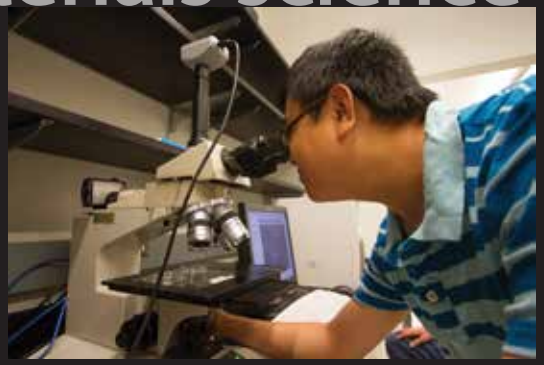
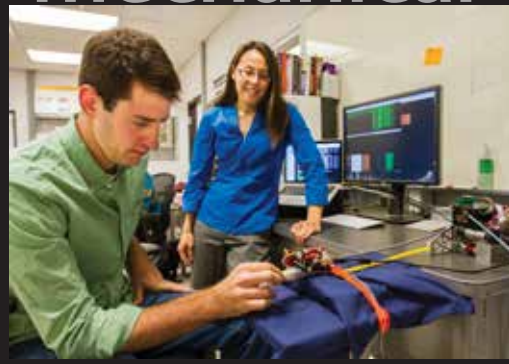
The School for Engineering of Matter, Transport and Energy

Annual Report 2012-2013

IRA A. FULTON SCHOOLS OF engineering
ARIZONA STATE UNIVERSITY

aerospace chemical materials science mechanical



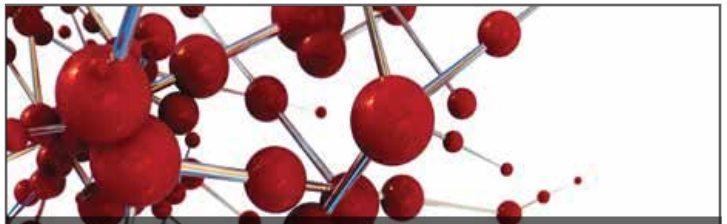
innovation across a broad range of disciplines
by world-class faculty

programs

aerospace engineering

program chair: Valana Wells
graduate chair: Marc Mignolet
undergraduate students: 543
graduate students: 61

degree programs:
b.s.e. aerospace engineering (aeronautics)
b.s.e. aerospace engineering (astronautics)
m.s. aerospace engineering
ph.d. aerospace engineering



chemical engineering

program & graduate chair: Lenore Dai
undergraduate students: 628
graduate students: 75

degree programs:
b.s.e. chemical engineering
m.s. chemical engineering
ph.d. chemical engineering

materials science & engineering

program chair: James Adams
graduate chair: Terry Alford
undergraduate students: 94
graduate students: 126

degree programs:
b.s.e. materials science & engineering
m.s. materials science & engineering
ph.d. materials science & engineering

mechanical engineering

program chair: Valana Wells
graduate chair: Marc Mignolet
undergraduate students: 1,137
graduate students: 301

degree programs:
b.s.e. mechanical engineering
b.s.e. mechanical engineering (energy & environment)
b.s.e. mechanical engineering (computational mechanics)
m.s. mechanical engineering
ph.d. mechanical engineering

solar energy engineering & commercialization

program director: Pat Phelan
professional science master's program

Table of Contents

SEMTE by the Numbers

Tenured/Tenure Track Faculty: 56

Lecturers: 2

Professors of Practice: 2

Research Awards:, FY 2013: $15,208,350

Undergraduate Students: 2,402

Barrett Honors College Students: 451

Graduate Students: 563

From the Director

Outstanding students and faculty

It has been an exciting year in our school and I am pleased to provide this update on faculty and student achievements in the School for Engineering of Matter, Transport and Energy. In the following pages are some of the major highlights of faculty and student scholarship, entrepreneurship, and outreach.

Our faculty and students perform at the highest level, advancing their research and unique learning experiences that impact all of the programs in the school – aerospace engineering, chemical engineering, materials science and engineering, and mechanical engineering. For the most recently completed fiscal year 2013, SEMTE faculty received $15.2M in research awards, up nearly 20 percent over fiscal year 2012. These awards are tangible evidence of the value of the faculty's innovative ideas as well as reflecting the fact that SEMTE faculty are sought-after collaborators with the expertise needed to solve the transdisciplinary research problems that are today the norm. The `entrepreneurial gene' of our faculty is also active – invention disclosures submitted by SEMTE faculty nearly doubled in FY2013 over FY2012, and with companies spinning off from faculty research continuing to gain prominence.

Central to our mission is the education and training of students from the bachelors to PhD. Enrollments continue to grow across the School at all levels and in all programs. SEMTE exceeded 2600 students in Fall 2012 and enrolled nearly 3000 students in Fall 2013. The number of our undergraduates in the Barrett Honors College continues to increase with nearly 20% of SEMTE majors belonging to Barrett. The unique environment for student success that exists here is attracting students who make key contributions to our research, to student organizations that add important dimensions to the student experience, to entrepreneurial activities including student-led companies, and to community outreach.

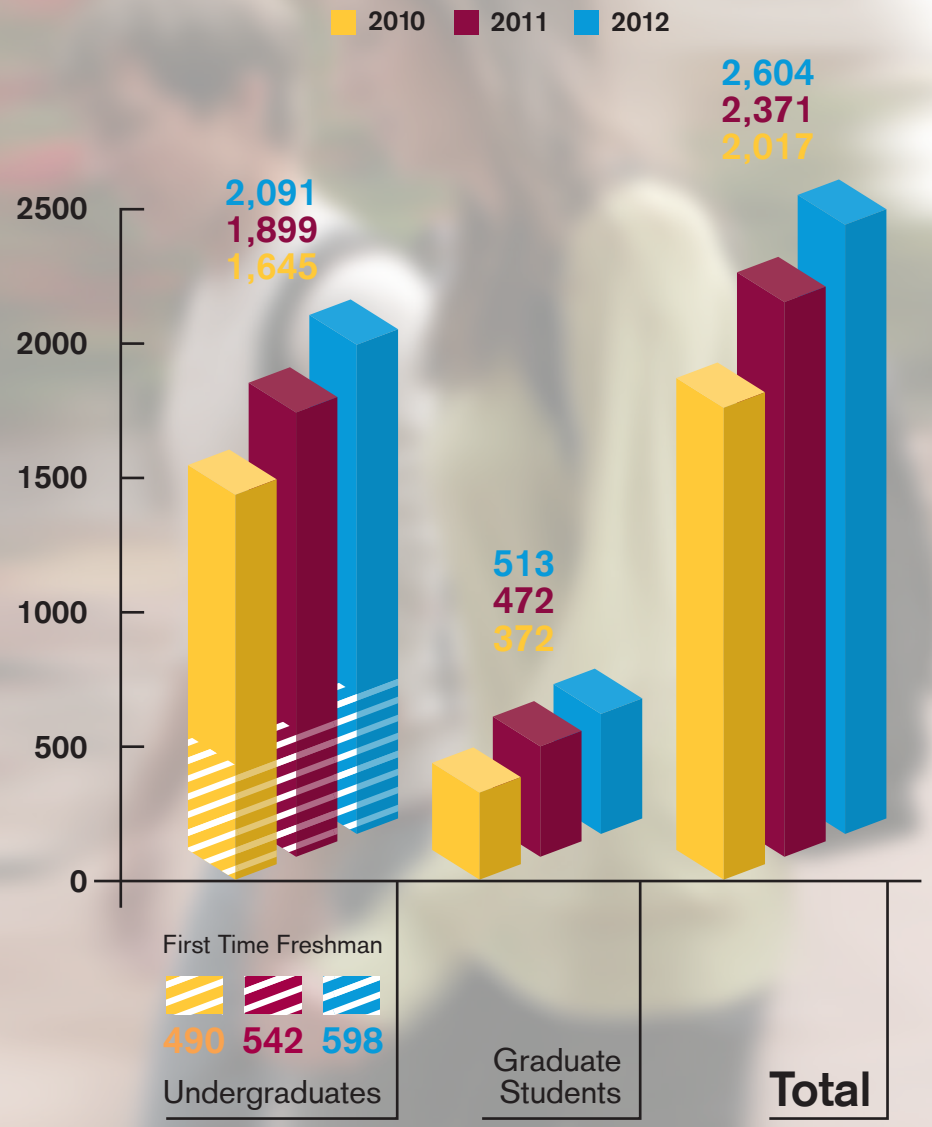
We continue to work hard to attract top faculty – 21 faculty members have joined SEMTE since 2010. This growth in our faculty is adding to core research strength and allowing us to expand the breadth of our programs and enable collaborations across themes of national importance. Supported by strong enrollment growth and the university administration, we will continue to aggressively recruit faculty in the coming year.

The success of our School would not be possible without the extraordinary efforts of our dedicated faculty, staff and students. We are excited about the future. Enjoy the report and I look forward to hearing from you.

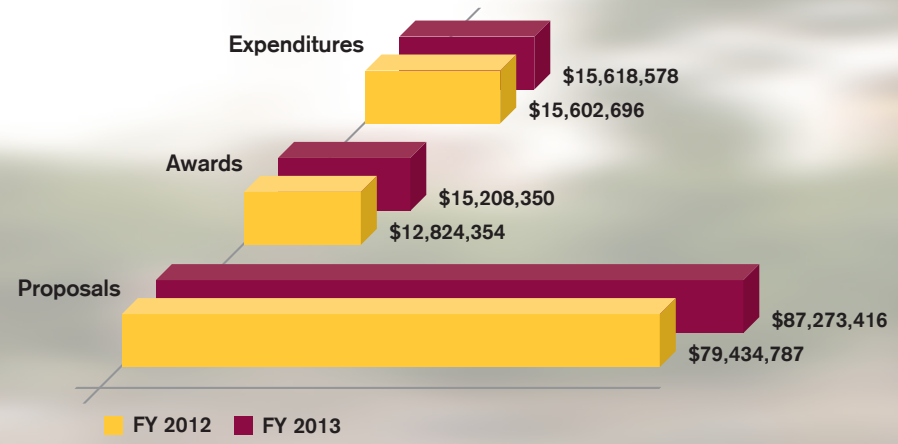
Kyle D. Squires, Ph.D
Director, School for Engineering of Matter, Transport and Energy

