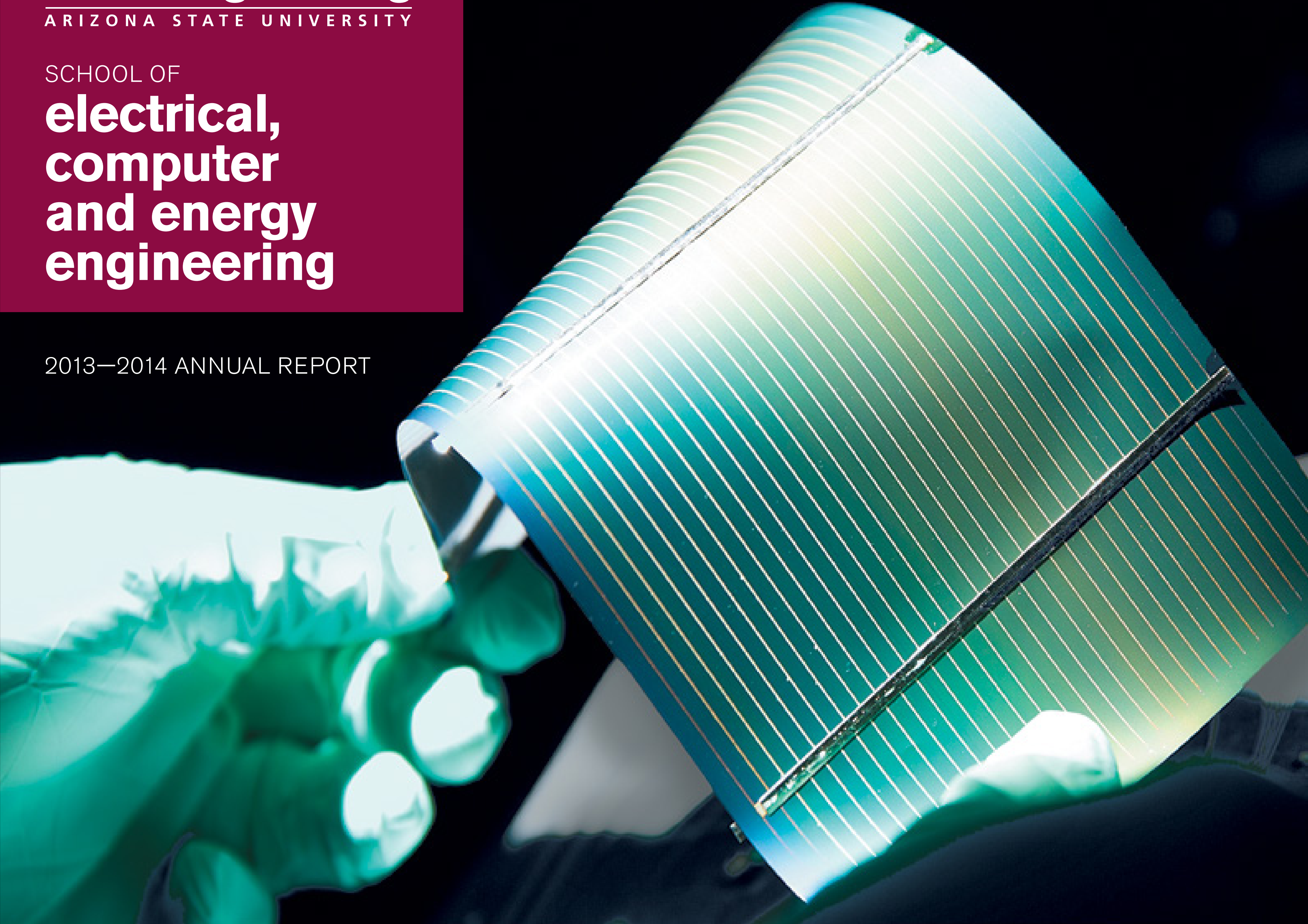
IRA A. FULTON SCHOOLS OF engineering
ARIZONA STATE UNIVERSITY

SCHOOL OF
electrical, computer and energy engineering

2013—2014 ANNUAL REPORT



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Annual Report 2013-2014

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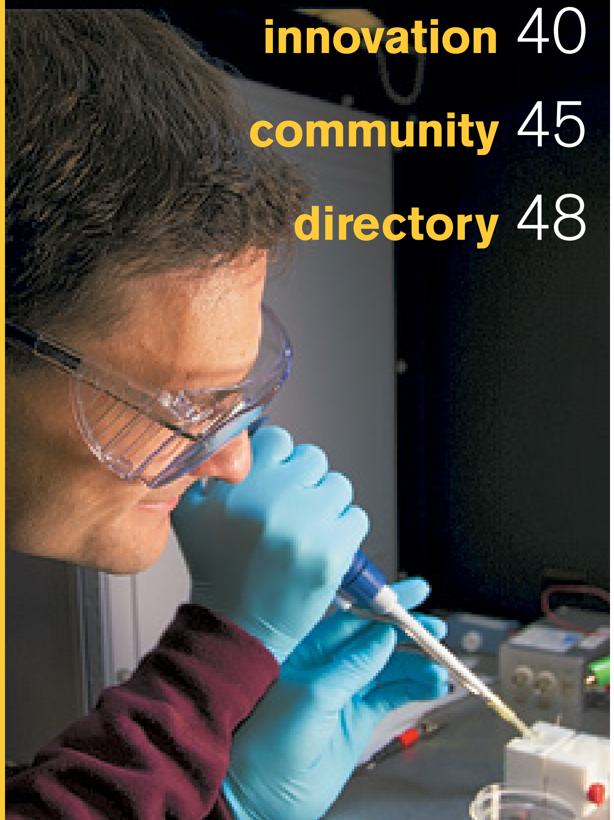

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STEPHEN M. PHILLIPS

"We continue to expand our faculty, hiring a dozen new members in the past two years to strengthen key areas like photovoltaics, power systems, nanoionics, integrated circuits, sensor technologies, flexible displays and renewable energy."

The School of Electrical, Computer and Energy Engineering continues its upward trajectory, with strong funding and recognition of its research, growth in the number and diversity of its faculty, and continued achievement by its students and alumni.

Annual research expenditures are at near-record levels with more than $30 million in external sponsored research expenditures, more than $35 million in awards, and more than $150 million in proposals.

This year, the National Science Foundation extended funding for the Quantum Energy and Sustainable Solar Technologies Engineering Research Center, an NSF/Department of Energy Engineering Research Center where ASU engineers are looking at how to best gather and distribute solar energy. The center already has produced a world-record high voltage for thin silicon devices, and its original five-year funding commitment has been extended to 10 years. The annual dollar amount will increase from $3.25 million to $4 million.

The NSF also awarded Lalitha Sankar, an assistant professor, a Faculty Career Development Award that provides $455,000 for her research exploring how our digital world forces us to make decisions between sharing useful information and maintaining privacy.

Two other faculty members, Srabanti Chowdhury and Raja Ayyanar, will lead research for the university's role in a new national consortium formed to develop the next generation of power electronics as part of President Obama's National Manufacturing Initiative.

These are only a few examples of the outstanding research projects of our faculty.

We continue to expand our faculty, hiring a dozen new members in the past two years to strengthen key areas like photovoltaics, power systems, nanoionics, integrated circuits, sensor technologies, flexible displays and renewable energy.

Some of the new faces include Yuji Zhao, whose research focuses on improving the energy efficiency of light-emitting diodes (LED) and laser diodes; Visar Berisha, whose work in psychoacoustics, the scientific study of sound perception, is helping assess patients with neurological disease and could help machines process and analyze human speech; and John Brunhaver, whose research focuses on energy-efficient computing hardware.

Our primary focus is the education of students, and they play prominent roles in our research, from graduate students, to undergraduates, to high school students. Jared Scott Becker, the spring 2014 outstanding undergraduate, has worked to design an amplifier for a solid-state nanopore DNA sequencing device. Kang Ding, the 2013-2014 winner of the school's Palais Award for the outstanding doctoral graduate, has published more than nine journal papers and presented more than 13 conference papers, primarily in the area of metallic and plasmonic nanolasers. He and his team were the first in the world to demonstrate a room-temperature nanolaser under electrical injection.

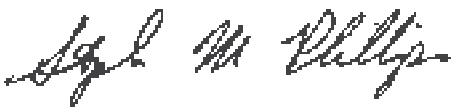
We have a variety of fellowships, scholarships and research stipends for all levels of students provided by gifts from generous alumni, corporations and friends. Charles "Chuck" Wheeler, who finished his doctorate in 2000, says he uses the problem-solving skills he learned here every day, and is thrilled to donate to the Senior Design Laboratory to help undergraduates develop the same skills.

Enrollment in our academic programs continues to grow, and hit a record of more than 2,400 in fall 2014. This includes an all-time high enrollment of more than 315 doctoral students, an average of about five doctoral students per tenured or tenure-track faculty member. Our graduate programs remain highly recognized.

The electrical engineering graduate program is ranked 27 by *US News and World Report*.

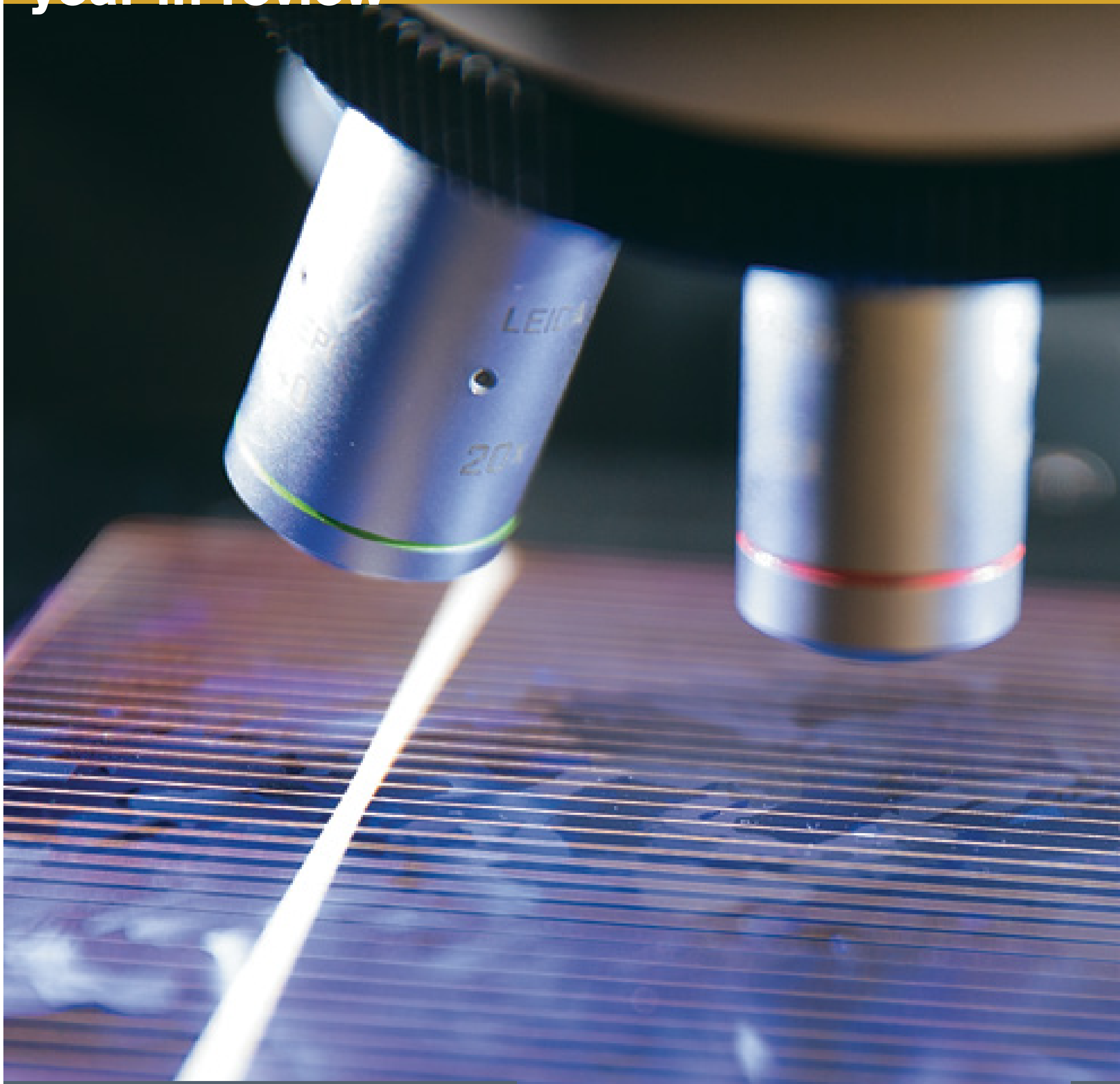
Our online bachelor's degree program is the only ABET-accredited, undergraduate electrical engineering program in the country that is 100 percent online. The demand among those who cannot come to campus is very strong, with enrollment doubling each semester, from 100 in fall 2013, the first semester the degree was offered, to 200 in the spring semester, to more than 400 this fall. And the lessons we are learning are being used to improve the experience in on-campus classrooms.

As always, these achievements and the success of our school are due to the extraordinary efforts of our dedicated faculty and staff and to the excellent students the programs attract.



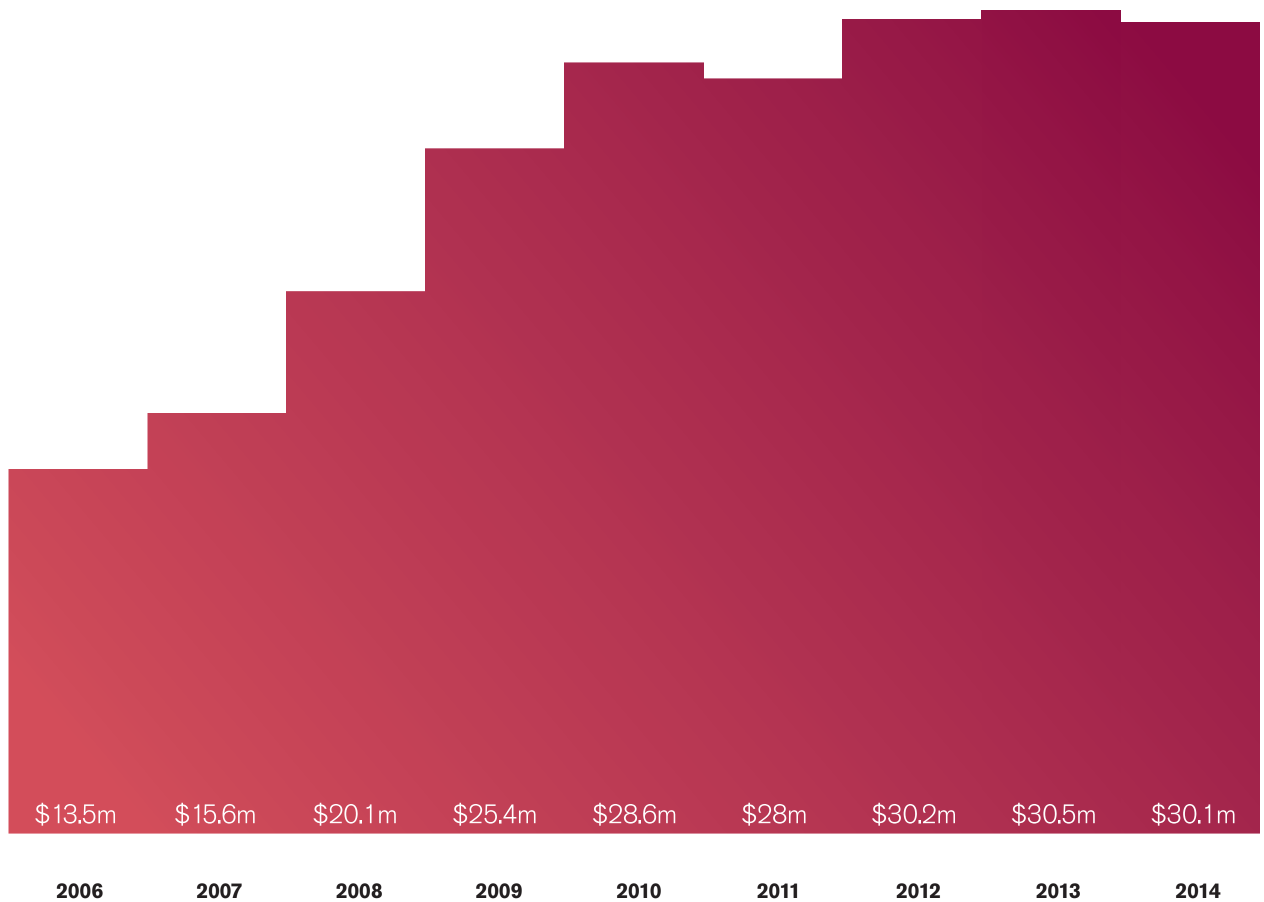
Stephen M. Phillips, Ph.D., P.E.
Professor of Electrical Engineering
Director, School of Electrical, Computer and Energy Engineering

year in review



“Annual research expenditures are at near-record levels with more than $30 million in external sponsored research expenditures, more than $35 million in awards, and more than $150 million in proposals.”

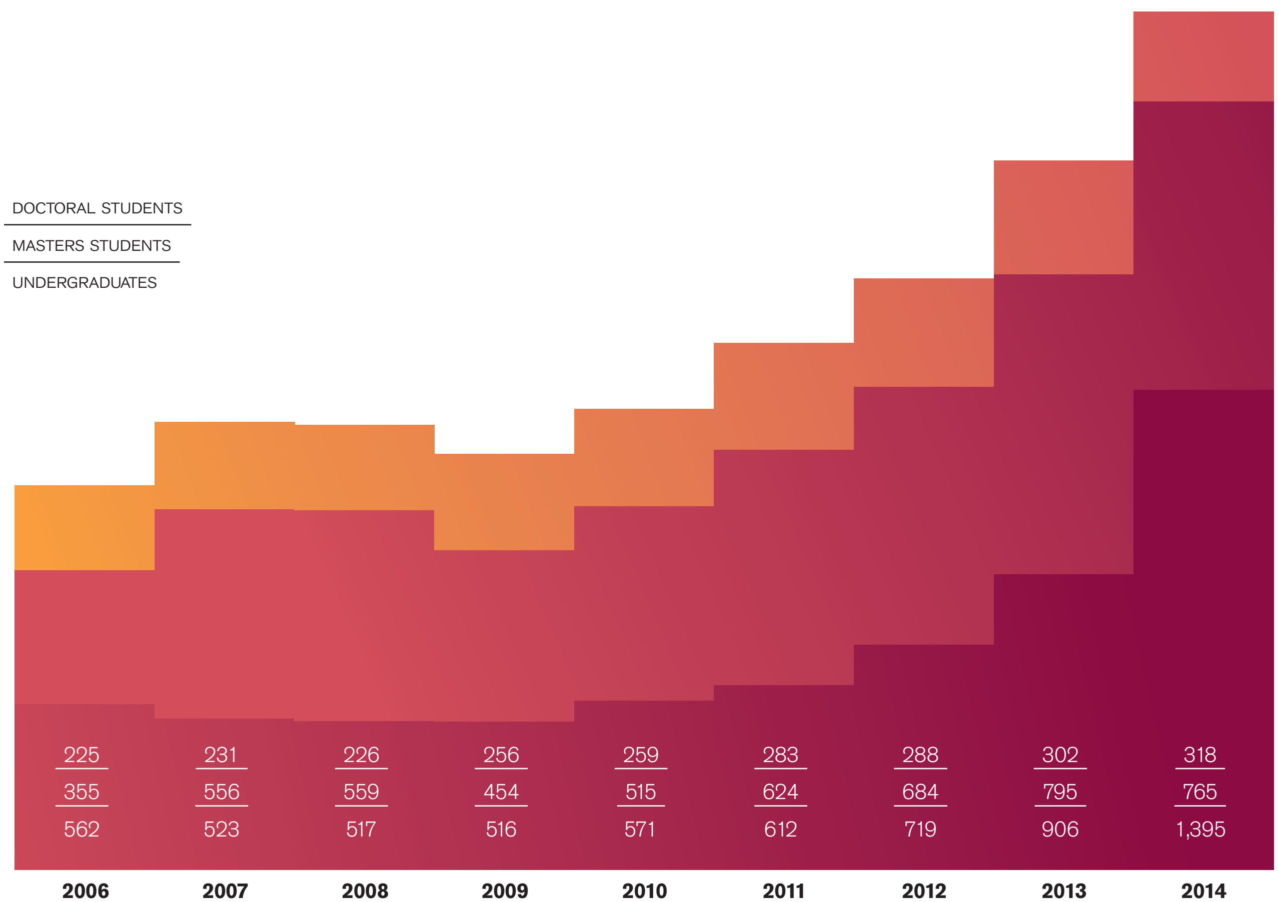
research expenditures

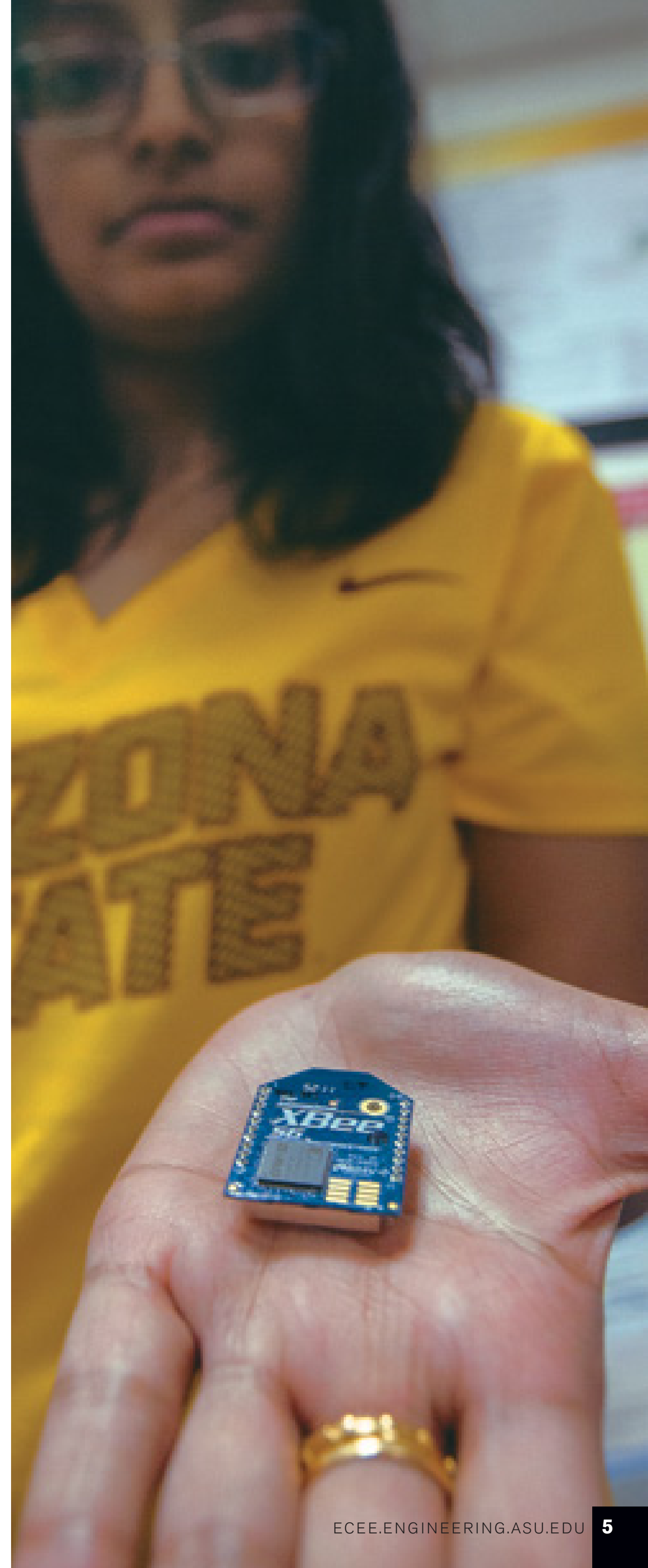


RESEARCH FUNDING

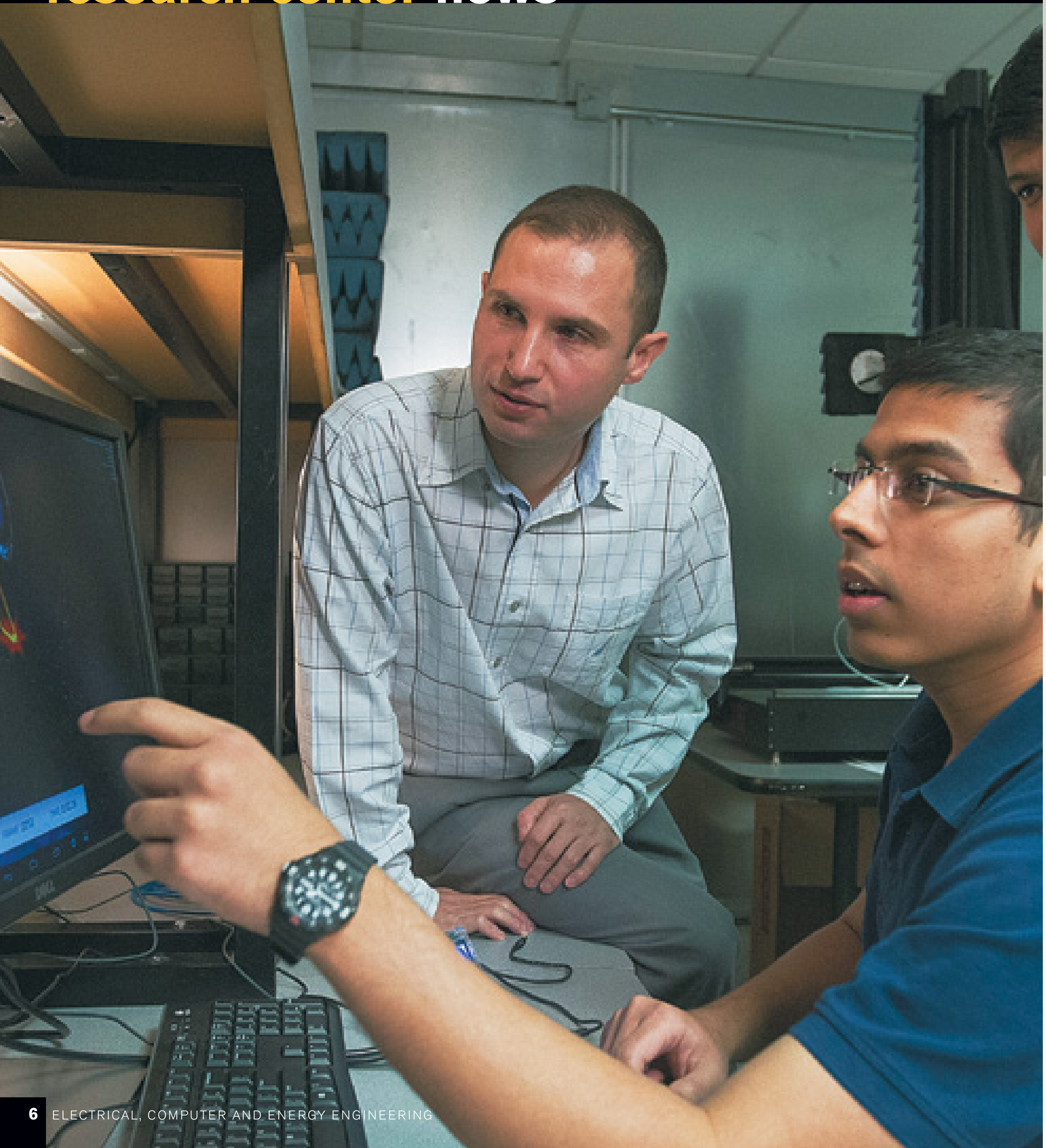
enrollment

The School of Electrical, Computer and Energy Engineering continues to attract outstanding students from around the world. In 2013-2014, 22 percent of the first-time, full-time freshmen are also students at ASU's Barrett, The Honors College, and 108 received National Merit Scholarships based on their academic achievements.





research center news



The School of Electrical, Computer and Energy Engineering continues to expand its research, building strength in core areas, including solar power and its transmission and distribution through the smart grid. In addition, faculty research is growing in areas of national importance, including new semi-conductor materials—part of President Obama's nanomanufacturing initiative—new electronic devices, new circuits for computing, and work on signal processing to build speech and hearing systems. In addition to adding to the body of knowledge in these crucial areas and the infusion of new concepts in industry, the research provides exceptional experiences for both undergraduate and graduate students working with our outstanding faculty.

QESST: Funding extension supports ongoing solar energy research

The work of engineers at Arizona State University looking at how to best gather and distribute solar energy received a vote of confidence in 2014.

The Quantum Energy and Sustainable Solar Technologies Engineering Research Center (QESST), a National Science Foundation/Department of Energy Engineering Research Center, that already has produced a world-record high voltage for thin silicon devices, received an extension of funding following a review of its first three years of work.

The center's original five-year funding commitment has been extended to 10 years and the annual dollar amount will increase from $3.25 million to $4 million.

"Continuing funding is recognition of the fact that the center has succeeded in its startup phase," said

> Our unique role is that we put all three things together, bringing education into the mix, along with research and industry input."

Matthew Fraser, the center's executive director and an associate professor in the School of Sustainable Engineering and the Built Environment, one of the Ira A. Fulton Schools of Engineering at ASU.

The center focuses on photovoltaics, which are quantum mechanical devices that generate high-efficiency, scalable, and environmentally benign solar energy systems. The center has a three-pronged approach—industry, education and research—to improve performance and lower cost for commercial solar cells and devices.

Fraser is focused on sustainability, looking at what environmental issues might arise if photovoltaics rapidly scale up. "We're trying to make sure there's not some hidden, environmental liability and how to recover and reuse materials," Fraser said.

Fraser hopes to see tangible widespread examples of its research taken up for use by industry.

"Our unique role is that we put all three things together, bringing education into the mix, along with research and industry input," Fraser said. "The industry needs a knowledgeable and well-trained workforce, and we are helping create that through education and outreach."

Eight universities are involved in the center, with ASU serving as the lead.

The center has grown dramatically since its formation in 2011: industry partners have increased from zero to seven, annual research funding from about $200,000 to $3.8 million, and outreach to K-12 students from 1,600 to 6,300. About 165 faculty are connected to the center, 45 of them directly funded through the grant.

"Photovoltaics are hitting the mainstream," Fraser said. "When we have outreach events with students, their parents want to talk about photovoltaics. These applications and technology are used in the home. And kids are more interested in designing them and having hands-on interactions."

The outreach, through events like Night of the Open Door and DiscoverE Day, introduces K-12 students to photosynthesis, biofuels, biomass and photovoltaics. The center also works with the NSF's Integrative Graduate Education and Research Traineeship, and students regularly do internships with industry partners, like First Solar and Applied Materials.

Research at the center is focused on three areas: fundamental knowledge of materials, including photonics, optics and characteristics; device-level engineering, including work on individual photovoltaic cells and combining silicon with other materials; and systems-level engineering, with characterization of the entire photovoltaic system.

An Industry Advisory Board meets twice a year and industry members contribute financially and provide guidance for research. The partnership gives industry access to the cutting-edge intellectual property being produced at the university and to ASU's highly sought-after students.

Industry members also suggest pressing issues that could develop into research topics, such as potential-induced degradation, when solar panels deployed as arrays produce less than their maximum wattage because of degradation due to high voltages passing through the system.

"We are trying to understand and engineer modules that can be deployed in an array that is robust enough that there are not shorts or other problems," Fraser said.

Fraser said the center continues to grow through associated projects, including two recent awards through the Full-Spectrum Optimized Conversion and Utilization of Sunlight (FOCUS) program, part of the U.S. Department of Energy's Advanced Research Projects Agency—Energy (ARPA-E).

Stephen Goodnick, professor and deputy director of ASU LightWorks, a strategic framework for light-inspired research, will lead the High-Temperature Topping Cells from LED (Light-Emitting Diode) Materials, a $3.9 million project.

Zachary Holman will lead the Solar-Concentrating Photovoltaic Mirrors project, which has been allotted $2.6 million. (*Read more about the projects on page 21).*

Holman is one of two assistant professors recently hired for the center. The other is Mariana Bertoni.

"Mariana is an expert in materials and defects in materials," Holman said. "I am an expert in making solar cells with materials. We're working on several projects together."

The center allows scientists to pool funding and equipment. "Solar cell research is an equipment-intensive endeavor," Holman said. "This way we can share tools with people who have similar, yet unique interests. As a result of the structure provided by the center, ASU is one of only two universities in the United States that has the equipment to make a silicon solar cell.

"Silicon is the most popular material, with about 90 percent of solar cells made from silicon," Holman said. "We're looking at how to make those cells more efficient and cheaper, making new and better flavors, so to speak."

One focus is to reduce the absorption of light in the layers of the solar cell that don't generate power, making sure the silicon layer absorbs all the light to produce the most power. "We're looking at better, more transparent materials for the other layers," Holman said.

Another focus is related to optimally using all wavelengths of light emitted by the sun. "Solar cells are only good at absorbing certain colors, either blue, green or red," Holman said. "We're looking at how to stack them on top of each other, at multi-junction solar cells, to improve efficiency."

Holman said he wants the center to be known for new ideas. "I always wanted to have a research group known for creativity, for coming up with new ideas, for very thorough investigation of those ideas, and for openly sharing them with others," Holman said. "If we are known for those three things, that's more important than making a record solar cell."

Bertoni said QESST brings together many researchers focused on the same common goal of making solar energy a Terawatt-level reality.

"The center facilitates collaboration between the researchers and students from multiple universities," Bertoni said. "That's really unique. We work on projects together, we share samples and expertise, we look at things from different angles and, more importantly, we leverage each other's strengths."

Bertoni's focus is figuring out what limits device performance and, particularly, how improved materials and processes could make them work better.

"I don't assemble devices, I study them, with the goal of figuring out what governs their behavior," Bertoni said. "In the group, we look at a lot of different materials for energy conversion, such as silicon, copper indium gallium selenide (CIGS), gallium phosphide (GaP), gallium nitride (GaN) and metal oxides.

"Apart from bulk defects, we are interested in transport across interfaces," she said. "For example, we look at carrier collection after we stack layers of other materials on top of silicon."

Recently, Bertoni was able to acquire elemental and electrical maps of CIGS at really high resolutions.

"We used high-energy X-rays at Argonne National Laboratory in Chicago to characterize CIGS grains and grain boundaries with high resolution and high sensitivity," Bertoni said. "We were able to map areas of tens of microns, where we can correlate poor performing regions with very particular elemental compositions. This is powerful because, compared to previous reports, these new findings are statistically meaningful."

Bertoni and Holman also are focused on training students for the workforce. Bertoni said that while she was working in the solar energy industry, she had a difficult time finding applicants with a solid background in solar cell science, and it was one of the factors that brought her back to academia.

"I'm interested in doing great research," Bertoni said. "But looking beyond each of our own miniature kingdoms, QESST enables the training of a critical mass of students, and that can have the biggest impact for the nation, both in academic and industrial research environments."

PSERC: Center tackles questions surrounding renewable energy and the grid

As more homes and businesses are powered by renewable sources, such as solar and wind, and more states require utilities to increase the amount of renewable energy in the power grid, questions of technology, reliability, efficiency, economy, workforce and policy are becoming more critical.

Engineers, students, and industry partners are tackling them at Arizona State University's Power Systems Engineering Research Center (PSERC). The center is a National Science Foundation Industry-University Cooperative Research Center.

The center's research is focused on creating a more efficient and versatile power system, building bridges with industry and training a new generation of technical professionals, said Vijay Vittal, an Ira A. Fulton Chair Professor of Electrical Engineering, who serves as the center's director.

"There is a wide range of technical and policy issues associated with the integration of renewable resources, relating to power systems, transmission and distribution networks, component devices and electricity markets," Vittal said. "We focus on problems identified by industry, like how to design markets to accommodate a higher penetration of renewable resources."

The center was founded in 1996, with Cornell University as the lead institution, and a 10-year grant from the NSF. ASU took over lead duties in 2005, and the center currently receives funding from the NSF and industry. There are now 40 affiliated faculty members and 80 graduate students from 13 universities.

The center works with the U.S. Department of Energy and the Electric Power Research Institute as well as more than 40 industry partners, including large electrical utilities, independent system operators, manufacturers and several national labs.

"We focus on problems identified by industry, like how to design markets to accommodate a higher penetration of renewable resources."

