-energy physics, proton–antiproton collisions, top quark physics

Naomi C. R. Makins

Experimental nuclear physics, hadronic structure, origin of spin in the proton and neutron, nucleon structure

Richard M. Martin

Theoretical condensed matter physics, the electronic structure of condensed matter

Telemachos Mouschovias

Theoretical astrophysics, interstellar gas dynamics, theory of star formation in the presence of magnetic fields

Alan M. Nathan

Experimental nuclear physics; physics of sports

Munir H. Nayfeh

Experimental and theoretical atomic physics, laser atomic spectroscopy, silicon nanotechnology

Yoshitsugu Oono

Theoretical statistical physics in the broadest sense (nonequilibrium, including biological, hydrodynamical, and dynamical systems), applied mathematics

Vijay R. Pandharipande

Theoretical nuclear physics, many-body theory, neutron star matter

Jen-Chieh Peng

Experimental nuclear physics, heavy ion physics, parton structures of the nucleons and nuclei, including production and decays of charm and beauty mesons

Matthias Grosse Perdekamp

Experimental high-energy nuclear physics, nucleon structure, spin-dependent structure of the proton, quark transversity distribution in the proton, spin dependent quark fragmentation functions

Philip W. Phillips

Theoretical condensed matter physics, quantum critical phenomena, quantum magnetism, strongly correlated electrons

David Pines, Emeritus

Theoretical condensed matter physics, liquid helium, astrophysics, plasma physics

Kevin T. Pitts

Experimental high-energy physics, CP violation in bottom quark decays

Ian K. Robinson

Experimental condensed matter physics, x-ray diffraction, surfaces, interfaces

Myron B. Salamon

Experimental condensed matter physics, phase transitions, superconductivity, magnetic behavior of oxides and nanophase materials

Klaus Schulten

Theoretical biological and computational physics, statistical physics

Mats Selen

Experimental high-energy physics, production and decays of heavy *b* and *c* quarks

Paul Selvin

Experimental biological physics, new forms of resonance energy transfer techniques, structure and dynamics of biological macromolecules

Stuart L. Shapiro

Theoretical astrophysics, general relativity, physics of black holes and neutron stars, gravitation, dynamics of large *N*-body dynamical systems; computational physics and astrophysics; numerical relativity

Ralph O. Simmons, Emeritus

Experimental condensed matter physics

Charles P. Slichter, Emeritus

Experimental condensed physics, nuclear magnetic resonance, NMR studies of high-temperature superconductors

John D. Stack

Theoretical high-energy physics, quantum field theory, lattice field theory, QCD

Michael Stone

Theoretical condensed matter physics, statistical physics, mathematical physics, quantum field theory

Jeremiah D. Sullivan

Physics and society: nuclear nonproliferation, arms control and international security, science policy

Jon J. Thaler

Experimental high-energy physics, properties of bottom and charmed quarks and the tau lepton

Dale J. Van Harlingen

Experimental condensed matter physics, superconductivity, microfabrication of superconductor devices, scanning probe microscopy, mesoscopic systems

Benjamin D. Wandelt

Theoretical cosmology, cosmic microwave background, structure formation, dark matter, early universe

William D. Watson, Emeritus

Theoretical astrophysics, interstellar medium, atomic and molecular processes

Albert Wattenberg, Emeritus

History of physics

Michael Weissman

Experimental condensed matter physics, $1/f$ noise, spin glasses, amorphous materials, inhomogeneous phase transitions

Scott Willenbrock

Theoretical high-energy physics, including strong, weak and electromagnetic interactions, Higgs phenomenon

James E. Wiss

Experimental high-energy physics, photoproduction of charmed mesons, precision study of the B meson

James P. Wolfe

Experimental condensed matter physics, optical properties of semiconductors, phonon imaging

Ali Yazdani

Experimental condensed matter physics, physics of nanostructures, scanning probe microscopy, atomic manipulation, tunneling spectroscopy, properties of correlated and low-dimensional electron systems, mesoscopic physics

Theoretical and Applied Mechanics

Ronald J. Adrian

Turbulent boundary layers, turbulent thermal convection, experimental fluid mechanics, geophysical fluid dynamics, microfluidics, turbulence physics

S. Balachandar

Computational fluid dynamics, convection, flow instability, geophysical fluid dynamics, multiphase flows, particulate flows, turbulence physics, vortex dynamics

Donald E. Carlson

Continuum thermomechanics, elasticity

Sahraoui Chaïeb

Biological mechanics, experimental fluid mechanics, experimental solid mechanics, microfluidics, micromechanics, multiphase flows, particulate flows, phase transitions, smart materials

Jonathan B. Freund

Acoustics, atomistic models, compressible flow, computational fluid dynamics, biomedical-fluid dynamics, numerical methods, turbulence physics

Gustavo Gioia

Biological mechanics, boundary layers, constitutive theory, continuum mechanics, foams, granular materials, phase transitions, turbulence physics

Robert B. Haber

Atomistic models, computational fluid dynamics, computational solid mechanics, continuum mechanics, elasticity, fracture, materials processing, numerical methods, material microstructure evolution

Kimberly M. Hill

Experimental fluid mechanics, granular materials, multiphase flows, particulate flows

K. Jimmy Hsia

Experimental solid mechanics, fracture, micromechanics, plasticity

Richard D. Keane

Experimental fluid mechanics

Robert D. Moser, Jr.

Chaos, compressible flow, computational fluid dynamics, numerical methods, turbulence physics, vortex dynamics

James W. Phillips

Experimental solid mechanics

William R. C. Phillips

Biological mechanics, boundary layers, environmental effects, flow instability, geophysical fluid dynamics, nonlinear waves, turbulence physics, vortex dynamics

Daniel N. Riahi

Boundary layers, convection, flow instability, geophysical fluid dynamics, materials processing, multiphase flows, nonlinear waves, turbulence physics

D. Scott Stewart

Combustion, compressible flow, computational fluid dynamics, continuum mechanics, detonation and shock physics, multiphase flows, nonlinear waves, numerical methods, phase transitions

Mark Short

Combustion, compressible flow, detonation and shock physics, nonlinear waves

Petros Sofronis

Atomistic models, computational solid mechanics, continuum mechanics, elasticity, plasticity, environmental effects, fracture, granular materials, materials processing, micromechanics, plasticity, smart materials

Nancy R. Sottos

Experimental solid mechanics, micro- and nano-mechanics, self-healing materials, composite materials, thin film reliability