SEMTE Numbers

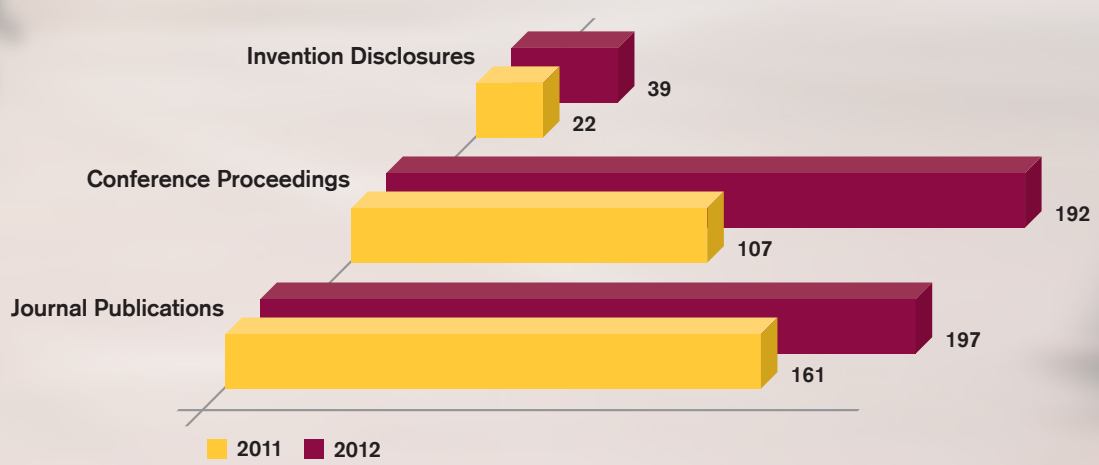
On-Campus Enrollment



Research Expenditures



Faculty Research Output

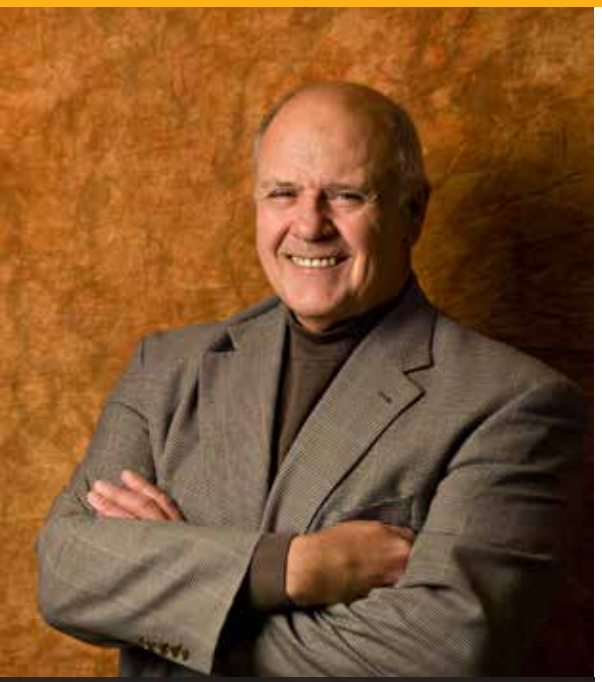


SEMTE

SCHOOL FOR ENGINEERING OF MATTER, TRANSPORT & ENERGY

FACULTY EXCELLENCE

Regents' Professor



As a prominent expert in fluid dynamics, Ron Adrian has been at the forefront in developing techniques and tools that have spawned new kinds of research endeavors, earned patents and become foundations for new branches of industry.

Ron Adrian received the highest faculty honor at ASU, as a 2012 Regents' Professor.

Regents' Professors recognize faculty who have made pioneering contributions in their areas of expertise, achieved a sustained level of distinction and enjoyed international recognition for their accomplishments. It is the highest honor bestowed on faculty by Arizona State University.

His accomplishments earned him election to the National Academy of Engineering in 1996. Adrian joined the ranks of Regents' Professors at ASU in 2013.

Adrian's has advanced understanding of the fundamental mechanisms that govern behavior of turbulent flows through some of the field's most important experiments; mathematical models he developed revealed new knowledge about structure and organization of turbulence. Among his foremost achievements are contributions to two techniques – laser Doppler velocimetry and particle image velocimetry – that provided groundbreaking tools for quantifying and measuring some of the most complex aspects of fluid mechanics.

Adrian's work has led to more than 8,000 citations of his research manuscripts by other engineers and scientists, eight patents, and technologies that expanded the market in fluid flow measurement for research and industry.

Additional Honors in 2012-2013: Adrian was named Chair of the External Review of the International Institute on Carbon Neutral Energy Research.

CAREER Award

ASU chemical engineer Mary Laura Lind's research will be used as the basis for education outreach to middle school students.

Work to improve water systems, energy sustainability earns NSF support

Mary Laura Lind received an NSF CAREER Award to support research aimed at driving advances in water purification, wastewater recovery, biofuel production and energy sustainability.

The CAREER is given to young engineers and scientists who are demonstrating the potential research and education leaders in their fields

The NSF award comes with a grant of $400,000 to be distributed overfive years. It will enable Lind to assemble a team primarily of engineering graduate students, aided by undergraduates, to conduct research under her direction.

The project will focus on better understanding the fundamental transport properties of composite membranes at the nanoscale.

The goal is to apply the findings to a variety of processes that require separation of chemicals from water and volatile organic compounds using filtering devices called membranes. Lind's team will create new membranes using nontraditional materials.

The team hopes to develop combinations of new materials and membrane designs that will improve water-purification and wastewater-treatment processes, as well as filter out materials from solutions that can be used to produce biofuels.

Brimacombe Medalist

Nik Chawla (far right)

Leadership in materials field earns engineering professor special honor

Professor Nikhilesh Chawla was selected to receive one of the leading awards in his field. TMS – The Minerals, Metals and Materials Society – honored him as the Brimacombe Medalist for his achievements in materials science and engineering.

His research interests encompass the mechanical behavior and modeling of advanced materials at bulk and small- length scales, including four-dimensional materials science, lead-free solder alloys, composite materials and nanostructured materials. He and his father co-authored the textbook Metal Matrix Composites.

His accomplishments include winning awards from the National Science Foundation and the Office of Naval Research that recognize engineers and scientists who demonstrate leadership in their areas of research early in their careers.

He also won an award from ASM International – another prominent materials society – that recognizes outstanding teaching.

Chawla is editor of the Materials Science and Engineering Journal and serves on the editorial boards of other leading journals in the field.

Lifetime Achievement

Jami Shah, Lifetime Achievement Award: American Society of Mechanical Engineers

Outstanding contributions to advances in information and design technologies earned Arizona State University engineer Jami Shah a Lifetime Achievement Award from the American Society of Mechanical Engineers (ASME).

The award was bestowed by ASME's Computers and Information in Engineering Division for Shah's achievements in "furthering the discipline of computers and information engineering."

Shah describes his contribution primarily as "adding intelligence to computer tools."

His work has helped propel the evolution of computers from functioning merely as "primitive number crunchers and equation solvers" to technology that aids the human creative process, he explains. Shah has focused on enhancing the capabilities of computer-aided design (CAD) and computer-aided manufacturing (CAM). Through that effort he has become a leader in the emerging fields of machine informatics and cognitive informatics

Young Leader Award & Air Force Grant

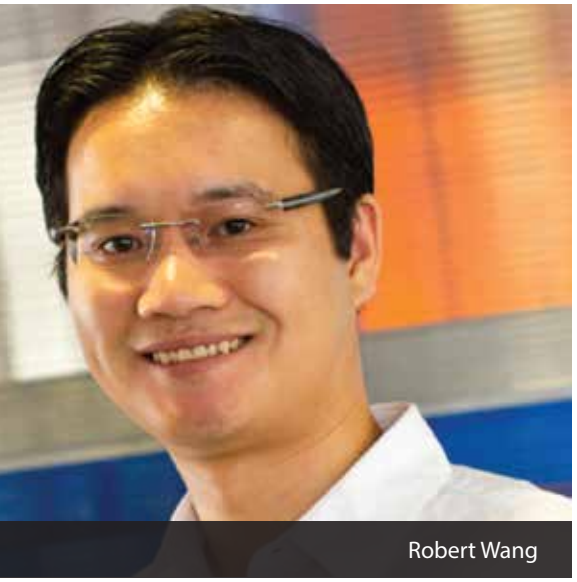
Kiran Solanki

Kiran Solanki - Young Leader Professional Development Award, TMS-The Minerals, Metals & Materials Society

Solanki was recognized by TMS for his accomplishments and leadership potential. He is one of four selected that received the 2013 Young Leader Professional Development Award from The Minerals, Metals & Materials Society, which bestows the honor on young faculty members to help support their research.

Solanki was recognized by the TMS Light Metals Division for his work with a range of materials, including magnesium for automotive applications, titanium for aerospace and naval applications, and steel-based materials used for nuclear reactors and related technologies.

The results of his research promise to help engineers and scientists better understand how to enhance the performance of new light-weight materials used in a wide variety of technological applications. The light-weight materials can be particularly effective in helping to improve the energy efficient of motor vehicles and reduce their polluting emissions.



Robert Wang

Kiran Solanki & Robert Wang: materials research wins Air Force support for engineers

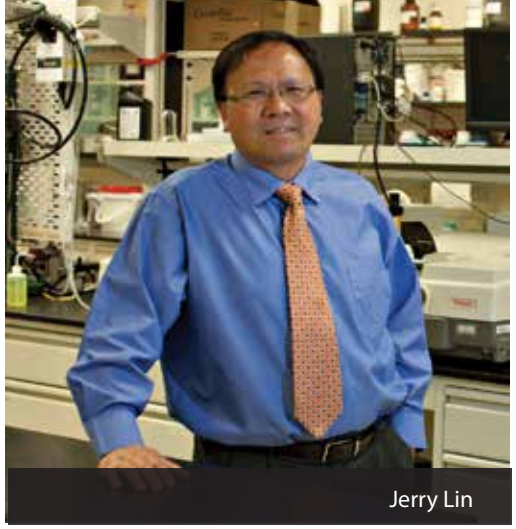
Promising research in areas that can be applied to national defense goals earned Solanki and Wang grants from the Air Force Office of Scientific Research.

Solanki was awarded a grant of more than $346,000 over three years and Wang has received a grant for close to $360,000 over the same time period through the Air Force's Young Investigator Research Program. The program aids researchers in the early years of their careers whose work demonstrates potential for achieving significant advances in their fields of engineering and science.

Solanki's work focuses on how the ratios of solute to base metals affect the performance of metal alloys, and how atomic-scale impurities aff¬ect the resiliency and strength of materials to be used in advanced technologies.

Wang is conducting nanoscale heat transfer research that could improve thermoelectric devices and thermal barrier coatings. Solanki's work with multiscale modeling of lightweight alloys, specifically their fatigue and fracture behavior, helped earn him the grant.

Their proposals to address research challenges related to Air Force missions were among 40 selected for funding from across the country.



Jerry Lin

Lin Awarded Distinguished Visiting Professorship

Regents' Professor Jerry Lin is an internationally recognized pioneer of modern inorganic membrane science. In chemistry, membranes are thin, porous films of matter used to filter out or separate gases, liquids and chemicals from compounds on a molecular level. Such separation or "selective transport" methods are critical to technological advances in medicine, manufacturing, energy production and environmental protection.

Lin is also known for his work with adsorbents – often granular materials – that can selectively separate various gases and liquids. Combining expertise in materials science and chemistry, Lin creates new adsorbents and membranes and designs the processes for using them for specific purposes.

Among his most recent awards includes the George T. Piercy Distinguished Visiting Professorship from the University of Minnesota.

Jean Andino

Jean Andino Fulbright U.S. Scholar Award

Andino shared her expertise in renewable energy development with research colleagues and students in Panama with the support of a prestigious Fulbright U.S. Scholar award.

Andino spent a semester at Universidad Tecnológica de Panamá with the Centro de Investigación e Innovación Eléctrica, Mecánica y de la Industria, as well as with the Facultad de Ingeniería Mecánica, where she consulted on air quality and energy issues, gave seminars and taught a short course.

Fulbright awards enable U.S. faculty members to teach and conduct research in other countries in efforts to exchange ideas and foster collaborations aimed at finding solutions to common international challenges.

César Torres (left)

Torres wins national group's award for leading young Hispanic researcher

César Torres received the Society of Hispanic Professional Engineers (SHPE) 2012 Young Investigator Award. The honor recognizes his contributions to bioenergy research.

Torres' research is conducted in the Swette Center for Environmental Biotechnology at ASU's Biodesign Institute. The research is funded by the Department of Defense, the National Science Foundation and the Office of Naval Research. Torres also works with a number of industrial partners.