The electric power and energy group recently added two faculty members: Lalitha Sankar, whose research focuses on cybersecurity, *(read a profile of Sankar on page 8)* and Kory Hedman, who is exploring market-based operation associated with the integration of renewable resources into the power grid and smart-grid technology, among other areas.

In March 2015, PSERC will host a national forum in Washington, D.C., for industry leaders.

On the training side, the center has created PSERC Academy, with online training videos available to the public and a textbook on synchrophasor technology, which provides real-time measurement of electrical quantities across a power system.

One of the center's major projects, The Future Grid to Enable Sustainable Energy Systems, funded by the U.S. Department of Energy, is looking at how to increase the amount of renewable energy supplying the grid, while improving stability, reliability, economy and efficiency.

"There is a high amount of variability of output of these resources, and people with solar panels on their roofs will always need some reliance on the grid, when the renewable resource is not available, unless they have storage, " Vittal said.

"So questions arise: What is the cost of having the reliability provided by the grid? Some customers want to have access to the grid without paying a charge, but there's a lot of work connecting someone to the grid. And there are safety issues, quality issues, questions of appropriate voltage and frequency requirements.

"A whole gamut of actions needs to be taken into consideration to connect a customer with a private renewable source powering their home. What if it fails? What do they do? Who provides the back-up resource? What are the market mechanism and pricing structure required to do this?

"What if they produce more energy than they need and want to sell it to the grid? The resource is not fixed. What if they promise a certain amount of energy, but it is not produced? How can we be sure there are adequate reserves available online in the grid to meet the energy shortage?

"And nobody has answered the important question of, what level of renewable resource penetration (in terms of energy) in the grid would work best: 10, 20, 30 percent?"

The people at PSERC are figuring out some answers.

Sankar: A life exploration of privacy vs. revelation

Every day, Lalitha Sankar, an assistant professor of engineering at Arizona State University, ponders how our digital world forces us to make decisions between sharing useful information and maintaining privacy.

It's a teetering balance reflected in her life. Sankar is a woman working in the nearly exclusive male world of engineering education and research, a wife and mother raising two girls, a mentor of doctoral students, and a transplant from India embracing her new home but holding onto tradition by sharing Indian dance classes with her daughter.

"She's wildly curious," said Narayan B. Mandayam, the Peter D. Cherasia Faculty Scholar at Rutgers University, where Sankar worked on her doctorate a decade ago. "The energy she brings to anything is almost infectious. When you discuss a research problem, the amount of enthusiasm she brings to the problem makes everybody really excited."

Sankar, faculty member in the School, researches the best protocols for sharing information between data collecting and processing entities, such as operators in the electric power grid, that allow sharing enough information to work efficiently and safely without revealing proprietary information. She recently received the prestigious National Science Foundation Faculty Career Development Award, or CAREER Award, which provides $455,000 for her research.

Her research is all about privacy-aware information sharing, an issue that has ramifications in all aspects of our daily lives.

"We are in a new generation of data gathering," Sankar said. "Information gathering, aggregation and analysis is being done by everyone, including Google, Target, Safeway, Amazon and Facebook. It is important to make sure that these information compilers are not making inferences about individuals that violate their privacy."

"We need to be able to share data easily, but not so much that our privacy is compromised."

For example, she said, a smart meter in your house, which measures electric power consumption at a fine-grained level, can reveal a variety of personal habits of household members, including the presence or absence of people in a house. Who has access to that information and what they might do with is an issue of concern.

"We need to be able to share data easily, but not so much that our privacy is compromised," she said.

Sankar grew up in the southern Indian city of Chennai, where her father, a mechanical engineer, designed tractors during India's Green Revolution in the late 1960s through the '90s. It was a time when mechanization was replacing the water buffalo and crop yields were skyrocketing.

Her father took her to the shop floor, where she loved watching the fabrication of parts and talking to the workers.

At home, her mother, a math teacher, encouraged a love of academic rigor.

"She was the most inspiring person in my life," Sankar said. "I was told there was no other way out, that higher education was the only way to be independent."

Sankar always loved the sciences, but she thought she would most like to be a math teacher, like her mother.

At the point in the Indian education system when you must select an academic path to take, Sankar changed her mind, choosing engineering.

"I was always very competitive," she said. "Once I decided to sit for the exam that would determine whether I could get an engineering degree from a reputed institution, I studied 18 hours a day."

Sankar was accepted into the India Institute of Technology, an exclusive, merit-based institution, where less than 10 percent of the students were women.

She started studying chemical engineering, then physics.

"It was isolating; I was the only girl," she said. "My classmates were shy and didn't talk. It was hard to find a mentor. It was depressing."

But she had come 500 miles to go to school in Bombay, and she refused to give up.

"I just kept telling myself, 'I will not quit. I did not come all this way to go back home.' Eventually, I made friends."

Most of the students graduating from IIT planned to go to the United States for graduate studies, and Sankar applied to the University of Maryland, where she completed her master's degree, and went to work for Polaroid in Cambridge, Massachusetts.

She researched digital image processing, working on the first digital cameras. Her husband, a computer scientist and researcher in cybersecurity of control systems at Honeywell, was working on his doctorate at Boston University.

Sankar moved to AT&T Shannon Labs in New Jersey, where she worked for eight years.

"Eventually, I got bored, and decided to go back to school for a doctorate," she said.

She applied at Rutgers, The State University of New Jersey, where faculty members at the Wireless Information Network Laboratory, or WINLAB, were working on understanding the fundamental limits of communications over a wireless interface.

"The anytime, anywhere model provided by wireless devices is here to stay," Sankar said. "However, with increasing concurrent users, the wireless channel gets more and more congested, and there is a crying need for higher data rates.

"Each new base station costs millions in real estate, so my doctoral thesis was on understanding if smaller intermediate devices, referred to as relays, could benefit multiple wireless users simultaneously."

Mandayam became Sankar's thesis advisor.

"She was by far the most outstanding student in an advanced graduate class," Mandayam said. "I was very impressed with her.

"I tell everybody that the students I like the most are the ones who teach me the most," Mandayam said. "Lalitha, of the 20 Ph.D. students I've had, was truly someone who taught me things I didn't know.

"Her area of research was information theory. While I had worked in that area, I didn't consider myself to be an expert. By the time she graduated, I felt like I had become an expert."

Mandayam said that Sankar could easily translate the theories and issues.

"She was able to articulate the most complex of problems in the simplest of terms, so you'd think, 'Oh, I already know this.' "

Even though she was a woman in a man's world, Mandayam said her work and confidence carried her through.

"She's so confident, and the quality of her work is so high, that I don't think she ever has to 'prove herself,'" Mandayam said. "Her colleagues have the highest respect for her and what she does. Her promise was never an issue."

Mandayam said the issue of privacy in the information age is a crucial research topic.

"It basically frames everything else about the world we live in," Mandayam said. "The notion of what privacy is gets slimmer and slimmer. The amount of our information that is exposed to the outside world is staggering: Google searches, Facebook, what you buy, what you read, the movies you watch, your friends on Facebook, the pictures you post, the vacations you take.

"There's no going back. The world is digital. Everything about its use makes the notions of privacy extremely important. Sharing has so many benefits. In medical emergencies, lives are saved. Knowing things about people can benefit them, but we don't want to become too open.

"Her area of work is tremendously important."

After finishing her doctorate, Sankar went to Princeton University for a postdoctoral fellowship program promoted by Princeton's Council on Science and Technology, which gives fellowships that support research while enabling fellows to gain additional experience in teaching.

There she met and worked with H. Vincent Poor, dean of Princeton's School of Engineering and Applied Science, a specialist in wireless, telecommunications, signal processing and information theory.

"She was working on new ideas about privacy and information technology," Poor said. "She was very creative and very thorough in her scholarly approach to the problem. She looked throughout the world of information technology at what other people thought, how they approached the issue. She tried to understand what approaches from other fields brought to the problem.

"Her research came out of that. She took a new approach to the problem. She was not inventing the wheel; she was making sure the wheel needed reinvention. I was very impressed."

In addition to her research, Sankar developed and taught a freshman seminar course three times, then stayed an additional year as a more senior associate research scholar.

Sankar set out to teach information theory that all freshman, regardless of their level of math, would be able to understand.

She used intuitive concepts and brought in guest lecturers who discussed how they apply information theory in fields such as game theory, neuroscience and biology. She explained coding theory using examples from ancient oral traditions, such as the chanting of Vedas, long texts from ancient India, composed in Sanskrit, transmitted orally for hundreds of years without losing meaning or content.

"I taught about Claude Shannon—an American mathematician and engineer who developed 'information theory' in the late 1940s at Bell Labs and forever changed the landscape of electronic communications—and his theoretical contributions, using simple math and a lot of intuition," Sankar said. "I used examples from English language including how one could remove all the vowels from words and phrases and still grasp the meaning to illustrate the idea of communicating the least amount of information needed.

"I showed how you can compress information up to a point, then no more. The wireless medium is noisy. Cable, phone, satellites, all get interference from other sources. So you reach a point where efficiency comes up against accuracy."

And she explored with her students how the transmission of information changed again with digital devices. "Now there's Twitter, and it's having an affect on the information content of the English language. There is a concept defined by Shannon called entropy, which is the average amount of information of any source. With one of my freshman students, we showed that the entropy of written English has been reduced by analyzing a large volume of Twitter feeds."

Poor said Sankar's area of research is crucial, and her approach through information theory fundamentals is novel and enduring.

"The whole area of privacy and the security of information within technology and the Internet is huge," Poor said. "You see it in the newspaper every day: the National Security Agency and Edward Snowden, the breach of security at Target, and on and on.

"Technologies are changing so rapidly that privacy can't keep up. As new technologies emerge, new issues will emerge. Her approach is very fundamental information theory and can be developed to apply to many different technologies."

Poor said Sankar is a highly driven multitasker, and that she continues to evolve her research, regularly moving into new avenues.

"The CAREER Award is a wonderful distinction," Poor said. "It helps promising young people get a start. She's the prototype of the person you want to give this award to. She has all the right abilities.

"Her careful scholarship and creativity, along with her nurturing attitude toward students, make her a great success in the university," Poor said. "She's a very good people-person in addition to her intellectual abilities. That's part of the secret of her success."

Sankar also is dedicated to increasing the number of women in engineering.

Her CAREER award includes requirements for outreach efforts focused on STEM (science, technology, engineering and math) education for K-12 students.

She plans to work with middle-school students, particularly girls, to explore the idea of privacy and their use of social media applications such as Facebook.

"Bringing more women into the engineering field only broadens its focus and diversifies its approach," Sankar said. "I'd love for these girls to see me as an example that women can be engineers, that it is a field they can enter."

Srabanti Chowdhury, Raja Ayyanar: Exploring wide-bandgap semiconductors in national manufacturing research consortium

Arizona State University electrical engineers Srabanti Chowdhury and Raja Ayyanar will lead research for the University's role in a new national consortium formed to develop the next generation of power electronics.

Funded by the U.S. Department of Energy, the work of the Next Generation Power Electronics Innovation Institute is expected to boost the nation's manufacturing industry and create new jobs.

The institute led by North Carolina State University brings together 18 companies, five universities and two major laboratories.

"We are very excited to be part of the national network for manufacturing innovation, focused on the development of next-generation power electronics," said Sethuraman "Panch" Panchanathan, senior vice president for Knowledge Enterprise Development at ASU. "This institute is an excellent example of how universities can work with the government and the private sector to respond to the need for rapid economic development expansion."

The energy department is awarding $70 million over five years to support the institute, and that funding will be matched by at least $70 million in nonfederal commitments by a team of businesses, universities and the state of North Carolina.

ASU's research for the consortium will be supported by a five-year, multimillion-dollar program.

The Obama administration plans to establish three manufacturing institutes as part of an effort to secure U.S. leadership worldwide. This consortium is the first of the three institutes.

Chowdhury is the principal investigator for ASU in the national consortium.

> "The inefficiency of the current power conversion process results in enormous amounts of wasted power."

"We are proud to be part of this major national initiative that recognizes the accomplishments and promise of our faculty and students," said Stephen M. Phillips, School director.

Chowdhury, assistant professor, will focus on development of gallium nitride-based power electronic devices for energy-efficient power conversion. "The main goal is to develop a technology that can be readily adopted by industries for high-volume manufacturing," she said.

Ayyanar, associate professor, will focus on applications of devices and develop medium voltage high power converters—particularly for renewable-energy interface and motor drive—using silicon carbide-based materials.

Their research will be essential to the consortium's primary engineering mission to provide technology for more efficient and reliable power conversion—the process of converting one form of power to another.

Power conversion is necessary for the functioning of many common electronic devices, from charging laptop computers, cell phones and electric vehicles to powering the electrical systems in homes. It is also needed to provide an interface between sources of renewable energy and the existing national power grid.

Most of today's power conversion is accomplished with a silicon-based technology that has reached the limits of its capability to convert power efficiently, Chowdhury explains. "The inefficiency of the current power conversion process results in enormous amounts of wasted power," she said.

Chowdhury, Ayyanar and their consortium partners will use silicon carbide and gallium nitride, the two leading wide-bandgap semiconductors, to significantly out-perform the current technology in efficiency and minimize power waste.

Wide-bandgap semiconductors can operate at higher temperatures than silicon-based technologies, thus providing better durability and reliability at higher voltages—improving performance while using less electricity.

Such advances would not only make power conversion more efficient but enable motors, consumer electronics and devices that are components of electrical power grids to be made smaller and operate faster.

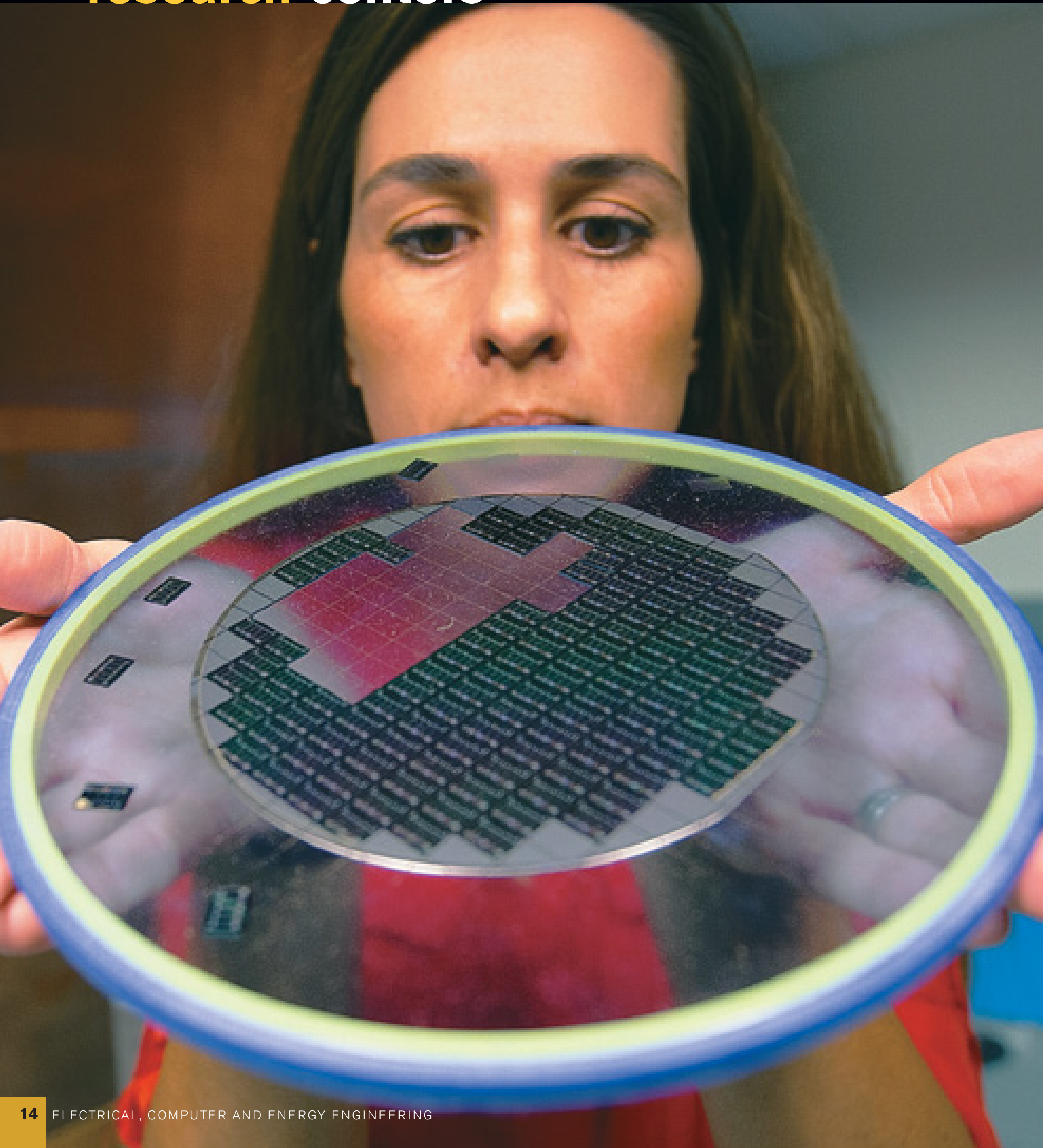
ASU's involvement with the new institute will give engineering faculty members an opportunity to give students training in power electronics based on the research consortium's progress, Chowdhury said.

Companies that are part of the institute are ABB, APEI, Avogy, Cree, Delphi, Delta Products, DfR Solutions, Gridbridge, Hesse Mechantronics, II-VI, IQE, John Deere, Monolith Semiconductor, RF Micro Devices, Toshiba International, Transphorm, USCi and Vacon.

Member universities in addition to ASU and North Carolina State are Florida State University, the University of California at Santa Barbara and Virginia Polytechnic Institute.

The National Renewable Energy Laboratory and the U.S. Naval Research Laboratory are the other members.

research centers



CANi: Center for Applied Nanoionics

asu.edu/aine/cani/cani_main.html

Director: Michael Kozicki

Focus: Nanoionic materials and devices. Whereas nanoelectronics involves the movement of electrons within their nanostructured settings, nanoionics involves materials and devices that rely on ion transport and chemical change at the nanoscale.

Accomplishments:

Generation of several dozen U.S. and foreign patents ▪ Licensing of the Programmable Metallization Cell (PMC) platform to industry

Affiliates:

ASU NanoFab ▪ Center for Solid State Electronics Research

Partners:

Axon Technologies Corp. ▪ Adesto Technologies

Connection One: Communication Circuits and Systems

A National Science Foundation Industry/University Cooperative Research Center

connectionone.org

Director: Sayfe Kiaei

Associate Director: Bertan Bakkaloglu

Focus: Developing integrated solutions for wireless systems ranging from sensor nodes to fifth- and sixth-generation wireless systems, including next-generation antennas, low-power computer chips, advanced transistor models and cutting-edge multiple-function circuitry to enhance technologies ranging from cellular to environmental and defense applications

Accomplishments:

A multi-mode transceiver integrated on a single chip that enables reduced size and complexity and greater efficiency ▪ A meta-ground plane that reduces the size of bulky antenna systems and provides extremely wide bandwidth ▪ Ultra-wideband radar ▪ Implantable neuron sensors and nanosensors ▪ Integrated radio IC ▪ New technology for digital hearing aids

University partners:

The Ohio State University ▪ Rensselaer Polytechnic Institute ▪ University of Hawaii

Industry and government partners

Air Force Research Laboratory ▪ Agilent ▪ Altera Corp. ▪ Analog Devices, Inc. ▪ BAE Systems ▪ Berriehill Research Corp. ▪ Bridgestone Americas Tire Operations ▪ CommScope, Inc. ▪ Crystal IS ▪ Freescale Semiconductor ▪ General Dynamics C4 Systems ▪ IBM ▪ Intel Corp. ▪ Kyocera ▪ Motorola ▪ NeWave Sensor Solutions ▪ NXP Semiconductors ▪ Orton Foundation ▪ Qualcomm ▪ Raytheon Company ▪ Ridgetop Group Inc. ▪ Samsung ▪ Sensor Electronic Technology, Inc. ▪ Space Micro Inc. ▪ Texas Instruments ▪ Timbre Technologies, Inc./TEL ▪ Traycer Diagnostic Systems, Inc. ▪ U.S. Army Communications-Electronics Research, Development and Engineering Center (CERDEC) ▪ U.S. Army Research Laboratory ▪ U.S. Central Intelligence Agency ▪ U.S. Department of Defense ▪ U.S. Department of Energy ▪ U.S. Office of Naval Research ▪ Velox ▪ Zomega Terahertz Corp.

PSERC: Power Systems Engineering Research Center

A National Science Foundation Industry/University Cooperative Research Center

pserc.wisc.edu

Director: Vijay Vittal

Deputy Director: Dennis Ray

Focus: The diverse challenges facing the electric power industry, educating the next generation of power engineers

Accomplishments:

Participation in The Future Grid Initiative, a U.S. Department of Energy project on how to support high penetrations of variable sustainable energy, such as wind, solar and hydro resources ▪ Identification of six areas of technical challenges ▪ White papers and workshop discussions on: *The Information Hierarchy for the Future Grid, and Grid Enablers of Sustainable Energy Systems* ▪ Publication of a grand challenges white paper ▪ Publication of a public report on the future grid initiative

Partners and donors:

ABB ▪ Alstom Grid ▪ American Electric Power ▪ American Transmission Company ▪ Arizona Public Service ▪ BC Hydro ▪ Bonneville Power Administration ▪ California Independent System Operator Corp. (CAISO) ▪ CenterPoint Energy ▪ Duke Energy ▪ Economic Policy Research Institute (EPRI ▪ Exelon Corp. ▪ FirstEnergy Corp. ▪ GE Energy ▪ Institut de Recherche d'Hydro-Quebec (IREQ) ▪ ISO New England ▪ ITC Holdings ▪ Lawrence Livermore National Laboratory ▪ Midwest Independent System Operator (MISO) ▪ Mitsubishi Electric Research Laboratories (MERL) ▪ National Renewal Energy Laboratory (NREL) ▪ National Rural Electric Cooperative Association (NRECA) ▪ New York Independent System Operator (NYISO) ▪ New York Power Authority ▪ Pacific Gas and Electric Company ▪ PJM Interconnection ▪ PowerWorld Corporation ▪ RTE-France ▪ Salt River Project ▪ Southern California Edison ▪ Southern Company ▪ Southwest Power Pool ▪ The Energy Authority ▪ Tennessee Valley Authority ▪ Tri-State Generation and Transmission ▪ U.S. Department of Energy ▪ Western Area Power Administration

QESST: Quantum Energy and Sustainable Solar Technologies

A National Science Foundation-Department of Energy Engineering Research Center

qesst.asu.edu

Director: Christiana Honsberg

Executive Director: Matthew Fraser

Focus: Photovoltaic science and technology, transforming electricity generation to sustainably meet the growing demand for energy

Accomplishments:

Developed novel thin crystalline silicon wafers with highly passivated surfaces with measured world-record open circuit voltages proving that devices with reduced silicon usage and high efficiency can be achieved to significantly reduce the cost of photovoltaic systems ▪ Demonstrated extremely high-hole concentrations in gallium nitride (GaN) and indium gallium nitride (InGaN), overcoming previously accepted limits for this material system, which allows for drastic improvement in many devices like transistors, and demonstrates the feasibility of GaN and InGaN for use in high-efficiency and multi-junction solar cells.

University Partners:

California Institute of Technology ▪ Massachusetts Institute of Technology ▪ University of Delaware ▪ University of New Mexico ▪ Georgia Institute of Technology ▪ University of Arizona ▪ University of Houston ▪ Imperial College London ▪ University of New South Wales ▪ University of Tokyo

Industry partners

Accustrata, Inc. ▪ Amtech ▪ Applied Materials ▪ Hanwha ▪ National Instruments ▪ PV Recycling ▪ Sinton Instruments ▪ Soitech ▪ Veeco

SenSIP: Sensor, Signal and Information Processing Center

A National Science Foundation Industry/University Cooperative Research Center

sensip.asu.edu

Director: Andreas Spanias

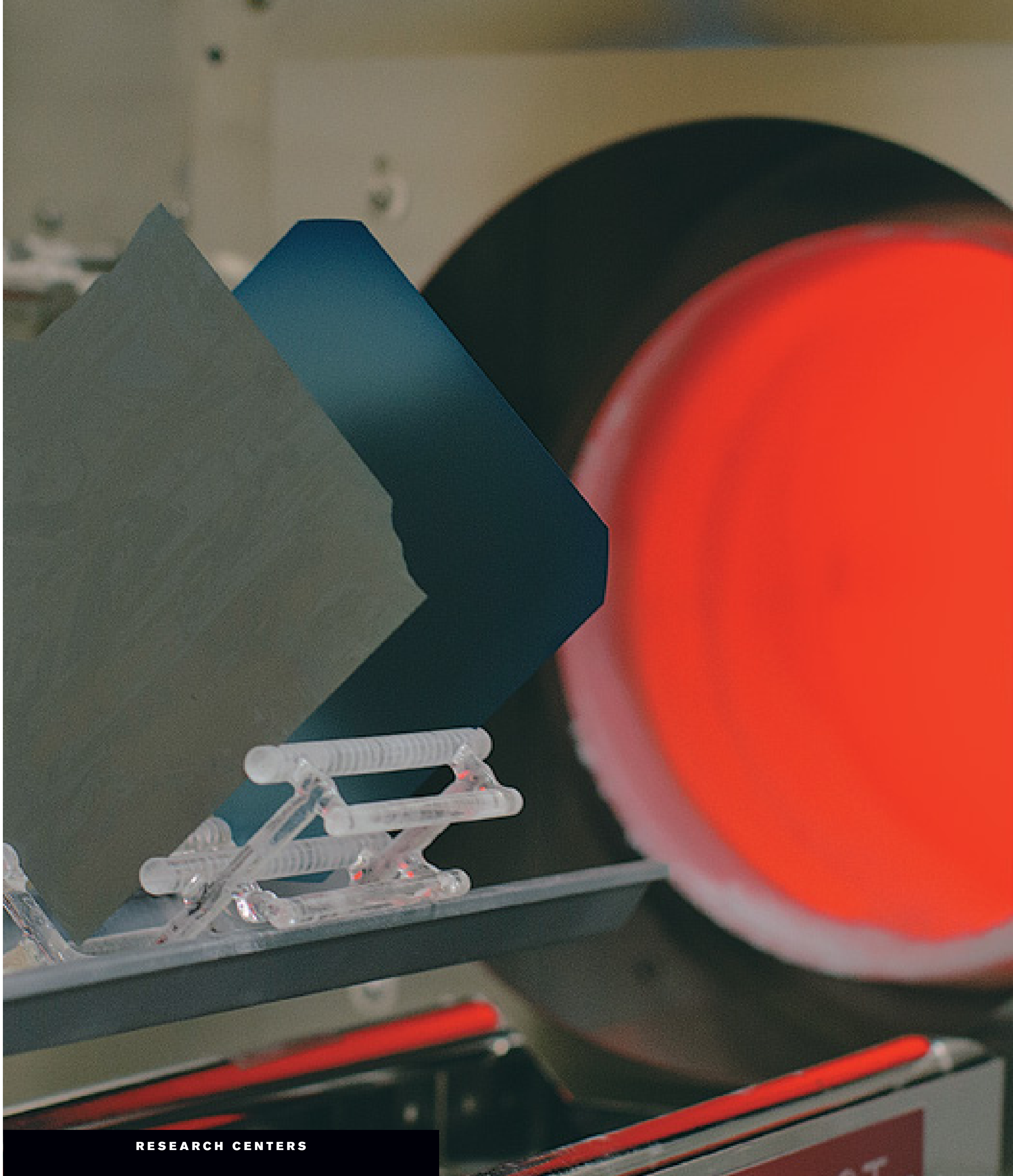
Focus: Development of a broad array of digital signal processing, imaging and communications algorithms for sensor technologies including those used in chemical sensors, cell phones and radar systems.

Accomplishments:

- Industry partnerships sponsoring research through the I/UCRC; Five new I/UCRC agreements and projects established in 2013.
- Development of new fault detection and monitoring algorithms for solar panel monitoring funded by NSF Grant Opportunities for Academic Liaison with Industry and ACT.
- Developed and disseminated digital signal processing and health monitoring award-winning apps.
- Faculty and student affiliates submitted six patent pre-disclosures.
- Two Memorandums of Understanding signed for international research partnerships. Two international partnerships funded.
- Affiliated research faculty won sizeable and competitive awards in sensor, signal processing and communications areas.
- Four training workshops organized co-sponsored by NSF Transforming Undergraduate Education in STEM award.
- Outreach sessions with Corona del Sol High School supported by NSF Research Experience for Teachers supplement.
- Three undergraduate students engaged in research through NSF and Research Experiences for Undergraduates, VRS and REV supplements. One of these resulted in a publication.

Partners:

- Net-Centric Systems collaboration with UNT, SMU and UTD funded by the NSF I/UCRC.
- University of Cyprus, Polytechnic Milano, and ETH Zurich; research collaboration in sensor networks and telecommunications systems—funded by the Research Promotion Foundation (EU Prime).
- Imperial College London's University Defence Research Centre. Collaboration on sensor localization research funded by British Council.
- Technologico de Monterey (ITESM), Collaboration in speech processing and communications research.
- University of British Columbia; International Conference on Information, Communications and Signal Processing; Collaboration on Digital Home.
- Collaboration with ASU's Arts, Media + Engineering School.



I/UCRC MEMBERS WITH FUNDING SENSIP PROJECTS

(EIGHT MEMBERSHIPS ACTIVE)

Applied Core Technology, Inc. ▪ Energy Wireless ▪ Freescale Semiconductor ▪ IFS ▪ Intel ▪ LG Electronics ▪ Raytheon Missile Systems ▪ Sprint Communications, Inc. ▪ ASU NanoFab

ASU Nanofab

more.engineering.asu.edu/nanofab

Director: Edward Hall

HIGHLIGHTS: A 4,000-square-foot, class-100 cleanroom, state-of-the-art equipment and knowledgeable technical staff ▪ Carbon nanotubes for nanofluidics ▪ Plasma lithography for cell networks formation ▪ Autonomous brain implant ▪ MEMS resonator for monitoring blood coagulation

CENTER EXTERNAL CUSTOMERS:

Ambature, LLC ▪ Amtech Systems, Inc. ▪ ASM America, Inc. ▪ First Point Scientific, Inc. ▪ Freeform Wave Technologies, LLC ▪ Fujifilm ▪ Soitec Phoenix Research Laboratory ▪ INanoBio ▪ Laser Components DG, Inc. ▪ Nabsys, Inc. ▪ NthDegree Technologies Worldwide ▪ Sonata Biosciences, Inc. ▪ SJT Micropower, Inc. ▪ Intel ▪ INanoBio ▪ Laser Components DG, Inc. ▪ NanoTEM ▪ NthDegree Technologies Worldwide ▪ Soitec Phoenix Labs ▪ Sonata Biosciences, Inc. ▪ SJT Micropower ▪ Sumco Phoenix Corp. ▪ U.S. Army ▪ Vitriflex ▪ Zipton Labs

Flexible Display Center

flexdisplay.asu.edu

Director: Nick Colaneri

Director of Operations: Mark Strnad

Backplane Electronics R&D Director: David Allee

FOCUS: A government-industry-academia partnership to advance full-color flexible display technology and foster development of a manufacturing ecosystem to support the rapidly growing market for flexible electronic devices

ACCOMPLISHMENTS:

Successfully manufactured the world's largest flexible color organic light-emitting display(OLED) prototype using advanced mixed-oxide thin-film transistors (TFTs)

GOVERNMENT PARTNERS:

U.S. Army Research Laboratory ▪ U.S. Army Natick Soldier RD&E Center (NSRDEC) ▪ U.S. Army Manufacturing Technology (ManTech) Program ▪ Office of the Assistant Secretary of the Army for Acquisition, Logistics and Technology (ASA(ALT)) ▪ U.S. Army Research, Development and Engineering Command (RDECOM)

INDUSTRY PARTNERS:

AKT America, Inc. ▪ Corning Incorporated ▪ dpiX ▪ DuPont Teijin Films ▪ E Ink Corporation ▪ Etched in Time, Inc. ▪ EV Group ▪ FlexTech Alliance ▪ General Electric ▪ Henkel ▪ Hewlett-Packard ▪ Honeywell ▪ Honeywell Electronic Materials ▪ Ito America ▪ Kolon Industries, Inc. ▪ L-3 Communications Display Systems ▪ LG Display ▪ Palo Alto Research Center ▪ Physical Optics Corporation ▪ Plextronics, Inc. ▪ Raytheon Company ▪ Sunic ▪ Universal Display Corporation

ASU LightWorks

asulightworks.com

Director: Gary Dirks

Deputy Director: Stephen Goodnick

Deputy Director: Ellen Stechel

FOCUS: A university-wide initiative that pulls light-inspired research at ASU under one strategic framework. A multidisciplinary effort to leverage ASU's unique strengths, particularly in renewable energy fields, including artificial photosynthesis, biofuels and next-generation photovoltaics.

Partner centers:

Center for Computational Nanoscience

Director: Marco Saraniti

Brings together multidisciplinary groups working on modeling and simulation of nanoscale systems. Projects focus on the development of novel numerical methods and algorithms, as well as applications to the study of phenomena with nanoscale resolution.

Center for Photonics Innovation

Director: Yong-Hang Zhang

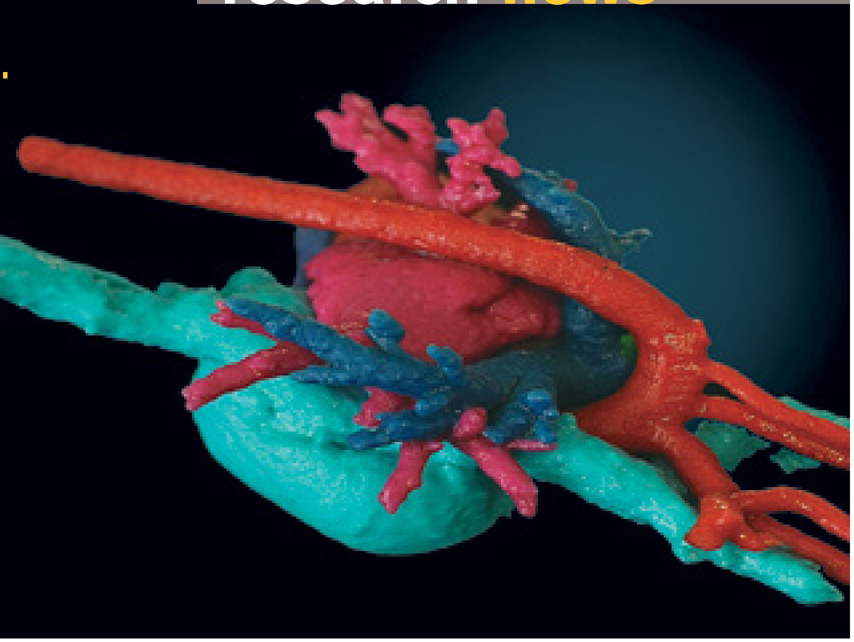
Integrates a broad spectrum of research areas, ranging from the fundamental study of photon-matter interactions to practical devices, such as solar cells, lasers and optical sensors for medical and biological applications.

The Solar Power Laboratory

Director: Christiana Honsberg

Part of the QESST Engineering Research Center, working to overcome the barriers for existing solar cells reaching theoretical limits, focusing on increasing efficiency and reducing cost.

"3-D heart models... are no longer the inventions of science fiction... they are impacting medicine, medical education and quality of life right now."



Frakes' research team helps advance virtual artificial heart implantation

Some firsts in the history of artificial heart implantation are being achieved by an Arizona State University research group and medical professionals at Phoenix Children's Hospital. They have performed what they believe is the first virtual implantation of a pioneering artificial heart, and an implantation of that artificial heart in an undersized adolescent patient.

The ASU team is led by David Frakes, an assistant professor in the School of Biological and Health Systems Engineering and the School of Electrical, Computer and Energy Engineering, both in the Ira A. Fulton Schools of Engineering.

Frakes has been working with technology developed by the Tucson-based company SynCardia Systems Inc., which has developed the Total Artificial Heart for adult patients with end-stage biventricular heart failure who are waiting for a permanent heart transplant.

Frakes is using advanced software developed by the Belgium-based company Materialise to generate 3-D reconstructions of cardiovascular, respiratory and skeletal structures that provide a virtual screening of pediatric patients that helps ensure a proper fit of the artificial heart in the patients.