Torres works closely with Swette Center director Bruce Rittmann, an ASU Regents' Professor. Rittmann nominated him for the SHPE award. "In my view, César Torres is the world's most outstanding researcher of microbial electrochemical cells," Rittmann says. "César is truly unique in that he has advanced the field in extracellular electron transport, proton transport and microbial ecology. He is appreciated by allthe leaders of the field, and many of them are eager to collaborate with him."

Torres also recently began work with the Integrative Graduate Education and Research Traineeship: Solar Utilization Network, a program supported by the National Science Foundation that will train doctoral students in the solar energy field.

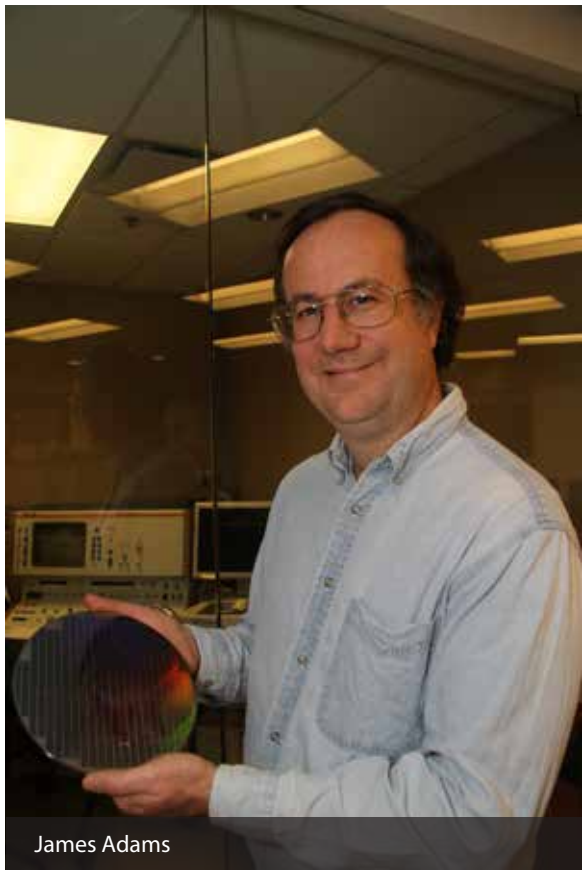
James Adams

James Adams was elected a Fellow of ASM International – The Materials Information Society.

Adams is also an ASU President's Professor, an honor that recognizes outstanding contributions to undergraduate education at ASU. His expertise encompasses computational materials, materials toxicity and autism research.

He serves on the graduate faculty in chemistry, biochemistry, and materials science and engineering.

His ASM International Fellow honor recognizes "distinguished contributions in computational materials science, in particular, the development of highly reliable interatomic potentials."



James Adams

As a Fellow, Adams will join a forum of accomplished scientists and engineers whose members serve as technical and professional advisers to the society's leaders and other members.

B.L. Ramakrishna

B.L. Ramakrishna appointed Jefferson Science Fellow

B.L. Ramakrishna is spending a year as an adviser to the U.S. government on science and technology issues related to the nation's foreign policy interests.

Ramakrishna was selected to serve as a Jefferson Science Fellow, an assignment to advise officials of the U.S. Department of State or the U.S. Agency for International Development (USAID). He is the first faculty member from an Arizona university to be awarded the prestigious fellowship in the program's 10-year history.

B.L. Ramakrishna

He is among 13 scientists, engineers and physicians from ins[illegible]tion[illegible] 2013-2014 class Jefferson Science Fellows. Candidates for the positions are nominated by either the National Academy of Sciences, the National Academy of Engineering or the Institute of Medicine of the National Academies.

FURI Fulton Undergraduate Research Initiative

The Fulton Undergraduate Research Initiative (FURI) is designed to enhance the engineering undergraduate curriculum by providing hands-on lab experience, independent and thesis-based research and the opportunity to travel to professional conferences. Many FURI participants have gone on to apply their unique experience to work in industry, as well as graduate studies in engineering, medicine, law and other disciplines.

Students in FURI's research program develop an idea under the mentorship of an engineering doctoral student or faculty member, then apply for funding. Once accepted, they perform research, attend workshops, prepare research summaries and participate in the research symposium.

Panagiotis Artemiadis

Marcus Herrmann

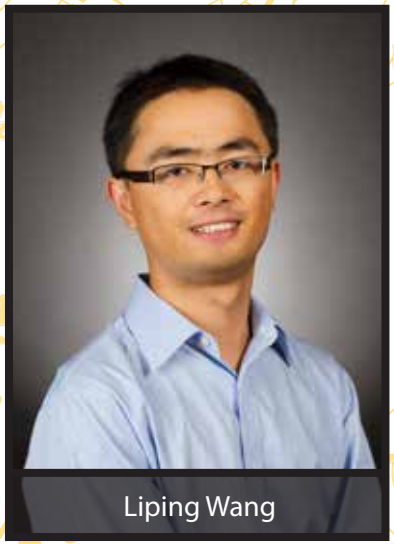
James Middleton

2013 Top 5% Teaching Awards

Quality and innovative instruction is one of the top priorities of the Ira A. Fulton Schools of Engineering. The Schools recognize excellence in instruction by awarding an annual selection to their Top 5% Teachers List. Students nominations and feedback are reviewed by a faculty committee in determining these honors.

2013 Award Winners: Panagiotis Artemiadis, Marcus Herrmann, James Middleton, Veronica Santos, Liping Wang

Veronica Santos



Liping Wang

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ENTREPRENEURSHIP

FacultyEntreprenurship

Researchers showcase energy technologies at Innovation Summit

Fulton Entrepreneurial Professor, SEMTE Professor & Fluidic Energy founder, Cody Friesen (at left)

Friesen sees the combination of efforts at the university to advance solar-power and energy-storage technologies "demonstrating a holistic approach to energy research that is making ASU a global leader in renewable energy advances."

The Department of Energy's fourth annual ARPA-E Innovation Summit showcased a wide array of ASU energy technologies at the Gaylord Convention Center in Washington D.C. on Feb. 25-27, 2013. Prominent in the Summit was research conducted under the leadership of Cody Friesen, whose ARPA-E program is pursuing advances in battery technology and energy storage that aims to develop new types of ultra-high-energy metal-air batteries using advanced ionic liquids. The research promises to provide low-cost, long-range power for a range of applications and that over the long-term could reduce dependence on less reliable energy sources.

ARPA-E is the Advanced Research Projects Agency-Energy housed within the U.S. Department of Energy, seeking to streamline the awards process in fostering and cultivating cutting-edge, high-impact energy research that is too early for private sector investment. ARPA-E awards are highly competitive, awarded to transformative projects with the high potential of radically improving U.S. energy security, economic prosperity and environmental well-being.

Spinoff research in air battery storage

Friesen's research has led to the creation of Fluidic Energy, a spinoff from ASU that is developing high-power, low-cost, rechargeable metal-air batteries for renewable energy storage. Traditionally, metal-air batteries are found in small, non-rechargeable devices like hearing aids, delivering low power levels over extended periods of time and have thus not been useful for applications requiring periodic increases in power. Fluidic's goal is to combine the low-cost, high energy, long running metal-air battery with new chemistry approaches that allow high efficiency, high power, quick responding battery technologies. The company already employs 24 people, many of them engineers and Ph.D.'s.

This research has the potential to offer transformative, high-impact solutions for renewable energy storage issues in the grid. Electricity currently accounts for 40 percent of U.S. carbon emissions and could substantially decrease with the grid resiliency provided by this new technology.

Friesen says that "ARPA-E has enabled us to go after technologies and solutions that we would not have otherwise gone after because of the degree to which those solutions and those ideas were off the beaten path from our core technology. That is massive impact."

FacultyEntreprenurship

Spin-off launches world's first portable metabolism tracker

Professor Erica Forzani is co-founder of a new startup offering the world's first portable device that can track an individual's metabolism and use that information to provide diet and exercise recommendations for maintaining or reaching a healthy weight.

Using Breezing in the field to check metabolic activity.
Photo by: Breezing

Breezing, co-founded by professors Erica Forzani and NJ Tao, is a new startup based on technology is offering the world's first portable device that can track an individual's metabolism and use that information to provide diet and exercise recommendations for maintaining or reaching a healthy weight.

Breezing is a pocket-sized device that analyzes exhalations and transmits that information to an integrated app on a cell phone or tablet via Bluetooth. The user can then apply that information to customize a diet or exercise program through the app that will help achieve personal weight goals.

Breezing works via "indirect calorimetry," the preferred measurement method of the American Dietetic Association, World Health Organization, and other institutions. Traditional indirect calorimeters are bulky, difficult-to-use and usually found only in doctor's offices. Breezing replaces all that with a simple, handheld device based on cutting-edge sensor technology.

Metabolic information flows via Bluetooth to an integrated app on a cell phone or tablet
Photo by: Breezing

Breezing co-founder Erica Forzani meets with potential investors at First Look LA.
Photo by: Derek Sarley

Breezing is being launched through a crowdsourcing campaign on Indiegogo, the largest global crowdfunding platform.

In the last decade, more than 50 companies have been formed out of business start-ups launched from ASU through Arizona Technology Enterprises (AzTE), the exclusive intellectual property management and technology transfer organization of ASU. Start-up companies that have licensed ASU IP have attracted more than $300 million in financing from venture capital firms and other investors.

"With Breezing, we are taking something that would typically be available in a high-end sports training laboratory and making it available to anyone looking to change their behaviors to become healthier. In the long run, we can even apply this same technology to help with the prevention and management of chronic diseases."

- Breezing co-founder, Erica Forzani

SEMTE

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RESEARCH HIGHLIGHTS

MarcusHerrmann

Advances in use of liquids and gases for medical, environmental and energy-efficiency improvements earn support for ASU researcher from National Science Foundation

Marcus Herrmann is a kind of expert mixologist – but one who specializes in things that don't mix well, like oil and water.

Herrmann is helping make strides in understanding the flow dynamics of immiscible interfaces – in other words, how gases and liquids that don't combine well can be expected to behave when they must be used together to spark various mechanical and chemical processes.

Predicting and controlling that behavior is critical to systems that require the characteristics of both gases and liquids for energy-conversion processes for technologies such as the standard combustion engine in most of the world's motor vehicles.

Better prediction and control of such processes are the keys to advances toward the next generations of fuel and energy-conversion technologies, including fuel-injection systems, as well as medical sprays and environmental protection and management methods.

Herrmann is working with ASU colleagues and graduate students in developing better computational tools and methods for simulating the flows of immiscible gases and liquids under various environmentaland operational conditions.

Progress in that endeavor can play a pivotal role in making significant improvements in engine performance, fuel efficiency, reducing pollution from combustion engines, and development of alternative energy sources that would decrease the nation's dependency on fossil fuels.

Kaushal Rege

Students play role in research to advance health, public safety

Kaushal Rege is working at the forefront of research that promises to produce far-reaching beneficial impacts on human health, public safety and national security. He's also providing students opportunities to not only learn about the research as it happens but enabling them to help make it happen.

With support from the National Institutes of Health, he is pursuing advances in battling cancer by engineering polymers (compound materials made by combining different kinds of molecules) that can be used to deliver therapeutic genes directly to cancer cells in the body.

The process is designed to overcome the negative effects of unhealthy genes by administering healthy genes on a cellular level directly at the source of the cancer.

The method involves generating several polymers that are rapidly screened to identify the particular ones most effective for delivering therapeutic genes. These genes then produce proteins that can kill cancer cells. A key advance employed in the research involves use of cutting- edge computational methods for correlating the chemical properties of polymers with their ability to deliver genes within the body.

Rege is collaborating on various aspects of this research with partners at the Medical University of South Carolina and Rensselaer Polytechnic Institute in New York.

Kaushal Rege (center) consults in his lab with graduate students David Taylor (left) and Huang-Chiao "Joe" Huang. Photo by: Jessica Slater/ASU

In a project supported by the Defense Threat Reduction Agency, Rege is also doing work on "smart materials." The project focuses on assembling polypeptide nanoparticles in ways that canbe used for detecting thermal changes (changes in heat).

Sensors that can detect radiation, thermal (heat) and magnetic changes can be effective in indicating when major weapons testing by foreign nations has occurred or detecting the presence of certain weapons-grade materials.

DanielRivera

Battling addictions with engineering algorithms

Most people don't associate engineers with advances in behavioral health, but new research shows engineers might have much to offer those fighting addictions and other behavioral disorders.

One of the leaders in this unlikely collaboration is Daniel Rivera program director for ASU's Control Systems Engineering Laboratory. He and other engineering researchers are applying concepts from control systems engineering to behavioral health interventions.

> "Experts in behavioral health have already realized that not only is it necessary to provide treatment over time, it has to be adapted to participant response. We're using ideas from engineering to optimize how to deliver adaptive interventions."
>
> - Daniel Rivera

Control systems engineering is the field that develops algorithms to automatically adjust variables in a system based on measured responses. Everyday examples of control systems include the home thermostat, cruise control in a car or an insulin pump. There are even natural control systems within the human body.

Since control systems automatically adjust variables based on measured outcomes, they are an ideal technology for adaptive behavioral interventions, which must change dosages as patients progress in their treatment. In this case, a dosage could refer to the amount of medicine a patient takes or the type and frequency of counseling they receive.

Interventions are expressed as a feedback control system in which the frequency of family counseling visits changes over time, based on a quarterly assessment of parental function. The intervention also accounts for potential disturbances in the family, such as job stress or depression.

Daniel Rivera and students

The approach relies on dynamical systems models to make optimal dosage decisions over time. In previous behavioral health interventions, researchers have used simple "if-then" rules that are not as personalized, resulting in less successful outcomes.

Engineering and behavioral health researchers believe that the control systems approach of tailoring treatments based on participant response could improve behavioral health treatments. Conduct disorder is just one topic within the field of behavioral health, which also includes the complicated issue of addiction.

Adaptive Intelligent Materials & Systems Center

Aditi Chattopadhyay
AIMS Center Director

ASU Arizona State University
Adaptive Intelligent Materials & Systems Center

The Adaptive Intelligent Materials and Systems (AIMS) Center exemplifies the success that can be achieved by and interdisciplinary team of faculty researchers focused on shared goals.

The AIMS Center brings together researchers with backgrounds in smart materials and adaptive systems, solid/structural mechanics, computational mechanics, multidisciplinary optimization, signal processing, neuroscience, intelligent design, and data mining and computational statistics to develop a solid foundation in the area of integrated intelligent system design with applications that cut across various disciplines.

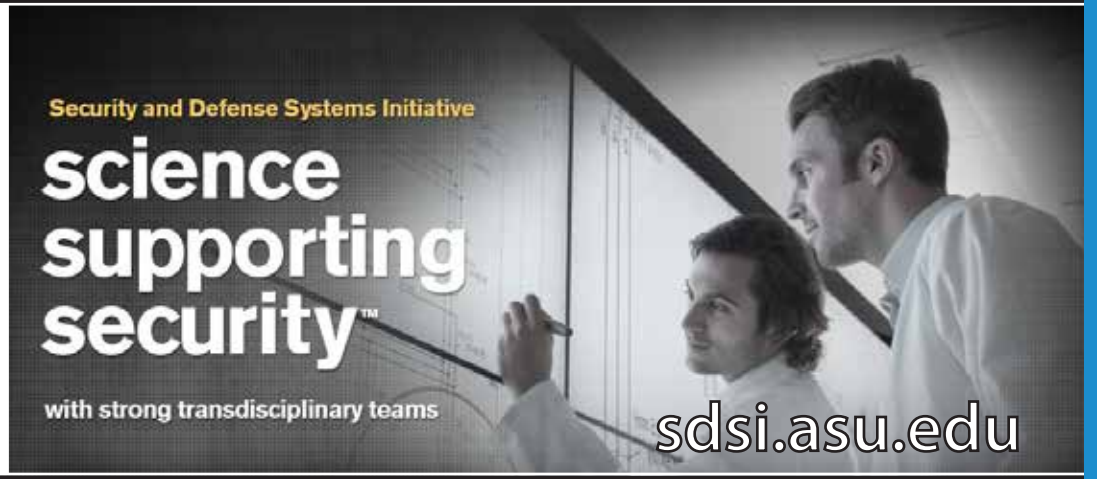
The center's focus is to develop unified theoretical foundations for designing intelligent systems, building on the tremendous advances made in various individual disciplines in the last decade. Current research thrusts include areas of system health monitoring, self-healing materials, autonomous materials and sensing systems, energy harvesting bio-inspired sensors and morphing vehicles. These areas have significant impact on aerospace systems that are of interest to both industry and government.

AIMS Center membership includes faculty from the Aerospace and Mechanical Engineering, Electrical Engineering, Materials Science and Engineering, Computer Science and Engineering, The Biodesign Institute at Arizona State University, and Mechanical and Manufacturing Engineering Technology. The AIMS Center also has established partnerships with the Air Force Research Laboratory (AFRL), Boeing Helicopter, Mesa; Boeing Phantom Works, Seattle; the Naval Research Laboratory and the United Technologies Research Center, and continues to reach out to the community to build collaborative support among industry and government agencies.

aims.engineering.asu.edu

Security & Defense Systems Initiative

ASU created SDSI as a major, new, university-wide effort to enable large-scale, coordinated, strategically managed, use-inspired, transdisciplinary research, development and educational programs to assist government, industry, and other partners in the security and defense sector.



ASU's Security & Defense Systems Initiative (SDSI), brings our defense-related research efforts under a single, orchestrated, university-wide initiative that can coordinate major new research and technology development efforts. It also enables broader engagements with government and industry that reach across the university's research, education, and public service missions, all focused around a set of targeted research thrust areas aligned with key needs in the security and defense sector.

The security and defense field is changing rapidly. The traditional decades-long time needed to develop and field technology-enabled solutions to key security challenges has become untenable. Technology development and insertion must occur on far faster timescales than ever before. Ways of creating systems that place a premium on rapid innovation and development to decrease obsolescence while emphasizing reduced costs to gain affordability will become increasingly essential. SDSI has been established to provide a new kind of university entity, based on the ASU President's New American University model, for meeting these needs and for producing ASU graduates who are unmatched in their readiness to address real-world needs in the security and defense sector.

Werner J.A. Dahm
Director, SDSI

SDSI is based on an organizational structure designed to enable an unprecedented level of partnership between the university, government, and industry in the security and defense area. Central to this is a new off-campus university-affiliated entity called ASU Research Enterprise (ASURE), staffed by non-tenure-track professional researchers whose role is to engage in higher-TRL applied research and advanced technology development programs. Those efforts complement our traditional on-campus basic research and early-stage applied research programs and are integrated with them, but allow a breadth of research involvement at ASU with government and industry that goes far beyond the limitations of a traditional university research model.

SDSI is also based on a strong partnership model. We have an exceptional network of established working relationships, close partnerships, and connections with universities and companies that allow us to rapidly assemble superior solution teams within our research thrust areas. We are able to engage in creative, nontraditional contractual mechanisms in our interactions with industry, such as open-ended arrangements and IP-free interactions, that allow us to overcome many of the traditional obstacles to effective industry-university partnerships. And, we are able to remain a reliable research partner even as our solutions move through technology readiness levels beyond those that universities normally are involved in, rebalancing our own role and that of our partners along the way.

Piper Health Solutions Workshop on Rehabilitation Robotics
Hosted by Arizona State University

Next Workshop:
February 28, 2014
Arizona State University

In February 2013, ASU hosted the Piper Health Solutions Workshop on Rehabilitation Robotics in Tempe, Arizona. A second workshop is scheduled early in 2014, again to be hosted by ASU.

The main theme the workshop is rehabilitation robotics. However, the workshop included a wide range of topics aimed at improving quality of life and covering the multidisciplinary field of robotics, including human robot interaction and human motor control. The main goals of the workshop were to discuss the state of the art in rehabilitation robotics and to identify the main challenges in this field.

This workshop is supported by a Piper Health Solutions grant to the School of Biological and Health Systems Engineering at Arizona State University.

This workshop was open to:

- Researchers in the fields of robotics, rehabilitation, assistive devices, and physical human-robot interaction
- Undergraduate and graduate students in the fields of engineering, medicine, physical rehabilitation, and nursing
- Clinicians and therapists in neuro-rehabilitation
- General public

Experts from around the world attended to share their expertise with workshop attendees. SEMTE faculty participated as workshop commitee members and to share their research findings:

Panagiotis Artemiadis, Assistant Professor, Mechanical & Aerospace Engineering - SEMTE

Spring Berman, Assistant Professor, Mechanical & Aerospace Engineering - SEMTE

Veronica Santos, Assistant Professor, Mechanical & Aerospace Engineering - SEMTE

SEMTE

SCHOOL FOR ENGINEERING OF MATTER, TRANSPORT & ENERGY

NEW FACULTY

New Faculty

In the past three years, SEMTE has added 21 new faculty members, adding to our foundational strengths and bringing new research dimensions that complement and build upon broad engineering and university initiatives in energy, security, health, and education.

Chemical Engineering

Mary Laura Lind, assistant professor

Ph.D., materials science, California Institute of Technology

Research expertise: advanced materials synthesis and characterization, environmental nanotechnology, membrane technology, sustainable energy and water production. synthesis and characterization of bulk metallic glasses.

Bin Mu, assistant professor

Ph.D., chemical & biomolecular engineering, Georgia Institute of Technology

Research expertise: synthesis, characterization & applications of a new class of novel porous materials (metal-organic frameworks). design & development of fluorescent nanosensors using single-walled carbon nanotubes

Cesar Torres, assistant professor

Ph.D., environmental engineering, Arizona State University

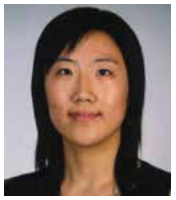
Research expertise: bioenergy, microbial electrochemical cells, microbial & biofilm kinetics, microscopic techniques to image biofilms

Materials Science & Engineering

Candace Chan, assistant professor

Ph.D., physical chemistry, Stanford University

Research expertise: electrochemical energy storage, lithium-ion batteries & electrochemical capacitors, photocatalytic processes, solar-to-fuel photoelectrochemistry, nanomaterials synthesis, bottom-up assembly & fabrication, applied electrochemistry, materials chemistry, solid-state ionics



Ximin He, assistant professor

Ph.D., chemistry, University of Cambridge

Research expertise: polymers, smart/ responsive materials, micro/nano-structure assembly & fabrication, biologically inspired systems & devices, organic optoelectronics, biosenseing, & biomaterials

Michael O'Connell assistant professor

Ph.D., physical chemistry, Rice University

Research expertise: Carbon nanomaterials Work includes synthesis, chemical modification, spectroscopy, microscopy, and other characterization. Applications in energy, bio-medical topics, printed electronics, nano-actuation, nanofluidics, and others.