Through that technique, Frakes aided a Phoenix Children's Hospital team to map procedures for the first-ever virtual implantation of the Total Artificial Heart. The actual device was implanted into a 14-year-old boy, one of the smallest pediatric patients to date to receive a Total Artificial Heart as a bridge until actual heart transplantation can be performed.

He said that initially the Total Artificial Heart was implanted into the teen, but complications arose. Images were obtained at the hospital and an accurate 3-D model was made by engineers at ASU. The 3-D data set helped reveal the reason for the complication, allowing the team to create virtual implantations for small patients who will need the Total Artificial Heart in the future.

A virtual implantation is used to assess the fitness of pediatric patients for an actual implantation of the Total Artificial Heart, particularly those whose body stature could complicate implantation, such as pediatric patients or patients with skeletal abnormalities.

"This cutting-edge technology helps medical interventionists and surgeons plan complex procedures," explained physician Stephen Pophal, chief of cardiology at Phoenix Children's Hospital. "With the help of the bioengineers at ASU, we can see if devices designed for adults can fit in children. This is especially important as a newer and smaller version of the Total Artificial Heart is awaiting Food and Drug Administration approval."

Frakes' team performed the virtual implantation of the heart in the patient using Materialise's Mimics Innovation Suite's diagnostic technology to create a 3-D reconstruction of the adolescent's chest cavity from a computerized tomography (CT) scan, and then used a laser scan of the Total Artificial Heart to virtually place the heart into the chest cavity.

After the implantation, a clinical review and a series of measurements—called a virtual fit analysis—determined whether the Total Artificial Heart could properly fit into the boy's chest cavity. Phoenix Children's Hospital has adopted this procedure for use with all future Total Artificial Heart candidates.

The artificial heart supported the boy for 11 days before he underwent a heart transplant. "It literally helps pump blood through a patient's body because their own heart can't," said Frakes, explaining that the Total Artificial Heart isn't a long-term solution, but it keeps patients stable until a heart for transplant is available.

"It can also increase quality of life during the waiting time," said Justin Ryan, a doctoral student on Frakes' research team. In many cases, patients are able to freely move around during the wait time with the use of a transportable external driver component connected to a small mobile battery pack.

The virtual implantation technology isn't only a significant achievement for care of pediatric patients, Frakes said. "Virtual implantations can help bridge the gap between heart failure and transplant in congenital patients of all ages," he said. "They can help optimize a proper fit during pre-operative planning so that complications are minimized by orienting the device in the chest cavity correctly."

Frakes said his team and partners at Phoenix Children's Hospital plan to continue the use of virtual implants pre-operatively to identify suitable candidates for the Total Artificial Heart and other cardiac-support devices.

"Many patients may be labeled too small for the device, based on standard criteria, when their body may actually accept it," he said. Virtual implants and fit analyses will help to show compatibility on a case-by-case basis.

SynCardia has a smaller Total Artificial Heart in development that is designed for patients of smaller stature. But with the current model, implantation into such patients could be risky without the pre-operative virtual implant.

Frakes documented Phoenix Children Hospital's experience using the Syncardia Total Artificial Heart in a recent edition of the medical journal *Perfusion*. Frakes' team has since performed four other pre-operative planning scenarios with virtual implantations performed by Ryan.

The team has also developed a series of 3-D models of hearts with congenital defects, designed for use in helping physicians plan surgical strategies based on

> "Virtual implantations can help bridge the gap between heart failure and transplant."

the individual conditions of patients. The venture is called Heart in Your Hand.

The Materialise company recently licensed the entire Heart in Your Hand library of congenital heart defect models and is displaying them on its HeartPrint website. Heart in Your Hand is also working with St. Joseph's Medical Center in Phoenix to develop more 3-D congenital heart defect models for educational purposes.

Materialise's HeartPrint catalogues 3-D models of all types for use in education and clinical trials. "Materialise is the world's largest 3-D printing service, meaning that Heart in Your Hand models will now be distributed all over the world," Frakes said.

Said Ryan, "3-D heart models and performance of virtual heart implantations are no longer the inventions of science fiction. They are happening and they are impacting medicine, medical education and quality of life right now."

'Big data' reveals human interests, behavior

Information technology advances are leading to ever-growing accumulations of "big data," making it feasible to quantify more things long thought immeasurable.

Professor Ying-Cheng Lai and his research partners are combining expertise in computer science, engineering, mathematics, statistics and physics in analyzing big data to explore human-interest dynamics.

They want to see if it's possible to identify patterns in what motivates people to become interested in particular things, what makes them maintain certain interests and what causes them to lose interest.

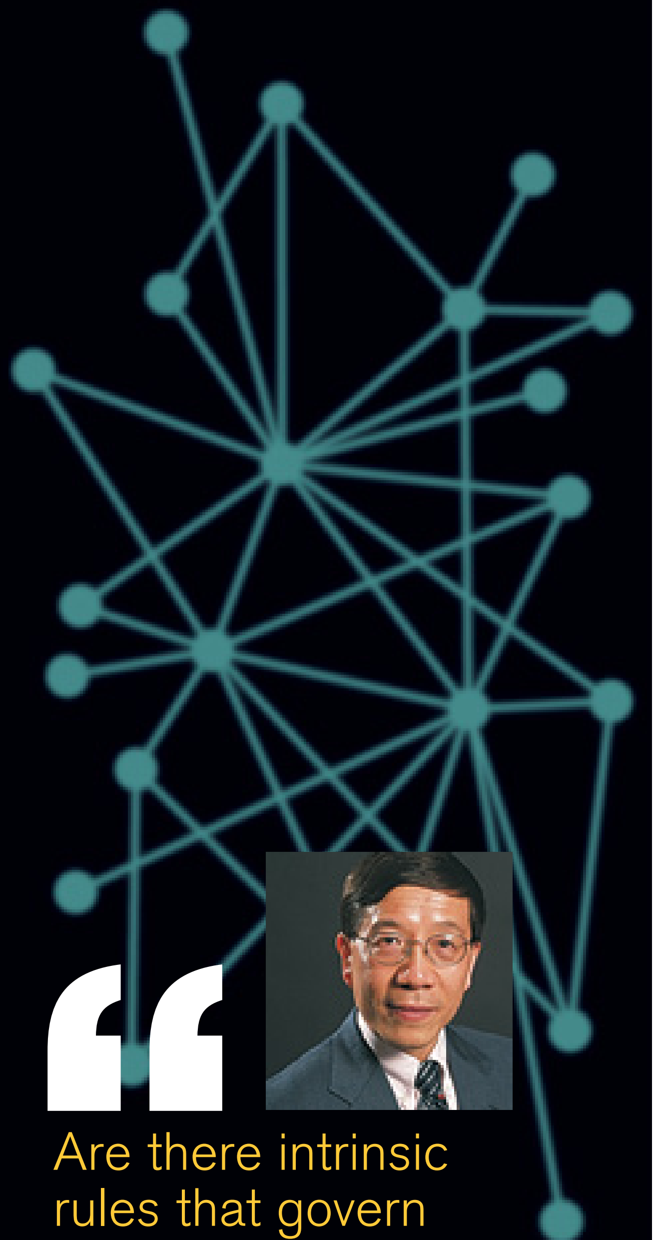
"Big data now provides a platform for exploring the dynamics of why people change their minds about certain things," Lai said. "Are there intrinsic rules that govern when something interests people, and what influences us to become interested?"

Learning what attracts and holds people's interests is a door to better understanding and predicting human behavior—providing knowledge that can be valuable to business, economics, social sciences, healthcare, even national defense, Lai said.

He is working on the human-interest dynamics project with ASU electrical engineering research scientist Zi-Gang Huang and graduate student Zhi-Dan Zhao. Huang is also a researcher with the Institute of Computational Physics and Complex Systems at Lanzhou University in China. Zhao is also with the Web Sciences Center at the University of Electronic Science and Technology of China.

Other team members are Zimo Yang, Tao Zhou and Zike Zhang, all with the Web Sciences Center in China. Zhang is also with the Institute for Information Economy at Hangzhou Normal University in China.

The team is working with large data sets being provided by three large companies in China—two e-commerce companies and a mobile communications business.



"Are there intrinsic rules that govern when something interests people, and what influences us to become interested?"

Those data sets are big enough to eventually give researchers a credible indication of about how much of peoples' decision-making follows patterns, or if it's mostly random and chaotic, Lai said.

By examining and analyzing how millions of people are making decisions online or on mobile phones about using the companies' services, researchers expect to understand how a wide variety of factors attracts, or fails to attract, individuals' interest.

Lai, who brings a physics perspective to solving engineering challenges, is providing a key aspect to the project: the application of a statistical physics approach to the study of big data. As he explains, trying to analyze a large amount of data to seek trends and patterns is similar to what physicists do when examining millions of particles of matter and trying to understand the nature of all the interactions of the particles and the affects of those interactions.

"It is difficult to pin down the exact relationships between all the particles and how all the variables are changing, particularly when changes in the microscopic particles are having an impact on a large macroscopic system," he said. However, it is possible to deduce from microscopic interactions how macroscopic variables depend upon each other, the so-called "scaling relations," he adds.

Having information on the massive scale provided by big data can enable researchers to get a clearer picture despite the variables and randomness in peoples' decision-making. "We should be able to develop some predictive capability," Lai said.

Such predictive findings about human-interest dynamics could aid psychiatrists in better diagnosing patients' conditions and prescribing more effective mental-health therapies.

Using knowledge of what drives interest to predict human behavior could also be valuable in devising national security and defense strategies, and in guiding the engineering and design of transportation systems and similar high-interaction environments.

By providing a deeper understanding of what shapes and changes consumer interests and behavior, the research promises to offer advertising, marketing and product-development industries a more solid basis for long-term business planning and strategy.

Lai said the project is the first thoroughly systematic attempt to probe the intricacies of the dynamics at work when people develop—or lose—interest in various things. "We expect our findings to have applications in many more areas."

Nanoelectronics key to advances in renewable energy

Nanoscale technology looks promising as a major contributor to advancements needed to fulfill the potential of emerging sources of clean, renewable energy. Progress in the comparatively new area of nanoelectronics in particular could be the basis for new manufacturing processes and devices to make renewable energy systems and technologies more efficient and cost-effective.

Stephen Goodnick, professor, detailed what nanoelectronics advances could do to help push the performance of solar energy systems to the next level in his talk at the 2014 annual meeting of the American Association for the Advancement of Science (AAAS).

Goodnick is also deputy director of ASU LightWorks, a strategic framework for light-inspired research at ASU.

AAAS is the world's largest science and technology society. Its annual meetings draw thousands of scientists, engineers, educators, policymakers and journalists from around the world.

Titled "Pathways to Next-Generation Photovoltaics," Goodnick's presentation looked at how innovations driven by nanoelectronics research can enable photovoltaic technology to significantly improve our ability to convert sunlight and heat into electric power.

He delved into how new types of nanostructure-based devices can make it possible to produce photovoltaic solar cells that achieve better energy-conversion efficiency. Goodnick explained that the key is in the different characteristics, properties and behavior of materials at the nanoscale.

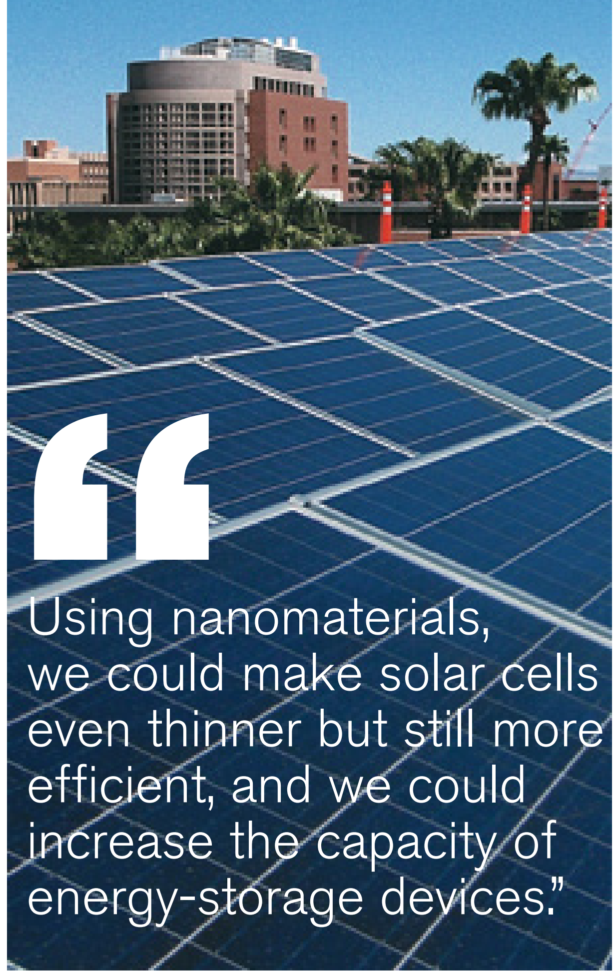
A nanometer is one-billionth of a meter (one meter is a little more the 39 inches long). About 100,000 nanometers amount to the same thickness as a typical sheet of paper. At that tiny scale, silicon and other materials that are used to make solar cells can perform in ways that boost the effectiveness of devices for producing energy, Goodnick said.

“With the use of nanoparticles, made into nanostructures, we could, for instance, improve optical collection, enabling systems to trap more light for conversion into electrical power,” he said. “Using nanomaterials, we could make solar cells even thinner but still more efficient, and we could increase the capacity of energy-storage devices.”

Such progress will hinge on the success of science and engineering research in overcoming current high production costs and some technical challenges. But Goodnick said he’s confident nanotechnology advances “are going to be big factors in the future of energy.”

Goodnick’s talk was part of an AAAS conference session that also featured presentations on aspects of nanoelectronics and renewable energy by four of his colleagues.

In July Goodnick joined those fellow engineers and scientists in a research collaboration at the Institute for Advanced Study at the Technical University Munich in Germany. Goodnick has been awarded the German university’s Hans Fischer Senior Fellowship, which will enable him to spend six months conducting research at the institute. The fellowship award is given to engineers and scientists doing innovative work in areas of interest to the institute.



ASU engineers to lead national solar energy technology projects

Arizona State University engineers will lead two multi-university/industry research teams in support of a new U.S. Department of Energy (DOE) program to develop technologies that use the full spectrum of sunlight to produce inexpensive power during both day and night.

DOE’s Advanced Research Projects Agency—Energy (ARPA-E) recently announced allocation of $30 million in funding for 12 projects selected to conduct research for its Full-Spectrum Optimized Conversion and Utilization of Sunlight (FOCUS) program.

Stephen Goodnick, professor, will lead the project, High-Temperature Topping Cells from LED (Light-Emitting Diode) Materials, which has been allocated $3.9 million. Goodnick is also deputy director of ASU LightWorks, a strategic framework for light-inspired research.

Zachary Holman, assistant professor, will lead the project Solar Concentrating Photovoltaic Mirrors, which has been allotted $2.6 million.

ARPA-E selects energy technology development projects based on their potential to enhance the nation’s economic and energy security. The projects promise to help reduce imports of energy from foreign sources, reduce energy-related emissions—including greenhouse gases—improve energy efficiency in all economic sectors and ensure the United States maintains a technological lead in developing and deploying advanced energy technologies.

Goodnick’s FOCUS project will develop a photovoltaic device that operates effectively at more than 400 degrees Centigrade (more than 750 degrees Fahrenheit) as the key component of a hybrid concentrating solar thermal power (CSP) system that provides overall higher sunlight-into-electricity conversion efficiency than either a stand-alone photovoltaic system or current CSP systems. It is also to provide a lower dollar-per-watt cost.

The material technology used in the photovoltaic device has already demonstrated its reliability and performance in solid-state lighting applications and should be rapidly applicable to solar systems, Goodnick said.

ASU’s research partners on the project are professor Alan Doolittle at the Georgia Institute of Technology, Soitec, one of the world’s leading providers of concentrator photovoltaic systems and a manufacturer of semiconductor materials for electronic and energy industries, and AREVA Solar, a leader in providing concentrated solar power to a global customer base.

The project team includes ASU professors Christiana Honsberg and Dragica Vasileska, and assistant professor Srabanti Chowdhury, faculty members in the School, along with Fernando Ponce, a professor in the Department of Physics in ASU's College of Liberal Arts and Sciences. Honsberg is director of the Quantum Energy and Sustainable Solar Technologies (QESST) Engineering Research Center at ASU, which is supported by the Department of Energy and the National Science Foundation.

Holman's FOCUS project will incorporate photovoltaic cells into large reflectors used by solar power plants to generate heat—and subsequently electricity—from the concentrated sunlight.

The process is designed to improve the efficiency of how solar thermal power plants generate electricity, promising a significant increase in the daytime output of energy while also being able to store solar energy for power generation at night.

Holman said the photovoltaic cells he will use will replace the traditional silver mirrored surface of the large parabolic troughs now used in solar power plants such as the Solana plant in Gila Bend, Arizona.

The cells will absorb visible light and efficiently convert it to electricity, while ultraviolet and infrared light, which would be wasted if it were collected in photovoltaic cells, will instead be reflected onto a black tube at the trough focus. A fluid in the tube will carry the generated heat to be either converted to electricity with a steam turbine or stored for later conversion, he explains.

His project team includes researchers at the University of Arizona, along with Mariana Bertoni, assistant professor.

Engineering project aims at improving disaster response networks

ASU and UA engineers are teaming on a national project to develop a more technologically advanced and reliable disaster response network.

An advanced smart-grid disaster response network will be developed by engineers at Arizona State University and the University of Arizona with support from the National Science Foundation (NSF).

Their goal is to design and test new utility-grid architecture that will enable telecommunications technology to be integrated into such systems to make them more reliable.

The project, funded by a recently awarded two-year $400,000 NSF grant, will bring together researchers at the ASU-based Connection One center, the Quantum Energy and Sustainable Solar Technologies Engineering Research Center based at ASU and the Center for Integrated Access Networks at UA.

Connection One, an NSF Industry/University Cooperative Research Center, is at the forefront in development of the next generations of antennas, low-power computer chips, advanced transistor models and multiple-function circuitry. The is center directed by professor Sayfe Kiaei.

Kiaei will oversee the project along with Jennifer Kitchen, an assistant professor of electrical engineering at ASU, and Nasser Peygambarian, director of the Center for Integrated Access Networks.

The UA center develops optoelectronic technologies that can be cost-effectively integrated with existing and future telecommunications and data-communication networks.

The Quantum Energy and Sustainable Solar Technologies Engineering Research Center, established by the NSF and the U.S. Department of Energy, focuses on solving challenges to producing electricity from solar power in more technologically efficient and economically viable ways.

A smart grid is a technologically advanced electrical grid integrated with communications technologies. The integration enables the system to quickly gather information to guide its operations and improve the efficiency and reliability of electricity production and distribution.

During disaster situations, high demand on energy grids combined with infrastructure damage often results in power outages over large areas that can threaten public safety.

ASU and UA engineers will explore ways to integrate alternative energy sources, such as solar, into power utility grids to serve as a backup for conventional energy sources during widespread emergencies.

They'll seek to achieve this by creating an underlying reconfigurable optical network, using "smart" wireless sensors on solar-energy panels to form the backbone of the disaster response network, Kiaei explains.

Researchers will develop a smart-grid prototype equipped with multiple solar-energy panels, which can be used to gather data as well as provide backup power.

The project will also focus on employing new technologies to improve emergency preparedness, using alternative energy sources to provide more reliable backup power for hospitals and the data services that are critical during public disasters.

ASU, An-Najah National University partner on renewable energy

With a shared goal of advancing global renewable energy solutions, Arizona State University has partnered with An-Najah National University in the West Bank to offer the Renewable Energy Leadership Training Program.

The inaugural event took place Nov. 17 in Nablus, West Bank, and was attended by Palestinian Prime Minister Rami Hamdallah, officials from the Palestinian Energy Authority and representatives from both partner universities.

"Together, ASU and An-Najah National University will develop comprehensive and implementable renewable energy strategies that not only address our regional energy challenges, but will also impact the global energy arena," said Sayfe Kiaei, professor and director of the Connection One research center.

"The objective of this course is to develop a comprehensive training program on renewable energy," Kiaei said. "The participants included representatives from energy industry, utility companies, policymakers and energy sectors. After a one-week successful training program at An-Najah, there will be a one-week course at ASU.

"We look forward to continued collaboration and international transfer of knowledge between the two universities," added Kiaei, who was joined by Ron Roedel, ASU emeritus professor of electrical engineering; Stephen Feinson, assistant vice president of ASU Global Engagement; Mike Pasqualetti, professor in ASU's School of Geographical Sciences and Urban Planning; and Jessica Cheng, a project manager at ASU.

The training program is funded by LightWorks, an ASU initiative that unites resources and researchers across ASU to confront global energy challenges.

During the commencement speech, Prime Minister Hamdallah said Palestine has reached an important milestone in the advancement of the energy sector, and assured that it meets the increasing needs of the Palestinian people and reduces the need to buy electric power from Israel. This milestone is thanks to the complementary roles between the public and private sectors and to the support of friendly states.

The Deputy President for International and Strategic Affairs at An-Najah National University, Kherieh Rassas said the Renewable Energy Leadership Training Program is the culmination of more than two year's work that emphasized the importance of the development of renewable energy resources in order to improve community and environmental objectives in Palestine.

"We are optimistic, for as soon as the project is completed, it will have marked the establishment of a clearer strategic path for improving access to renewable energy resources, and this is what will also help in the development of an independent electricity supply in Palestine," Rassas said.

Vasileska will lead SunShot project to make solar cells more durable

A national project to improve the reliability of the photovoltaic cells used in solar energy systems will be led by an Arizona State University electrical engineer.

Through its SunShot Initiative, the U.S. Department of Energy has awarded a grant of $1.8 million over three years to a research team headed by professor Dragica Vasileska. The project is one of several research efforts supported by the SunShot Initiative to develop ways to produce stronger components that provide more dependable performance from solar energy technology.

Vasileska's team will focus on comprehensively addressing the problem of metastabilities in cadmium telluride solar cells, via "first-principle calculations, solution of a diffusion-reaction set of equations and experimental verification," she said.

The project involves the development of one-dimensional and two-dimensional unified solvers for solution of the diffusion-reaction equations that mitigate migration of point defects and grain boundaries in the materials of which solar cells are used.

Heat, cold, moisture, humidity and other environmental and atmospheric conditions cause cell materials to degrade and system performance to decline, Vasileka explained.

The chemical reactions involved in the workings of solar cells and the wear and tear on cells caused by environmental conditions combine to cause defects in the active device region.

Vasileska's team must learn more about the mechanisms that drive defect formation in the materials, so that methods can be designed to prevent formation of defects harmful to solar cell performance.
The researchers will focus on cadmium sulfite and cadmium telluride materials, which have been shown to be particularly effective for fabrication of thin-film solar cells.

Vasileska's co-leader on the project is engineer Igor Sankin, manager of the device physics group for Tempe, Arizona-based First Solar, one of the world's largest manufacturers of thin-film solar cells.

They will collaborate with Christian Ringhofer, a professor in the School of Mathematics and Statistical Sciences in ASU's College of Liberal Arts and Sciences, and with James Sites, a professor of physics at Colorado State University, and Su-Huai Wei, a physicist with the National Renewable Energy Laboratory.

The endeavor will be an affiliate project of the Quantum Energy and Sustainable Solar Technology (QESST) Engineering Research Center at ASU. The center, supported by the National Science Foundation and the Department of Energy, focuses on solving challenges to producing electricity from solar power in more technologically efficient and economically viable ways.

ASU-led national project aims at solar cell advances

A national project promising a significant advance in the technology for converting sunlight into electricity will be led by a team of Arizona State University engineers.

With support of a $3.5 million, three-year grant from the U.S. Department of Energy's SunShot Initiative, the team will develop new ultra-thin silicon solar cells designed to increase the amount of electricity that can be produced through direct conversion of sunlight.

It's one of an array of projects funded recently by $60 million in SunShot Initiative grants intended to help make solar energy economically competitive with other energy sources, advance the integration of solar energy into the nation's energy grids and support a growing U.S. solar workforce.

The ASU team and its partners will achieve higher efficiency by developing a new silicon solar cell architecture. The cells will incorporate new design approaches that partner crystalline silicon with carrier-selective contacts. This will enable the novel cell design to circumvent the limitations of current silicon solar cells and allow low-cost silicon to achieve its full potential.

The project plans include making the advanced solar cell technology available to energy-related industries in the United States.

"Our work will be a part of helping the U.S. maintain its lead in advanced clean-energy technologies," said Stuart Bowden, the ASU team leader. "A wave of advances is expected in photovoltaic solar cell technologies that should propel solar-energy industry growth within the next several years, and our efforts stand to make a big contribution to move that forward."

Bowden, an associate research professor, will work with professor Stephen Goodnick, professor Christiana Honsberg, and assistant professors Mariana Bertoni and Zachary Holman. They will collaborate with researchers at the project's partner institutions—the Massachusetts Institute of Technology (MIT), the California Institute of Technology (Caltech), the University of New South Wales in Australia and École Polytechnique Fédérale de Lausanne in Switzerland.

The ASU-led endeavor will be an affiliate project of the Quantum Energy and Sustainable Solar Technology (QESST) Engineering Research Center at ASU. The center, supported by the National Science Foundation and the Department of Energy, focuses on solving challenges to harnessing solar power in more technologically effective and economically viable ways.

QESST is a big part of the "critical mass" of engineers and scientists in energy-related fields that has formed at ASU over the past decade, Bowden said. This depth of expertise has equipped the university to take the lead in efforts such as those being supported by the national SunShot Initiative, he said.

Chae developing wireless, implantable biosensor to monitor brain health

An Arizona State University engineer whose work focuses on biomedical devices to monitor and improve human health is developing a small implantable wireless device that can provide vital information about the brain's condition.

The project led by associate professor Junseok Chae is supported by a $2 million, four-year grant awarded by National Science Foundation (NSF).

Chae works with Connection One, an NSF Industry/University Cooperative Research Center based at ASU.

Connection One is at the forefront in development of the next generations of antennas, low-power computer chips, advanced transistor models and multiple-function circuitry.

For the wireless brain-health sensor project, Chae is teaming with researchers at Ohio State University (OSU), which is a Connection One partner. His partners are John Volakis, the R. & L. Chope Chair Professor in OSU's Department of Electrical and Computer Engineering, and Julian Thayer, the Ohio Eminent Scholar Professor in OSU's Department of Psychology.

Noninvasive biosensors, such as those that are typically attached to the head, can miss critical medical information because they fail to detect some neural signals. Wires connect the biosensors to batteries and transmit information from the sensor to a computer. The system presents a significant inconvenience for patients.

Chae's research team is developing a device that does not require an external power source and transmits data wirelessly. The new biosensor could potentially be placed inside the brain to gather information from an unobstructed array of neural signals.

"One of our main aims is to make the wireless device more sensitive to the brain's smaller neural signals and better able to filter out unwanted background signals.

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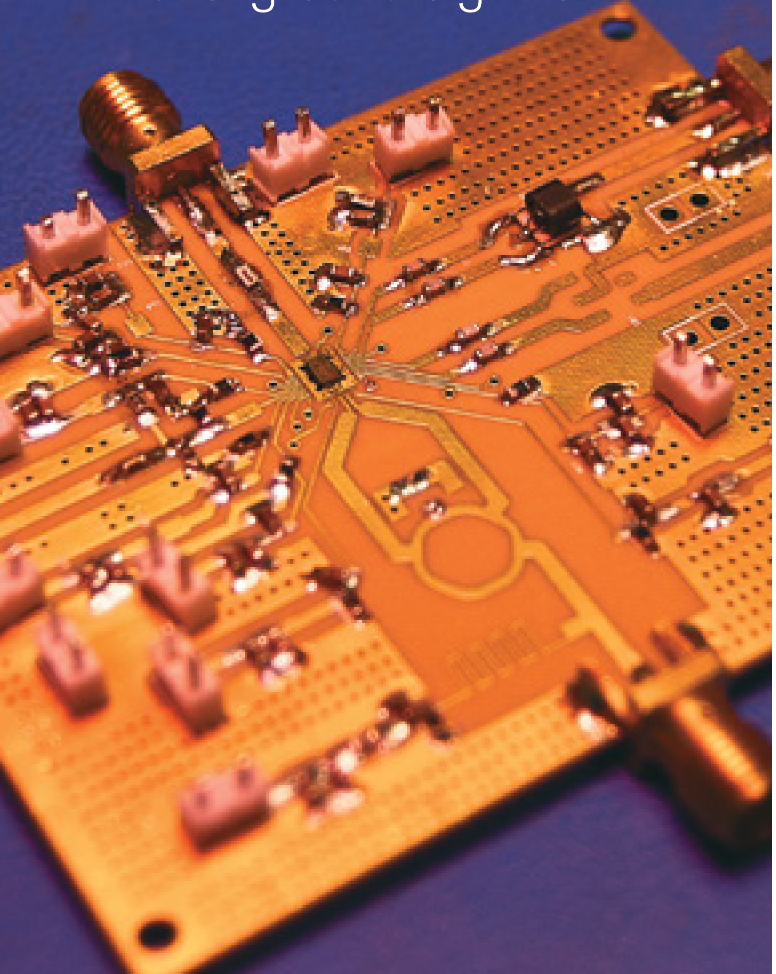


It also needs to be durable enough to be effective over long periods of time," Chae said.

Tests of such devices have so far yielded positive results, although the wireless signals are slightly weaker than signals transmitted through wires.

In a related project, Chae is developing a microdevice capable of mimicking the function of specific tissues that control water pressure within the brain.

The device could be used to treat people with hydrocephalus—also known as "water on the brain"—a medical condition in which there is an abnormal accumulation of cerebrospinal fluid surrounding the brain.

Tao to design new microscopy system with support from foundation grant

Peering through a homemade instrument—toy-like by today's standards—the Dutch tradesman Antony van Leeuwenhoek (1632-1723) first observed a dizzying menagerie of life forms, invisible to the naked eye. Since then, scientists have steadily refined the field of microscopy, achieving spectacular results at ever-tinier scales.

At Arizona State University's Biodesign Institute, Nongjian (NJ) Tao has been designing advanced microscopy methods with the ambitious aim of capturing molecular-scale phenomena in living systems. The new techniques, which combine multiple imaging modalities, are poised to revolutionize the study of biology and the development of new drugs.

"To study the dynamics of individual molecules in living systems, extremely high resolution alone is not enough," Tao said. "You also need the ability to image and record very fast processes as they occur."

Tao is the recipient of a $1.6 million grant from the Gordon and Betty Moore Foundation for research titled "Label-free imaging and tracking of single protein-protein interactions."

The three-year project calls for the design of a novel microscopy system based in part on a phenomenon known as plasmonic resonance.

The new microscope will allow researchers to not only observe a specimen's form at a remarkably minute scale, but also investigate chemical reactions and charge-related properties of living systems. The microscopy techniques employed will permit these molecular spectacles to be imaged with greatly enhanced contrast and unprecedented temporal resolution.

Tao directs Biodesign's Center for Bioelectronics and Biosensors. He is also a professor in the School of Electrical, Computing and Energy Engineering, one of ASU's Ira A. Fulton Schools of Engineering.

In previous research, Tao's group exploited plasmonic imaging to examine single cells, cell organelles, viruses and nanoparticles. The new grant calls for an extension of this work in order to image the dynamics of single protein interactions in living systems—a feat never before accomplished.

Proteins are essential components in all life processes and play a central role in the maintenance of health and the onset of disease. A more thorough understanding of their multifarious activities is crucial. Until now, however, studying the subtle dynamics of proteins in their native state—including their binding properties—has been beyond the ability of imaging technology.

Over the course of the three-year project, the research team will develop a fast and low-noise plasmonic imaging system capable of resolving fine structure, as well as following the transport of sub-cellular features with startling precision, with temporal resolution in the sub-millisecond range.

Getting closer A variety of sophisticated techniques have been applied to extend the range and versatility of modern microscopy, from traditional optical methods to scanning probe techniques, opening up previously inaccessible realms. Such methods have succeeded at imaging structures down to the single molecule level, i.e., fractions of a nanometer—an enormous achievement.

These techniques have been invaluable for the advance of biological research and medical diagnostics, however some critical tasks have remained out of reach. One of these is the direct imaging of single molecules within living systems—for example, a live cell.

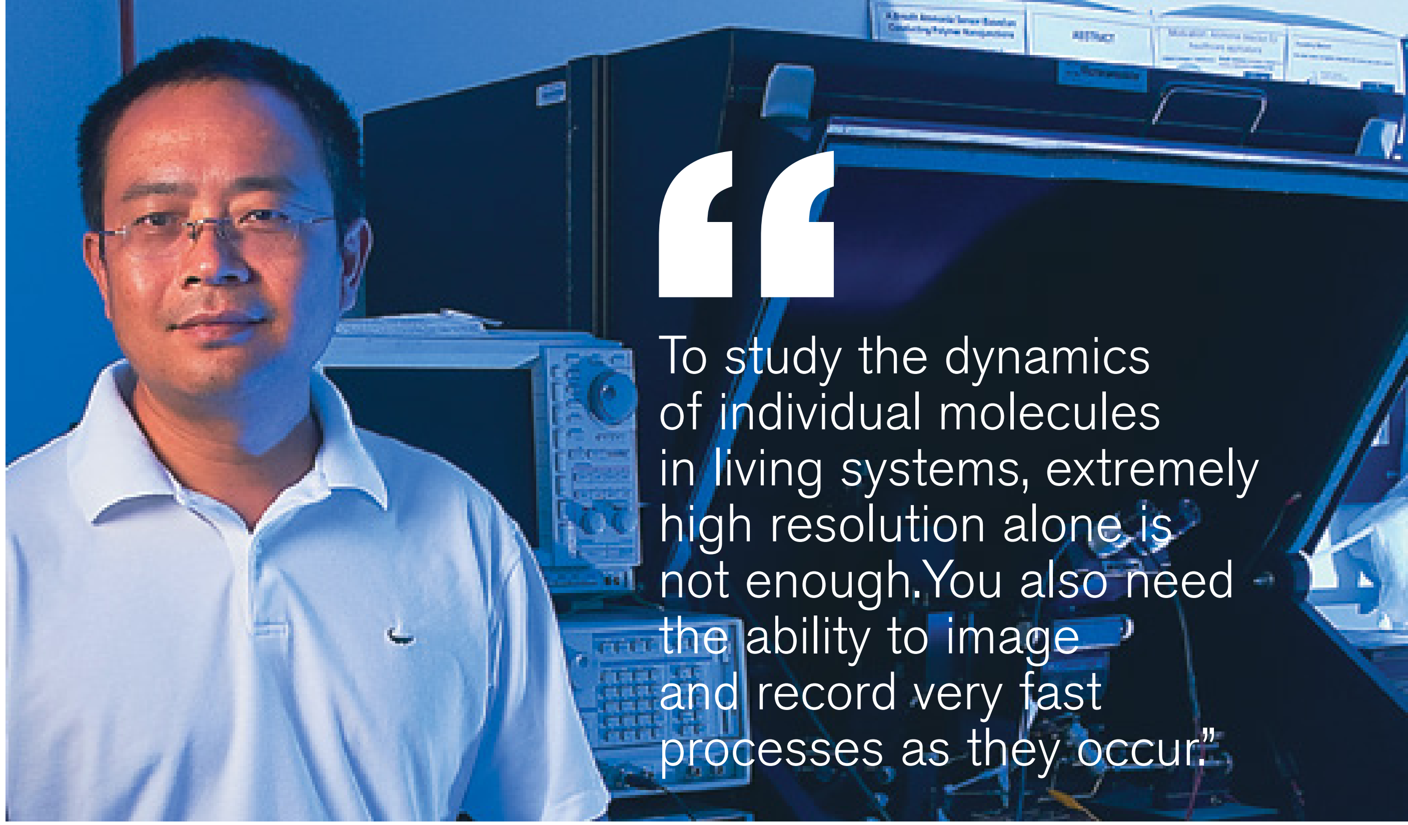
Optical microscopy methods, including fluoresce and confocal imaging, have produced stunning images at high resolution. Nevertheless, the resolving power of such instruments has been constrained by the diffraction limit of light, which dictates that spatial resolution is limited to approximately half the wavelength of the incident light used to illuminate the sample.

From a practical standpoint this means that conventional optical microscopy cannot resolve features smaller than 200-300 nanometers—too small to visualize subcellular structures, much less, proteins, which are typically less than 10 nanometers.