Mechanical & Aerospace Engineering

Iman Alizadeh, lecturer

Ph.D., mechanical & aerospace engineering, University of California, Irvine

Research expertise: spacecraft trajectory design, guidance and control; spacecraft design

Panagiotis Artemiadis, assistant professor

Ph.D., mechanical engineering, National Technical University of Athens, Greece

Research expertise: robotics, control systems, system identification, brain-machine interfaces, rehabilitation robotics, neuro-robotics, orthotics, human motor control, mechatronics & human-robot interaction

Spring Berman, assistant professor

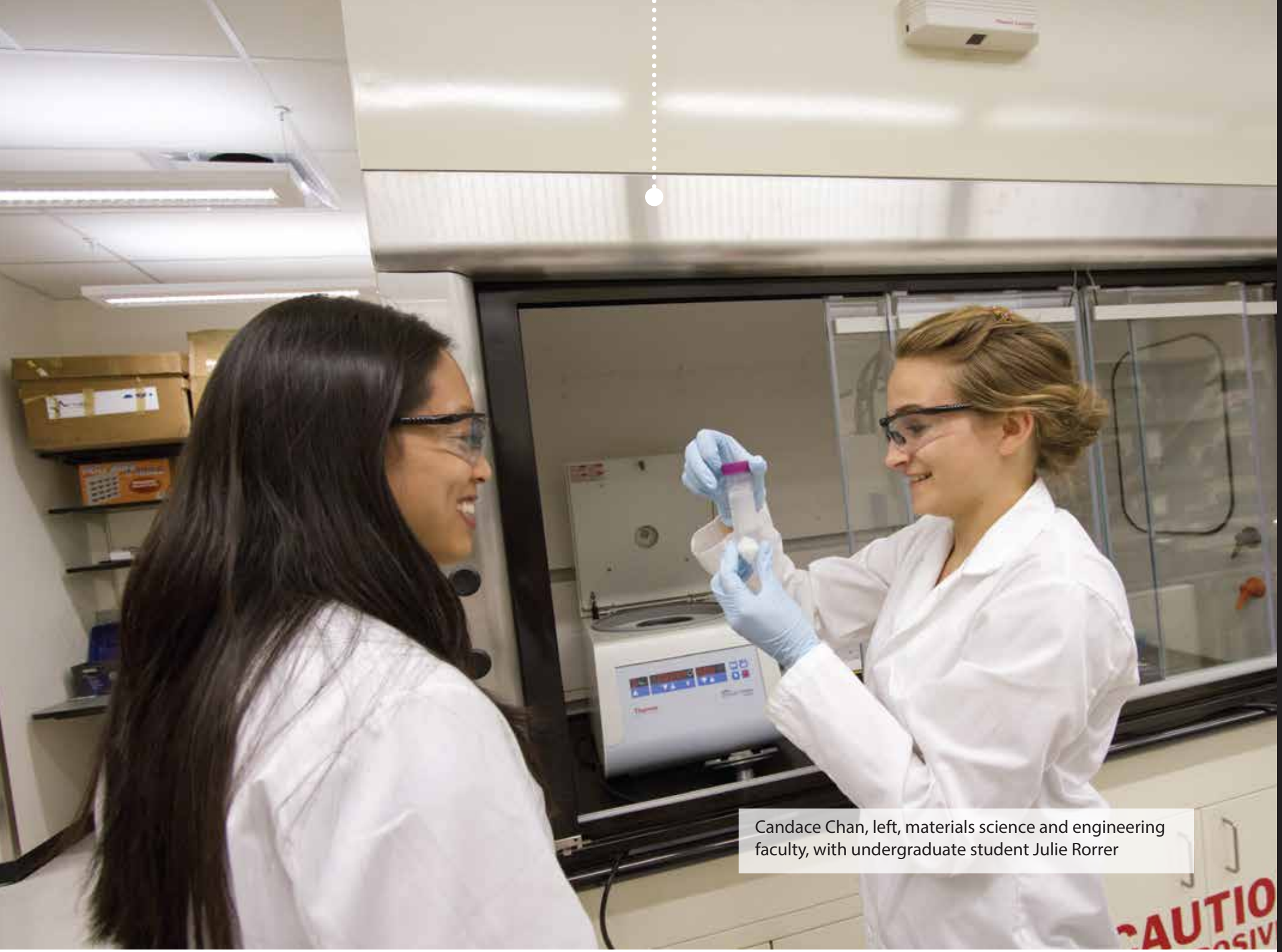
Ph.D., mechanical engineering & applied mathematics, University of Pennsylvania

Research expertise: modeling, analysis, control, and optimization of multi-robot systems including robotic swarms; analysis of collective behaviors in biology and biologically-inspired control of distributed systems

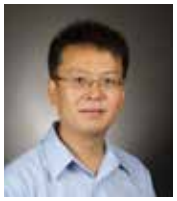
Werner Dahm, director, Security & Defense Systems Initiative ASU Foundation professor

Ph.D., aeronautics, California Institute of Technology

Research expertise: defense science & technology, science & technology assessments/planning, fluid dynamics, aerodynamics, turbulent flow, turbulence modeling, combustion science, propulsion, advanced propulsion systems



Candace Chan, left, materials science and engineering faculty, with undergraduate student Julie Rorrer



Yongming Liu, associate professor

Ph.D., civil and environmental engineering, Vanderbilt University

Research expertise: Fatigue and fracture of engineering materials and structures, probabilistic computational mechanics, risk assessment & management, multi-physics damage modeling & structural durability, multi-scale uncertainty quantification and propagation, imaging-based experimental testing, diagnostics & prognostics

James Middleton, professor

Ph.D., educational psychology, University of Wisconsin, Madison

Research expertise: student learning of mathematical concepts, motivation & mathematics learning, teacher change, applications of technology to mathematics teaching & learning

Jay Oswald, assistant professor

Ph.D., mechanical engineering, Northwestern University

Research expertise: development of computational mechanics: finite element methods, molecular dynamics, & multiscale methods for applications in MEMS, materials failure analysis, & material design

Matthew Peet, assistant professor

Ph.D., aeronautics & astronautics, Stanford University

Research expertise: Analysis & control of dynamic systems including development of optimization-based tools for nonlinear differential equations; systems with hybrid, nonlinear & decentralized dynamics; sparse interconnection & delayed feedback.

Yulia Peet, assistant professor

Ph.D., aeronautics & astronautics, Stanford University

Research expertise: computational modeling & simulation in fluid mechanics and turbulent flows, spectral element methods, multidomain & integrative simulation techniques, numerical analysis; applications in wind energy, gas turbine engines, & bio-fluid mechanics

Jagannathan Rajagopalan, assistant professor

Ph.D., mechanical engineering, University of Illinois at Urbana-Champaign

Research expertise: mechanics of micro/nano scale materials, MEMS for in situ materials characterization, BioMEMS, cell mechanics

Konrad Rykaczewski, assistant professor

Ph.D., mechanical engineering, Georgia Institute of Technology

Research expertise: development of nanoengineered surface technologies for enhancing the efficiency of thermal systems in a variety of industries including energy, water, gas & oil & transportation

Kiran Solanki, assistant professor

Ph.D., mechanical engineering, Mississippi State University

Research expertise: multiscale modeling of plasticity and damage behavior in metals, uncertainty analysis, fatigue & fracture, constitutive modeling for metallic alloys, atomistic simulations, crystal plasticity, anisotropic plasticity & damage, finite element method, solid mechanics, optimization, & stress analysis.

Timothy Takahashi, professor of practice

Ph.D., mechanical & aerospace sciences University of Rochester

Research expertise: fixed wing aircraft design, aerodynamics, performance, multi-disciplinary optimization, legal aspects of aviation

Liping Wang, assistant professor

Ph.D., mechanical engineering, Georgia Institute of Technology

Research expertise: nanoscale heat transfer, metamaterials, plasmonics, & nanophotonics with an emphasis on solar thermal energy harvesting using plasmonic-enhanced light trapping for photovoltaics, as well as near-field enhancement & spectral control of radiation for thermophotovoltaic energy conversion. other research interests also involve electronic cooling, MEMS, & bio-sensing

Robert Wang, assistant professor

Ph.D., mechanical engineering, University of California, Berkeley

Research expertise: thermal energy conversion, storage, and transport in nanostructured materials; thermoelectric power generation; thermal storage media; heat transfer, & phonon optics. custom-design of colloidal nanoparticles, chemical precursors, and nanocomposites

SEMTE

SCHOOL FOR ENGINEERING OF MATTER, TRANSPORT & ENERGY

FACULTY

Faculty

Chemical Engineering

Program Chair

Lenore Dai, professor
Ph.D., materials science & engineering, University of Illinois
Research expertise: surface, interfacial, and colloidal science, nanorheology and microrheology, materials at the nanoscale, synthesis of novel polymer composites and materials

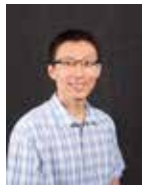
Jean Andino, associate professor
Ph.D., chemical engineering, California Institute of Technology
Research expertise: atmospheric chemistry, air pollutant sensing & control, chemical kinetics

Veronica Burrows, associate professor
Ph.D., chemical engineering, Princeton University
Research expertise: engineering education, applied surface chemistry, semiconductor processing

Erica Forzani, assistant professor
Ph.D., chemistry, Cordoba National University, Argentina
Research expertise: chemical & biosensors,non-invasive sensors, sensor integration, wireless & lab-on-cell-phone sensors

Jerry Lin, regents' professor
Ph.D., chemical engineering, Worcester Polytechnic Institute
Research expertise: inorganic membrane science, adsorption science & technology; separation technologies, membrane uses for energy processing; carbon dioxide capture; membrane reactors

Mary Laura Lind, assistant professor
Ph.D., materials science, California Institute of Technology
Research expertise: advanced materials synthesis & characterization, environmental nanotechnology, membrane technology, sustainable energy & water production. synthesis & characterization of bulk metallic glasses.



Bin Mu, assistant professor
Ph.D., chemical engineering, Georgia Institute of Technology
Research expertise: synthesis, characterization, & applications of a new class of novel porous materials (metal-organic frameworks); design and development of fluorescent nanosensors using single-walled carbon nanotubes.

David Nielsen, assistant professor
Ph.D., chemical engineering, Queen's University at Kingston, Canada
Research expertise: biochemical engineering, metabolic engineering, bioreactor & bioprocess engineering, product recovery

Gregory Raupp, professor & director, macrotechnology works, office of the executive vice president for knowledge enterprise development
Ph.D., chemical engineering, University of Wisconsin
Research expertise: reaction kinetics & mechanisms, surface & interface reactions, chemical reaction engineering w/emphasis on high tech materials & micro/nano fabrication for flexible electronics and displays

Kaushal Rege, associate professor
Ph.D., chemical engineering, Rensselaer Polytechnic Institute
Research expertise: molecular & nanoscale bioengineering, drug & gene delivery, nanobiotechnology, theranostics, synergistic therapeutics, sub-cellular delivery, biological separations

Daniel Rivera, professor
Ph.D., chemical engineering, California Institute of Technology
Research expertise: control systems engineering with emphasis on system identification advanced control concepts applied to process systems, supply chain management & behavioral health

Michael Sierks, professor
Ph.D., chemical engineering, Iowa State University
Research expertise: neurodegenerative disease, protein engineering, enymology

Cesar Torres, assistant professor
Ph.D., Environmental Engineering, Arizona State University
Research expertise: bioenergy, microbial electrochemical cells, microbial and biofilm kinetics, microscopic techniques to image biofilms

Materials Science & Engineering

Program Chair

James Adams, president's professorPh.D., materials science & engineering, University of Wisconsin-Madison
Research expertise: computational materials, materials toxicity, & autism research

Terry Alford, graduate program chair & professor
Ph.D., Materials Science, Cornell University
Research expertise: Silver & copper metallization and low-k dielectrics for future integrated circuit (IC) technologies advanced metallization for low-power electronics and for novel IC components formation and adhesion of sol-gel hydroxyapatite-metal systems for biomedical applications