Electron microscopy is one method used to overcome the diffraction limit of light, but the technique requires involved sample preparation and is not suitable for imaging living systems like cells. Electrons cannot penetrate the native aqueous environment of most biological matter and energetic electrons can damage biological samples.

On the other hand, scanning probe techniques, like atomic-force microscopy, which use a probe to scan a biological sample line by line, and which are applicable in aqueous environments, are not fast enough to capture dynamic processes at the molecular level, which occur at very high speed.

A new look Tao's technique relies on a phenomenon known as surface plasmon resonance. When polarized light strikes a specially prepared surface coated with a thin metallic film, free electrons (or plasma) absorb



incident photons and convert them into a surface plasmon wave that propagates like a water wave near the surface of the metal film.

When a sample such as a living cell, virus or nanoparticle interacts with the plasmon wave, it disrupts it, thereby causing a measurable change in light reflectivity. These alterations in reflectivity can be converted into an image.

Plasmonic imaging in general is limited to samples near the surface of the metal film with an image depth of around 200 nanometers. While this limitation prevents imaging of whole cell bodies, it is easily capable of imaging proteins, viruses, dendrites of neurons and cell organelles.

Using a newly invented technique known as P-EIM (plasmonic electrical impedance imaging), image depth can be significantly increased. P-EIM also improves imaging contrast and importantly allows charge-related properties of biological samples to be imaged.

The P-EIM imaging method relies on the fact that the surface plasmonic signal is sensitively dependent on the surface charge density, which can be measured optically. P-EIM permits very rapid, non-invasive impedance imaging in living systems and unlike normal surface plasmon resonance can monitor a thick biological sample such as an entire cell body.

"Recent developments in optical microscopy have created exciting new ways to investigate the structure and function of living cells, but directly 'seeing' molecules interacting in live cells remains a major challenge," said Gary Greenburg, program officer with the Gordon and Betty Moore Foundation. "We believe the development of the Plasmonic-based Electrochemical Impedance Microscope will deliver novel, label-free imaging capabilities that do not currently exist and will have a major impact on our fundamental understanding of how cells work."

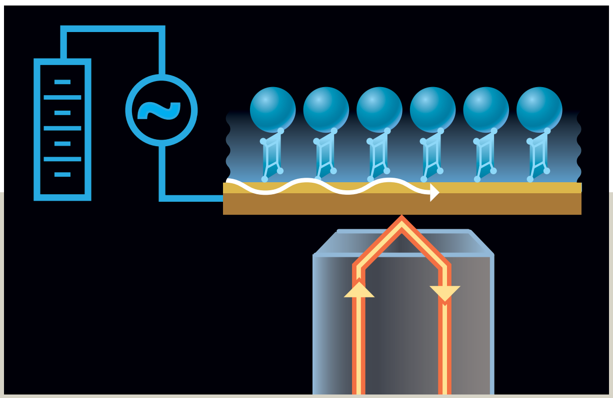
A related technique, known as P-ECM (plasmonic-based electrochemical current imaging), measures electrochemical current density from an optical signal produced by surface plasmon resonance, thereby allowing precision imaging of electrochemical reactions. The rapid and noninvasive nature of P-ECM permits the imaging of catalytic reactions in single nanoparticles for the first time.

The new microscope system therefore enables the simultaneous imaging of gross morphology, chemical reactions and charge-related properties (including charged molecules or ions) using a single imaging system. The technique provides high spatial resolution, as well as unprecedented temporal resolution capable of imaging very fast molecular phenomena, as surface plasmons can respond to light on femtosecond time scales.

Part of the new grant project will involve tracking the movement of mitochondria in a living cell. Tao stresses that the new microscope's unrivalled spatial and temporal resolution will help provide new insights into the interactions of motor proteins between mitochondria and microtubules, among many other molecular-scale events.

Using new, ultrafast cameras capable of recording over a million frames per second, plasmonic imaging with microsecond time resolution will be possible. Further, the technique is compatible with conventional bright field and fluorescence imaging.

Thus, a single instrument can combine the imaging strengths of conventional and plasmon-based techniques, opening the door to intense investigations of life processes occurring in their native state at the most intimate scale.



Engineering professor aims to strengthen national defense systems

Professor Nongjian Tao will have an important role in producing technological advances considered critical to enhancing the nation's military defense systems.

He was awarded a grant from the Air Force Office of Scientific Research through the U.S. Department of Defense Multi-University Research Initiative (MURI).

Tao also directs the Center for Bioelectronics and Biosensesors at ASU's Biodesign Institute, where work for this project will be performed.

Tao's project seeks to make advances in electro–chemical microscopy, which is the foundation for many major technologies such as batteries, fuel cells, chemical analysis, chemical sensors and biological sensors, and corrosion prevention.

He will work at developing a new form of microscopy—optical electrochemical microscopy, which converts an electrochemical signal into an optical signal—that will produce more precise imaging of activity during electron transfer, the fundamental trigger for electrochemical processes.

The research is designed to reveal new knowledge of the spatial aspects of electron-transfer dynamics in real time on the nanoscale.

Advanced understanding of those dynamics can help enable development of improved chemical analysis, sensor technology and electroplating processes, as well as more effective energy and fuel devices.

Tao will work with colleagues from the University of Texas, Austin, the University of Washington, the University of Utah, Queens College-City University of New York and Northwestern University, the lead institution for the project.

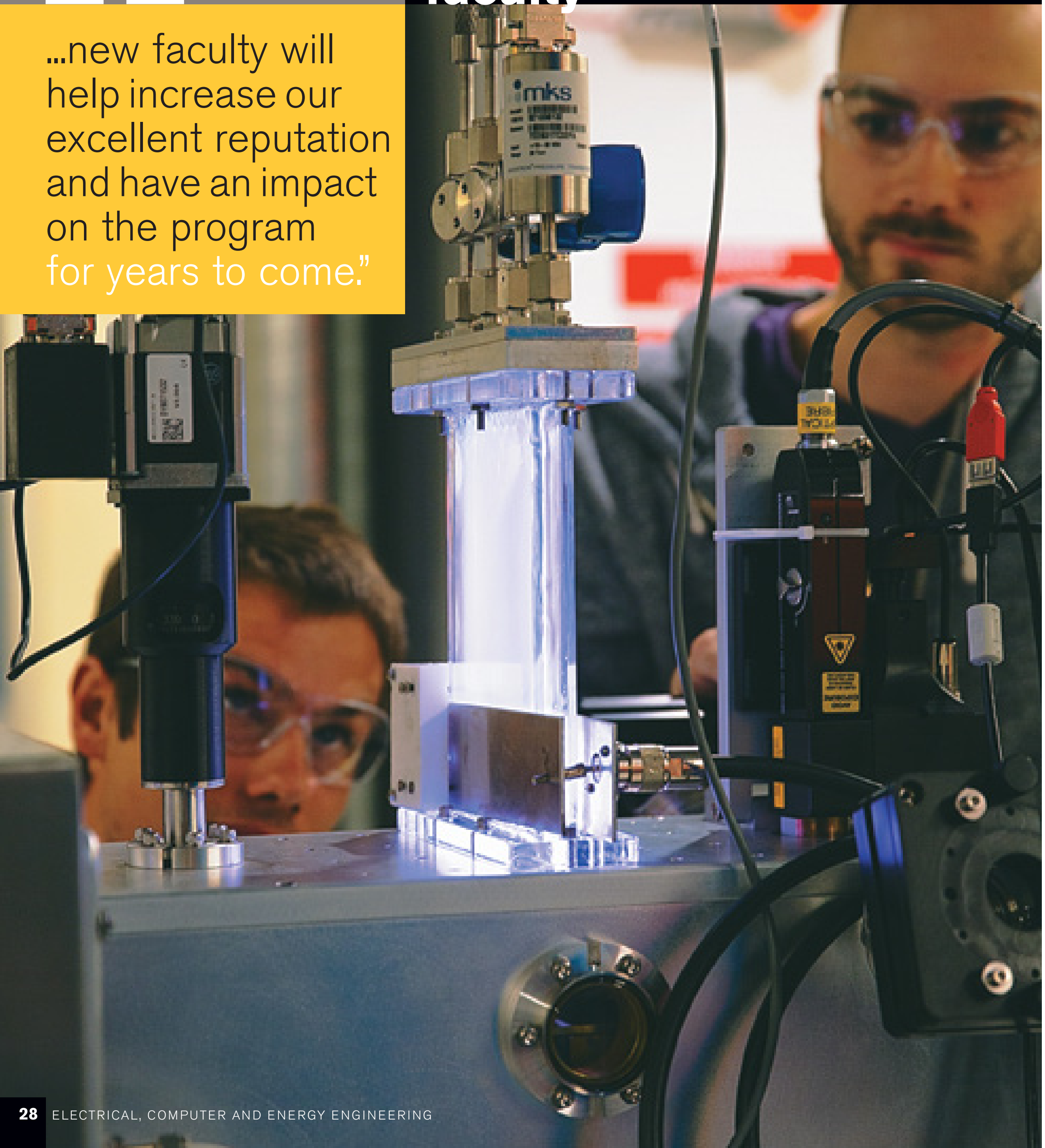
Electrical engineering postdoctoral research associate Xiaonan Shan will assist Tao, along with two graduate students.

The MURI grant is providing $12.5 million over five years to the universities for the entire project, allotting $1 million to ASU for Tao's work.

Competition for MURI grants is intense, with multi-university teams from the science and engineering programs of leading research institutions typically vying for support—only seven of 28 were selected for funding in 2013.

faculty

> "...new faculty will help increase our excellent reputation and have an impact on the program for years to come."



Targeted hiring expands faculty numbers, areas of expertise

As the School of Electrical, Computer and Energy Engineering continues to expand its footprint at Arizona State University and beyond, perhaps nothing is more important to its excellence than the expansion of its faculty. Twelve new hires in the past two years have made the faculty the strongest in the school's history.

Through ongoing, targeted hiring, the school continues to build strength in key areas like photovoltaic science and technology; power systems technology; semiconductor materials and devices; integrated circuits, systems and sensors; digital signal processing, imaging and communication algorithms for sensor technologies; flexible display technology and renewable energy.

"We're enhacing our current strengths, such as the NSF-funded QESST, PSERC, Connection One and SenSIP center, and have grown in new areas, such as advanced semiconductor materials and devices," said Stephen Phillips, the school's director.

These faculty members not only bring critical research skills, but also create core research groups that attract other top-level faculty. Their classroom teaching brings the latest science to undergraduate students. And their mentorship attracts the best graduate students.

"We continue to grow in depth and breadth, and these new faculty will help increase our excellent reputation and have an impact on the program for years to come," Phillips said.

In the past two years, the school has hired:

Visar Berisha, assistant professor, who focuses on digital signal processing and psychoacoustics, the scientific study of sound perception, and heads ASU's Signal Analysis Representation and Perception Laboratory.

Mariana Bertoni, assistant professor, who works in the Quantum Energy and Sustainable Solar Technologies Engineering Research Center and specializes in materials and defects in solar cells.

John Brunhaver, assistant professor, whose research focuses on energy-efficient computing that doesn't reduce flexibility or functionality of mobile devices.

Daniel Bliss, associate professor, whose focus is on adaptive signal processing and information theoretic performance bounds for multisensor systems, primarily for wireless communications.

Srabanti Chowdhury, assistant professor, who works with gallium nitride vertical devices for power electronic application.

Rajib Datta, associate professor, whose expertise includes high-power electronics, particularly in wind and utility-scale applications at multi-megawatt power levels.

Zachary Holman, assistant professor, whose research interests include solar cells, nanotechnology, semiconductors, plasmas and aerosols.

Jennifer Kitchen, assistant professor, who focuses on exotic materials such as gallium nitride and gallium arsenide to create high-efficiency power management systems for solar arrays and batteries.

Oliver Kosut, assistant professor, whose research focuses on security and stochastic systems, with the goal of bringing theoretical insights to bear on complex interconnected systems, such as power grids and communication networks.

Lalitha Sankar, assistant professor, whose research focuses on information privacy in distributed and cyberphysical systems, wireless communications and network information theory.

Lei Ying, associate professor, whose expertise includes developing fundamental models and basic theories for the design of next-generation, large-scale, complex and socially aware information networks.

Yuji Zhao, assistant professor, whose research focuses on improving the energy efficiency of light-emitting diodes (LED) and laser diodes.

Yuji Zhao: Lighting up the future

Yuji Zhao's path toward electrical engineering started in college in his native Shanghai, China. "I was learning about microelectronics and solid state semiconductors," he said. "I visited the lab and developed a passion."

Zhao joined the Ira A. Fulton Schools of Engineering as an assistant professor in fall 2014. His research focuses on improving the energy efficiency of light-emitting diodes (LED) and laser diodes.

Zhao said his passion grew while working on his doctorate at the University of California, Santa Barbara, where he studied with Shuji Nakamura, who developed LED lights and has been called the Thomas Edison of the 21st century.

LED lights are many times more efficient than incandescent bulbs, but the biggest challenge has been "drooping," or the point at which applying more electricity does not give the light the corresponding kick. The light's productivity just seems to plateau.

In his work at Santa Barbara, Zhao discovered that by changing the orientation of the crystal structure in semiconductor films, he could create high-efficiency LEDs with greatly reduced droop.

Zhao said he describes his research to non-engineers using the metaphor of a sandwich.

"The bottom layer is the bread, or what we call substrate," he said. "That's what we use to grow the other layers. Those layers can be beef, chicken or pork. By changing the layers, we get a different device. One way, say with chicken, the device lights up and becomes an LED. Change that layer to beef, and the device becomes an electronic transistor that can sustain extremely high voltage. Make it pork and it becomes a solar cell that absorbs energy rather than emitting it."

Zhao believes the research will greatly improve LEDs, lasers and solar cells for energy efficiency research, but that it also can have applications in new directions, including power electronics and biomedical devices for health and medicine.

In addition to teaching a graduate class in semiconductor optoelectronics, the fundamentals of his own research, Zhao will be setting up a lab tha t will house a $1 million Metal-Organic Chemical Vapor Deposition, or MOCVD, machine, that is used to grow crystalline layers. He will supervise one doctoral student, and hopes to shortly grow his team to 5 to10 people, depending on the funding he may receive. He already has applied for, and is waiting to hear about, several research grants.

When he's not in the lab, Zhao enjoys watching or playing soccer or basketball, or spending time with his wife and new son. Zhao met his wife, Yuli Yan, at UCSB. She has a master's degree in economics and statistics and also is a native of China.

"I'm from southeast China and Yuli is from the middle," Zhao said. "We were lucky to find each other."

Their son, Henry, named for the chancellor of UC, Santa Barbara, was born last November.

Zhao said that, before Henry was born, he and Yan traveled back to China regularly, where Zhao visits his parents and his identical twin brother.

"It's great fun to have someone who looks exactly like you," Zhao said. "We always had each other to watch the midnight soccer games from Europe."

Zhao said he chose ASU because of the energy on campus, the focus on use-inspired research, and the growing team of the scientists in his area.

"We have the top scientists in the field, great funding and support and wise administration," Zhao said. "ASU has momentum, resources and determination. It's going up, and I want to be a part of it. I am very confident of success."

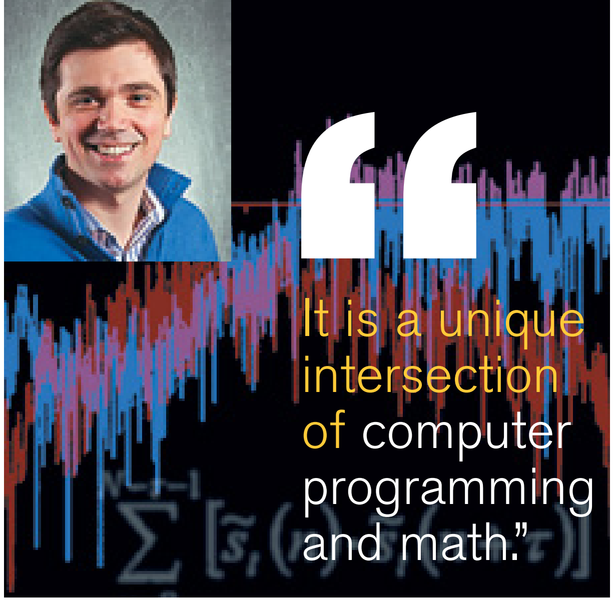
Visar Berisha: Computing our words

Visar Berisha is fascinated with seeing what we hear and manipulating that sound through digital signal processing. His work in psychoacoustics, the scientific study of sound perception, is helping assess patients with neurological disease and could help machines process and analyze human speech.

In fall 2013, he joined ASU as an assistant professor with a joint appointment in the Department of Speech and Hearing Science, part of the College of Health Solutions, and the School of Electrical, Computer and Energy Engineering, one of ASU's Ira A. Fulton Schools of Engineering. He also heads ASU's Signal Analysis Representation and Perception Laboratory.

Berisha was born in Kosovo and moved to the United States in the early 1990s. His father, a professor of electrical engineering in Kosovo, taught math and physics at a community college.

Berisha was a STEM kind of kid. In elementary school, he loved computers, math and science, and at Marcos de Niza High School in Tempe, he belonged to the Math, Engineering and Science Achievement Club and worked on advanced computer programming with ASU students.



It was a toss-up whether he would study electrical engineering or computer science, and he chose electrical engineering at ASU. One of his early classes, digital signal processing, intrigued him.

"It is a unique intersection of computer programming and math," Berisha said. "There are rows of numbers that represent signals. It's easy to see and hear the application of your work. You change something and play it back and you immediately see and hear the difference. The math challenges were exciting as well as the science."

After finishing his bachelor's degree, Berisha went back to Kosovo to work on an Internet service provider startup, then returned to ASU to work on his doctorate in speech signal processing. He finished in 2008, and was named the Palais Outstanding Doctoral Student.

Afterward, Berisha worked for two years at the Massachusetts Institute of Technology Lincoln Lab, focusing on statistical signal processing and machine learning, then moved to Raytheon as principal research engineer, where he was a principal investigator on basic research activities in signal processing and machine learning.

While at Raytheon, Berisha collaborated with Julie Liss, associate dean in ASU's College of Health Solutions and a professor in the Speech and Hearing department, and became inspired by the work they were doing, eventually accepting a faculty position.

"Measuring speech changes is especially important in neuro-degenerative diseases like Parkinson's, Alzheimer's and Huntington's," Berisha said. "One of the first things to go is clean and intelligible speech. The muscle movement required for clear speech is very precise, so when it begins to degenerate, you have a predictor of disease onset or a biomarker for disease progression."

Berisha is working on an automated system in which the patient would speak into a microphone and the speech would be analyzed by a computer. His research is supported by the National Institutes of Health and the Office of Naval Research.

He and his students already have produced Speaklear, a telemedicine device that enables speech-language pathologists to treat patients remotely. It won first place in a contest organized by the Acoustical Society of America and was a finalist in the international Wireless Innovation Project competition sponsored by Vodafone Americas Foundation.

In the next five years, Berisha hopes the research will produce useful tools and be applied in other domains.

He and his wife, Drena, who works in corporate strategy for a local company, have two daughters, Bora, 3, and Hana, 1.

Berisha is fascinated by his daughter's speech development. "Bora used to say 'wawa' for water, and my wife and I still say it that way," Berisha said. "But now, she's started correcting us."

John Brunhaver: Energy-efficient computing

John Brunhaver stumbled into electrical and computer engineering at registration at Northeastern University in Boston.

"My dad was an Air Force pilot, and I thought about aero-astro engineering, but Northeastern didn't offer an aeronautics engineering program," Brunhaver said. "My dad and I took apart computers a lot, and computer and electrical engineering was close to that experience."

During his sophomore year, Brunhaver signed up for a co-op at Intel working on microprocessors and was hooked. He went on to co-op at Intel four more times during college and graduate school at Stanford, where he earned master's and doctoral degrees in electrical engineering.

Brunhaver joined the Ira A. Fulton Schools of Engineering in fall 2014 as an assistant professor at the School of Electrical, Computer and Energy Engineering, where he plans to continue research in energy-efficient computer hardware.

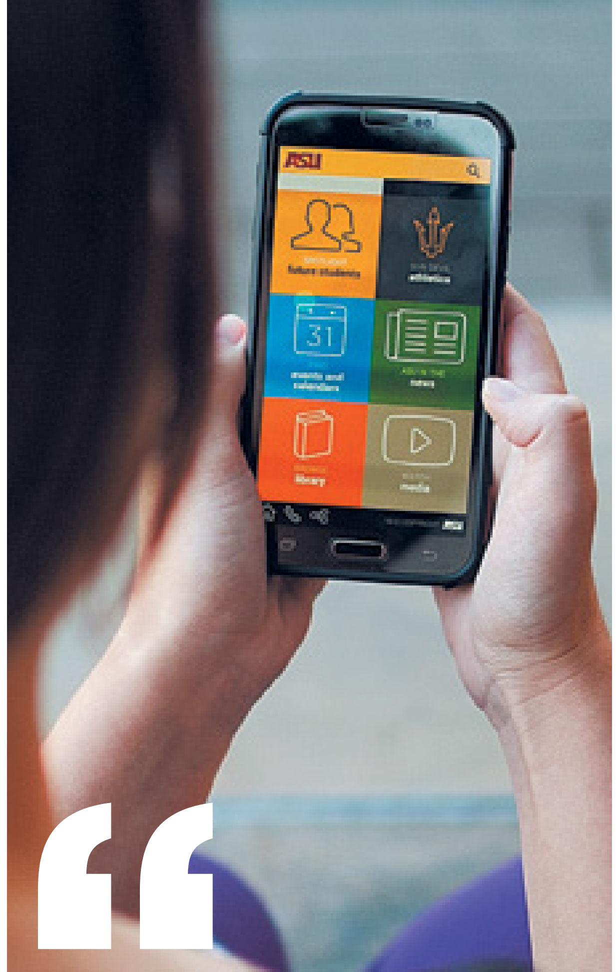
He developed close ties with Intel, NVIDIA and Google at Stanford, and said there is industry interest in the solutions he is pursuing.

"Research in energy-efficient computing is becoming more critical because the devices we use now are energy and power limited, and the efficiency increases we used to get from improved fabrication technology have ended," Brunhaver said.

Still, consumers want cheaper, better, faster, more-efficient devices.

"You can increase efficiencies by having a chip do only one or two things," Brunhaver said. "But that is problematic because of the flexibility that products require and consumers want.

"For example, your phone camera sucks up a fair amount of energy taking the raw information from the sensor and turning it into an image you can see," Brunhaver said.



"Research in energy-efficient computing is becoming more critical because the devices we use now are energy and power limited, and the efficiency increases we used to get from improved fabrication technology have ended."

"You could create an algorithm that increases efficiency by limiting actions to a specific phone. But manufacturers want to put chips into different phones. And consumers, in the future, will want to run different camera apps, similar to Instagram, that simulate more expensive or esoteric cameras. So the chips must have a significant level of flexibility but retain much of their original efficiency."

Bruhnaver's wife, Samantha, has joined the Fulton Schools of Engineering, too, as an assistant professor at the Polytechnic School, where she will teach engineering design and work on issues of persistence in the engineering workforce.

With two engineers in the house, they say their conversations are often engineering related.

"One person will wonder aloud how something works or is made, and then both people are looking through their textbooks and online to figure it out," Samantha said.

They also talk to each other a lot about how to build a strong research narrative.

"Being able to describe the work you're doing is important," John said. "More than experiments, it's about the insight underlying the process. We share our ideas and drafts with one another, to get that sounding board."

They're both big readers, with Samantha picking up magazines, biographies, fiction and non-fiction, and John rifling through Stephen King's *Dark Tower* series, the *Dresden Files* and *Make* magazine.

John also likes to garden, growing bonsai trees from seed. Samantha has given back, serving on the executive board of student organizations and as a K-12 outreach volunteer.

They're renting a house in Gilbert, splitting the difference in their commutes and researching places to hike, bike, and travel.

> No more than one-tenth of one percent of the 400,000 IEEE members from 160 countries are chosen each year as Fellows.

Achievements earn Newman, Reisslein IEEE Fellow status

Outstanding accomplishments in engineering have earned Arizona State University professors Nathan Newman and Martin Reisslein honored status in one of the world's most prominent professional organizations.

They are among colleagues selected as new Fellows of the Institute of Electrical and Electronics Engineers (IEEE). No more than one-tenth of one percent of the 400,000 IEEE members from 160 countries are chosen each year as Fellows.

The IEEE is a leading authority on a wide variety of areas ranging from aerospace systems, computers and telecommunications to biomedical engineering, electric power and consumer electronics.

Newman is on the faculty of the School for Engineering of Matter, Transport and Energy. Reisslein is on the faculty of the School of Electrical, Computer and Energy Engineering.

Newman is being recognized by the IEEE specifically for "for contributions to the development and production of novel thin film materials and devices."

Reisslein is recognized for "contributions to the design and performance evaluation of metropolitan networks and multimedia networking mechanisms."

Newman's research focuses on the growth, characterization and modeling of new solid-state materials for microwave, photonic and high-speed electronics uses. His expertise includes semiconductors, superconductor and dielectric materials, thin-film materials synthesis and materials characterization.

Newman is the Lawrence Professor of Solid State Sciences at ASU and has been director of the LeRoy Eyring Center for Solid State Science at the university His worked has earned him 12 patents, and his more than 200 technical articles have been cited more than 5,000 times by fellow researchers. He won a Van Duzer Prize, an annual award for the best research paper published by the *IEEE Transactions on Applied Superconductivity*. He is also an editor for the journal.

Newman was elected as a Fellow of the American Physical Society in 2006, and chairs the U.S. Committee for Superconducting Electronics.

Before joining the ASU faculty, he was an associate professor at Northwestern University in Illinois, a member of technical staff at the University of California, Berkeley, Lawrence Berkeley Laboratory, and at Stanford University and Conductus, Inc.

Newman earned a bachelor's degree in biomedical and electrical engineering at the University of Southern California, then a master's degree and a doctoral degree in electrical engineering from Stanford University.

Reisslein has made significant contributions to the development and performance evaluation of network architectures and protocols for reliable high-speed Internet access. His research team developed and evaluated a series of metropolitan area networks that exploit advanced photonic communication components for highly efficient transport of Internet traffic.

He has identified the fundamental performance limits of metropolitan area networks, which are often the cause of Internet traffic bottlenecks. He has led the development of strategies for managing the medium-access control and scheduling in optical-access networks that connect individual households and businesses to metropolitan area networks, as well as the integration of access networks with metropolitan area networks.

He is credited for advancing research on multimedia networking mechanisms, making advances in the caching of streaming video in content distribution networks and to collaborative streaming protocols. These video transport and distribution mechanisms help ensure continuous video playback at the receiver.

He developed the first collaborative streaming protocol to base scheduling decisions on the pre-buffered video in the individual receivers for both wireline and wireless networks. The research has provided insights into the performance characteristics of the pre-buffering of streaming video, which is now a common technique for video streaming over the Internet.

Reisslein is associate editor-in-chief of the IEEE Communications Surveys and Tutorials, the top-ranked journal of the IEEE Communications Society. He is associate editor for the Computer Networks journal and the *IEEE Transactions on Education* journal. He earned a doctoral degree in systems engineering from the University of Pennsylvania.

Tao wins prestigious award for innovations in microscopy

Nongjian (NJ) Tao is a winner of the Fourth Annual Innovation Award from *Microscopy Today*.

Each year, just 10 recipients are selected for the prize, which recognizes investigators whose work has made an outstanding contribution to the field. This year, the Innovation Award honored critical advances in light microscopy, scanning probe microscopy, electron microscopy and microanalysis.

"While many people are pushing the spatial resolution of microscopy, we are interested in creating new capabilities to image local chemical reactions at extremely fast time scales," Tao says. "I am glad this effort has been recognized." Xiaonan Shan, a postdoctoral researcher in the Tao lab carried out the experiments.

Tao is director of the Center for Bioelectronics and Biosensors at Arizona State University's Biodesign Institute and a professor in the School of Electrical, Computer and Energy Engineering, one of ASU's Ira A. Fulton Schools of Engineering. He is also the senior sustainability scientist with ASU's Global Institute of Sustainability.

Microscopy Today is the trade magazine of the American Microscopy Society of America. The journal covers the depth and breadth of microscopic imaging techniques and features cutting-edge work from scientists in both the life sciences and physical sciences.

Charles E. Lyman, editor-in-chief of *Microscopy Today*, presented this year's Innovation Awards at the annual Microscopy & Microanalysis trade show in Indianapolis. Innovation Award winners are featured in the current issue of the journal.

The magazine emphasizes that the featured innovations will make imaging and analysis "more powerful, more flexible, more productive, and easier to accomplish."

Tao's award recognizes his development of a revolutionary technique known as Plasmonic-Based Electrochemical Microscopy or P-ECM. The method allows for the imaging of local chemical reactions of individual nanoparticles. To accomplish this, P-ECM determines the electrochemical current density from an optical signal generated from a phenomenon known as surface plasmon resonance, rather than from electrical measurement with traditional electrochemical detection methods.

The procedure involves placing the specimen on a prepared surface, which is coated with a thin metallic film. The sample is then illuminated with polarized light. This causes free electrons (or plasma) to absorb the incident photons, which are converted into a plasmon wave, which travels across the surface of the metal film. When the specimen under study interacts with the plasmon wave, there is a change in light reflectivity, which can be converted into an image.

P-ECM boasts a number of advantages. Chief among these are its speed, (it can complete imaging of samples on micro-second time scales), non-invasive character and compatibility with conventional optical microscopy. These traits allow P-ECM to capture molecular phenomena in living systems, a significant advance in the study of biological features including protein interactions. It may also be applied in the development of new drugs or vaccines, in order to closely observe drug-target or antibody-antigen activity in real time.

Tao's new approach is a label-free method that will enable researchers to observe minute features of specimens as well as study chemical reactions and charge-related properties in living systems with enhanced contrast, (using a modified approach known as P-EIM). The technique's unprecedented speed will permit the imaging of molecular-scale interactions as never before.

Conventional optical microscopy methods can resolve samples down to a few hundred nanometers in size—small, but not sufficient to observe chemical reactions of nano-scaled objects directly. Other methods like atomic force microscopy, which make use of a scanning electrode, are too slow to capture the brisk pace of activity at the molecular scale and may interfere with the phenomena under study.

Tao is currently refining his plasmon-based microscopy under a grant from the Gordon and Betty Moore Foundation. In previous research, his group used plasmonic imaging to examine single cells, cell organelles, viruses and nanoparticles.

His recent advances have extended the method by allowing electrical impedance imaging, significantly increasing image depth and imaging contrast, as well as permitting charge-related properties (for example, the transport of charged molecules or ions) to be investigated in living systems.

NSF CAREER awards advance biosensors, cardiovascular research

Supported by National Science Foundation CAREER Awards, two faculty members are advancing fundamental research that can have significant impacts on disease diagnostics.

Michael Goryll, assistant professor, School of Electrical, Computer and Energy Engineering, is recreating the functionality of a natural ion channel using a solid-state nanopore. Goryll is working to create a more robust, versatile solution using electrostatically controllable solid-state nanopores.

One aspect of his research is gaining a better understanding of how natural channels allow some ions and molecules to pass through the channel, but not others. That knowledge is used to reproduce electric field geometries that repel or attract molecules in a similar way to natural channels. The use of engineered nanopores as biosensing elements is a rapidly developing area. The sensors can be used for a wide range of applications from testing water quality to disease diagnostics.

Goryll cites drug discovery as an area of particular interest. For example, several drugs have been pulled from the market, or denied regulatory approval, due to potentially life threatening reactions including clinical arrhythmia. Preclinical testing for these interactions can only be done by ion channel research.

Goryll and students in his lab have already made advances in ion channel research, including development of an acrylic cup array that allows parallel measurement of four channels at the same time and a multichannel, low-noise amplifier, which allows recording of the extremely small ionic current through the ion channels.

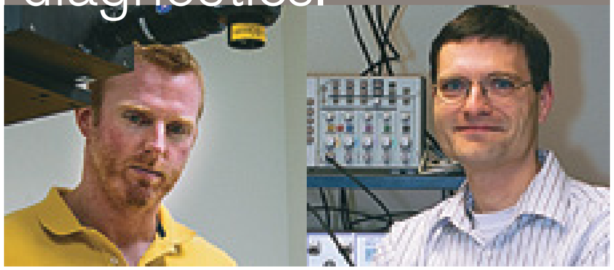
David Frakes will further his research of cardiovascular fluid dynamics and the impact on the onset, progression and treatment of major diseases such as heart disease, stroke and aneurysms. Frakes, assistant professor in the School of Biological and Health Systems Engineering and the School of Electrical, Computer and Energy Engineering, is focusing on advanced simulation and modeling of intracranial aneurysms (ICAs) to help design and execute optimal patient treatments.

ICAs account for approximately 20,000 deaths in the U.S. alone. Current endovascular devices used to treat ICAs have led to a 50 percent reduction in the death rate over the last decade. Frakes' research aims to reduce that even further.

ICA treatment is a relatively tractable fluid dynamic problem, Frakes says. Unlike vessels near the heart that require very complicated simulations, cerebral vessels can be modeled more robustly, which presents an attractive starting point for cardiovascular fluid dynamic research. Yet the general methods developed through this research hold promise for much wider application in disease treatment.

Frakes is using imaging-driven engineering tools, physical and computational modeling, and fluid dynamic measurement and simulation as the methodological basis for development of advanced device-based cardiovascular disease treatment

> "...faculty members are advancing fundamental research that can have significant impacts on disease diagnostics."



Recent Books by Faculty

Adaptive Wireless Communications: MIMO Channels and Networks, by Daniel W. Bliss, Cambridge University Press, 2013

Communication Networks: An Optimization, Control and Stochastic Networks Perspective, by Lei Ying, Associate Professor, School of Electrical, Computer and Energy Engineering at ASU, and Rayadurgam Srikant, the Fredric G. and Elizabeth H. Nearing Endowed Professor of Electrical and Computer Engineering at the University of Illinois.

Electrical Energy Conversion and Transport: An Interactive Computer-Based Approach *(second edition)*, by George G. Karady and Keith E. Holbert, Wiley-IEEE Press, 2013.

Grid Integration and Dynamic Impact of Wind Energy, by Vijay Vittal and Raja Ayyanar, Springer, New York, 2013.

Terawatt Solar Photovoltaics: Roadblocks and Opportunities, by Meng Tao, Springer, New York, 2014.

students

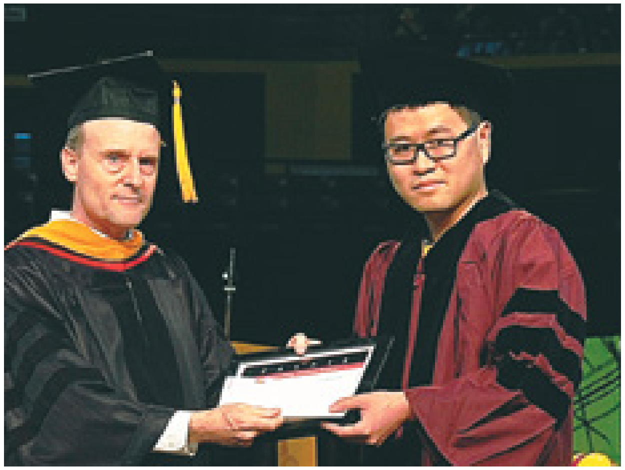
> “135 undergraduate ECEE students also were students at ASU’s Barrett, The Honors College.”

student awards

Palais Outstanding Doctoral Student Award

Professor Joseph Palais, longtime graduate program chair, and his wife, Sandra, established the Palais Outstanding Doctoral Student Award. The award is presented annually to the best graduating doctoral student in the electrical engineering program. Candidates must have a minimum 3.75 GPA and at least one journal or conference publication. Faculty members nominate students within the program each year. The recipient receives $1,000 and a commemorative plaque.

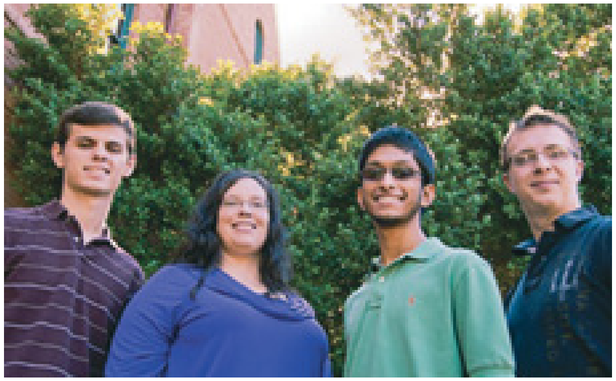
Kang Ding was chosen to receive the 2013-2014 Palais Award. He graduated in spring 2014, and Professor Cun-Zheng Ning was his advisor. Ding has published more than nine journal papers and presented more than 13 conference papers, primarily in the area of metallic and plasmonic nanolasers, while maintaining a perfect 4.0 GPA at ASU. He and his team were the first in the world to demonstrate a room-temperature nanolaser under electrical injection. He graduated from Peking University in spring 2008 with an undergraduate degree.