Candace Chan, assistant professor
Ph.D., Physical Chemistry, Stanford University
Research expertise: electrochemical energy storage, lithium-ion batteries & electrochemical capacitors, photocatalytic processes, solar-to-fuel photoelectrochemistry, nanomaterials synthesis, bottom-up assembly and fabrication, applied electrochemistry, materials chemistry, solid-state ionics

Nikhilesh Chawla, Ira A. Fulton professor of materials science & engineering
Ph.D., materials science & engineering, University of Michigan
Research expertise: mechanical behavior & microstructural characterization of materials. 4D materials science, nanomechanics, fatigue, & fracture behavior of materials

Peter Crozier, associate professor
Ph.D., physics, University of Glasgow
Research expertise: synthesis, characterization & evolution of nanomaterials & nanostructures related to energy & the environment

Sandwip Dey, professor
Ph.D., ceramic engineering, Alfred University
Research expertise: MOCVD and chemical processing, science of electroceramics and contact metals

Cody Friesen, associate professor
Ph.D., materials science & engineering, Massachusetts Institute of Technology
Research expertise: surface/interface physics & thermodynamics, physical electrochemistry, thin film growth, & new paradigms in electrochemical energy devices

Ximin He, assistant professor
Ph.D., chemistry, University of Cambridge
Research expertise: polymers, smart/responsive materials, micro/nano-structure assembly & fabrication, biologically inspired systems & devices, organic optoelectronics, biosenseing, & biomaturials

Yang Jiao, assistant professor
Ph.D., mechanical & aerospace engineering, Princeton University
Research expertise: microstructure & effective properties of heterogeneous materials; multifunctional composites design & modeling; soft matter (colloids, foams & polymer network); granular materials; biomaterials; physics of cancer

Stephen Krause, professor
Ph.D., materials engineering, University of Michigan
Research expertise: engineering education, engineering outreach to K-12, education materials characterization

Jian Li, associate professor
Ph.D., chemistry, University of Southern California
Research expertise: design & synthesis of organic semiconductor materials, study of the structure & electrical & optical properties of organic & inorgnaic molecule & molecule aggregate

Nathan Newman, Lamonte H. Lawrence professor in solid state science
Ph.D., electrical engineering, Stanford University
Research expertise: semiconductor, superconductor & dielectric materials, thin film materials synthesis, materials characterization, electronic structure

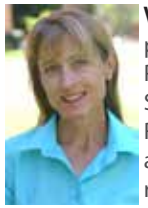
Michael O'Connell, assistant professor
Ph.D., physical chemistry, Rice University
Research expertise: carbon nanomaterials (e.g. carbon nanotubes, graphene, nanodiamond, buckyonions/carbon dots). work includes synthesis, chemical modification, spectroscopy, microscopy, and other characterization. applications in energy, bio-medical topics, printed electronics, nano-actuation, nanofluidics, & others

B.L. Ramakrishna, associate professor
Ph.D., India Institute of Technology, Madras
Research expertise: biomaterials engineering education

Karl Sieradzki, professor
Ph.D., materials and solid state science, Syracuse University
Research expertise: mechanics and physics of solids, electrochemistry and alloy corrosion, thermodynamics of surfaces and thin film processes

Mechanical & Aerospace Engineering

Program Chair



Valana Wells, associate professor
Ph.D., aeronautics & astronautics, Stanford University
Research expertise: rotorcraft aeroacoustics & high-speed rotorcraft design

Ronald Adrian, regents' professor, member of National Academy of Engineering
Ph.D., physics, University of Cambridge
Research expertise: turbulence, experimental fluid mechanics, laser diagnostics, laser instrumentation, micro detonation

Iman Alizadeh, lecturer
Ph.D., mechanical & aerospace engineering, University of California, Irvine
Research expertise: spacecraft trajectory design, guidance & control; spacecraft design

Panagiotis Artemiadis, assistant professor
Ph.D., mechanical engineering, National Technical University of Athens, Greece
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Ph.D., mechanical engineering & applied mechanics, University of Pennsylvania
Research expertise: modeling, analysis, control, & optimization of multi-robot systems including robotic swarms; analysis of collective behaviors in biology & biologically-inspired control of distributed systems

Ronald Calhoun, associate professor
Ph.D., civil & environmental engineering, Stanford University
Research expertise: environmental remote sensing; atmospheric flows; wind energy; experimental measures using lidar, sonar & tower deployment

Aditi Chattopadhyay, Ira A. Fulton professor of mechanical & aerospace engineering
Director, Adaptive Intelligent Materials & Systems (AIMS) Center
Ph.D., aerospace engineering, Georgia Institute of Technology
Research expertise: adaptive structures, structural health monitoring, composites, multiscale analysis, multidisciplinary design optimization

Kangping Chen, associate professor
Ph.D., aerospace engineering & mechanics, University of Minnesota, Twin Cities
Research expertise: fluid mechanics, hydrodynamics stability theory, interface phenomena, non-newtonian fluids, flow in porous media, drilling engineering, multiphase flow & heat transfer

Werner Dahm, director, Security & Defense Systems Initiative (SDSI)
ASU Foundation professor
Ph.D., aeronautics, California Institute of Technology
Research expertise: defense science & technology, science & technology assessments/planning, fluid dynamics, aerodynamics, turbulent flow, turbulence modeling, combustion science, propulsion, advanced propulsion systems

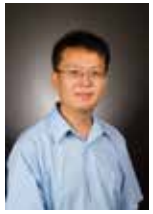
Marcus Herrmann, associate professor
Ph.D., mechanical engineering, University of Technology (RWTH) Aachen, Germany
Research expertise: fluid mechanics; modeling & numerical simulation of atomization processes in turbulent multiphase flows; numerical methods for discontinuous interfaces; Richtmyer-Meshkov instability; numerical methods for massively parallel computer systems; premixed & partially premixed combustion

Huei-Ping Huang, assistant professor
Ph.D., atmospheric sciences, University of Illinois at Urbana-Champaign
Research expertise: geophysical & environmental fluid dynamics; numerical simulation; climate analysis & prediction

Hanqing Jiang, associate professor
Ph.D., solid mechanics, Tsinghua University, Beijing
Research expertise: solid mechanics; multiscale modeling and simulations; stretchable electronics; diffusion phenomena, lithium ion battery & thermodynamics

Taewoo Lee, associate professor
Ph.D., aerospace engineering, University of Michigan
Research expertise: energy system analysis, thermal & fluid process characterization, & fuel property measurements combustion & its effects on environment optical monitoring of thermofluid processes

Yabin Liao, senior lecturer
Ph.D., mechanical engineering, Arizona State University
Research expertise: acoustics & vibrations, structural dynamics & modal analysis, signal processing



Yongming Liu, associate professor
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James Middleton, professor
Ph.D., educational psychology, University of Wisconsin, Madison
Research expertise: student learning of mathematical concepts, motivation & mathematics learning, teacher change, applications of technology to mathematics teaching & learning

Marc Mignolet, professor
Ph.D., mechanical engineering, Rice University
Research expertise: vibrations, structural dynamics, modeling of uncertainty in structures, stochastic multiscale analyses

Jay Oswald, assistant professor
Ph.D., mechanical engineering, NorthwesternUniversity
Research expertise: development of computational mechanics: finite element methods, molecular dynamics, and multiscale methods for applications in MEMS, materials failure analysis& material design

Matthew Peet, assistant professor
Ph.D., aeronautics & astronautics, Stanford University
Research: analysis & control of dynamic systems including development of optimization-based tools for nonlinear differential equations; systems with hybrid, nonlinear & decentralized dynamics; sparse interconnection and delayed feedback; & models of tumor growth with emphasis on therapy

Yulia Peet, assistant professor
Ph.D., aeronautics & astronautics, Stanford University
Research: computational modeling & simulation in fluid mechanics & turbulent flows, spectral element methods, multidomain & integrative simulation techniques, numerical analysis; applications in wind energy, gas turbine engines, bio-fluid mechanics

Pedro Peralta, professor
Ph.D., materials science & engineering, University of Pennsylvania
Research: mechanical properties of materials, fatigue and fracture in metals, shock loading

Patrick Phelan, professor
Ph.D., mechanical engineering, University of California
Research: heat transfer, sustainable energy systems, nanoscale energy transport, urban heat island; transport phenomena, thermodynamics, & energy

Jagannathan Rajagopalan, assistant professor
Ph.D., mechanical engineering, University of Illinois at Urbana-Champaign
Research expertise: mechanics of micro/nano scale materials, MEMS for in situ materials characterization, BioMEMS, cell mechanics

Konrad Rykaczewski, assistant professor
Ph.D., mechanical engineering, Georgia Institute of Technology
Research expertise: development of nanoengineered surface technologies for enhancing the efficiency of thermal systems in a variety of industries including energy, water, gas & oil, & transportation. expertise includes quantitative nanoscale imaging of thermofluidic processes & scalable 3-D nanofabrication

Veronica Santos, assistant professor
Ph.D., mechanical engineering, Cornell University
Research expertise: hand biomechanics, neural control of movement, robotics, prosthetics, tactile sensors, stochastic modeling, & clinical applications of biomechanical modeling

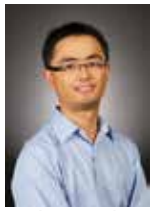
Jami Shah, professor
Ph.D., mechanical engineering, Ohio State University
Research expertise: geometric computing & design informatics

Kiran Solanki, assistant professor
Ph.D., Mississippi State University
Research expertise: multiscale modeling of plasticity & damage behavior in metals, uncertainty analysis, fatigue and fracture, constitutive modeling for metallic alloys, atomistic simulations, crystal plasticity, anisotropic plasticity & damage, finite element method, solid mechanics, optimization, & stress analysis

Kyle Squires, school director & professor
Ph.D., mechanical engineering, Stanford University
Research expertise: direct numerical simulation & large eddy simulation applied to particle-ladenturbulent flows & the development of hybrid Reynolds-averaged & large eddy simulation techniques for high Reynolds number wall-bounded flows

Timothy Takahashi, professor of practice
Ph.D., mechanical & aerospace sciences, University of Rochester
Research expertise: fixed wing aircraft design, aerodynamics, performance, multi-disciplinary optimization, legal aspects of aviation

Steven Trimble, professor of practice
Ph.D., business administration, Union Institute & University
Research expertise: power systems, solar energy and other renewable energy systems, gas turbines, reciprocating engines, reliability, maintainability, safety, product design, high-performance team dynamics & project management for aerospace, defense, automotive, industrial and commercial applications



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Robert Wang, assistant professor
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Research expertise: thermal energy conversion, storage, & transport in nanostructured materials; thermoelectric power generation; thermal storage media; heat transfer, & phonon optics, custom-design of colloidal nanoparticles, chemical precursors, & nanocomposites

SEMTE

SCHOOL FOR ENGINEERING OF MATTER, TRANSPORT & ENERGY

STUDENTS

StudentEntreprenurship

ASU Student Startup G3 Box Prepares to Ship First Maternity Clinic to Africa

Members of G3Box are pictured in a mobile medical care facility they made from a steel shipping container. From left to right are Clay Tyler, Gabrielle Palermo and Susanna Young. (Not pictured is member Billy Walters.) Photo: Jessica Slater/ASU

G3Box, part of ASU's Edson Student Entrepreneur Initiative based at ASU SkySong, has reached a significant milestone for their young company. Over the past two years, G3Box has been working to successfully create and develop a solution for delivering quality healthcare to communities that do not currently have access to it. The hard work is paying off. G3Box's first clinic is complete and, in collaboration with IMEC America, has been shipped to Kenya.