IEEE Power and Energy Society scholarships

Four Fulton Engineering undergraduate students received scholarships from the IEEE Power and Energy Society (PES) in the inaugural round of the Scholarship Plus Initiative™. Carrie Culp, Abhishek Dharan, Anthony Pelot and Alban Shemsedini are among approximately 93 recipients chosen from 51 U.S. universities. ASU had the second highest number of recipients in the nation.

The PES Scholarship Plus Initiative™ is a new program established to attract high quality engineering students to the power and energy field. The industry faces challenges of responding to enormous growth, replacing aging infrastructure and adapting to new green technologies—challenges compounded by a projected energy workforce shortage.



doctoral graduates

Summer 2014

George Kunnen, *TFT-Based Active Pixel Sensors for Large Area Thermal Neutron Detection.* Chair David Allee

Edgar Marti-Arbona, *Integrated Distributed Power Management System for Photovoltaic.* Chair: Sayfe Kiaei

Lloyd C Breazeale, A Double Grounded Transformerless Photovoltaic Array String Inverter with Film Capacitors and Silicon Carbide Transistors. Chair: Raja Ayyanar

Cheng Chen, *Portable Wireless Sensors for Personal Exposure and Environmental Monitoring.* Chair: Nongjian Tao

Helen Schwerdt, *Fully Passive Wireless Acquisition of Neuropotentials.* Chair: Junseok Chae

Revak R. Tyagi, *Performance Models for LTE-Advanced Random Access.* Chair: Martin Reisslein

Spring 2014

Sunil Desphande, *Optimal Input Signal Design for Data-Centric Identification and Control with Applications to Behavioral Health and Medicine.* Chair: Daniel E. Rivera

Nishant Chandra, *Nanowire Speciality Diodes for Integrated Applications.* Chair: Stephen Goodnick

Kang Ding, *Fabrication and Characterization of Metallic Cavity Nanolasers* Chair: Cun-Zheng Ning

Hai Huang, *Molecular Electronic Transducer-Based Seismometer and Accelerometer Fabricated With Micro-Electro-Mechanical Systems Techniques.* Chair: Hongyu Yu

Xing Wei, *Object-Based Pon Access and Tandem Networking.* Chair: Martin Reisslein

James Bridgewater, *Photovoltaic Characterization of Porphyrin and Porphyrin-Fullerene Electropolymers.* Chair: John Gust

Srenivas Varadarajan, *Texture Structure Analysis.* Chair: Lina Karam

Song Zhang, *Improved Grid Resiliency through Interactive System Control.* Chair: Vijay Vittal

Hongwei Mao, *Exploring the Neural Code in Rat's Agranular Medial and Agranular Lateral Cortices during Learning of a Directional Choice Task.* Chair: Jennie Si

Chengen Yang, *Improving the Reliability of Non-volatile Memories Flash memory, PRAM and STT-MRAM.* Chair: Chaitali Chakrabarti

Garrett J. Schlenvogt, *Total Dose Simulation for High Reliability Electronics.* Chair: Hugh Barnaby

Jongwon Lee, *Advanced Hybrid Solar Cell Approaches for Future Generation Ultra-High Efficiency Photovoltaic Devices.* Chair: Christiana Hongberg

Junghoon Lee, *Large-scale Wireless Networks: Stochastic Geometry and Ordering.* Chair: Cihan Tepedelenlioglu

Adithya Rajan, *On the Ordering of Communication Channels.* Chair: Cihan Tepedelenlioglu

Srikanth Sridharan, *Multidisciplinary Optimization for the Design and Control of Uncertain Dynamical Systems.* Chair: Armando Rodriguez

Yuan Yuan, *Rats Motor Cortical Activities Underlying Cognitive Learning*. Chair: Jennie Si

Fall 2013

Stanislau Herasimenka, *Large Area Ultrapassivated Silicon Solar Cells Using Heterojunction Carrier Collectors.* Chair: Christiana Honsberg

Bin Zhou, *Codoped Zinc Oxide by a Novel Co-Spray Deposition Technique for Solar Cells Applications*. Chair: Meng Tao

Pradeep Dandamudi, *Resistance Switching in Chalcogenide based Programmable Metallization Cells (PMC) and Sensors under Gamma-Rays.* Chair: Michael Kozicki

Tathagata Ray, *Low Power, High Throughput Continuous Flow PCR Instruments for Environmental Applications*. Chair: Aaron Youngbull

Steven R. Miller, *Multipath Mitigating Correlation Kernels for Direct Sequence Spread Spectrum Receivers*. Chair: Andreas Spanias

Daniel W. Huff, *Adaptive Methods within a Sequential Bayesian Approach.* Chair: Antonis Papandreou-Suppappola

Ahmet Cemal Durgun, *Analysis, Design, Simulation, and Measurements of Flexible High Impedance Surfaces.* Chair: Constantine Balanis

Hao Wu, *Integrated Inductors with Micro-patterned Magnetic Thin Films for RF and Power Applications*. Chair: Hongbin Yu

Alix Y. Rivera-Albino, *Performance Enhancement of Space-Time Adaptive Processing for GPS and Microstrip Antenna Design Using Ferrite Rings.* Chair: Constantine Balanis

Haojun Luo, *Design of a Low Power and Delay Multi-Protocol Switching System for IO and Network Virtualization.* Chair: Yu Hui

Robert Santucci, *Energy-Efficient Distributed Estimation by Utilizing a Nonlinear Amplifier*. Chair: Andreas Spanias

Anna J. Malin, *Adaptive Learning with Unsupervised and Semi-Supervised Clustering of Immune Response Using Microarray Random Sequence Peptides.* Chair: Antonia Papandreou-Suppappola

Craig R. Bush, *A Single-Phase Current Source Solar Inverter with Constant Instantaneous Power, Improved Reliability, and Reduced-Size DC-Link Filter*. Chair: Raja Ayyanar

Ahmad Dashtestani, *A Fast Settling Oversampled Digital Sliding Mode Controller for DC DC Buck Converters.* Chair: Bertan Bakkaloglu

Christopher MacGriff, *Small Molecule Detection by Surface Plasmon Resonance; Improvements in Sensitivity and Kinetic Measurement.* Chair: Nongjian Tao

Jounghyuk Suh, *Programmable Analog Device Array (PANDA): A Methodology for Transistor-Level Analog Emulation.* Chair: Bertan Bakkaloglu

Joel Steenis, *Modeling and Control for Microgrids.* Chair: Raja Ayyanar

Vivek Sharma, *Study of Charges Present in Silicon Nitride Thin Films.* Chair: Stuart Bowden

Jared Scott Becker: Seeking academic rigor and versatility

Jared Scott Becker may look like he sailed through college: honors student, scholarships, 4.0 GPA. But he admits it wasn't always easy.

"There were many times when I thought I would not prevail in engineering," Becker said. "But I persevered because I knew the rewards would outweigh the difficulty of the rigorous program."

In spring 2014, Becker was named the Outstanding Graduate in Electrical Engineering.

Becker was born in Highlands Ranch, Colorado, and graduated from Highlands Ranch High School. He chose ASU for Barrett, The Honors College, the Fulton Schools of Engineering and the exceptional value.

"There is no better educational value at any other university in the country," Becker said. "Barrett has the ability to take a university with tens of thousands of students and give the feeling of a school with only a couple thousand students."

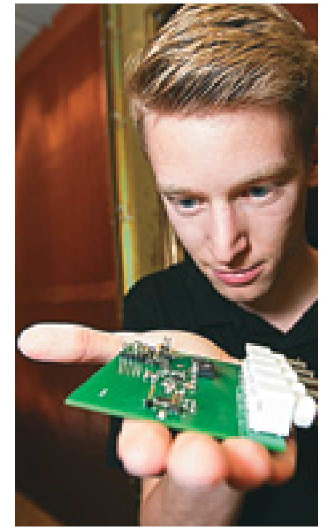
Becker chose engineering for its academic rigor and versatility. "Engineering has kept me intellectually engaged and has pushed the limits of what I thought I was capable of," Becker said. "I knew if I stuck with it, I would have no limit in my career choices."

Becker received the New American University Scholarship—President's Award, the IEEE Phoenix Section Student Scholarship – Dieter Schroder Award, and the International Switching Symposium Endowed Scholarship.

He received the Outstanding Award for Calculus from the ASU Math Department and was chosen for the selective Mayo Clinic Premedical Scholars Program.

Through the Fulton Undergraduate Research Initiative (FIRI) program, Becker has worked to design an amplifier for a solid-state nanopore DNA sequencing device.

"FURI has given me the opportunity to improve my skills in public speaking, networking, and demonstrating my research to an audience," Becker said. "I also have gained experience in technical writing, research skills, critical evaluation of nontrivial concepts, and bench work in the lab."



Becker is a member of IEEE and Eta Kappa Nu, and served the community through the Barrett Talent Match and Barrett Page Turners programs. He has also held a job as a community assistant in the engineering residential community at Barrett for three years.

Becker said the most rewarding part of ASU has been the relationships he's built with friends and faculty, a skill he learned while playing whist, pinochle and bridge with his grandparents and family members.

"The card games help me build relationships with people I love to spend time with, and the games have a competitive nature, which is a strong trait of mine," he said. "It is something I will be able to do throughout my life, and I hope to teach my children how to play as well one day."

At ASU, Becker said, he has developed relationships he will cherish for a lifetime.

"From faculty members, to my senior design group and residents of the honors college, the people I have had the pleasure to connect with have been the most fulfilling part of my college experience," he said.

Becker hopes to work in the San Francisco Bay Area at an engineering company that will support graduate work, and someday hopes to start his own company.

"I would like to work with medical prosthetics," Becker said. "There would be nothing more exciting for me than to be a part of a group that impacts the lives of individuals."

Father and daughter share graduation day

Karl Lauk recalls that at one time he had told his daughter Stephanie she might want to reconsider her plans to study electrical engineering in college.

He had been working in the semiconductor field for many years after earning an undergraduate degree in electronics engineering technology from the Oregon Institute of Technology in 1989. But as the economic recession hit several years ago, he was seeing business slow down in the electronics industries that had been keeping many electrical and electronics engineers employed.

Karl had been thinking about retraining to earn qualifications for other types of jobs. At about that time, the medical device company he had worked with for 20 years outsourced his job.

So in 2010, a year after Stephanie began undergraduate studies at Arizona State University, Karl followed by enrolling at ASU to pursue a master's degree.

Attracted by fun of engineering Stephanie had decided not to heed her father's warning. She chose to major in electrical engineering. Karl had decided that advanced education in the field was a surer path to a new job than starting over in another area.

Thus, the two Lauks were on the roster of students in the electrical engineering program in the School of Electrical, Computer and Energy Engineering.

Stephanie's interest in the field had been stoked when she and a fellow Gilbert High School robotics team member competed in SkillsUSA events—winning a statewide robotics competition one year and placing seventh and third in national competitions in consecutive years. She had cofounded the school's robotics team and served as its vice president.

Stephanie found electrical engineering to be her kind of fun: something complex and challenging that tested her mental acuity and her willpower.

While still in high school she did a summer internship at Foresight Technologies, an engineering and manufacturing company based in Tempe, Arizona.

Her impressive academic record and achievement test scores in high school earned her support for tuition at ASU through the Arizona Board of Regent's High Honors Tuition Scholarship (called the AIMS Scholarship).

Learning experiences At ASU, she expanded her knowledge of robotics technology by contributing to a project to develop a miniature submarine for oceanographic and glacier studies in the Antarctic.

She gained expertise in communications technology and assisted in research exploring problems arising from the use of recycled electronic parts in new products.

One year she was one of only three ASU students accepted into the Korean University International Summer Campus, an academically intensive study-abroad program, where she studied the Korean language and game theory.

Karl had used his undergraduate engineering education to find fulfilling roles as a process and manufacturing engineer. He went back to school after two decades to build on those career experiences.

Among highlights of his ASU experience, he said, was getting to apply circuit principles he was learning in graduate courses directly to his work manufacturing electronic control devices used by law enforcement.

Seeing benefit of advanced degree Once father and daughter were simultaneously ASU students, they soon found themselves spending more time together.

They carpooled to and from the family home in Gilbert to ASU's Tempe campus and often ate lunch together. They shared experiences after long days going to

"...a really cool thing, getting to graduate with my daughter.."

Elliot Hanson: Born to engineer

Elliot Hanson, Distinguished Graduate in Electrical Engineering for spring 2014, knew from an early age that he wanted to be an engineer.

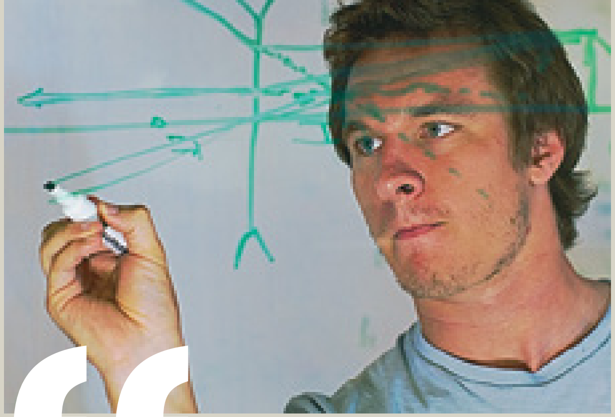
Elliot Hanson was born in San Francisco, but grew up in Albuquerque. He graduated from a small college-preparatory high school, the Albuquerque Academy, where he was an all-state baseball player, winning the New Mexico state championship in his junior year.

"I came to ASU for its size," Hanson said. "Albuquerque Academy was a small high school where everyone knew each other's names, so I knew I wanted to experience a large school. Naturally, I chose the largest. Also, Barrett, The Honors College was appealing, as well as the engineering school."

Hanson knew from an early age that he wanted to be an engineer. "My dad is a structural engineer in Albuquerque, so I was interested in civil engineering from an early age," he said.

While shadowing electrical engineers at Boeing's office in Albuquerque, he decided that was his calling.

"The overriding reasons for my decision being the fact that electrical engineers are involved in just about every



> "...electrical engineers are involved in just about every possible engineering project, to some degree."

possible engineering project, to some degree, and that the stuff the electrical engineers were doing at Boeing was so cool," Hanson said.

Hanson, a Barrett student, received the New American University Scholarship— President's Award, as well as the Dean's Exemplar Student Scholarship. He maintained a 3.87 GPA and has been on the Dean's List for all but one semester. He also was nominated for the Greater Phoenix Area eWeek Engineering Student of the Year in 2014.

Hanson has been on the men's rugby team, and is president of the ASU chapter of IEEE-Eta Kappa Nu, the electrical engineering honors society.

"My biggest achievement as a member of Eta Kappa Nu was being able to represent the ASU chapter as an officer at the 2013 National conference, hosted by ASU," Hanson said.

Hanson said the most rewarding, and most challenging, part of his studies has been his senior design project, which required "learning on the fly," with professors Rodolfo Diaz and James Aberle, both associate professors.

After graduation, he plans to work on a master's degree in electrical engineering through the integrated bachelor's and master's degree program after a summer internships at Raytheon Missile Systems in Tucson, Arizona. He hopes to work in the defense industry.

"My long-term career aspirations are to have a career in an ever-evolving field so I can continue to build my knowledge, and have a satisfying work career," he said.

classes, working on lab assignments and extracurricular projects, and doing research. In the evenings, Stephanie would sometimes consult with her father when she needed help with a tough homework project.

The routine changed somewhat when at the end of 2010, as Karl was finishing a second semester of graduate studies, he was hired for a new job and had to continue studies on a part-time basis.

He took on a senior manufacturing engineer role for Scottsdale-based Taser International, an industry leader in personal safety technology.

For Karl, it was a payoff on the value of an advanced degree in engineering even before he had completed the program. "When I interviewed for the job and was asked what I had been doing since leaving my previous job, I told them I was studying for a master's degree at ASU," he explains. "I am certain that was a positive factor in the company's considerations about hiring me."

Interruption led to 'cool thing' Had he been able to remain a full-time student, Karl would have been on track to complete the master's degree program in two years, by 2012. But his progress was set back by more than just having to switch to taking classes part-time.

Karl, who had just turned 50, was preparing to take his final master's of science in engineering exam in fall 2013 and graduate at the end of the semester, when his doctor discovered he had "a pretty serious heart murmur."

He was soon undergoing heart valve repair surgery and a month-and-a-half-long recovery. "I was really caught off-guard," he said. "I had never been hospitalized for anything in my life up until then."

The surgery was a success, and he was back in good health in time to complete his master's degree final exam this semester.

The delays resulting from finding a new job and heart surgery, he said, "did lead to a really cool thing, getting to graduate with my daughter. That has to be a rare event."

Family's ASU connection Now the two new graduates have joined Stephanie's mother and Karl's wife of 30 years, Wendy, an ASU alumni. *(continued...)*

Wendy Lauk earned an education degree from ASU in 1998 with *summa cum laude* honors, and also won an outstanding student teacher award. She has been teaching English-as-a-second-language (ESL) courses in the Gilbert school district for more than 15 years, recently switching to teaching second-grade students.

In addition to what she learned in her education studies at ASU, Wendy had first-hand experience in understanding the needs of ESL students. English is Wendy's second language. She immigrated to the United States from Korea when she was 14, and said she remembers how difficult it was to learn a new language and assimilate into a new culture.

The Lauks other daughter, Krystal, attended ASU as an art and English Literature major and now works as an art illustrator and designer for a California web-based advertising agency.

Daughter off to begin career There was be little time after graduation ceremonies for the family to celebrate the father-and-daughter accomplishment. Only two days later Stephanie moved to Colorado to begin her first job as a professional engineer.

She is a products-testing engineer for a startup called Revolv. She has a role in helping to refine the company's new "universal smart home hub and app," technology that enables users to connect and control all of a home's automated devices and systems with a single app.

Stephanie said she intends to accumulate a significant number of years of industry experience before following in her father's footsteps and returning to school to earn her own master's degree.

She does, however, expect that she will best her father by achieving that goal much sooner than at age 51.

Electrical engineering offers online program unique in country

The School of Electrical, Computer and Energy Engineering offers its nationally recognized ABET-accredited, undergraduate, electrical engineering program in an online format. As of press time it is the only bachelor's level engineering program accredited by ABET as 100 percent online.

Demand for the program is very strong, with enrollment doubling each semester, from 100 in fall 2013, the first semester the degree was offered, to 200 in the spring semester, to more than 400 in fall 2014.

"We've experienced unexpectedly strong enrollment growth," said Stephen Phillips, professor and School director. "There is great demand."

Phil Regier, dean of ASU Online, said enrollment will continue to increase.

"There's no top end on the size of the program," Regier said. "We haven't even begun to seriously tap into partnerships with industry. We purposely haven't gone full bore until all the courses are built."

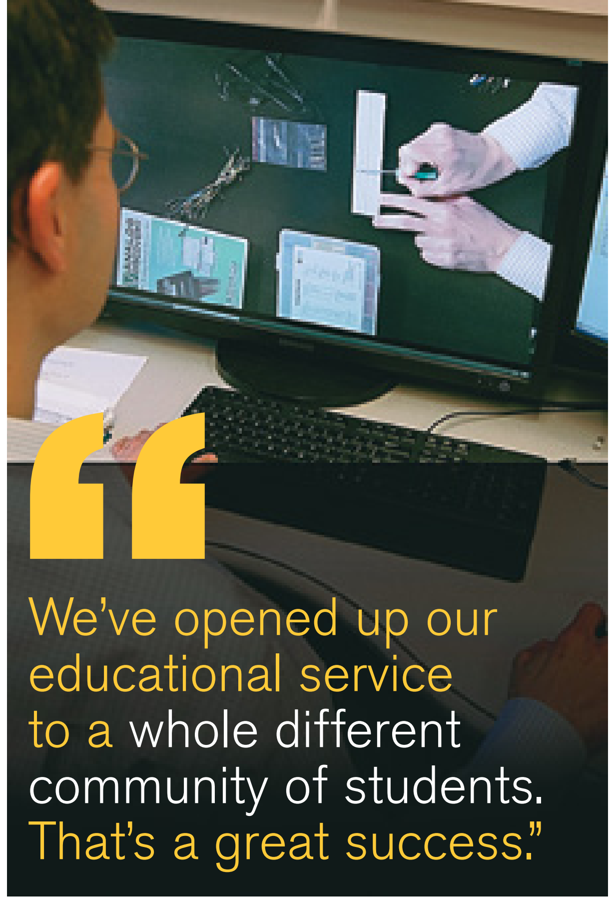
Phillips said he began seriously considering online program options when massive open online courses, or MOOCs, captured considerable attention in 2012.

"I saw the increasing numbers in MOOCS, and I started to think about the impact this would have on engineering education," Phillips said. "I wanted to figure out the right way to do it, and I decided that offering the entire degree online would be the best option for our program and it would be distinct from the MOOC approaches."

ASU already was a leader in online education, and had already begun to develop online classes in math, physics, language arts and social sciences, all building blocks of the electrical engineering degree.

Regier, a champion of the value of online education to society, said he was excited to take on the challenge of the electrical engineering program and its unique labs.

"There are tens, if not hundreds of thousands of people working in engineering positions who do not have the ability to attend a brick-and-mortar institution to get a degree and advance their career," Regier said.



"These students are very different. They're not 21 years old. They average about 33, with years of experience at companies or in the armed forces, and now they want to add academic credit and training to their skill set."

Phillips and a group of the electrical engineering faculty worked with instructional designers to create a plan for the specific additional courses needed. Creating online coursework that met the accrediting requirements for the existing program was challenging, especially for the lab work.

For some courses, students use a hardware kit that connects to their computer and allows them to create and test electrical circuits. For other courses they log on through the web to use dedicated equipment in ASU labs.

Michael Goryll, assistant professor, who helped pioneer one of the courses, recently finished teaching the first online lab course over the summer, and deemed it a success.

"We've opened up our educational service to a whole different community of students," Goryll said. "That's a great success."

The summer course, taught in a 7.5 week session, had a widely diverse student makeup from beginners to highly skilled, Goryll said.

"I had lab reports that far exceeded any that I have gotten in face-to-face classes," he said.

Goryll said that online courses must be carefully planned, with video lectures reading assignments, homework and quizzes closely aligned in content.

"It's not something you record, hit the launch button and it goes by itself," Goryll said. "The students appreciate and expect interaction with the instructors."

That interaction is one of the biggest challenges, Goryll said. "In a face-to-face class, students can come up after a lecture to ask questions," he said. "Online, we have to use different mechanisms."

Goryll said that online discussion boards have proved invaluable, with students using them regularly to communicate with each other and ask questions of the instructor.

"We try to respond to questions within a day," Goryll said. "They can't wait a week."

Goryll said he was pleasantly surprised at how well students could follow online instructions, and at the persistence of students, with a completion rate comparable to the face-to-face version.

Challenges include creating more automated grading, counseling students about time management and the rigors of a 7.5 week lab course, which moves at a brisk pace.

Regier and Phillips said it was essential that students have the same requirements and experiences as those taking face-to-face engineering courses.

"We offer a top-flight, nationally recognized engineering degree," Regier said. "Steve would not have allowed anything less."

Regier also was excited to offer electrical engineering online, because it gives him leverage when talking to faculty in other disciplines.

"It has given us great credibility," Regier said. "Once we're offering electrical engineering, it's difficult for someone to say it's too hard to offer their courses."

Regier said the curriculum of online programs is exceptional.

"Online learning technologies have improved rapidly over the past eight years," Regier said. "You used to have to dissect a cadaver to learn anatomy and physiology, but now the technology overlay and the richness of the digital content is incredible."

ASU also is working on improving social networks for online students to help them feel part of the university community.

"It's not just getting the classes," Regier said. "Anything we provide on-ground, we're trying to offer to online students, including meet-up places in their hometown, getting them connected on alumni chapters, communicating on a regular basis, getting them ASU news, even streaming football games."

Regier said that Starbucks, which recently partnered with ASU to offer online classes to employees, will have online learning centers with dedicated study tables in some of its stores this fall.

Online students must meet the same admissions standards to enroll and complete the same rigorous requirements to earn a degree.

"Student engagement is at least as intensive as in a face-to-face class," Phillips said. "It takes a lot of time for the instructor. In addition to the class discussion boards, some faculty members have scheduled office hours using Skype, and students also communicate through phone calls and email."

Phillips said he measures success two ways.

"First, are we providing access to a degree program to students who couldn't otherwise take it? We are doing that. Second, are students persisting in the program to graduation? We won't know that for a while, but so far we don't see alarming dropout rates."

Regier said that online students are often juggling work, parenting and caregiving, and so may have breaks in their studies and take longer to complete degrees.

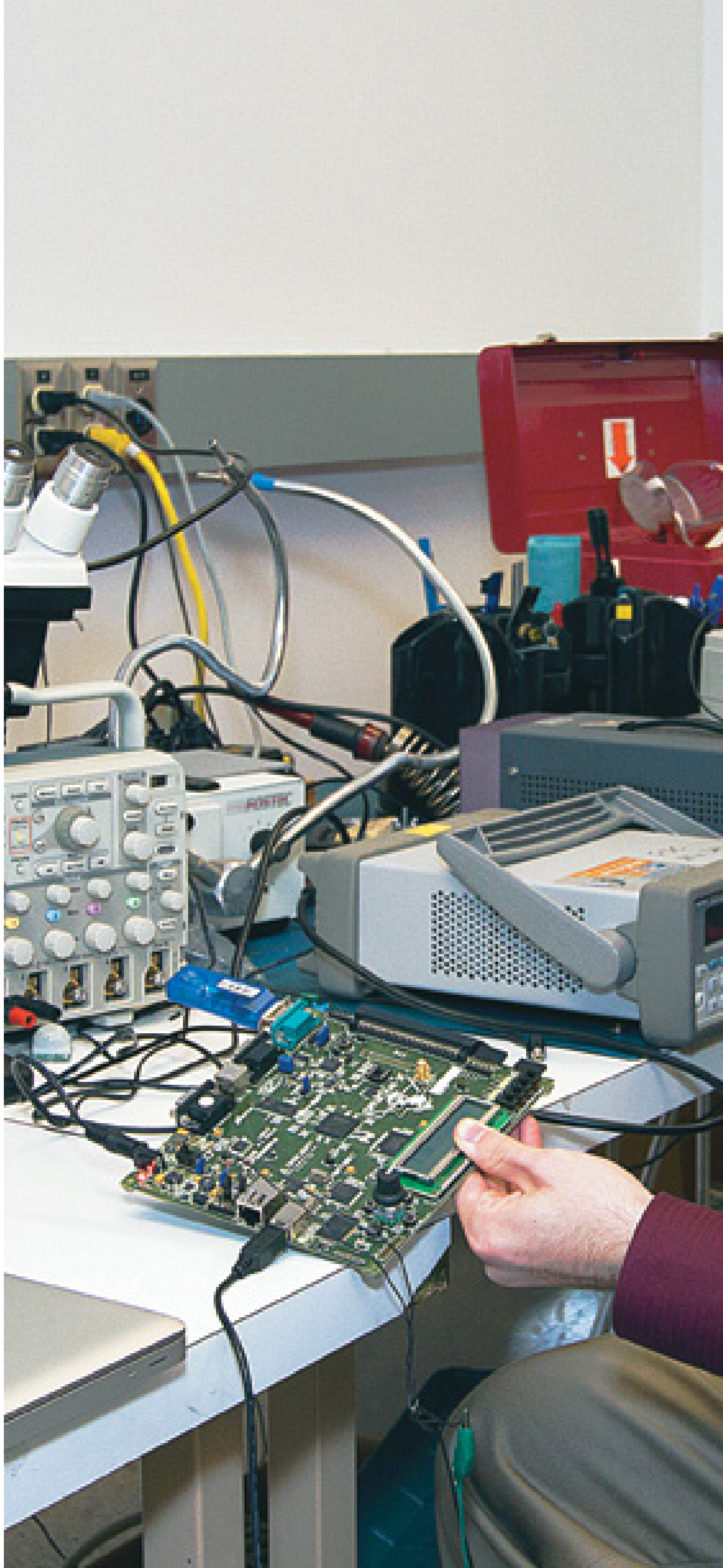
An additional benefit of the online program is the integration of online teaching techniques in face-to-face classes. With the digital presentation tools, instructors can create animations and movies, record lectures and provide online interaction.

"A lot of it is transferable," Regier said. "Faculty members are figuring out that putting lectures online isn't a bad way to do it. Students come to class already having the information, allowing deeper discussion. And faculty will have more time for other responsibilities, like research."

Regier said that an additional 120 students are enrolled in the School of Computing, Informatics, and Decision Systems Engineering's management program, and several hundred in three programs at the Polytechnic School: technical entrepreneurship, software engineering and information technology.

He predicts that, in the future, face-to-face learning will be mainly for 18-24 year olds, while nearly all adult learning will be online, and digital learning tools will be used in both areas.

"In the future, everything will be hybrid," Regier said. "Classrooms will be enriched by digital tools, including efficiencies, assessments, better ways of grading."



"It enhances your résumé, proves you are capable of original work, and is a great topic of discussion in an interview."

Senior Design Laboratory develops teamwork, research skills, independence

Before graduation, all students in the School of Electrical, Computer and Energy Engineering are required to complete a team project in the two-semester Senior Design Laboratory class.

"Senior design is different from most courses taken in the electrical engineering major because of the focus on independent and creative work," said Brett Larsen, a senior electrical engineering and physics major who will soon choose his own team project and has collaborated on two projects of previous seniors.

In the senior design lab, students form teams of four and select a faculty mentor. They can then choose a project related to the faculty member's research or develop an idea of their own. Over the course of the year, the project is completed in team meetings organized by the students and their mentors. The students also have a weekly class to work on effective technical writing and project planning, as well as discussing post-graduate opportunities.

"Rather than solving textbook problems or working on smaller design challenges, this class allows students to explore their own interests through a sustained, open-ended project," Larsen said. "Most of the work is done by the students on their own time and is guided by interests of both the students and faculty member."

Larsen said that the senior design lab helps students learn how to work in a team, communicate their ideas, independently manage a project, and write an effective technical proposal, all skills essential for engineers in industry and academia. Also, working on an original project sets students apart when applying for jobs or graduate school.

"It enhances your résumé, proves you are capable of original work, and is a great topic of discussion in an interview," Larsen said.

Larsen explained the project work is similar to other undergraduate research opportunities such as the Fulton Undergraduate Research Initiative (FURI), but with a stronger emphasis on small teams of students rather than individual work.

Larsen recently was awarded a Goldwater Scholarship, the nation's premier award for undergraduates studying science, math and engineering. He spent the summer of 2014 researching at CERN in Geneva, Switzerland, and the previous summer at Sandia National Labs in Albuquerque, New Mexico.

An Honors student, Larsen started researching in ASU's Flexible Display Center as a freshman, developing ultra low-power circuits and applying advanced signal processing techniques to personnel detection around secure areas. His research has also expanded to other areas of applied mathematics, such as identifying proteins passing through silicon nanopores and analyzing measurements taken with an electric field sensor.

The project focused on the use of nanopores in the development of biosensors for various applications was for a senior design lab team that included students Jared Becker, Abhishek Dharan, Josh Lambert, and Josh Sloan.

"Nanopores are small holes created either by natural processes or in synthetic materials such as silicon, and these holes can be used to detect many different biomolecules," Larsen said. "The nanopore is placed in a solution, an electric field is set up across the hole, and the current is measured to look for the characteristic changes in resistance caused by certain biomolecules. The resulting signal is typically very small, however, and thus sophisticated electronics and signal processing must be used to extract the data."

The senior design team worked on the development of the nanopore and a broadband amplifier to effectively increase the signal to a level that can be used by other electronics.

Larsen worked on signal processing algorithms for distinguishing when a molecule passed through the pore from when it simply bounces off and how these algorithms could be programmed onto hardware for more efficient collection of data.

A second project Larsen worked on was focused on electric field sensors for the senior project team consisted of students Jake Sciacca, Wei Dong Ye, Keegan Scowen, and Sandeep Vora, working under the direction of David Allee.

"The team constructed a basic electric field sensor using commercial off-the-shelf electronics and an inexpensive lock-in amplifier to extract the E-field signal from the noise," Larsen said. "They have detected fields down to an impressive 1V/m at 97Hz."

The team also developed a micro-air vehicle to carry the electronics to monitor power lines in case of outages during storms or natural disasters. Tests with the micro-air vehicle will be done indoors due to FAA restrictions.

Larsen also has worked on ground sensors that could have promise for military uses.

"With a seismic or electric field sensor, you want to be able to tell the difference between a person and an animal," Larsen said. "Beyond that, you want the software to analyze data to find features like how far apart the footsteps are, what the gait pattern is, how strong the footsteps are, and anything else you can see in the data."

The ultimate goal: sensors on flexible materials that can meet a variety of form factors for different products.

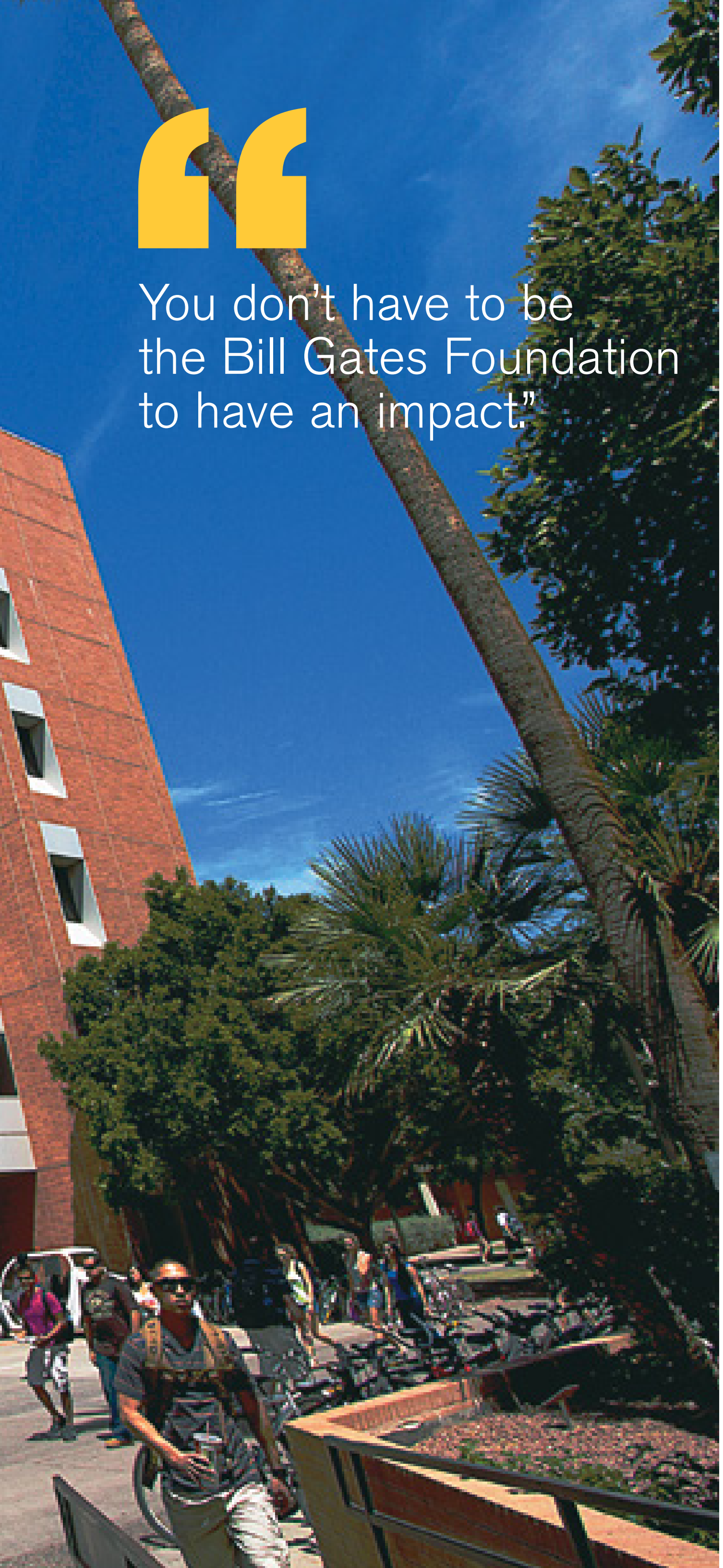
Larsen, who already has presented papers at national conferences, hopes to earn a doctorate in physics, conduct research in mathematical modeling for national security applications, and teach at a major university.

Larsen said that working closely with a faculty member is one of the most beneficial parts of the senior design lab.

"All the faculty members I have worked with have been very approachable and more than willing to provide advice and guidance on the project," Larsen said. "Engineering professors are also invaluable sources of advice on looking for a job or applying to graduate school.

"They often have an insider's perspective on how your field is developing and may even be able to recommend employers or advisers for future research. In addition, working in a senior design team introduces you to the professor's research and may provide opportunities for a future project together."

community



"You don't have to be the Bill Gates Foundation to have an impact."

Alumnus gives back: 'Everybody should'

Charles "Chuck" Wheeler says he uses the problem solving skills he learned in graduate school at Arizona State University every day, and he is thrilled to donate to the Senior Design Laboratory at ASU's Ira A. Fulton Schools of Engineering to help undergraduates learn those same skills.

"ASU is a public university, there for the public good," Wheeler said. "It helped me, supported me as a graduate student. I feel a responsibility to give back in the ways I can. I hope everybody feels that way."

Wheeler grew up in Portland, earned his bachelor's degree in materials science from Stanford, and came to Fulton Schools of Engineering for his master's and doctorate in electrical engineering, finishing in 2000.

"As a graduate student, ASU wants you to solve a really hard problem from beginning to end," Wheeler said. "Your advisor calls you into his office and tells you to create the world's best 'xyz.' It's supposed to be difficult and take some time to figure out. At some point, you throw your hands up in the air because it seems hopeless, but you keep walking through it, and solve it.

"ASU does a good job of giving you the tools to work through those kinds of challenges."

Wheeler founded 3P Motor Controls, his third company, in 2010. Based in Tempe, it specializes in industrial controls, the bulk of which are for water-pumping and telemetry applications.

"We're a small company that we bootstrap financed, which means we're always in poverty," Wheeler said. "But we're in a growth mode. As an ASU engineer, I would like to think that we are creating jobs in Arizona and developing relevant technology in our industry.

"We have one project, a solar water pump controller that we have very high hopes for. We have the first 10 production units out in the field, and they're performing well. We think there's a big market for it."

Wheeler's support of ASU comes through The Wheeler Foundation. The foundation was started by Wheeler's grandfather, Coleman, who owned Willamette Industries, a forest products company that became one of Oregon's two Fortune 500 companies. Wheeler's father, Sam, ran it until his death a few years ago, and now Chuck and his three brothers manage it.

"The Wheeler Foundation is a fairly small fund," Wheeler said. "We don't have a lot of money. We don't write big checks to anybody because we can't. We prefer not to give annuities or multiple-year donations, but to donate on a year-to-year basis.

"There are ways to give, even if you're small," Wheeler said. "You don't have to be the Bill Gates Foundation to have an impact."

Wheeler reached out to David Wahls, associate director of development at Fulton Schools, and Joe Palais, professor and graduate program chair in the School. "I said, 'I like what you guys are doing. I'm a graduate. What can we do with a limited amount of money to make an impact?' We settled on the Senior Design Lab." The Wheeler Foundation has donated $50,000 since 2011.

Wheeler likes the lab because it gives juniors and seniors a taste of that experience of working through the same kind of challenges that he had as a grad student. "Undergraduate students are given a pretty hard problem to solve," Wheeler said. "They have to come together in a group environment, determine what they're going to build and implement a plan. And they have to do it in a certain amount of time. It's as close to a real-world experience as the university can make it."

Wheeler said that visiting with students when they present their senior projects gives him hope for the future. "They're bright, motivated young people, eager to go out and make something of themselves, using the tools ASU gave them.

"Their success is good for everybody, and we feel privileged to be able to give to ASU to help support that."

Aaron Franklin, Class of 2004: A rocky start, a storybook recovery

Aaron Franklin will tell you that the School of Electrical, Computer and Energy Engineering made all the difference in his life. It was here that he erased his stumbling academic start at the University of Arizona, here where he came into his own, earning a 4.0 GPA and diving into the world of nanoelectronics, and here where he met his wife, with whom he now has three children.

"ASU gave me the right support structure through Barrett, The Honors College, and a healthy connection to industry," Franklin said. "It was a springboard to other high-quality educational institutions, and I will always be grateful."

He's also grateful to a mutual friend, who introduced him to Lianne, who had finished her bachelor's degree in marriage, family, and human development and was working on a post-baccalaureate teaching certificate. They have been married for 11 years, and have three children: Elizabeth, 9; Grant, 7; and Blake, 5.

After earning his bachelor's degree in electrical engineering in 2004, Franklin took a coveted position at Intel, then was awarded a National Science Foundation Research Fellowship and went to Purdue University, where he finished a doctorate in electrical engineering in 2008. Even before graduation, IBM was recruiting him, and he joined the T.J. Watson Research Center in New York. For six years, he has shared work, research and conversation with the top names in science and engineering, exploring what might be the next revolution in computing performance.

This fall, he will realize a longtime dream, accepting a tenured associate professorship at Duke University and setting up a lab to continue his research on carbon nanotubes, among other thrusts.

It's a story of success that was nearly derailed at the start.

"It was a springboard to other high-quality educational institutions, and I will always be grateful."

Franklin grew up in Phoenix, and at age 12, when two Motorola engineers visited his middle school, decided he wanted to be an electrical engineer.

"They talked about going into cleanrooms and making computer chips, and I was enthralled," Franklin said. "I thought it sounded like a cool thing to do, and it impressed people when I said, 'I want to be an electrical engineer.' I never thought of it as odd that I decided at 12, not until I had kids of my own."

When Franklin graduated from Camelback High School in Phoenix, he earned a full-ride scholarship to any state university and enrolled in engineering at the University of Arizona, becoming the first in his family to go to college.

But although high school had been easy, Franklin found himself lost in higher education.

"I did terribly," Franklin said. "I didn't understand how to do homework. Professors were asking me to go to office hours. I didn't get it."

His freshman GPA was 0.961. "I decided I must not be fit for college and went back to being a painting contractor," Franklin said.

Then, Franklin, a member of The Church of Jesus Christ of Latter-day Saints, went on a two-year mission to Atlanta, Georgia. "I had a very eye-opening experience about what my goals were," Franklin said. "When I got back, community college was my only choice. I couldn't have gotten accepted to ASU to save my life."

So Franklin went to Mesa Community College and continued to run his painting business to pay for school. After two years, he and several classmates transferred to ASU and worked together in study groups and on projects.

Franklin was accepted to Barrett, The Honors College, and began working with electrical engineering professor Michael Kozicki.

"He was phenomenal," Franklin said. "I worked with him on my honors thesis and my senior design project, and I have a lasting relationship with him."

Franklin said Kozicki allowed him and a couple of other undergraduates to work on a research project looking at programmable metallization cells, a novel memory device for computing.

"We were doing endurance testing, looking at the best voltage to operate these nanoscale memory devices, working with grad students. I remember he would allow us to attend the group meetings, letting us feel like we were part of the main research thrust, not just fiddling around in the corner."

Kozicki said that Franklin was a cut above other students in his desire to get involved in research.

"He had a kind of professional maturity that made me comfortable in giving him a project," Kozicki said. "I put him to work on an issue, a mystery if you like, relating to a memory technology we created."

Kozicki has been working on solid-state memory for about 20 years and the technology is now having success in the marketplace. When Franklin arrived, in 2002, Kozicki asked him to look at erasing data from the memory cells.

"Normally, flash memory uses a lot of energy to erase data," Kozicki said. "Aaron and his capstone design colleagues came up with some delightfully surprising results that showed how best to erase the memory with as little energy as possible.

"They also helped us understand how best to cycle the memory in order to erase it, something that hadn't been obvious before. They found a 'sweet spot' for the erase voltage."

Through ASU's strong connection to industry, Franklin was offered a job at Intel as a component design engineer. Although most of his colleagues loved it, Franklin quickly decided it wasn't the job for him and started looking at grad school.

In interviews, he explained his GPA discrepancy—original (0.961) and final (4.0)—in scientific terms, as "suggestive not of inability, but the difference in ability to apply myself.

"They accepted that as valid."

He turned down Stanford and accepted Purdue, where he had done a summer undergraduate research program, and where the $30,000 NSF fellowship stipend would go much farther for his young family.

At Purdue, he followed their graduate-study option of moving directly to a doctorate program, combining the credits for master's and doctoral work and finishing with a Ph.D., but focusing on research. Franklin began working on carbon nanotube transistors, which can increase computer performance while decreasing power that creates heat and degrades battery life.

The direct doctoral program usually takes four to six years, but Franklin's research was so promising that in his third year IBM was knocking on his door. So Franklin sped up his coursework, dissertation and defense, finishing in another four months, and moved to New York for what he thought would be a year or two of intense research.

"When I left Intel to go back to school, I had only one target in mind: to be a professor," Franklin said. "I was honored by the IBM offer. I had never thought of going to a research lab. In fact, I had already started talking to ASU about a faculty position."

But the foray into research turned into three, four, five and six years. Franklin was rubbing elbows with the most advanced researchers in the world, meeting at conferences where they would debate whether nanotube transistors would ever replace silicon, whether the high cost of manufacturing transition would kill the idea, whether there would be enough money for the research needed to improve consistence.

Kozicki said that Franklin is rare in his tenacious dedication to one research focus, and that he has been a mainstay in the field.

"A lot of researchers jump from one ship to another, following trends in money allocations, but they learn almost nothing and do little to push societal knowledge forward," Kozicki said. "Aaron, more than most, has taken this technology to a point where people understand what it's going to take to get it into production.

"I don't want to sound like he's a grumpy old man in the basement working on vacuum tubes. But he resisted the temptation to drop the technology when issues arose. He plowed through, and he's put the technology in a good state, a fantastic starting point for taking it to the next levels."

In fall 2013, Franklin started teaching as an adjunct professor at Columbia University and, after one semester, they asked him to consider joining the permanent faculty. He applied, but also put in an application at Duke, where he had some connections.

Franklin said they both came up with generous offers and he chose Duke, where he is putting together a lab with a dual focus: nanoelectronics and low-cost printed electronic components, in which electronic circuits are designed on a computer then printed on paper, plastic or other mediums. These low-cost circuits can be used for things like temperature sensors on fresh foods at the grocery story.

Kozicki said that Franklin has given several seminars at ASU that point to him being a great teacher.

"I have rarely seen such well-organized seminars," Kozicki said. "They were delivered in a genuine and sincere way. He has a great bedside manner, and talks about his failures as well as his successes in a way that's inspiring.

"It's safe to say that he's already a rising star. I see him becoming a top-flight player."

Outside of the office and lab, Franklin stays active with his church, and spends time with his family, taking vacations to new places each year.

He sees a genetic glimmer of engineering in seven-year-old Grant, who recently begged for a watch like his father's. "It has a stopwatch feature," Franklin said. "So now, whenever we're leaving the house, you hear a beep as he starts it. And when we arrive, another beep, and he'll say, 'It took us 10 minutes and 47 seconds to get to the store.' "

Franklin marvels at where his life has come and frequently tells students to persevere and take advantage of opportunities, saying, "If Aaron Franklin can do it, you certainly can."

faculty directory

James T. Aberle, *Associate Professor; Ph.D., University of Massachusetts; aberle@asu.edu; 480-965.8588 Research expertise: antennas, microwave and RF electronics, signal and power integrity.*

James T. Aberle received the BS and MS degrees in electrical engineering from the Polytechnic Institute of New York (now Polytechnic University) in 1982 and 1985, respectively, and the Ph.D. degree in electrical engineering from the University of Massachusetts in 1989. From 1982 to 1985, he was employed by Hazeltine Corporation, Greenlawn, NY, where he worked on the development of wide-band phased array antennas. As a graduate research assistant at the University of Massachusetts from 1985 to 1989, Aberle developed and validated computer models for printed antennas. He has been a faculty member at Arizona State University since 1989, and is currently an associate professor of electrical engineering. His research interests include the design of radio frequency systems for wireless applications as well as the modeling of complex electromagnetic phenomena. In addition to his position as a faculty member at ASU, Professor Aberle has been a NASA/ASEE summer faculty fellow at NASA Langley Research Center (1993), a visiting academic at the Royal Melbourne Institute of Technology in Melbourne, Victoria, Australia (1997), a visiting researcher at Atlantic Aerospace Electronics Corp. in Greenbelt, MD (1998), and a senior member of the technical staff at a start-up company (2000-2002).

SELECTED PUBLICATIONS

McCann, J.F., Aberle, J.T., Ying-Cheng Lai, "A nonlinear-dynamics based approach to stability analysis of non-foster networks with electrically-small antennas," *Microwave Symposium Digest* (IMS), 2013 IEEE MTT-S International, pp.1,4, 2-7, June 2013. doi: 10.1109/MWSYM.2013.6697365

Aberle, James T. and Bensalem, Brahim, "Ultra-high speed memory bus using microwave interconnects," IEEE 21st Conference on Electrical Performance of Electronic Packaging and Systems (EPEPS), 2012, pp.3-6, 21-24 Oct. 2012.

Hang Song, J. T. Aberle, and B. Bakkaloglu, "A mixed-signal matching state search based adaptive antenna tuning IC." *IEEE Microwave and Wireless Components Letters*, vol. 20, no. 10, pp. 581-583, Oct. 2010.

J. T. Aberle, "Two-port representation of an antenna with application to non-foster matching networks," I*EEE Transactions on Antennas and Propagation*, vol. 56, no. 5, pp. 1218-1222, May 2008.

J. T. Aberle, S.-H. Oh, and G. A. Taylor, "Frequency-agile antennas for a software-defined and cognitive radio," in *Printed Antennas for Wireless Communications*, R. Waterhouse, Ed. John Wiley and Sons, pp. 379-406, 2007.

David R. Allee, *Professor; Ph.D., Stanford University; allee@asu.edu; 480-727.8939; Research expertise: flexible electronics, radiation and electric field sensing arrays, mixed-signal circuit design.*

David R. Allee (BS in Electrical Engineering, University of Cincinnati; MS and Ph.D. in Electrical Engineering, Stanford University) is a professor of electrical engineering at Arizona State University. While at Stanford University, and as a research associate at Cambridge University, he fabricated field effect transistors with ultra-short gate lengths using custom e-beam lithography and invented several ultra-high resolution lithography techniques. Since joining Arizona State University, his focus has been on mixed signal integrated circuit design. Professor Allee is currently Director of Research for Backplane Electronics for the Flexible Display Center (flexdisplay.asu.edu) funded by the Army, and he is investigating a variety of flexible electronics applications. He has been a regular consultant with several semiconductor industries on low voltage and low power mixed signal CMOS circuit design. He has co-authored over 100 archival scientific publications and patents.

SELECTED PUBLICATIONS

R. Wahl, F. Wang, H. Chung, G. Kunnen, S. Yip, E. Lee, E. Pun, G. Raupp, D. Allee, J. Ho, "Stability and low-frequency noise in InAs NW parallel array thin film transistors," *IEEE Electron Device Letters*, vol. 34, no. 6, 2013, pp. 765-767

S. Kim, X. Zhang, R. Daugherty, E. Lee, G. Kunnen, D.R. Allee, E. Forsythe, and J. Chae, "Design and implementation of electrostatic micro-actuators in ultrasonic frequency on a flexible substrate, PEN (polyethylene napthalate)," *Sensors and Actuators, A: Physical*, 2012, 8 pages

Sangpyeong Kim, Xu Zhang, Robin Daugherty, Ed Lee, George Kunnen, David R. Allee, Eric W. Forsythe, and Junseok Chae, "MEMs based ultrasonic electrostatic actuators on a flexible substrate," *IEEE Electron Device Letters*, vol. 33, no. 7, 2012, pp. 1072-1074

David R. Allee, Guest Editorial, *IEEE/OSA Journal of Display Technology*, vol. 8, no. 7, 2012, p. 372

John W. Murphy, George R. Kunnen, Israel Mejia, Manuel A. Quevedo-Lopez, David Allee, Bruce Gnade, "Optimizing diode thickness for thin-film solid state thermal neutron detectors," *Applied Physics Letters*, vol. 101, no. 14, 2012, 5 pages

Ed Lee, George Kunnen, Alfonso Dominguez, David R. Allee, "A low noise dual stage a-Si:H active pixel sensor," *IEEE Transactions on Electron Devices*, vol. 59, no. 6, pp. 1679-1685, June 2012

Raja Ayyanar, *Associate Professor, Ph.D., University of Minnesota; rayyanar@asu.edu; 480-727.7307; Research expertise: power electronics, DC-DC converters, power management, power conversion and control for renewable energy interface, especially PV and wind, electric vehicles, and motor drives.*

Rajapandian Ayyanar joined the Arizona State University faculty as an assistant professor in August 2000. He received a BE in electrical engineering from P.S.G. College of Technology, India in 1989, an MS in power electronics from the Indian Institute of Science in 1995, and a Ph.D. in power electronics from the University of Minnesota in 2000. He has published over 80 journal and conference papers in the area of power electronics and renewable energy integration, and he holds three U.S. patents. Professor Ayyanar was awarded the ONR Young Investigator Award in 2005.

SELECTED PUBLICATIONS

S. Falcones, R. Ayyanar, X. Mao, "A DC–DC Multiport-Converter-Based Solid-State Transformer Integrating Distributed Generation and Storage," *IEEE Transactions on Power Electronics*, vol. 28, pp. 2192 – 2203 May 2013.

M. Fan, V. Vittal, G.T. Heydt, R. Ayyanar, "Probabilistic Power Flow Analysis with Generation Dispatch Including Photovoltaic Resources," *IEEE Transactions on Power Systems*, vol. 28, pp. 1797-1805, May 2013.

G.T. Heydt, R. Ayyanar, K.W. Hedman, V. Vittal, "Electric Power and Energy Engineering: The First Century," *Proceedings of the IEEE,* vol. 100, Special Centennial Issue, 2012, pp. 1315 – 1328.

M. Fan, V. Vittal, G.T. Heydt, R. Ayyanar, "Probabilistic Power Flow Studies for Transmission Systems with Photovoltaic Generation Using Cumulants," IEEE Transactions on Power Systems, vol. 27, no. 4, pp.2251-2261 Nov. 2012.

A. K. Jain, R. Ayyanar, "PWM control of dual active bridge: Comprehensive analysis and experimental verification," *IEEE Transactions on Power Electronics*, vol. 26, pp. 1215-1227, Apr. 2011.

D. Gautam, L. Goel, R. Ayyanar, V. Vittal, and T. Harbour, "Control strategy to mitigate the impact of reduced inertia due to doubly fed induction generators on large power systems," *IEEE Transactions on Power Systems,* vol. 26, pp. 214-224, Feb. 2011.

X. Mao, A.K. Jain, R. Ayyanar, "Hybrid Interleaved Space Vector PWM for Ripple Reduction in Modular Converters," *IEEE Transactions on Power Electronics*, vol. 26, July 2011, pp. 1954-1967.

D. Zhao, V. S. S. Pavan Kumar Hari, G. Narayanan, and R. Ayyanar, "Space-vector-based hybrid pulsewidth modulation techniques for reduced harmonic distortion and switching loss," *IEEE Transactions on Power Electronics*, vol. 25, pp. 760-774, Mar. 2010.

R. Ayyanar, W.J. Lambert, S. Chickemenahalli, "Transient Voltage Compensation System and Method," US Patent 8,243,410, August 14, 2012.

Bertan Bakkaloglu, *Professor, Ph.D., Oregon State University; bertan.bakkaloglu@asu.edu; 480-727.0293 ; Research expertise: Analog, RF and mixed-signal IC design, integrated power management circuits for high reliability applications, self-test and calibration of high reliability circuits, biomedical and chemical instrumentation ICs.*

Bertan Bakkaloglu joined the Arizona State University faculty in August 2004. He received a Ph.D. in electrical and computer engineering in 1995 from Oregon State University. Prior to ASU, Bakkaloglu was with Texas Instruments where he was responsible for analog, mixed signal, and RF system-on-chip development for wireless and wireline communication transceivers. His current areas of research are power and battery management circuits, Analog-to-Digital and Digital-to-Analog converters for instrumentation and telecommunication circuits, frequency synthesizers and self-test and self-healing of mixed signal circuits. He is the General Chair for IEEE Radio Frequency Integrated Circuits Conference and founding chair of the IEEE Solid State Circuits Society Phoenix Chapter. He is an Associate Editor of *IEEE Transactions on Microwave Theory and Techniques*.

SELECTED PUBLICATIONS

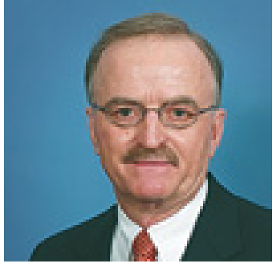
S. Min, T. Copani, S. Kiaei, B. Bakkaloglu, "A 90-nm CMOS 5-GHz Ring-Oscillator PLL With Delay-Discriminator-Based Active Phase-Noise Cancellation", *IEEE Journal of Solid State Circuits*, vol: 48, no: 5, pp:1151-1160, 2013.

H. Hedayati and B. Bakkaloglu, "A 3 GHz wideband $\Sigma\Delta$ fractional-N synthesizer with switched-RC sample-and-hold PFD," *IEEE Transactions on Very Large Scale Integration (VLSI) Systems*, vol.20, no. 9, pp. 1681-1690, 2012.

W. Khalil, S. Shashidharan, T. Copani, S. Chakraborty, S. Kiaei, and B. Bakkaloglu, "A 405-MHz all-digital fractional-frequency-locked loop for ISM band applications," *IEEE Transactions on Microwave Theory and Techniques*, vol. 59, no. 5, pp. 1319-1326, May 2011.

T. Copani, S. Min, S. Shashidharan, S. Chakraborty, M. Stevens, S. Kiaei, and B. Bakkaloglu, "A CMOS low-power transceiver with reconfigurable antenna interface for medical implant applications," *IEEE Transactions on Microwave Theory and Techniques*, vol. 59, no. 5, pp. 1369-1378, May 2011.

K. Chandrashekar, M. Corsi, J. Fattaruso, and B. Bakkaloglu, "A 20-MS/s to 40-MS/s reconfigurable pipeline ADC implemented with parallel OTA scaling," *IEEE Transactions on Circuits and Systems*, vol. 57, no. 8, pp. 602-606, Aug. 2010.



Constantine A. Balanis, *Regents' Professor, Ph.D., The Ohio State University; balanis@asu.edu; 480-965.3909; Research expertise: Computational electromagnetic methods (FDTD, FEM, MoM, GO/GTD/UTD, PO/PTD) for antennas and scattering; flexible and conformal antennas and high impedance surfaces; RCS reduction techniques; ferrite-loaded non-uniformly biased CBS antennas; and smart/adaptive antennas for wireless communications.*

Constantine A. Balanis joined the electrical engineering faculty in 1983 and is now an ASU Regents' Professor. He has published more than 135 journal papers, 235 conference papers, 12 book chapters, 9 magazine/newsletter papers and numerous scientific reports. He also has published four books: *Antenna Theory: Analysis and Design*; *Advanced Engineering Electromagnetics*; *Introduction to Smart Antennas*; and *Modern Antenna Handbook*.

Honors and Distinctions: ASU Regents' Professor; Honorary Doctorate-University of Thessaloniki (Greece); IEEE Life Fellow; IEEE Third Millennium Medal; IEEE AP Society Distinguished Achievement Award; IEEE AP Society Chen-To Tai Distinguished Educator Award; Ohio State University Distinguished Achievement Alumnus Award; ASU Outstanding Graduate Mentor Award; ASU School of Engineering Graduate Teaching Excellence Award; ASU College of Engineering Distinguished Achievement Award; IEEE Region 6 Individual Achievement Award; IEEE Phoenix Section Professionalism Award.

SELECTED PUBLICATIONS

C. A. Balanis, *Advanced Engineering Electromagnetics (2nd edition)*, John Wiley & Sons, 2012.

C. A. Balanis, L. Sevgi and P. Y. Ufimtsev, "Fifty Years of High Frequency Diffraction," *International Journal of RF and Microwave Computer-Aided Engineering*, vol. 23, no. 4, July 2013, pp. 394-402, 2013.

Rivera-Albino and C. A. Balanis, "Gain Enhancement in Microstrip Patch Antennas Using Hybrid Substrates," *IEEE Antennas and Wireless Propagation Letters*, vol. 12, Issue 1, pp. 476-479, 2013.

N. A. Aboserwal, C. A. Balanis and C. R. Birtcher, "Conical Horn: Gain and Amplitude Radiation Patterns," *IEEE Trans. Antennas Propagat.*, vol. 61, no. 7, July 2013, pp. 3427-3433.

M. Askarian Amiri, C. A. Balanis and C. R. Birtcher, "Gain and Bandwidth Enhancement of Ferrite-Loaded CBS Antenna Using Material Shaping and Positioning," *IEEE Antennas and Wireless Propagation Letters*, vol. 61, pp. 611-614, 2013.

V. G. Kononov, C. A. Balanis and C. R. Birtcher, " The Impact of the Non-Uniform Bias Field on the Radiation Patterns of the Ferrite-Loaded CBS Antennas," *IEEE Trans. Antennas Propagat.*, vol. 61, no. 8, August 2013, pp. 4367-4371.

C. Durgun, C. A. Balanis and C. R. Birtcher, "Reflection Phase Characterization of Curved High Impedance Surfaces ," *IEEE Trans. Antennas Propagat.*, vol. 61, no. 12, December 2013, pp. 6030-6038.

N. Aboserval, C. A. Balanis and C. R. Birtcher, invited paper dedicated to the memory of Robert E. Collin, "Impact of Finite Ground Plane Edge Diffractions on Radiation Patterns of Aperture Antennas," *Progress in Electromagnetic Research B (PIER B)*, vol. 55, Sept. 2013, pp. 1-21, 2013.

Hugh Barnaby, *Associate Professor; Ph.D., Vanderbilt University; hbarnaby@asu.edu; 480-727.0289; Research expertise: Semiconductors for hostile environments, device physics and modeling, microelectronic device and sensor design and manufacturing, analog/RF/mixed signal circuit design and test*

Hugh Barnaby joined the ASU faculty in 2004. Prior to coming to ASU, he was an assistant professor at the University of Arizona. His primary research focuses on the analysis, modeling and experimental characterization of extreme environment effects in semiconductor materials, devices and integrated circuits. As part of this research, he also develops design and processing techniques that enable the reliable operation of electronics in these environments. In addition, Professor Barnaby has ongoing research activities in wireless (RF and optical) IC and data converter design, radiation-enabled compact modeling, and memristor technologies and applications. He has been an active researcher in the microelectronics field for 18 years in both industry and academics, presenting and publishing more than 100 papers during this time.

Honors and Distinctions: ONR Faculty Research Fellow; Senior Member IEEE; Session Chairperson, 2008 IEEE IRPS, 2005, 2011 RADECS conference, 2002, 2014 IEEE NSREC; Short Course Chairman, IEEE NSREC 2007; Poster Chairman, IEEE NSREC 2006; Short Course Instructor, NSREC 2005, RAEECS 2013; Arizona State University Circuits Group Chairman; *IEEE Transactions on Nuclear Science* Associate Editor.

SELECTED PUBLICATIONS

I. S. Esqueda and H. J. Barnaby, "A defect-based compact modeling approach for the reliability of CMOS devices and integrated circuits," *Solid-State Electronics, vol. 91*, pp. 81-86, 2014.

Y. Gonzalez-Velo, H. J. Barnaby, M. N. Kozicki, C. Gopalan, and K. Holbert, "Total Ionizing Dose Retention Capability of Conductive Bridging Random Access Memory," *Electron Device Letters, IEEE,* vol. 35, pp. 205-207, 2014.

M. S. Ailavajhala, Y. Gonzalez-Velo, C. Poweleit, H. Barnaby, M. N. Kozicki, K. Holbert, D. P. Butt, and M. Mitkova, "Gamma radiation induced effects in floppy and rigid Ge-containing chalcogenide thin films," *Journal of Applied Physics*, vol. 115, pp. 043502-043502-9, 2014.

P. Dandamudi, M. N. Kozicki, H. J. Barnaby, Y. Gonzalez-Velo, M. Mitkova, K. E. Holbert, M. Ailavajhala, and W. Yu, "Sensors Based on Radiation-Induced Diffusion of Silver in Germanium Selenide Glasses," *IEEE Transactions on Nuclear Science*, vol. 60, pp. 4257-4264, Dec 2013.

Z. Zhu, A. Kathuria, S. G. Krishna, M. Mojarradi, B. Jalali-Farahani, H. Barnaby, W. Wu, G. Gildenblatt, "Design applications of compact MOSFET model for extended temperature range (60 to 400k)," *Electronics Letters*, vol. 47, no. 2, pp. 141-142, 2011.

X. J. Chen and H. J. Barnaby, "The effects of radiation induced interface traps on base current in gated bipolar test structures," *Solid State Electronics*, vol. 52, issue 5, pp. 683-687, May 2008.

H. Barnaby, "Total-ionizing-dose effects in modern CMOS technologies," *IEEE Trans. on Nuclear Science*, vol. 53, pp. 3103-3121, 2006 (review article).

Visar Berisha, *Assistant Professor, Ph.D., Arizona State University visar@asu.edu; 480-727.6455; Research expertise: Statistical signal processing, speech perception and processing, psychoacoustics.*

Visar Berisha received his Ph.D. in electrical engineering from Arizona State University in 2007. From 2007 to 2009, he was a member of the technical staff at MIT Lincoln Laboratory, where he worked on signal processing for radar applications. Following his appointment at MIT LL, Berisha joined Raytheon Co. in 2009 as principal research engineer, where he was PI on a number of basic research activities in machine learning and signal processing. He has been a member of the faculty at ASU since Fall 2013 with a joint appointment in the departments of Speech and Hearing Science and the school of ECEE. The over-arching goal of research conducted in his lab is to develop and apply new machine learning and statistical signal processing tools to better understand and model signal perception. With a focus on speech, the goal is to develop reliable, data-driven models that can mimic aspects of human cognition. Some recent projects include developing models of pathological speech perception, developing auditory perception models based on psychoacoustics, and developing new machine learning tools for use with behavioral experiments.

SELECTED PUBLICATIONS

V. Berisha, S. Sandoval, R. Utianski, J. Liss, and A. Spanias, "Modeling Pathological Speech Perception From Data with Similarity Labels," *Proceedings of IEEE International Conference on Acoustics, Speech, and Signal Processing*. May 2014.

V. Berisha, S. Sandoval, R. Utianski, J. Liss, and A. Spanias, "Characterizing the Distribution of the Quadrilateral Vowel Space Area," *Journal of the Acoustical Society of America*, January 2014.

S. Sandoval, V. Berisha, R. Utianski, J. Liss, and A. Spanias, "Automatic Assessment of Vowel Space Area," *Journal of the Acoustical Society of America*, November 2013.

V. Berisha, S. Sandoval, R.L. Utianski, J.M. Liss, and A. Spanias, "Selecting Disorder-Specific Features for Speech Pathology Fingerprinting," *Proceedings of IEEE International Conference on Acoustics, Speech, and Signal Processing*. May 2013.

V. Berisha, R.L. Utianski, and J.M. Liss, "Toward a Clinical Tool for Automatic Intelligibility Assessment," *Proceedings of IEEE International Conference on Acoustics, Speech, and Signal Processing*. May 2013.

Mariana I. Bertoni, *Assistant Professor; Ph.D., Northwestern University ; Bertoni@asu.edu; 480-727.0755; Research expertise: defect engineering of solar cell materials, transparent conducting oxides, defects in semiconductors, synthesis, growth and deposition of semi-conductors, electrical and optical characterization, X-ray microscopy and spectroscopy.*

Mariana Bertoni joined ASU as an assistant professor in 2012. Prior to this, she held senior scientist positions at two emerging start-up firms in the photovoltaic industry and a visiting scientist appointment at the Massachusetts Institute of Technology (2010-2012). Her previous postgraduate experience includes a postdoctoral appointment at the Massachusetts Institute of Technology (2008-2010), a Marie Curie postdoctoral fellowship at Creavis Technologies & Innovation in Germany (2007-2008) and a visiting researcher appointment at the National Renewable Energy Laboratory. She has published more than 35 research articles in peer-reviewed journals and presented more than 30 papers at scientific meetings. She serves in the Center for Nanoscale Materials proposal evaluation board at Argonne National Laboratory and is active in various committees and chairing positions at the IEEE photovoltaic specialists conferences.

Honors and Distinctions: ACERS Electronics division Edward C. Henry Award; Marie Curie Fellow, Fulbright Scholar

SELECTED PUBLICATIONS

H. Choi, M. I. Bertoni, D. Fenning, J. Hofstetter, S. Castellanos, D.M. Powell, and T. Buonassisi, "Dislocation Density Reduction During Impurity Gettering in Multicrystalline Silicon," *Journal of Photovoltaics*, vol. 3, no. 1, pp. 189 – 198, 2013.

M. I. Bertoni, D. Fening, M. Rinio, M. Holt, V. Rose, J. Maser, and T. Buonassisi, "Nanoprobe X-ray fluorescence characterization of intragranular defects in large-area solar cells," *Energy & Environmental Science*, vol. 4, no. 10, pp. 4252 – 4257, 2011.

M. I. Bertoni, S. Hudelson, B. Newman, S. Bernardis, D. Fenning, H. Dekkers, E. Cornagliotti, A. Zuschlag, G. Hahn, G. Coletti, B. Lai, and T. Buonassisi, "Influence of defect type on hydrogen passivation efficacy in multicrystalline silicon solar cells," *Prog. in Photovoltaics*, vol. 19, no. 2, pp. 187–191, 2011.

M. I. Bertoni, J. E. Medvedeva, Y. Wang, A. J. Freeman, K. R. Poeppelmeier, and T. O. Mason, "Enhanced electronic conductivity in a si-substituted calcium aluminate," *Journal of Applied Physics*, vol. 102, pp. 113704, 2007

Jennifer M. Blain Christen. *Assistant Professor, Ph.D., Johns Hopkins University, MD; jennifer.blainchristen@asu.edu; 480-965-9859; Research expertise: Bio-compatible integration techniques for CMOS electronics/sensors, microfluidics and soft lithography, bio-MEMS, low power analog and mixed-mode circuits for bio-medical/analytical instrumentation, systems engineering focusing on multi-physics/multi-modal and feedback, including neural, electrochemical and optical/fluorescence systems*

Jennifer Blain Christen joined the ASU faculty in 2008. She received a Ph.D. in 2006 and an MS in electrical engineering in 2001 from the Johns Hopkins University. She conducted her post-doctoral research at the Immunogenetics Department of the Johns Hopkins School of Medicine. Her research focuses on engineering systems that directly interface biology; this interface usually includes bioMEMS/sensors, low-power analog circuits and microfluidics.

Honors and Distinctions: Transactions on Biomedical Circuits and Systems Best Paper Award (2007-2010); 2010 Science Foundation Arizona Grand Challenges Conference Poster Contest 1st Place; STIMESI MultiMEMS Design Contest, Advanced Category 1st Place, 2008; National Science Foundation Graduate Teaching Fellows in K-12 Education, 2005-2006; National Science Foundation Graduate Research Fellowship, 2001-2004; Grant recipient for the Undergraduate Engineering Research Opportunities Program, sponsored by General Electric Faculty for the Future, 1998; Maryland Scholars Award, 1997.