G3Box, a company dedicated to passionately pursuing solutions to healthcare concerns around the world with a commitment to integrity, humility, and collaboration, repurposes abandoned shipping containers into portable, on-demand medical clinics. The first application of their clinics is to address the crisis of maternal fatalities in the developing world. Kenya has an incredibly high mortality rate among birthing mothers, which is why G3Box founders are shipping their first clinic there. There are women in the developing world who currently give birth on dirt floors in unsanitary and dangerous conditions. The Indiegogo campaign was launched to help G3Box raise the capital needed to get their container on the ground in Kenya to provide safer, healthier places for women to access maternal care.

G3Box fully utilized the new and unique concept of crowdfunding. On their campaign site www.indiegogo.com/projects/g3box-ship-a-maternity-clinic-to-kenya, there is a brief introduction video that explains their background and plans for the clinic. They have also been able to create incentives and special programs to encourage donations. Most recently, G3Box created a "Mother's Day" perk on their campaign page. Donors were able to contribute funds in honor of their mothers and G3Box sent a personal email message to that mother informing her of the donation made in her honor. Donations through the crowdfunding initiative have exceeded their initial funding goal.

The project is one of 10 finalists in the United States for the international James Dyson Awards for student innovators.

G3Box has been supported in their venture acceleration by ASU's Edson Student Entrepreneur Initiative. The Edson Accelerator helps students from all university disciplines accelerate their ventures by providing funding, office space and mentorship. G3Box is one of twenty-five student ventures that were awarded support for the 2012-2013 academic year. The Edson Student Entrepreneur Initiative is a part of ASU's Venture Catalyst program within the Office of Knowledge Enterprise Development.

StudentEntreprenurship

SafeSIPP finalist for Entrepreneur of the Year

A student-led project that started as part of the Engineering Projects in Community Service (EPICS) program was one of five finalists in Entrepreneur Magazine's College Entrepreneur of the Year competition.

SafeSIPP co-founders Lindsay Fleming, Jacob Arredondo, Jared Schoepf and Taylor Barker

SafeSIPP (Sustainable Innovative Portable Purification) is simultaneously solving three problems for rural communities in Africa: transportation, purification and storage of clean drinking water. The team has designed a three-phase water purification system that works when a barrel—made from 80 percent recycled materials—is rolled across the ground from a water source to the community for consumption.

"Our mission is to provide 2,500 people access to clean drinking water," says SafeSIPP co-founder Jared Schoepf. "We plan to launch a second pilot test with sales starting in January."

For more on SafeSIPP, visit safesipp.org

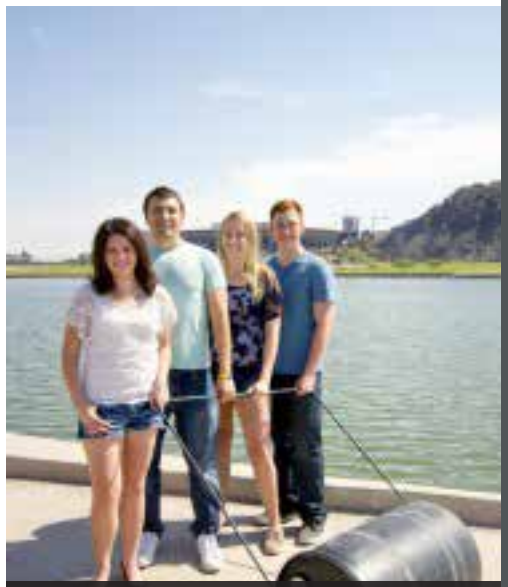
Schoepf graduated with a bachelor's degree in chemical engineering in May from ASU's Ira A. Fulton Schools of Engineering and is now pursuing his doctoral degree at ASU in the same field. Other SafeSIPP members include Lindsay Fleming and Taylor Barker, both recent chemical engineering graduates.

Schoepf teamed with Fleming, Barker and Jacob Arredondo, a marketing and finance major, to take on a project addressing some of the extensive water problems in developing countries.

Each day, women and children travel several miles to obtain water, and then must transport heavy 80-pound jugs back to their communities. The water is often laced with disease-causing contaminants.

The team designed and built an inexpensive and sustainable water purification system that serves the dual purpose of providing transportation for the water.

Working with Warren Te Brugge from the nonprofit organization My Arms Wide Open, team members traveled to South Africa last fall.



"We have complementary skills," Schoepf says. "I cover research, development and manufacturing. Taylor has taken law classes and studied market research. Lindsay focuses on networking with mentors to gain valuable expertise."

SafeSIPP's system has undergone testing for efficiency and durability, and the team is pursuing certification for the technology through the Environmental Protection Agency and NSF (National Sanitation Foundation) International. They hope to launch sales in January.

The nomination as College Entrepreneur of the Year is not the team's first accolade for their efforts. SafeSIPP has won funding through ASU's Innovation Challenge and as winner of ASU's 10,000 Solutions Challenge last fall. SafeSIPP was also one of the ventures selected during the 2012-2013 academic year to receive support from ASU's Edson Student Entrepreneurship Initiative, earning the team some funding as well as office space and business mentoring.

StudentEntreprenurship

Team builds hunger-fighting venture on solid ground

Team FlashFood continues to advance its education in entrepreneurship en route to developing a venture aimed at helping communities alleviate hunger.

Most recently the group of former and current ASU engineering, marketing and sustainability students learned valuable lessons while competing in the 2012 YUM! Global Sustainability Challenge in Louisville, Ken..

The company's sustainability challenge invites students from around the country to pitch innovative and entrepreneurial solutions to societal and community problems.

FlashFood is developing a mobile-phone application as a communication and coordination tool for a food recovery and distribution network. The idea is to collect leftover and excess food from restaurants, catering services and banquet halls and deliver it to various community and neighborhood gathering places, from which the food will be distributed to people in need.

FlashFood has exceled in major student entrepreneurship competitions and showcases:

- First place at the 2012 U.S. Microsoft Imagine Cup competition
- Best in Showcase at the 2012 YUM! Global Sustainability Challenge
- People's Choice Award at the international Dell Social Innovation Challenge
- Finished a close second in national voting for Inc. Magazine's Coolest College Startup of 2013

The team was one of six finalists selected from among the 40 teams that initially entered the Yum! Challenge. FlashFood members are recent ASU biomedical engineering graduate Eric Lehnhardt, computer science graduates Steven Hernandez and Ramya Baratam, along with marketing and sustainability graduate Jake Irvin, sustainability graduate Loni Amundson and junior materials science and engineering major Katelyn Keberle.

Team FlashFood includes (left to right) Ramya Baratam, Eric Lehnhardt, Loni Amundson, Steven Hernandez and Katelyn Keberle.
Photo: Jessica Slater/ASU

For three days in November they competed in finals against student teams from the University of California-Berkeley, the University of Louisville, the University of South Florida, the University of Southern California and American University in Washington, D.C.

More than the award, FlashFood members said the value of the competition was in learning ways they can improve their business plan and the service they hope to provide. Applying the guidance they received at the national competition, team members are now focusing on completing beta testing for their mobile-phone app and gathering information from market-validation research.

Success at the Yum! Challenge came after FlashFood won the U.S. finals of the highly competitive Microsoft Imagine Cup in the spring, earning the team a place in the premier international student technology and innovation competition – the Imagine Cup worldwide finals last summer in Sydney, Australia. It's the second year in a row a team of ASU students won the U.S. Imagine Cup finals and earned a trip to the world finals.

StudentEntreprenurship

Venture to help wheelchair users vying for national entrepreneurship award

A team of recent graduates and current students was among finalists for Entrepreneur Magazine's 2012 College Entrepreneur of the Year Award.

Four of the eight members of Vantage Realized are (from left to right) Kris Guiang, Gordon Freirich, Wade Gyllenhaal and Nick Gough. They're working at ASU's SkySong innovation center to refine designs for an improved manually operated wheelchair.
Photo by: Jessica Slater/ASU.

Called Vantage Realized, the eight-member team is developing a customized wheelchair designed to prevent injuries and physical ailments that often afflict long-term manual wheelchair users.

The start-up venture has already earned the support of ASU Edson Student Entrepreneur Initiative, and last year finished second in the ASU Innovation Challenge in which student entrepreneurial projects compete for support.

The co-founders of Vantage Realized are Gordon Freirich, who earned a degree in mechanical engineering , JJ Tang, a finance graduate, and Nick Gough, an industrial design major.

Other members are graduates Ami Bui (marketing) Teddy Lewis (visual communication design), Colin Ho (mechanical engineering), Kris Guiang (biomedical engineering) and graduate student Wade Gyllenhaal (mechanical engineering).

Vantage Realized is refining a method of propelling wheelchairs with the use of levers that produces less stress on the joints of users, who often develop infirmities such as carpal tunnel syndrome and rotator cuff injuries due to the physical strenuousness of using conventional manual wheelchairs.

During the past summer the team built a prototype and worked with long-term wheelchair users to test its effectiveness.

The next step is to refine the product and develop a manufacturing plan to either sell the parts of the wheelchair separately or to partner with a company to develop wheelchairs with the parts as factory add-ons.

For more on Vantage Realized, vantagerealized.com

Student Organizations

The academic, professional and social opportunities enabled by SEMTE student organizations build on the academic experience at ASU to create well-rounded graduates.

Student Clubs and Professional Organizations in the School for Engineering of Matter, Transport and Energy:

Air Devils
They are joined together with a common goal: to honorably represent ASU and the Ira A Fulton Schools of Engineering at the Design Build Fly challenge, which is a detailed design report and a remotely controlled aircraft competition. Completing this goal requires that each member grows in academic and professional standing.
Web: studentorgs.engineering.asu.edu/airdevils/home/

American Institute of Aeronautics & Astronautics (AIAA@ASU)
Connect students with professionals in aerospace and related fields through outreach, congressional visits and industry tours. **Web:** aiaa.engineering.asu.edu/

American Institute of Chemical Engineers (AIChE)
AIChE is the world's leading organization for chemical engineering professionals with over 40,000 members from over 90 countries. The student chapter introduces ASU's chemical engineering students to the countless professional opportunities and connects them to local professionals in the field. **Web:** aiche.org

American Society of Mechanical Engineers (ASME)
Their mission is to provide students with opportunities to begin their professional careers by enhancing the technical competency of members, and informing them of recent developments in the mechanical engineering field through publications, field trips and meetings. The goal is to promote fellowship and interaction with other engineering students, as well as professional members of the Society.
Web: studentorgs.engineering.asu.edu/asme

Daedalus Astronautics
Daedalus is dedicated to the design, manufacture and launch of sounding rockets. In addition, they perform math, science and engineering educational outreach in the community.
Web: daedalus.engineering.asu.edu

Material Advantage at ASU (MA)
The premier student organization for the materials science and engineering community. They bring in technical speakers, and members attend networking events through partnership with the local professional chapter. They also host field trips and social events for members and students interested in materials science.
Web: studentorgs.engineering.asu.edu/ma

Society of Automotive Engineers (SAE)
Their mission is to provide opportunities for students to participate in an engineering corporate environment where they will develop essential professional skills through networking and applied learning. SAE@ASU currently has two teams (Formula and Baja) in the design and build phase, preparing to compete in the SAE collegiate design series competitions.
Web: sae.club.asu.edu/

Sun Devil Satellite Laboratory (SDSL)
Their primary goal is to design, manufacture, and launch fully functioning space satellites. They are currently working with scientists at NASA Goddard Space Flight Center on the Flare Initiation Doppler Image mission. The goals are to complete various space craft engineering projects, learn abut space and spacecraft engineering, teach others about space and spacecraft engineering and help ASU, industry, and government agencies foster ties through spacecraft engineering.
Web: studentorgs.engineering.asu.edu/sdsl/

Student Organization Spotlight

Air Devils - Arizona State University Aero Student Design Team

Air Devils is a competition-based, engineering organization dedicated to the development of RC-type aircraft. Currently competing in the American Institute of Aeronautics and Astronautics – Design Build Fly challenge and the AUVSI Seafarer competition, members are exposed to the engineering challenge of taking paper requirements to a finished and flying aircraft.