SELECTED PUBLICATIONS

Welch, D., Blain Christen, J., "Real-Time Feedback Control of pH within Microfluidics Using Integrated Sensing and Actuation," *Lab on a Chip*, vol. 14, pp. 1191 – 1197, January 2014

Smith, J., O'Brien, B., Lee, Y.K., Bawolek, E., Blain Christen, J., "Application of Flexible OLED Display Technology for Electro-Optical Stimulation and/or Silencing of Neural Activity," *Journal of Display Techonology*, vol. 10, no. 6, pp 514 – 520, June 2014

Welch, D., Blain Christen, J., "Seamless Integration of CMOS and microfluidics using Flip Chip Bonding," *Journal of Micromechanics and Microengineering*, vol. 23, Issue 3, pp. 1-7, March 2013

Welch, D., Shah, S., Ozev, S., Blain Christen, J., "Experimental and Simulated Cycling of ISFET Electric Fields for Drift Reset," *Electron Device Letters*, vol. 34, no. 3, pp. 456-458, March 2013

Wang, H., Luo, T., Lu, Z., Song, H., Blain Christen, J., "CMOS Self-Powered Monolithic Light-Direction Sensor with Digitized Output," *Optics Letters*, vol. 39, no. 9, pp. 2618 - 2621, May 2014

Wang, H., Luo, T., Song, H., Blain Christen, J., "On-Chip Sensor for Light Direction Detection," *Optics Letters*, vol. 38, no. 22, pp. 4554 - 4557, November 2013

Welch, D., Georgiou, J., Blain Christen, J., "Fully Differential Current-Mode MEMS Dual-Axis Optical Inclination Sensor," *Sensors and Actuators A*, vol. 192, pp. 133-139, April 2013

Blain Christen, J.M., Andreou, A.G, "Integration of Silicon CMOS with Multilayer Silicone (PDMS) Fluidics into a Micro-Incubator for Cell Culture Studies", *IEEE Transactions on Biomedical Circuits and Systems*, Volume 1, Number 1, pp. 3-18, March 2007, Invited Paper

Daniel Bliss; *Associate Professor, Ph.D., University of California, San Diego; d.w.bliss@asu.edu; 480-965-3913; Research expertise: multiple-input multiple-output (MIMO) wireless communications, distributed cooperative communications, full-duplex relays, geolocation techniques, MIMO radar, nonlocal Bayesian estimation bounds, channel phenomenology and signal processing for anticipatory medical applications*

Daniel Bliss joined ASU in 2012 from the Massachusetts Institute of Technology Lincoln Laboratory where he was a senior member of the technical staff in the Advanced Sensor Techniques Group. His research focus is on adaptive signal processing and information theoretic performance bounds for multisensor systems, primarily for wireless communications, remote sensing and physiological prediction. Bliss has been the principal investigator on numerous small and large programs, requiring a broader system perspective. Bliss brings prior experience from General Dynamics, where he was a member of the superconducting magnet group and designed avionics for the Atlas-Centaur launch vehicle. Bliss is a Senior Member of the IEEE.

SELECTED PUBLICATIONS

D. W. Bliss and S. Govindasamy, *Adaptive Wireless Communications: MIMO Channels and Networks*, Cambridge University Press, Cambridge, 2013.

K. W. Forsythe and D. W. Bliss, "MIMO Radar: Concepts, Performance Enhancements, and Applications," *Signal Processing for MIMO Radar*, Ed. Jian Li and Petre Stoica, Wiley Publishing, 2009.

J. M. Kantor, C. D. Richmond, D. W. Bliss, B. Correll, "Mean-Squared-Error Prediction for Bayesian Direction-of-Arrival Estimation," *IEEE Journal on Signal Processing*, Oct., 2013.

S. Govindasamy, D. W. Bliss and D. H. Staelin, "Asymptotic Spectral Efficiency of the Uplink in Spatially Distributed Wireless Networks with Multi-Antenna Base Stations," *IEEE Transactions on Communications*, July, 2013.

J. R. Williamson, D. W. Bliss, D. W. Browne and J. T. Narayananb, "Seizure prediction using EEG spatiotemporal correlation structure," *Epilepsy & Behavior*, Oct., 2012.

D. W. Bliss, "Optimal SISO and MIMO Spectral Efficiency to Minimize Hidden-Node Network Interference," *IEEE Communications Letters*, July, 2010.

D. W. Bliss and P. A. Parker, "Temporal Synchronization of MIMO Wireless Communication in the Presence of Interference," *IEEE Transactions on Signal Processing,* March, 2010.

D. W. Bliss and K. W. Forsythe, "Multiple-Input Multiple-Output (MIMO) Radar and Imaging: Degrees of Freedom and Resolution," IEEE Asilomar Conference on Signals, Systems & Computers, Pacific Grove, Calif., Nov. 2003.

Yu (Kevin) Cao, *Associate Professor, Ph.D., University of California, Berkeley; ycao@asu.edu; 480-965-1472; Research expertise: physical modeling of nanoscale technologies, design solutions for variability and reliability, and reliable integration of post-silicon technologies*

Kevin Cao joined the ASU faculty in 2004. He received a Ph.D. in electrical engineering in 2002 and an M.A. in biophysics in 1999 from the University of California, Berkeley, and conducted his post-doctoral research at the Berkeley Wireless Research Center. He has published more than 160 articles, two books, and four book chapters. He has served on the technical program committee of many conferences and is a member of the IEEE EDS Compact Modeling Technical Committee.

Honors and Distinctions: Best Paper Award at, IEEE Computer Society Annual Symposium on VLSI, 2012; Teaching Excellence Award, Ira. A. Fulton Schools of Engineering, ASU, 2010, 2012 and 2013; Promotion and Tenure Faculty Exemplar, ASU, 2009; Distinguished Lecturer of the IEEE Circuits and Systems Society, 2009; Chunhui Award for Outstanding Oversea Chinese Scholars, China, 2008; Best Paper Award at the International Low-Power Electronics and Design, 2007; IBM Faculty Award, 2007 and 2006; NSF Faculty Early Career Development (CAREER) Award, 2006; Best Paper Award at the International Symposium on Quality Electronic Design, 2004; Beatrice Winner Award, International Solid-State Circuits Conference, 2000; Biophysics Graduate Program Fellowship at the University of California, Berkeley, 1997-98; UC Regents Fellowship at University of California, Santa Cruz, 1996-97.

SELECTED PUBLICATIONS

Y. Cao, *Predictive Technology Model for Robust Nanoelectronic Design*, Springer, 2011 (HYPERLINK "http://dx.doi.org/10.1007/978-1-4614-0445-3" http://dx.doi.org/10.1007/978-1-4614-0445-3).

Y. Cao, J. Velamala, K. Sutaria, M. S.-W. Chen, J. Ahlbin, I. S. Esqueda, M. Bajura, M. Fritze, "Cross-layer modeling and simulation of circuit reliability," *IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems*, vol. 33, no. 1, pp. 8-23, January 2014.

J. B. Velamala, K. B. Sutaria, H. Shimuzu, H. Awano, T. Sato, G. Wirth, Y. Cao, "Compact modeling of statistical BTI under trapping/detrapping," *IEEE Transactions on Electron Devices,* vol. 60, no. 11, pp. 3645-3654, November 2013.

J. Suh, N. Suda, C. Xu, N. Hakim, Y. Cao, B. Bakkaloglu, "Programmable analog device array (PANDA): a methodology for transistor-level analog emulation," *IEEE Transactions on Circuits and Systems I*, vol. 60, no. 6, pp. 1369-1380, June 2013.

B. H. Calhoun, Y. Cao, X. Li, K. Mai, L. T. Pileggi, R. A. Rutenbar, and K. L. Shepard, "Digital circuit design challenges and opportunities in the era of nanoscale CMOS," *Proceedings of the IEEE*, vol. 96, no. 2, pp. 343-365, Feb. 2008.

Junseok Chae, *Associate Professor, Ph.D., University of Michigan, Ann Arbor; junseok.chae@asu.edu; 480-965-2082. Research expertise: microdevices for bioenergy applications, Implantable microdevices, electronic circuit integration with microdevices*

Junseok Chae received the B.S. degree in metallurgical engineering from Korea University, Seoul, Korea, in 1998, and the M.S. and Ph.D. degrees in electrical engineering and computer science from University of Michigan, Ann Arbor, in 2000 and 2003, respectively. He joined Arizona State University in 2005 as an assistant professor and now he is an associate professor of electrical engineering. He has published over 100 journal and conference articles, six book chapters, one book, and holds three U.S. patents. His areas of interests are MEMS (Micro-Electro-Mechanical-Systems) sensors/actuators, integrating MEMS with readout/control electronics, and microdevices for bioenergy / biomedical applications. He received the first place prize and the best paper award in DAC (Design Automation Conference) student design contest in 2001. He is a recipient of NSF CAREER award on MEMS protein sensor array.

Honors and Distinctions: NSF CAREER Award, 2009; Best Poster Award in IEEE International Conference on Sensors, 2007. First Place Prize and the Best Paper, DAC (Design Automation Conference) Student Design Contest, 2001.

SELECTED PUBLICATIONS

X. Zhang, H. Ren, S. Pyo, J. Lee, J. Kim, and J. Chae, "A High Efficiency DC-DC Boost Converter for a Miniaturized Microbial Fuel Cell," *IEEE Transactions on Power Electronics*, in-print, 2014.

H. Ren, C. Torres, P. Parameswaran, B. Rittmann, and J. Chae, "Improved Current and Power Density with a Micro-scale Microbial Fuel Cell Due to a Small Characteristic Length," *Biosensors and Bioelectronics*, v. 61, pp. 587-592, 2014.

H. Schwerdt, R. Bristol, and J. Chae, "Miniaturized Passive Hydrogel Check Valve for Hydrocephalus Treatment," *IEEE Transactions on Biomedical Engineering*, v. 61, n. 3, pp. 814-820, 2014.

Q. Chen, Y. Lai, J. Chae, and Y. Do, "Anti-phase synchronization in microelectromechanical systems and effect of impulsive perturbation," *Physical Review B*, v. 87, 144304, 2013.

H. Schwerdt, F. Miranda, and J. Chae, "Analysis of Electromagnetic Fields Induced in Operation of a Wireless Fully Passive Backscattering Neurorecording Microsystem in Emulated Human Head Tissue," *IEEE Transactions on Microwave Theory and Techniques*, v. 61, n. 5, pp. 2170-2176, 2013.

Chaitali Chakrabarti, *Professor, Ph.D., University of Maryland ; chaitali@asu.edu; 480-965-9516; Research expertise: VLSI architectures for media processing and wireless communications, algorithm-architecture co-design of signal processing systems, low-power embedded systems and non-volatile memory system design.*

Chaitali Chakrabarti received her B.Tech. in electronics and electrical communication engineering from the Indian Institute of Technology, Kharagpur, India, and her M.S. and Ph.D. degrees in electrical engineering from the University of Maryland, College Park. She is an associate editor of the *IEEE Transactions on VLSI Systems* and the *Journal of Signal Processing Systems*. She is a Fellow of the IEEE.

Honors and Distinctions: Best Paper Awards in SAMOS'07, MICRO'08, SiPS'10 and HPCA'13; MICRO Top Picks in 2007, 2010 and 2014; Outstanding Educator Award, IEEE Phoenix section, 2001; Ira A. Fulton Schools of Engineering Top 5% Award, 2012 and 2014; Distinguished Alumni Award, Dept. of Electrical and Computer Engineering, University of Maryland, College Park, 2013.

SELECTED PUBLICATIONS

R. Sampson, M. Yang, S. Wei, C. Chakrabarti and T. F. Wenisch, "Sonic Millip3De: Massively Parallel 3D Stacked Accelerator for 3D Ultrasound," *Proc. of High Performance Computer Architecture*, pp. 318-329, Feb 2013, Best Paper Award.

Y. Emre and C. Chakrabarti, "Energy and Quality-Aware Multimedia Signal Processing," *IEEE Trans on Multimedia*, 15(7), pp. 1579-1593, 2013.

B. Giridhar, M. Cieslak, D. Duggal, H.-M. Chen, R. Dreslinski, R. Patti, B. Hold, C. Chakrabarti, T. Mudge and D. Blaauw, "Exploring DRAM Optimizations for Energy-Efficient and Resilient Exascale Memories," *Proceedings of the Supercomputing Conference*, 2013.

L. Miao, J. J. Zhang, C. Chakrabarti, and A. Papandreou-Suppappola, "Efficient Bayesian Tracking of Multiple Sources of Neural Activity: Algorithms and Real-Time FPGA Implementation," *IEEE Trans on Signal Processing*, pp. 633-647, March 2013.

C. Yang, Y. Emre, Y. Cao and C. Chakrabarti, "Improving Reliability of Non-volatile Memory Technologies through Circuit-level Techniques and Error Control Coding," E*URASIP Journal on Advances in Signal Processing*, Sep 2012.

M. Woh, S. Seo, S. Mahlke, T. Mudge, and C. Chakrabarti, "AnySP: Anytime anywhere anyway signal processing," *IEEE MICRO Top Picks*, pp. 81-91 January/February 2010.

Srabanti Chowdhury, *Assistant Professor; Ph.D., University of California, Santa Barbara; srabanti.chowdhury@asu.edu; 480-965-2831; Research expertise: power electronics, gallium nitride-based devices like HEMTs and CAVETs, device reliability, understanding failure modes (at a product level), device physics, study of dielectric materials and its characterization and device simulation, novel materials for power*

Srabanti Chowdhury joined ASU in 2013. As part of her Ph.D. thesis, she fabricated the first gallium nitride vertical transistor that demonstrated high voltage handling igniting interest in vertical devices in GaN. The effort was funded by Toyota Motor Corporation, Japan, to develop energy-efficient hybrid car inverter switches. In May 2010, she joined Transphorm, a leader in the gallium nitride technology, to develop reliable and manufacturable gallium nitride-based-high-voltage devices (>900V) for efficient power conversions. During her tenure, she successfully designed and fabricated 900V-1200V gallium nitride high-electron-mobility transistors (HEMTs) on both silicon carbide and Si substrates. The devices with breakdown voltages greater than 1kV were successfully incorporated into modules for motor drive applications resulting in the first demonstration of a high- frequency, GaN-on-Si-based motor drive in the world. She has also been involved in developing novel techniques to make the devices fail-proof and reliable—essential for commercialization. Her other fundamental research focuses on understanding the physics of the device leading to different device properties. In experimental work done with Masataka Higashiwaki, the accepted origin of surface barrier height in AlGaN/GaN material systems was challenged by the new findings leading to renewed research interest and questions in the topic. Chowdhury was also actively involved in dielectric studies and characterization of materials using electrical measurements both during her Ph.D. research and work at Transphorm. She received her M.S. from UCSB and B.Tech. from the Institute of Radiophysics and Electronics, India, with highest honors. She has coauthored over 12 journal publications and presented in over 15 conferences. Her ideas and designs have resulted in over 10 awarded or pending patents.

SELECTED PUBLICATIONS

Srabanti Chowdhury and Umesh K Mishra, "Lateral and Vertical transistors using the AlGaN/GaN heterostructure," *IEEE Transaction on Electron Devices*, vol. 60, No.10, [Invited Review].

Srabanti Chowdhury, Brian L Swenson, Man Hoi Wong and Umesh K Mishra, "Current status and scope of gallium nitride-based vertical transistors for high-power electronics application," *Semiconductor Science and Technology* vol. 28 No.7

[Invited Review].

Srabanti Chowdhury, Man Hoi Wong, Brian L Swenson and Umesh K. Mishra, "CAVET on Bulk GaN Substrates Achieved With MBE-Regrown AlGaN/GaN Layers

to Suppress Dispersion," ***Electron Device Letters, IEEE*** Vol, 33, no. 1, January 2012.

Srabanti Chowdhury, Brian L Swenson and Umesh K. Mishra, "Enhancement and Depletion Mode AlGaN/GaN CAVET with Mg-Ion- Implanted GaN as Current Blocking Layer," *Electron Device Letters, IEEE* vol. 29, no. 6, June 2008

Lawrence T. Clark, *Professor, Ph.D., Arizona State University; lawrence.clark@asu.edu; 480-727.0295; Research expertise: circuits and architectures for low power and high performance VLSI for harsh environments, and CAD for VLSI*

Lawrence T. Clark worked at Intel Corporation after receiving his BS in computer science in 1983. While completing his Ph.D. he worked at VLSI Technology Inc. designing PC chipsets. He received his Ph.D. in 1992 after receiving his M.S. in 1987, both in electrical engineering from Arizona State University. He re-joined Intel in 1992. He joined ASU in August 2004. Clark has been awarded 90 patents, with approximately 20 pending. He has published over 110 peer-reviewed technical papers. He has about 20 years of industry experience in various aspects of VLSI, CMOS imager, microprocessor design, test engineering, as well as TCAD compact modeling. At Intel he contributed to the Pentium, Itanium, and XScale microprocessor designs. Most recently, he was a principal engineer and Circuit Design Manager for the Intel XScale microprocessor designs. He also has worked with SuVolta Inc., where he is Chief Architect, since 2009.

Honors and Distinctions: Senior member, IEEE; Recipient of the Intel Achievement Award and multiple Intel divisional recognition awards; Best Paper Award ISLPED 2013. Technical committee member for IEEE Custom Integrated Circuits Conference, Previous committee member for IEEE Nuclear and Space Radiation Effects Conference (NSREC) and Int. Symposium on Low Power Design (ISLPED); Previous associate editor, IEEE Transactions on Circuits and Systems II; Previous guest editor, *IEEE Journal of Solid State Circuits* (twice).

SELECTED PUBLICATIONS

S. Maurya and L. Clark, "A Specialized Static Content Addressable Memory for Longest Prefix Matching in Internet Protocol Routing," *Journal of Low Power Electronics*, vol. 7, no. 3, Aug., 2011.

S. Mhambrey, S. Maurya and L. Clark, "Low complexity Out-of-Order Issue Logic using Static circuits," *IEEE Trans. VLSI Syst.*, vol. 21, no. 2, Feb. 2012.

L. Clark, D. Zhao, T. Bakhishev, H. Ahn, E. Boling, M. Duane, K. Fujita, P. Gregory, T. Hoffmann, M. Hori, D. Kanai, D. Kidd, S. Lee, Y. Liu, J. Mitani, J. Nagayama, S. Pradhan, P. Ranade, R. Rogenmoser, L. Scudder, L. Shifren, Y. Torii, M. Wojko, Y. Asada, T. Ema, and S. Thompson "A Highly Integrated 65-nm SoC Process with Enhanced Power/Performance of Digital and Analog Circuits," *Proc. IEDM*, 2012.

R. Rogenmoser and L. Clark, "Reducing Transistor Variability for High Performance Low Power Chips," *IEEE Micro*, vol. 33, no. 2, March 2013.

L. Clark, S. Leshner and G. Tien, "SRAM Cell Optimization for Low AVT Transistors," *Proc. ISLPED*, 2013. Winner of Best Paper Award.

L. Clark, D. Patterson, C. Ramamurthy and K. Holbert, "A Microprocessor Core Hardened by Microarchitecture and Circuit Techniques," *Proc. GOMAC Tech*, 2014.

Douglas Cochran, *Associate Professor, Ph.D., Harvard University; cochran@asu.edu; 480-965-7409; Research expertise: sensor signal processing, applied harmonic analysis, detection theory.*

Douglas Cochran joined the ASU faculty in 1989. Between 2000 and 2005 and again from 2008 through 2010, he was on assignment to program management positions in federal agencies, first at the U.S. Defense Advanced Research Projects Agency and subsequently at the U.S. Air Force Office of Scientific Research. He served as Assistant Dean for Research in the Ira A. Fulton School of Engineering between 2005 and 2008. Before coming to ASU, he was a senior scientist at BBN Laboratories. Professor Cochran has served as a visiting scientist at the Australian Defense Science and Technology Organisation, as associate editor of the *IEEE Transactions on Signal Processing*, and as general co-chair for the 1999 IEEE International Conference on Acoustics, Speech, and Signal Processing and the 1997 U.S.-Australia Workshop on Defense Signal Processing. He will be Technical Program co-Chair for the 2015 IEEE International Conference on Acoustics, Speech, and Signal Processing. He holds Ph.D. and SM degrees in applied mathematics from Harvard University and degrees in mathematics from UCSD and MIT.

Honors and Distinctions: Top 5% of Fulton School of Engineering Teaching Faculty Commendation, 2007, 2013; U.S. Secretary of Defense Medal for Exceptional Public Service, 2005; Engineering Teaching Excellence Award, 1996-1997.

SELECTED RECENT PUBLICATIONS:

"Sampling homogeneous polynomials and approximating multivariate functions," (with S. Datta and S. Howard), *Advances in Pure and Applied Mathematics*, vol. 3, no. 4, pp. 421—441, February 2013.

"Conjoining speeds up information diffusion in overlaying social-physical networks," (with O. Yăgan, D. Qian, and J. Zhang), *IEEE Journal on Selected Areas in Communications*, vol. 31, issue 6, pp. 1038—1048, June 2013.

"Edge detection from truncated Fourier data using spectral mollifers," (with A. Gelb and Y. Wang), *Advances in Computational Mathematics*, vol. 38, issue 4, pp 737—762, May 2013.

"Positive-Operator-Valued Measures: A General Setting for Frames," (with B. Moran and S. Howard), in *Excursions in Harmonic Analysis*, T. Andrews, R. Balan, W. Czaja, K. Okoudjou, and J. Benedetto, eds., vol. 2, pp. 49—64, Springer 2013.

"Information-driven sensor planning: Navigating a statistical manifold," (Invited paper with A. O. Hero III), *Proceedings of the IEEE Global Conference on Signal and Information Processing*, pp. 1049—1052, December 2013

"Control of Sensing by Navigation on Information Gradients," (Invited paper with S. Suvorova, B. Moran, and S. D. Howard), *Proceedings of the IEEE Global Conference on Signal and Information Processing*, pp. 197—200, December 2013.

Rodolfo Diaz, *Professor Emeritus ; Ph.D., UCLA; rudydiaz@asu.edu; 480-965.4281; Research expertise: Optical scattering of sub-wavelength objects in complex environments and nanophotonics, analytic theory of natural and artificial media, measurement of electromagnetic properties of materials, combined computational mechanics and electromagnetics.*

During his 20 years in the aerospace industry, Professor Diaz has worked on many aspects of the interaction between electromagnetic waves and materials, from lightning protection on the space shuttle through the design of microwave lenses and high-temperature broadband radomes for radar missiles to the design and manufacture of radar-absorbing structures for stealth applications. He joined the ASU faculty in 1998 and currently is an associate professor of electrical engineering. Professor Diaz is the former associate director of the Consortium for Metrology of Semiconductor Nanodefects, and former interim director of the Consortium for Engineered Materials in the School of Materials at ASU. He also holds 25 patents ranging from the design of broadband radomes to the amplification of magnetic fields. From 2010 to 2012 he was on IPA assignment (half time) to the Sensors Directorate, Meta-Electronics Branch, RYDM, WPAFB, Dayton, OH.

Honors and Distinctions: 1994 Association of Interamerican Businessmen Award to Distinguished Young Executives in the Professional Category for Excellence in Engineering, San Juan, Puerto Rico.

SELECTED PUBLICATIONS

Panaretos, A. ; Diaz, R., "Low Frequency Finite-Difference Time-Domain Modeling of a PEC sphere Based on a Quasi-Analytical Coupled Dipole Approximation," *IEEE Trans. Antennas and Propagation*, Volume: PP (not assigned yet – online) , Issue: 99; doi 10.1109/TAP.2013.2271311,Publication Year: 2013.

T. Sebastian, S. A. Clavijo, and R. E. Diaz, "Improved accuracy thin film permeability extraction for a microstrip permeameter," *J. Appl. Phys.* 113, Issue 3, 033906 (2013)

T. Sebastian, S. Clavijo, R.E. Diaz, C. Daniel, D. Auckland, "A new realization of an efficient broadband conformal magnetic current dipole antenna," IEEE Sym. on Antennas & Propag., Orlando, FL, July 2013

Panaretos, A.H. ; Diaz, R.E., "On the Stability of the Finite-Difference Time-Domain Modeling of Lorentz Media," *IEEE Microwave and Wireless Components Letters*, Volume: 21 , Issue: 6, 2011, Page(s): 283 – 285.

Inan, K., R.E. Díaz, "Automated Analytic Continuation Method for the Analysis of Dispersive Materials", *IEEE Trans. Ant. Propag.*, vol. 59, no. 4, April 2011, pp. 1228-1236.

H. Panaretos, R. E. Diaz. "Subcell modeling of a Plasmonic Drude Nanosphere," International Conference on Electromagnetics in Advanced Applications, IEEE-APS Topical Conference on Antennas and Propagation in Wireless Communications, September 12-17, 2011, Torino, Italy.

Tolga M. Duman, *Professor; Ph.D., Northeastern University; duman@asu.edu; 480-965.7888; Research expertise: Digital communications, wireless and mobile communications, channel coding, coded modulation, multi-user communications, information theory, underwater acoustic communications.*

Tolga M. Duman received a BS from Bilkent University, Turkey, in 1993 and his MS and Ph.D. degrees from Northeastern University in 1995 and 1998, respectively, all in electrical engineering. He has been with ASU's electrical engineering program since August 1998.

Honors and Distinctions: IEEE Fellow, 2010; NSF CAREER Award, 2000; IEEE Third Millennium Medal; Editor for *IEEE Trans. on Wireless Communications* (2003-2008) and *IEEE Trans. on Communications* (2007-present).

SELECTED PUBLICATIONS

Mojtaba Rahmati and Tolga M. Duman, "Bounds on the Capacity of Random Insertion and Deletion-Additive Noise Channels," *IEEE Transactions on Information Theory,* vol. 59, no. 9, pp. 5534-5546, September 2013.

Suhail Al-Dharrab,Murat Uysal and Tolga M. Duman, "Cooperative underwater acoustic communications," *IEEE Communications Magazine*, vol. 51, no. 7, pp. 146-153, July 2013.

Kai Tu, Tolga M. Duman, Milica Stojanovic and John G. Proakis, "Multiple-resampling receiver design for OFDM over Doppler distorted underwater acoustic channels," *IEEE Journal of Oceanic Engineering*, vol. 38, no. 2, pp. 333-346, April 2013.

Feng Wang, Tolga M. Duman and Defne Aktas, "Capacity bounds and concatenated codes over segmented deletion channels," *IEEE Trans. on Communications*, vol. 61, no. 3, pp. 852-864, March 2013.

Tolga M. Duman and Ali Ghrayeb. *Coding for MIMO Communication Systems.* Wiley, 2007.

David K. Ferry, *Regents' Professor; Ph.D., University of Texas; ferry@asu.edu; 480-965.2570; Research expertise: quantum effects in submicron semiconductor devices and nanostructures and the general development of quantum transport in open systems.*

David Ferry joined ASU in 1983 following stints at Texas Tech University, the Office of Naval Research and Colorado State University. He has published more than 750 articles, books and chapters and has organized many conferences.

Honors and Distinctions: Regents' Professor at ASU; IEEE Cledo Brunetti Award, 1999; Fellow, American Physical Society; Fellow, IEEE; Fellow, Institute of Physics; ASU Graduate Mentor Award, 2000; IEEE Engineer of the Year, 1990; Phoenix Section; Outstanding research awards at Texas Tech University and Colorado State University.

SELECTED PUBLICATIONS

D. K. Ferry, *Semiconductors: Bonds and Bands.* Institute of Physics Publishing, Bristol, UK, 2013.

B. Liu, R. Akis, and D. K. Ferry, "Conductance fluctuations in semiconductor nanostructures," *Journal of Physics Condensed Matter 25*, 395802 (2013).

R. Somphonsane, H. Ramamoorthy, G. Bohra, G. He, D. K. Ferry, Y. Ochiai, N. Aoki, and J. P. Bird, "Fast energy relaxation of hot carriers near the Dirac point in Graphene," *Nano Letters 13*, 4305-4310 (2013).

M. V. Fischetti, J. Kim, S. Narayanan, Z.-Y. Ong, C. Sachs, D. K. Ferry, and S. J. Aboud, "Pseudopotential-based studies of electron transport in graphene and graphene nanoribbons," *Journal of Physics Condensded Matter 25*, 473202 (2013).

W. Lepkowski, S. J.Wilk, A. Parsi, M. Saraniti, D. Ferry, and T. J. Thornton, "Avalanche breakdown in SOI MESFETs," *Solid-State Electronics 91*, 78-80 (2014).

N. Aoki, C. R. da Cunha, R. Akis, D. K. Ferry, and Y. Ochiai, "Scanning gate imaging of a disordered quantum point contact," *Journal of Physics: Condensed Matter 26*, 193202 (2014).

H. Ramamoorthy, R. Somphonsane, G. He, D. K. Ferry, Y. Ochiai, N. Aoki, and J. P. Bird, "Reversing hot-carrier energy-relaxation in graphene with a magnetic field," *Applied Physics Letters 104*, 193115 (2014).

David H. Frakes, *Associate Professor; Ph.D., Georgia Institute of Technology; dfrakes@asu.edu; 480-727.9284; Research expertise: general image and video processing, fluid dynamics, machine vision; specific endovascular treatment of cerebral aneurysms, surgical planning for congenital heart defects, suppression of atmospheric distortion in video, control of flexible systems*

David Frakes joined ASU in the spring of 2008. He received the BS degree in electrical engineering and MS degrees in electrical engineering and mechanical engineering from the Georgia Institute of Technology, where he also earned a Ph.D. in bioengineering and performed post-doctoral work.

Honors and Distinctions: 2014 ASU SBHSE Outstanding Graduate Faculty Member of the Year Award (3rd time); 2013 ASU Faculty Achievement Award—Best Innovation; 2013 Mimics Innovation Awards—1st Place Poster Competition; 2013 ASU SBHSE Outstanding Graduate Faculty Member of the Year Award (2nd time); 2013 ASME Summer Bioengineering Conference Ph.D. Paper Competition Awardee (3rd Place); 2012 IEEE Conference on Bioinformatics and Bioengineering Best Paper Competition Finalist; 2012 ASU Fulton Schools of Engineering College Marshal—Fall 2012 Commencement; 2012 ASU SBHSE Outstanding Graduate Faculty Member of the Year Award; 2012 ASU Faculty Women's Association Outstanding Mentor Award; 2012 ISMRM Annual Meeting Magna Cum Laude Award; 2011 Science Foundation of Arizona Grand Challenges Summit People's Choice Poster Award; 2011 Arizona State University Top 5% Excellence in Instruction Award; 2011 IEEE Phoenix Section Outstanding Faculty Award; 2010 Rosann Donato Chair of Research—The Brain Aneurysm Foundation; 2010 Mimics Innovation Awards—1st Place Poster Competition

SELECTED PUBLICATIONS OF SUPERVISED STUDENTS:

Kanberoglu B, Moore N, Frakes D, Karam L, Debins J, Preul M., "Neuronavigation Using Three-dimensional Proton Magnetic Resonance Spectroscopy Data,". *Stereotactic and Functional Neurosurgery*, accepted: May 2014.

Ryan J, Moe T, Richardson R, Frakes D, Nigro JJ, Pophal SG., "A Novel Approach to Neonatal Management of Tetralogy of Fallot, with Pulmonary Atresia, and Multiple Aortopulmonary Collaterals," *JACC: Cardiovascular Imaging*, accepted: Apr 2014.

Roszelle B, Nair P, Gonzalez F, Babiker H, Ryan J, Frakes D., "Comparison among Different High Porosity Stent Configurations: Hemodynamic Effects of Treatment in a Large Cerebral Aneurysm," *ASME Journal of Biomechanical Engineering*. accepted: Nov 2013.

Zwart C, Frakes D., "Segment Adaptive Gradient Angle Interpolation." *IEEE Transactions on Image Processing*. vol 22(8), pp 2960-9, Aug 2013.

Roszelle B, Gonzalez F, Babiker H, Ryan J, Albuquerque F, Frakes D., "Flow Diverter Effect on Cerebral Aneurysm Hemodynamics: An In Vitro Comparison of Telescoping Stents and the Pipeline," *Neuroradiology*. vol 55(6), pp 751-8, Jun 2013.

Babiker H, Gonzalez L, Chong B, Cheema S, Frakes D., "Finite Element Modeling of Embolic Coil Deployment: Multifactor Characterization of Treatment Effects on Cerebral Aneurysm Hemodynamics," *Journal of Biomechanics*, accepted: Jun 2013.

Stephen Goodnick, *Professor, Ph.D., Colorado State University; stephen.goodnick@asu.edu; 480-965-9572; Research expertise: Solid state device physics, transport in nanostructures, nanoelectronic devices and circuits, computational electronics, RF and microwave devices, optoelectronic and energy conversion devices.*

Stephen Goodnick is presently the deputy director of the ASU LightWorks initiative. He recently served as the associate vice president for research from 2006-2008, and prior to that as deputy dean of the Fulton Schools of Engineering. He came to ASU in fall 1996 as department chair. Prior to that, he was a professor of electrical and computer engineering at Oregon State University. He has also been a visiting scientist at the Solar Energy Research Institute and Sandia National Laboratories and a visiting faculty member at the Walter Schottky Institute, Munich, Germany, the University of Modena, Italy, the University of Notre Dame, and Osaka University, Japan. He is currently the past president of the board of governors of the IEEE Eta Kappa Nu engineering honor society and past president of the IEEE Nanotechnology Council. He served as president (2003-2004) of the Electrical and Computer Engineering Department Heads Association (ECEDHA) and as program chair of the Ninth IEEE Conference on Nanotechnology in 2009. Professor Goodnick has published over 200 refereed journal articles, books and book chapters.

Honors and Distinctions: IEEE Region 6 Outstanding Educator Award, 2013, Hans Fischer Senior Fellow, Technical University of Munich Institute for Advanced Study, 2013; IEEE Phoenix Section Outstanding Faculty Award, 2013; ASEE ECE Division Meritorious Service Award 2012; Robert M. Janowiak Outstanding Leadership and Service Award, Electrical and Computer Engineering Department Heads Association, 2008; Fellow, IEEE, 2004; IEEE Phoenix Section Society Award for Outstanding Service, 2002; Colorado State University College of Engineering Achievement in Academia Award, 1998; College of Engineering Research Award, Oregon State University,1996; Alexander von Humboldt Research Fellow, Germany, 1986.

SELECTED PUBLICATIONS

L. Zhou, E. Dimakis, R. Hathwar, T. Aoki, David J. Smith, T. D. Moustakas, S. M. Goodnick, and M. R. McCartney, "Measurement and effects of polarization fields on one-monolayer-thick InN/GaN multiple quantum wells," *Physical Review B 88*, 125310, 1-5 (2013).

S. M. Goodnick and M. Saraniti, "Modeling and Simulation of Terahertz Devices" (invited paper), *IEEE Microwave Magazine*, vol. 13, no. 7, pp. 36-44, 2012.

C. B. Honsberg and S. M. Goodnick, "Realizing terawatt-scale solar electricity: nanotechnology-enabled physical mechanisms and material properties" (invited paper), *IEEE Nanotechnology Magazine*, vol. 6, no. 2, pp. 6-14, 2012.

D. Vasileska, S. M. Goodnick, and G. Klimeck, *Computational Electronics: Semi-Classical and Quantum Device Modeling and Simulation*, UK: Taylor and Francis (600 pages), 2010.

D. K. Ferry, S. M. Goodnick, and J. Bird, *Transport in Nanostructures*, 2nd Ed., UK: Cambridge University Press (650 pages), 2009.

Ravi Gorur, *Professor, Ph.D., University of Windsor, Canada; ravi.gorur@asu.edu; 480-965-4894; Research expertise: dielectrics and electrical insulating materials for outdoor power delivery, nanodielectrics, electric field calculations, HV testing techniques and computer aided design*

Professor Ravi Gorur joined the faculty at ASU in 1987 as an assistant professor after graduating with a Ph.D. from the University of Windsor, Canada, in 1986. Since 1995, he has held the position of professor, and presently he is the program chair in the School of Electrical, Computer and Energy Engineering. Professor Gorur is a fellow of the IEEE and the U.S. representative to the CIGRE study committee D1, "Materials for Advanced Technologies." He has authored a textbook on outdoor insulators and more than 150 papers in IEEE journals and conferences on the subject of outdoor insulators for electric power transmission and distribution. He works in other related areas such as liquid dielectrics, dielectrics for aircraft and communications systems. He teaches a short course on the subject of insulators that is offered to the industry annually. He served as the Deputy Assistant Secretary in the US Department of Energy's Office of Electricity Delivery and Energy Reliability from May 2013-May 2014.

Honors and Distinctions: IEEE Fellow, 1999; U.S. representative to CIGRE Study Committee D1 (materials for advanced technologies); Claude de Tourreil Memorial Award for Lifetime Achievement in the field of electrical insulators, 2011. Outstanding technical contributor, IEEE Conference on Electrical Insulation and Dielectric Phenomena, 2011.

SELECTED PUBLICATIONS

G. Iyer, R. S. Gorur and A. Krivda, "Understanding electrical discharge endurance of epoxy micro- and nano-composites through thermal analysis", *IEEE Transactions on Dielectrics and Electrical Insulation,* vol. 21, no. 1, pp. 225-229, 2014.

E. A. Cherney, R. S. Gorur, et al, "End-of-life and replacement strategies for RTV silicone rubber coatings", *IEEE Transactions on Dielectrics and Electrical Insulation*, vol. 21, no. 1, pp 253-261, 2014.