The competition team encounters time management, budgeting, weight, aerodynamic, propulsion, structural and electrical challenges with a strong emphasis on team work and total integration! Students from all disciplines are encouraged to bring their unique strengths and interests to the table. By remaining multidisciplinary, the team builds critical communication skills that are necessary in the professional world.

Air Devils is an organization supporting and furthering the education goals of students at Arizona State University.

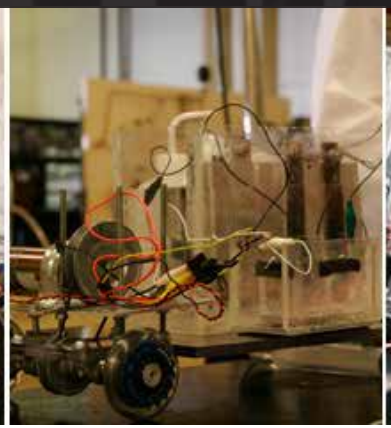
find the asu air devils on facebook

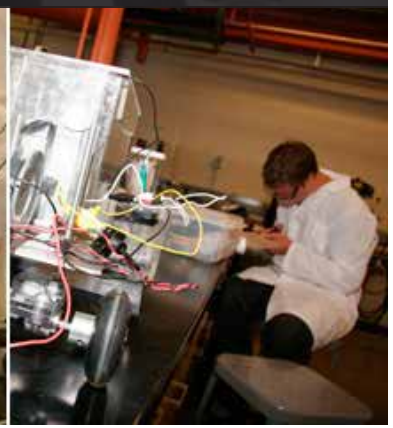
AIRDEVILS

Student Organization Spotlight

American Institute of Chemical Engineers

Engineering students (above, from left) Devon Bridgeman, Andrew Chesley, Matthew Mellott and Tyler Sherman were part of the team that competed in the national Chem-E-Car championship in Pittsburgh. Photo by: César Torres/ASU





ASU team finishes among leaders in Chem-E-Car championship

A team of engineering students finished in eighth place among 35 teamsthat competed in the annual American Institute of Chemical Engineers' Chem-E-Car national championship.

The competition requires students to design and build a small vehicle powered by a chemical source.

The team produced a vehicle – named Hydrospark – powered by a hydrogen fuel-cell, with an electronic system to control speed, and using a chemical-reaction process to stop the car. Teams are told only hours before the start of competition about the distance their cars must travel and the amount of cargo that each vehicle will carry.

Prior to competing at the AIChE national meeting, the team took first place in the regional competition.

At the national competition, students are givena certain distance that the car must travel while carrying a specified amount of weight.

The Chem-E-Car team members are chemical engineer majors Devon Bridgeman, Andrew Chesley, Jacob Sciacca, Mike Morales, Nick Dunteman, Tyler Sherman and Chelsea Francis, along with mechanical engineering students, Dinesh Kale, Anna Debrilovic, Tianyu Dua and computer systems engineering major Matthew Mellott.

The team's faculty adviser is César Torres, an assistant professor in chemical engineering.

Student Organization Spotlight

Daedalus Astronautics

Daedalus is a completely student-run organization at Arizona State University dedicated to the design, manufacture, and launching of large high-powered rockets. Members undertake advanced astronautical engineering projects to enhance their educational experience and develop professional skills. They participate in conferences and rocket competitions throughout the United States. The organization also has a strong K-12 outreach program that brings the science and fun of rocketry to kids in Arizona. Daedalusis always looking for students interested in all aspects of rocket design, propulsion and flight.

Daedalus sponsors include Raytheon, the ASU/NASA Space Grant Program, and DATAQ Instruments for providing state of the art data acquisition products and data logger systems. DATAQ support specifically helps to advance research by allowing an interface for load cells, pressure transducers, and other devices. Their sponsorship ensures the future success of the club and advancement of their research initiatives.

Student Organization Spotlight

Society of Automotive Engineers

Arizona State University's chapter of the Society of Automotive Engineers – SAE@ASU – showcased its progress this past year. More than 60 sponsors and other supporters of the chapter came to the first SAE@ASU Press Day in 2012 at the Bondurant School of High Performance Driving in Chandler, Arizona

The chapter has grown to 90 members, tripling membership in the past two years. In 2010 the group had just one ongoing project to prepare a vehicle for an automotive engineering competition. It has since assembled four design teams to work on four separate competition vehicles. Demonstrations of the projects were part of the Press Day event, highlighted by a drag race between the SAE@ASU's 2012 Formula racecar and a Bondurant Chevrolet Camaro SS. The ASU car won.

Chapter members are continually seeking to enlist additional sponsors and partners, hoping to recruit professional engineers and faculty members to conduct workshops and seminars for students on automotive design and technology.

SAE@ASU has become more than simply an extracurricular pursuit for students, says the chapter's faculty advisor, Steven Trimble, a professor of practice. The chapter is an integral part of ASU's mechanical and aerospace engineering program, providing hands-on engineering and leadership opportunities that complement students' coursework, Trimble says.

SAE@ASU "is getting freshmen and sophomores involved in engineering projects early in their academic careers, and that is helping significantly improve student retention rates," he says.

The chapter's activities are also providing students a source of ideas and knowledge they can apply to projects for their important senior capstone engineering design courses. More than that, Trimble says, the value of participating in SAE@ASU is that "many employers in the automotive industry are hiring only those newly graduated engineers who have contributed to SAE student projects."

Student Organization Spotlight

Sun Devil Satellite Laboratory

The Sun Devil Satellite Laboratory (SDSL) is a student organization with the mission to design, build, test, and operate small spacecraft. Through this, their organization is able to provide education and experience to a variety of engineering disciplines. Not only do they provide an educational environment but they also implement industry practices to advance the real world experience of students. SDSL's goals may be ambitious, but they always remember to maintain a fun environment for students to meet fellow students sharing the same passion while preparing for their future.

Founded in 2010, interested students gathered to organize SDSL. Within several months they attracted the attention of a solar science research team at NASA's Goddard center with their ideas for an earth-imaging satellite. That in turn led to a new effort, the Sun Devil Satellite 1 mission focusing on observation of the Sun.

The mission team has since completed successful preliminary NASA design reviews and is planning to have a satellite built in time for a projected 2015 launch.

The group is developing the Flare Initiation Doppler Imager as the main instrument to be attached to the roughly nine-pound satellite, and is building the platform on which the imager will operate.

If it works as planned, the imager will take rapid-fire photos of the Sun to capture solar flares as they emerge. The data it collects could aid research to predict the intensity of flares and forecast potential impacts on the Earth.

Pictured with a prototype of Sun Devil Satellite 1 are some of the leaders of the project: (Left to right) recent ASU electrical engineering graduate Andrew Menicosy, recent aerospace engineering graduate Aaron Goldstein and aerospace engineering undergraduates Michelle Smith and Chris Cady.

Terry Alford, Helping Africa elevate engineering education

Africa is rich in natural resources but significantly lacking in educational resources. That deficiency is making it difficult for the continent to benefit from what its natural bounty – especially vast troves of valuable minerals – could do to boost economic development and quality of life.

Terry Alford has been working with colleagues to help remedy the situation by bringing advanced training in materials science and engineering to African universities and technology centers.

His connection with Africa developed in the late 1990s after one of his doctoral students who had come to ASU from the University of Western Cape in South Africa returned there to become head of the physics department. Alford later accepted his former student's invitation to spend some time teaching at Western Cape.

Materials and modernization

Alford's expertise is in materials that can be used for electronics. He studies the properties and behaviors of such materials to reveal the most effective ways to process them for technological applications.

For example, he does research for ASU's MacroTechnology Works, which is pursuing advances in flexible technologies. Engineers and scientists at the center are laying the ground work for the next-generations of electronic devices that are not only more portable and durable but also can be rolled up or folded, or are otherwise bendable.

ASU engineering professor Terry Alford (sitting, in center, in purple shirt) poses with students from the Structure and Characterization of Materials course he taught earlier this year at the African University of Science and Technology in Nigeria.

Alford is experimenting with the kinds of materials that promise to enable such flexibility and resiliency. The knowledge and experience he brings to such work is what students in African education institutions must be able to attain if African countries are to use their mineral-rich environment to maximum advantage.

Alford hopes to accelerate that educational progress by eventually making ASU's graduate-level engineering and science courses available to students in Africa through the Internet.

James Mayer

In memoriam: James Mayer, an exemplary life of achievement

James Mayer, considered a "giant" of materials science and engineering, who was on the faculty of Arizona State University during the latter years of a research and teaching career spanning almost five decades, passed away June 14, 2012.

Mayer began making his mark in the field as a doctoral student at Purdue University – where he earned a bachelor's degree in mechanical engineering and a doctorate in physics – when he helped make significant advances in materials analysis.

He would go on to contribute to further advances in the materials that have enabled computers and other electronic devices to be made more compact and to operate rapidly.

Mayer was also widely recognized for contributions to solid-state engineering, particularly research on solid-state detectors, ion implantation and ion-beam spectrometry. He developed ion-implanted silicon that became a key element in a breakthrough processing technique used in semiconductor manufacturing.

In 1981, Mayer won the Von Hippel A ward, the highest honor bestowed by the Materials Research Society, and three years later was elected to the National Academy of Engineering.

James Mayer

Most important to Mayer, according to a statement from family members announcing his passing, was his role in guiding more than 40 graduate students through their doctoral and post-doctoral studies, and remaining a long-time career mentor to many.

Mayer made an impact on K-12 engineering and science education in Arizona, says colleague Vincent Pizziconi, an ASU associate professor of biomedical engineering. Mayer created a popular Patterns in Nature course (called PIN for short) to instruct K-12 teachers on engineering and science education methods, and he taught the course for many years.

He also created an ASU PIN Van, a "science laboratory on wheels," Pizziconi says, that housed state-of-the-art microscopes. It was driven door to-door to K-12 schools throughout the state to provide young students an introduction to materials science and engineering.

"Not only did he bring the excitement of materials science and engineering into the classroom for majors and non-majors alike, but he was a consummate builder of multidisciplinary teams," Pizziconi says. "He reached out to faculty from diverse disciplines across the university to create longstanding research collaborations."

Materials science and engineering professor Terry Alford, who worked with Mayer, says that among highlights of his career are his travels with Mayer to participate in professional conferences and work on research collaborations throughout Europe and Africa. During one trip, Alford says he learned that "Jim was not just one of the giants of materials science. He was also a giant as a humanitarian."

In South Africa one morning with Mayer, Alford remembers, "I thought we were driving to a lab as usual, but Jim stopped at a squatters' camp and he delivered some books to the local school. I found out Jim's family had been supporting this school and had even funded construction of a playground."

It was one of many charitable efforts Mayer and his family quietly supported over the years.

Mayer was an engineer for the U.S. Army early in his career. He then worked for Hughes Research Laboratories before joining the faculty at the California Institute of Technology, and then Cornell.

He came to ASU in 1992, where he became director of the Center for Solid State Science. He was made a Regents' Professor, the highest recognition for faculty at Arizona's state universities, in 1994. He retired in 2007 from his position as a professor with ASU's Ira A. Fulton Schools of Engineering.

During his career, Mayer was granted 12 patents related to his research and developmentwork. He authored or co-authored more than 750 research papers and 12 books. His articles and books have led to more than 17,000 citations of his work by other engineers and scientists.

SEMTE

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