E. A. Cherney, R. S. Gorur, et al, "RTV silicone rubber pre-coated ceramic insulators for transmission lines", *IEEE Transactions on Dielectrics and Electrical Insulation,* vol. 20, no. 1, pp, 237-244, 2013.

G. Iyer, R. S. Gorur and A. Krivda, "Corona resistance of epoxy nanocomposites: experimental results and modeling", I*EEE Transactions on Dielectrics and Electrical Insulation*, vol. 19, no. 1, pp. 118-125, 2012.

Michael Goryll, *Associate Professor; Ph.D., RWTH Aachen University; michael.goryll@asu.edu; 480-965-9517; Research expertise: Surface and interface physics, new materials in CMOS processing, fabrication of nanoscale semiconductor devices, transport phenomena in nanopores, integration of biomineralized structures with silicon MEMS, electrophysiological properties of cell membrane ion channels, low-noise analog amplifier design, electronic instrumentation for biophysical measurements.*

Michael Goryll joined the faculty in 2007. He received a Ph.D. in physics in 2000 and a diploma in physics in 1997, both from the RWTH Aachen University, Germany. He performed his post-doctoral research on biosensors at ASU during the years 2003-2005. Before joining ASU, Professor Goryll spent several years at the Research Centre Juelich, the largest national research lab in Germany, focusing on SiGe chemical vapor deposition and biosensor development.

Honors and Distinctions: 2012 NSF CAREER Award Recipient, 2012 Top Engineering Faculty Teaching Award at ASU, Helmholtz Research Fellowship for Outstanding Young Investigators granted by the Research Centre Julich, Germany (2001-2005); Post-Graduate Scholarship granted by the RWTH Aachen University, Germany (1997-2000).

SELECTED PUBLICATIONS

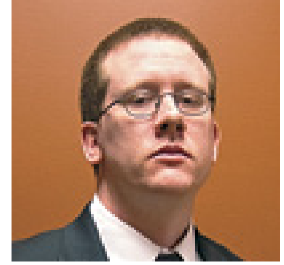
C. Corredor, Wen-Che Hou, S. A. Klein, B. Y. Moghadam, M. Goryll, K. Doudrick, P. Westerhoff, J. D. Posner, "Disruption of model cell membranes by carbon nanotubes," *Carbon,* vol. 60, pp. 67-75, 2013

G. V. Luong, S. Wirths, S. Stefanov, B. Hollander, J. Schubert, J. C. Conde, T. Stoica, U.Breuer, S. Chiussi, M. Goryll, D. Buca, and S. Mantl, "Study of dopant activation in biaxially compressively strained SiGe layers using excimer laser annealing," *Journal of Applied Physics*, vol. 113, 204902-1-9, 2013.

S. Choi, M. Goryll, L. Y. M. Sin, P. K. Wong, and J. Chae, "Microfluidic-based biosensors toward point-of-care detection of nucleic acids and proteins," *Microfluidics and Nanofluidics*, vol. 10, pp. 231-247, 2011.

P. Joshi, A. Smolyanitsky, L. Petrossian, M. Goryll, M. Saraniti, and T. J. Thornton, "Field effect modulation of ionic conductance of cylindrical silicon-on-insulator nanopore array," *Journal of Applied Physics*, vol. 107, 054701-1-6, 2010.

S. J. Wilk, L. Petrossian, M. Goryll, T. J. Thornton, S. M. Goodnick, J. M. Tang, and R. S. Eisenberg, "Integrated electrodes on a silicon based ion channel measurement platform," *Biosensors & Bioelectronics,* vol. 23, issue 2, pp. 183-190, 2007.



Kory W. Hedman, *Assistant Professor; Ph.D., University of California, Berkeley; khedman@asu.edu; 480-965-1276; Research expertise: power and energy systems, operations research, renewable energy, power system economics, operations and planning, transmission engineering, mathematical programming, stochastic optimization, market design, financial engineering*

Kory W. Hedman received the BS degree in electrical engineering and the BS degree in economics from the University of Washington, Seattle, in 2004, and the MS degree in economics and the MS degree in electrical engineering from Iowa State University, Ames, in 2006 and 2007, respectively. He received the MS and Ph.D. degrees in industrial engineering and operations research from the University of California, Berkeley in 2008 and 2010, respectively. He has worked for the California ISO (CAISO) in Folsom, CA, on transmission planning, as well as for the Federal Energy Regulatory Commission (FERC), Washington, DC, on transmission switching. Hedman joined the School of Electrical, Computer and Energy Engineering at Arizona State University as an assistant professor in 2010. He is also listed as a graduate faculty in the department of industrial engineering. Professor Hedman's research includes operations research applied to electric power systems, high performance computing applied to stochastic unit commitment, management of renewable resources and distributed resources, energy market design and pricing, smart grids, microgrids, and transmission topology control. Professor Hedman is a member of the Power System Engineering Research Center (PSERC).

SELECTED PUBLICATIONS

F. Wang and K. W. Hedman, "Dynamic reserve zones for day-ahead unit commitment with renewable resources," *IEEE Trans. Power Syst.*, accepted May 2014.

J. Lyon, M. Zhang, and K. W. Hedman, "Locational reserve disqualification for distinct scenarios," *IEEE Trans. Power Syst.*, accepted Apr. 2014.

C. Li, M. Zhang, and K. W. Hedman, "N-1 reliable unit commitment via progressive hedging," *JNL Energy Eng.*, accepted Jan. 2014.

P. Balasubramanian and K. W. Hedman, "Real-time corrective transmission switching in response to simultaneous contingencies," *JNL Energy Eng.*, accepted Jan. 2014.

A. Escobedo-Pinto, E. Moreno-Centeno, and K. W. Hedman, "A practical, efficient and effective algorithm for load shed recovery with transmission switching," *IEEE Transactions on Power Systems*, vol. 29, no. 2, pp. 908-916, Mar. 2014.

J. D. Lyon, K. W. Hedman, and M. Zhang, "Reserve requirements to efficiently manage intra-zonal congestion," *IEEE Trans. Power Syst.*, vol. 29, no. 1, pp. 251-258, Jan. 2014.

[7] A. Korad1 and K. W. Hedman, "Robust corrective transmission switching for system reliability," *IEEE Trans. Power Syst.*, vol. 28, no. 4, pp. 4042-4051, Nov. 2013.

[8] R. P. O'Neill, E. A. Krall, K. W. Hedman, and S. S. Oren, "A model and approach to the challenge posed by optimal power systems planning," *Math. Prog.*, vol. 140, no. 2, pp. 239-266, Sep. 2013.

Gerald T. Heydt, *Regents' Professor, Professor of Advanced Technology,; Ph.D., Purdue University; heydt@asu.edu; 480-965-8307 ; Research expertise: Power engineering, electric power quality, distribution engineering, transmission engineering, computer applications in power engineering, power engineering education, power system sensors and instrumentation.*

Gerald Thomas Heydt is from Las Vegas, NV. He holds a BEEE degree from the Cooper Union in New York and MSEE and Ph.D.. degrees from Purdue University. He spent approximately 25 years as a faculty member at Purdue, and in 1994, he took the position of site director of the NSF and industrially supported Power Systems Research Center at ASU. He has industrial experience with the Commonwealth Edison Company in Chicago, E.G. & G. in Mercury, NV, and with the United Nations Development Program. In 1990, he served as the program manager of the National Science Foundation program in power systems engineering. He is the author of two books in the area of power engineering. Professor Heydt is a Regents' Professor and Professor of Advanced Technology at ASU; he is a member of the National Academy of Engineering, and a fellow of the IEEE.

Honors and Distinctions: Life Fellow, IEEE; Member, U.S. National Academy of Engineering; Edison Electric Institute Power Engineering Educator Award, 1989; IEEE Power Engineering Society Power Engineering Educator of the Year, 1995; IEEE Kaufmann Award, 2010.

SELECTED PUBLICATIONS

H. Zhang, V. Vittal, G. T. Heydt, J. Quintero, "A mixed integer linear programming approach for multi-stage security constrained transmission expansion planning," *IEEE Transactions on Power Systems*, v. 27, no. 2, May 2012, pp. 1125 – 1133.

S. Eftekharnejad, V. Vittal, G. Heydt, B. Keel, J. Loehr, "Small signal stability assessment of power systems with increased penetration of photovoltaic generation: a case study," *IEEE Trans. on Sustainable Energy*, v. 4, no. 4, October 2013, pp. 960 – 967.

F. Meng, D. Haughton, B. Chowdhury, M. Crow, G. Heydt, "Distributed generation and storage optimal control with state estimation," *IEEE Transactions on Smart Grid*, v. 4, no. 4, December 2013, pp. 2266-2273.

Yacine Chakhchoukh, Vijay Vittal, Gerald T. Heydt, "PMU based state estimation by integrating correlation," *IEEE Transactions on Power Systems*, v. 29, no. 2, March 2014, pp. 617 – 626.

Keith Holbert, *Associate Professor; Ph.D., University of Tennessee; holbert@asu.edu; 480-965-8594; Research expertise: nuclear engineering, process monitoring and diagnostics, sensor fault detection, instrumentation development, and radiation effects on electronics.*

Keith Holbert is the director of the nuclear power generation program. He joined the faculty in 1989. Professor Holbert is a registered professional (nuclear) engineer and has published over 150 refereed journal and conference papers, two textbooks, and holds one patent.

Honors and Distinctions: Tau Beta Pi; Teaching Excellence Award from ASU College of Engineering, 1997; IEEE Senior Member; Outstanding Faculty Award, IEEE Phoenix Section, 2007; IEEE Transactions on Education Best Paper award, 2010; Guest Scientist, Los Alamos National Laboratory, 2005-2014; Top 5% Faculty, Fulton Schools of Engineering, 2012.

SELECTED PUBLICATIONS

R. L. Murray, K. E. Holbert, *Nuclear Energy: An Introduction to the Concepts, Systems, and Applications of Nuclear Processes*, 7th ed., Elsevier Butterworth-Heinemann, 2014.

G. G. Karady, K. E. Holbert, *Electrical Energy Conversion and Transport: An interactive computer-based approach*, 2nd ed., IEEE Series on Power Engineering, Wiley Interscience, 2013.

K. E. Holbert, T. Stannard, T. Zhang, A. Christie, E. B. Johnson, "Discriminating fission weapons using lithium-ion batteries," *Trans. American Nuclear Society*, vol. 109, pp. 501-503, 2013.

A. R. Indluru; K. E Holbert, T. L Alford, "Gamma radiation effects on indium-zinc oxide thin-film transistors," *Thin Solid Films*, vol. 539, pp. 342–344, July 2013.

E. B. Johnson, C. Whitney, X. J. Chen, C. J. Stapels, K. E. Holbert, A. Kaczmarowski, T. Stannard, J. F. Christian, "Li-ion batteries used as ubiquitous neutron sensors for nuclear forensics," *IEEE Trans. Nuclear Science*, vol. 60, no. 2, pp. 644-651, April 2013.

T. Zhang, K. E. Holbert, "Frequency domain comparison of multi-lump and distributed parameter models for pressurized water reactor cores," *Am. J. Energy Research*, vol. 1, no. 1, pp. 17-24, March 2013.

K. E. Holbert, K. Lin, "Nuclear power plant instrumentation fault detection using fuzzy logic," *Science and Technology of Nuclear Installations*, vol. 2012, Article ID 421070, 11 pages, September 2012.

W. Xin, K. E. Holbert, L. T. Clark, "Single event upset mitigation techniques for FPGAs utilized in nuclear power plant digital instrumentation and control," *Nuclear Engineering and Design*, vol. 241, no. 8, pp. 3317-3324, August 2011.

K. Lin and K. E. Holbert, "Void diagnostics in liquid-filled pressure sensing lines," *Progress in Nuclear Energy*, vol. 52, no. 5, pp. 503-511, July 2010.

K. E. Holbert, G. G. Karady, S. G. Adhikari, and M. L. Dyer, "Magnetic fields produced by underground residential distribution system," *IEEE Trans. Power Delivery*, vol. 24, no. 3, pp. 1616-1622, July 2009.

K. Lin and K. E. Holbert, "Applying the equivalent pi circuit to the modeling of hydraulic pressurized lines," *Mathematics and Computers in Simulation*, vol. 79, no. 7, pp. 2064-2075, Mar. 2009.

K. Lin and K. E. Holbert, "Blockage diagnostics for nuclear power plant pressure transmitter sensing lines," *Nuclear Engineering and Design*, vol. 239, no. 2, pp. 365-372, Feb. 2009.

Zachary C. Holman, *Assistant Professor; Ph.D., University of Minnesota; zachary.holman@asu.edu; 480-965.2995; Research expertise: amorphous silicon/crystalline silicon heterojunction solar cells, light management in solar cells, transparent conductive oxides, semiconductor nanoparticles, optical and electronic properties of nanoscale materials, plasma synthesis of powders, deposition of powders and thin films.*

Zachary C. Holman received a B.A. degree in physics from Reed College and a Ph.D. degree in mechanical engineering from the University of Minnesota. He spent two years as a postdoctoral fellow in the Institute of Microengineering at EPFL in Switzerland prior to joining the faculty at Arizona State University in 2013.

SELECTED PUBLICATIONS

J. Seif, A. Descoeudres, M. Filipič, F. Smole, M. Topič, Z. Holman, S. De Wolf, and C. Ballif, "Amorphous silicon oxide window layers for high-efficiency silicon heterojunction solar cells," *Journal of Applied Physics 115*, 024502 (2014).

M. Deceglie, H. Emmer, Z. Holman, A. Descoeudres, S. De Wolf, C. Ballif, and H. Atwater, "Scanning laser-beam-induced current measurements of lateral transport near junction defects in silicon heterojunction solar cells," *IEEE Journal of Photovoltaics 4*, 154–159 (2014).

Z. Holman, A. Descoeudres, S. De Wolf, and C. Ballif, "Record infrared internal quantum efficiency in silicon heterojunction solar cells with dielectric/metal rear reflectors," *IEEE Journal of Photovoltaics 3*, 1243–1249 (2013).

M. Filipič, Z. Holman, F. Smole, S. De Wolf, C. Ballif, and M. Topič, "Analysis of lateral transport through inversion layer in amorphous silicon/crystalline silicon heterojunction solar cells," *Journal of Applied Physics 114*, 074504 (2013).

Z. Holman, S. De Wolf, and C. Ballif, "Improving metal reflectors by suppressing surface plasmon polaritons: A priori calculation of the internal reflectance of a solar cell," *Light: Science & Applications* 2, e106 (2013).

L. Barraud, Z. Holman, N. Badel, P. Reiss, A. Descoeudres, C. Battaglia, S. De Wolf, and C. Ballif, "Hydrogen-doped indium oxide/indium tin oxide bilayers for high-efficiency silicon heterojunction solar cells," *Solar Energy Materials and Solar Cells 115*, 151–156 (2013).

A. Descoeudres, Z. Holman, L. Barraud, S. Morel, S. De Wolf, and C. Ballif, ">21% efficient silicon heterojunction solar cells on n- and p-type wafers compared," *IEEE Journal of Photovoltaics 3*, 83–89 (2013).

Christiana Honsberg, *Professor; Ph.D., University of Delaware; christiana.honsberg@asu.edu; 480-965.2831; Research expertise: Ultra-high efficiency solar cells, and silicon solar cells.*

Professor Christiana Honsberg joined the electrical engineering faculty in 2008 and is currently a professor. She received her BS, MS and Ph.D. from University of Delaware in 1986, 1989, and 1992, respectively, all in electrical engineering. Before joining the ASU faculty, Honsberg was an associate professor and director for the high performance solar power program at the University of Delaware. She currently holds one patent in the U.S., Japan, and Europe; three patents are pending.

SELECTED PUBLICATIONS

S. P. Bremner, M. Y, Levy, and C. B. Honsberg, "Limiting efficient of an intermediate band solar Cell Under a Terrestrial Spectrum," *Applied Physics Lett.*, February 2008.

S. P. Bremner, G. M. Liu, N. Faleev, K. Gosh, and C. B. Honsberg, "Growth and characterization of GaAs1−xSbx barrier layers for advanced concept solar cells," *Journal of Vacuum Science and Technology B*, 2008.

C. B. Honsberg, and M. Y. Levy, "Nanostructured absorbers for multiple transition solar cells," *IEEE Transaction on Electron Devices,* vol. 56, no. 3, 706-711, 2008.

S. P. Bremner, M. Y, Levy, and C. B. Honsberg, "Analysis of tandem solar cell efficiencies under AM 1.5G spectrum using a rapid flux calculation method," *Progress in Photovoltaics: Research and Application*, available online, February 2008.

O. Jani, I. Ferguson, C. B. Honsberg, and S. Kurtz, "Design and characterization of GaN/ InGaN solar cells," *Applied Physics Lett.*, vol. 91, no. 13, 1-3, 2007.

N. Fleev, C. B. Honsberg, O. Jani, and I. Ferguson, "Crystalline perfection of GaN and A1N epitaxial layer and the main Features of Structural Transformation of Crystalline Defects," *Journal of Crystal Growth*, vol. 300, 1400-1405, 2006.

O.K. Jani and C.B. Honsberg, "Absorption and Transport via Tunneling in a Quantum Well Solar Cells," *Solar Energy*, July 28, 2006.

B.S. Richards, S.F. Rowlands, A. Ueranatasun,J. E. Cotter, and C.B. Honsberg, "Potential Cost Reduction of Buried-Contact Solar Cells through the Use of Titanium Dioxide Thin Films," *Solar State Electronics*, vol. 50, 1400-1405,

2006.

Joseph Hui, *ISS Chair, Professor: Ph.D., Massachusetts Institute of Technology; jhui@asu.edu; 480-965.5188; Research expertise: wireless networks, broadband switching and routing, teletraffic analysis, coding and information theory, virtualization and cloud computing, renewable energy.*

Joseph Y. Hui joined ASU as ISS Chair Professor in 1999. He received his BS, MS, and Ph.D. degrees from MIT. He held research and teaching positions at Bellcore, Rutgers University, Columbia University and the Chinese University of Hong Kong before joining ASU. He founded and holds presidency for Nuon Labs and its subsidiaries Pcion, Virtuon, and Etherion.

Honors and Distinctions: ISS Chair Professor, IEEE Fellow, 1996; HKIE Fellow, 1998; NSF Presidential Young Investigator, 1990; IEEE William Bennett Prize Paper Award, 1984; Henry Rutgers Research Fellow, 1989.

SELECTED PUBLICATIONS

Joseph Y. Hui and David A. Daniel, "Terabit Ethernet: Access and core switching using time-space carrier sensing," *IEEE Systems Journal*, vol. 4 issue 4, pp. 458-466, Dec. 2010.

Joseph Y. Hui and Lingie Li, "First-fit scheduling for multi-stage packet switching networks," *Journal of Communications*, Academic Publishers, vol. 5, no. 3, pp. 205-210, Mar. 2010.

J. Hui, and D. Daniel, "Terabit Ethernet: A time-space carrier sense multiple access method," *Proceedings of the 2008 IEEE Globecom*, 1-6, 2008.

J. Hui, and L. Li, "First-fit scheduling for multistage packet switching networks," in *Proceedings of 2008 High Performance Switching and Routing Symposium*, 197-202, (also published as journal paper in 2008).

J. Hui, and D. Daniel, "Virtualization of local computer bus architectures over the Internet," IEEE Globecom 2007 Internet Protocol Symposium, Nov. 2007.

J. Hui and P. C. Gurumohan, "Selfish vs. social routing with competitive traffic pricing," in *Proceeding of 43rd Annual Allerton Conference on Communication, Control, and Computing*, 341-345, Sep. 2005.

J. Hui, S. B. Narasimhamurthy, P. C. Gurumohan, and S. Sreenivasamurthy, "Quanta data storage: An information processing and transportation architecture for storage area networks," *IEEE Journal on Selected Areas in Communications*, vol. 23, issue 10, pp. 2032-2040, Oct. 2005.

George G. Karady, *Professor, Ph.D., University of Technical Sciences, Budapest; karady@asu.edu; 480-965.6569; Research expertise: Power electronics, high-voltage engineering and power systems.*

George G. Karady received his MS and Ph.D. degrees in electrical engineering from the Technical University of Budapest. He was appointed Salt River Chair Professor at ASU in 1986. Previously, he was with EBASCO Services where he served as chief consulting electrical engineer, manager of electrical systems and chief engineer of computer technology. He was an electrical task supervisor for the Tokomak Fusion Test Reactor project in Princeton. Professor Karady has graduated 23 Ph.D. and 53 MS students. He is an IEEE Fellow, and has published a book, several book chapters, and 136 journal and 220 conference papers.

Honors and Distinctions: Fellow of IEEE; 2010 Best Transaction Paper Award (with K. Holbert); Chair, Awards Committee, IEEE PES Chapter and membership division, 2000-2005; President, IEEE Phoenix Section, 2004; Honorary doctorate, Technical University of Budapest, 1999; IEEE Third Millennium Medal; IEEE PES Working Group (WG) Recognition Award, 2002; Chair, WG that prepared IEEE Standard 1313-2.

SELECTED PUBLICATIONS

G. Karady, K. Holbert, *Electric Energy Conversion and Transport using an Interactive Computer-Based Approach*, Second Edition, John Wiley and Sons Inc. ISBN 978-0-470-93699-3- 2013.

J.R. Prigmore, J. A. Mendoza, G. G. Karady, "Comparison of Four Different Types of Ferromagnetic Materials for Fault Current Limiter Applications," *IEEE Transaction on Power Delivery*, vol. 28, no. 3, pp. 1491-1498, July 2013

Jiajun Liu, George Karady, Hassan Alamer, Ahmad Alhabib, Qixing Yan, "Influence of Grounded Back Electrode on AC Creepage Breakdown," *IEEE Transactions on Dielectrics and Electrical Insulation*, vol. 20, Issue 5, pp. 1887-1894, October 2013.

Xianjun Zhang, George G. Karady, Kalyan R. Piratla, Samuel T. Ariaratnam, "Network Capacity Assessment of Combined Heat and Power-Based Distributed Generation in Urban Energy Infrastructures," *IEEE Transactions on Smart Grid,* pp 2131-2138, vol. 4, no. 4, December 2013

Xianjun Zhang, George G. Karady, Kalyan R. Piratla, Samuel T. Ariaratnam, "Optimal Allocation of CHP-Based Distributed Generation on Urban Energy Distribution Networks," *IEEE Transactions on Sustainable Energy*, pp. 246-253, vol. 5, no. 1, January 2014

Jay R Prigmore, Jorge A. Mendoza, and George G. Karady: "A neodymium hybrid fault current limiter," *International Transactions on Electrical Energy Systems*, DOI: 10.1002/ETEP.1915 2014.

Lina Karam, *Professor; PhD, Georgia Institute of Technology; karam@ asu.edu; 480.965.3694; Research expertise: image and video processing, compression, and transmission; computer vision, perceptual-based processing, multidimensional signal processing; digital filtering.*

Lina Karam directs the Image, Video, & Usabilty research laboratory (IVU). She is a Fellow of the IEEE. She was awarded a US National Science Foundation CAREER Award, a NASA Technical Innovation Award, and the 2012 Intel Outstanding Researcher Award. She was also awarded the Outstanding Faculty Award by the IEEE Phoenix Section. She is currently serving as the General Chair of the 2016 IEEE International Conference on Image Processing. She has co-founded two international workshops (VPQM and QoMEX). Her industrial experience includes image and video compression development at AT&T Bell Labs (Murray Hill), multi-dimensional data processing and visualization at Schlumberger, and collaboration on computer vision, image/video processing, compression, and transmission projects with industries including Intel, Google, NEC, Qualcomm, Motorola/Freescale, General Dynamics, and NASA.

SELECTED PUBLICATIONS

Qian Xu, Srenivas Varadarajan, Chaitali Chakrabarti, and Lina J. Karam, "A Distributed Canny Edge Detector: Algorithm and FPGA Implementation," *IEEE Transactions on Image Processing*, vol. 23, issue 7, pp. 2944-2960, July 2014.

Lina J. Karam, W. Bastiaan Klein, and Karon MacLean, "Perception-based Media Processing," *Proceedings of the IEEE*, vol. 101, issue 9, pp. 1900-1904, Sep. 2013.

Akshay Pulipaka, Patrick Seeling, Martin Reisslein, and Lina J. Karam, "Traffic and Statistical Multiplexing Characterization of 3-D Video Representation Formats," *IEEE Transactions on Broadcasting*, 59(2), pp. 382-389, June 2013.

Gaurav Sharma, Lina Karam, and Patrick Wolfe, "Select Trends in Image, Video, and Multidimensional Signal Processing," *IEEE Signal Processing Magazine*, pp. 5-8, Jan. 2012.

Lina J. Karam, Nabil G. Sadaka, Rony Ferzli and Zoran A. Ivanovski, "An Efficient Selective Perceptual-Based Super-Resolution Estimator," *IEEE Transactions on Image Processing*, vol. 20, no. 12, pp. 3470-3482, Dec. 2011.

Niranjan D. Narvekar and Lina J. Karam, "A No-Reference Image Blur Metric Based on the Cumulative Probability of Blur Detection (CPBD)," *IEEE Transactions on Image Processing*, vol. 20, no. 9, pp. 2678-2682, Sep. 2011.

Asaad F. Said, Bonnie L. Bennett, Lina J. Karam, and Jeff Pettinato, "Automated Detection and Classification of Non-Wet Solder Joints," *IEEE Transactions on Automation Science and Engineering*, vol. 8, no. 1, pp. 67-80, Jan. 2011.

Sayfe Kiaei, *Professor; Director of NSF Connection One Center, Motorola Chair Professor; Ph.D., Washington State University; sayfe@asu.edu; 480-727.7761; Research expertise: RFIC, Mixed-Signal IC, Power Management IC, Communications, Signal Processing.*

Sayfe Kiaei has been with ASU since January 200. He is a professor and the director of the Connection One NSF/IUCRC. From 2008-2012 he was the associate dean of research at the Ira A. Fulton Schools of Engineering. From 1993 to 2001, he was a senior member of technical staff with the Wireless Technology Center and Broadband Operations at Motorola. Kiaei was an associate professor at Oregon State University from 1987-1993. Kiaei assisted in the establishment of the Industry-University Center for the Design of Analog/Digital ICs (CDADIC) and served as a co-director of CDADIC for 10 years. He has published more than 100 journal and conference papers and holds several patents and his research interests are in wireless transceiver design, RF and mixed-signal IC's in CMOS and SiGe. His research projects are funded by a large number of industrial sponsors including Motorola Inc., Intel, the National Science Foundation, Texas Instruments and SRC. Kiaei is an IEEE Fellow, and has been the chair and on the technical program committee of several IEEE conferences including RFIC, MTT, ISCAS, and other international conferences.

Honors and Distinctions: IEEE Fellow; IEEE Microwave Techniques and Society (MTT) Fellow; Carter Best Teacher Award; IEEE Darlington Award; Global Standards Award (ITU Standards); IEEE Circuits and Systems Society Best Paper Award; Motorola 10X Design Award; IEEE Fellow Selection Committee Chair; IEEE Fellow Committee Award; Associate Dean for Research at ASU's Ira A. Fulton Schools of Engineering; Director of the Connection One Center.

SELECTED PUBLICATIONS

Deng, L., et al., "Electrical calibration of spring-mass MEMS capacitive accelerometers." *Proceedings of the Conference on Design, Automation and Test in Europe*. EDA Consortium, 2013.

Min, S.; Copani, T.; Kiaei, S. & Bakkaloglu, B., "A 90-nm CMOS 5-GHz ring-oscillator PLL with delay-discriminator-based active phase-noise cancellation," *IEEE Journal of Solid-State Circuits,* vol. 48, no. 5, pp. 1151-1160, 2013.

Marti-Arbona, E.; Bakkaloglu, B. and Kiaei, S., "Ultra-Low Power Current-to-Digital Sensor for Switching DC-DC Converters." 8th Conference on Ph. D. Research in Microelectronics and Electronics (PRIME), 2012 VDE, 2012.

Lee, J.; Copani, T.; Mayhugh Jr., T.; Aravind, B.; Kiaei, S. and Bakkaloglu, B. "A 280 mW, 0.07% THD+N class-D audio amplifier using a frequency-domain quantizer," *Analog Integrated Circuits and Signal Processing*, 173-186, 2012.

Jennifer N. Kitchen, *Assistant Professor; Ph.D., Arizona State University; kitchen.jennifer@asu.edu; 480-965.1857; Research expertise: RF integrated transceivers on silicon and III-V materials (GaN); power management and distribution for high-frequency integrated circuits for consumer applications; low-power/long-term field deployment ICs for the military and green energy (solar arrays); programmable, broadband wireless transceivers for future generation (5G) wireless communication systems.*

Jennifer Kitchen received a Ph.D. in electrical engineering at Arizona State University in 2007. During her graduate studies, Kitchen was a National Science Foundation Graduate Fellow, and a Semiconductor Research Corporation Master's Scholar. While at ASU, from 2003-2006, Kitchen worked for the RF power amplifier handset product group at Motorola, Inc., and Freescale Semiconductor. In 2007, she became the Arizona Design Center Manager for a startup company, Ubidyne, Inc., that aims to revolutionize wireless basestations by producing a digital antenna-embedded radio solution. In 2009, Kitchen joined ViaSat, Inc., as head of an IC (Integrated Circuit) design team within the Advanced Microwave Product Group. Her group focused on designing low-power integrated transceivers for SATCOM; among other chipsets for military applications. Kitchen joined the faculty of Arizona State University as an assistant professor of electrical engineering in 2012.

Kitchen's research focuses on efficiency-enhancement, integration and programmability of high-frequency (RF) circuits and systems. She uses silicon as well as III-V materials, such as gallium nitride, to create high-efficiency power management and power amplifier systems. She is also working on integrated electronics for solar arrays.

SELECTED PUBLICATIONS

J. Kitchen, W.Y. Chu, I. Deligoz, S. Kiaei and B. Bakkaloglu, "Combined linear and ΔM switch-mode PA supply modulator for polar transmitters," *IEEE Journal of Solid-State Circuits*, vol. 44, no. 2, pp. 404-413, February 2009.

J. Kitchen, I. Deligoz, S. Kiaei, and B. Bakkaloglu, "Polar modulated SiGe class E and F amplifiers using switch-mode supply modulation," *IEEE Trans. Microwave Theory Tech.*, vol. 55, no. 5, pp. 845-856, May 2007.

J. Kitchen, W.Y. Chu, I. Deligoz, S. Kiaei and B. Bakkaloglu, "Combined linear and ΔM switch-mode PA supply modulator for polar transmitters," IEEE International Solid-State Circuits Conference, ISSCC 2007, February 2007.

J. Desai, I. Deligoz, S. Kiaei, and B. Bakkaloglu, "Fully-integrated, programmable, polar-modulated class E power amplifier," in *Proceedings of Wireless Networks and Emerging Technologies 2006*, Banff, Canada, July 2006.

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Oliver Kosut received B.S. degrees from the Massachusetts Institute of Technology in electrical engineering and mathematics in 2004, and a Ph.D. in electrical and computer engineering from Cornell University in 2010. He was a postdoctoral associate in the Stochastic Systems Group at MIT from 2010 to 2012. He joined ASU as an assistant professor in 2012. He was a finalist for three ISIT student paper awards, and a finalist for the IBM Ph.D. fellowship.

SELECTED PUBLICATIONS

J. Liang, O. Kosut, and L. Sankar, "Cyber Attacks on AC State Estimation: Unobservability and Physical Consequences," Power & Energy Society General Meeting, July 2014.

O. Kosut, L. Tong, and D. N. C. Tse, "Polytope codes against adversaries in networks," IEEE Trans. on Information Theory, vol. 60, no. 6, pp. 3308–3344, June 2014.

V. Y. F. Tan and O. Kosut, "On the dispersion of three network information theory problems," IEEE Trans. on Information Theory, vol. 60, no. 2, pp. 881–903, Feb. 2014.

O. Kosut and L. Sankar, "Universal fixed-to-variable source coding in the finite blocklength regime," International Symposium on Information Theory, July 2013.

O. Kosut, L. Jia, R. J. Thomas, L. Tong, "Malicious data attacks on the smart grid," IEEE Trans. on Smart Grid, vol. 2, pp. 645–658, October 2011.

Michael N. Kozicki, *Professor, Ph.D.; University of Edinburgh; michael.kozicki@asu.edu; 480-965.2572; Research expertise: nanoionics, dendritic/fractal structures, low-energy resistive memory (CBRAM/RRAM), and advanced interconnect/electrode systems.*

Michael Kozicki joined ASU in 1985 from Hughes Microelectronics. He is a professor of electrical engineering. He has served as interim and founding director of entrepreneurial programs and director of the Center for Solid State Electronics Research in the Ira A. Fulton Schools of Engineering at ASU. He develops new materials, processes, and device structures for next generation integrated circuits and security systems. Professor Kozicki holds several dozen key patents in nanoionic technologies, in which ion conductors are used for storage and control of data and for verification of goods and information. He has published extensively, developed undergraduate and graduate courses in solid state electronics and is a frequent invited speaker at international meetings. He is also a founder of two ASU spin-out companies involved in the development and licensing of solid-state ionic technologies, a visiting professor at the University of Edinburgh in the United Kingdom, and has served as Chief Scientist of Adesto Technologies and adjunct professor at GIST in Korea. *Honors and Distinctions:* Founder, Axon Technologies Corporation and Idendrix, Inc.; Visiting Professor, College of Science and Engineering, University of Edinburgh; Founding Member, Globalscot Network; Chartered Engineer (UK/EC Professional Engineer); Charter member of the ASU Academic Council; ASU Faculty Achievement Award (Most Significant Invention), 2007; Best Paper Awards, Non-Volatile Memory Technology Symposium, 2005 and European Symposium on Phase Change and Ovonic Science, 2006; IEEE Phoenix Section Outstanding Educator, Research Award, 2001.

SELECTED PUBLICATIONS

Y. Gonzalez-Velo, H.J. Barnaby, M.N. Kozicki, C. Gopalan, and K. Holbert, "Total Ionizing Dose Retention Capability of Conductive Bridging Random Access Memory," *IEEE Electron Device Letters*, vol. 35, 205-207, DOI: 10.1109/LED.2013.2295801 (2014).

I. Valov and M.N. Kozicki, "Cation-based resistance change memory, " *J. Phys. D—Appl. Phys.*, vol. 46, DOI: 10.1088/0022-3727/46/7/074005 (2013).

Wei Lu, Doo Seok Jeong , Michael Kozicki , and Rainer Waser, "Electrochemical metallization cells—blending nanoionics into nanoelectronics?" *MRS Bulletin*, vol. 37, 124-130 (2012).

I. Valov, R. Waser, J.R. Jameson and M.N. Kozicki, "Electrochemical metallization memories—fundamentals, applications, prospects," *Nanotechnology*, vol. 22 doi:10.1088/0957-4484/22/25/254003 (2011)

N. Derhacobian, S.C.Hollmer, N. Gilbert, M.N. Kozicki, "Power and Energy Perspectives of Nonvolatile Memory Technologies," *Proc. IEEE*, vol. 98, 283-298 (2010).

Ying-Cheng Lai, *Professor; Ph.D., University of Maryland at College Park; Ying-Cheng.Lai@asu.edu; 480-965.6668; Research expertise: nonlinear dynamics, complex networks, quantum transport in nanostructures, graphene physics, signal processing, and biological physics*

Ying-Cheng Lai joined the ASU faculty in 1999. Prior to that, he was an associate professor of physics and mathematics at the University of Kansas. He has authored or co-authored about 350 refereed-journal papers. His works have been cited more than 12,000 times. His current H-index and i10 index are 55 and 230, respectively (Google-Scholar based). In the past five years, he gave about 50 invited talks worldwide. *Honors and Distinctions:* Outstanding Referee Award, American Physical Society, 2008; NSF ITR Award, 2003; Fellow of the American Physical Society since 1999; AFOSR/White House Presidential Early Career Award for Scientists and Engineers, 1997; NSF Faculty Early Career Award, 1997; Undergraduate Teaching Award in Physics, University of Kansas, 1998; Institute for Plasma Research Fellowship, University of Maryland at College Park, 1992; Ralph D. Myers Award for Outstanding Academic Achievement, University of Maryland at College Park, 1988.

SELECTED PUBLICATIONS

H.-Y. Xu, L. Huang, Y.-C. Lai, and C. Grebogi, "Chiral scars in chaotic Dirac fermion systems," *Physical Review Letters* 110, 064102, 1-5 (2013).

Z.-Z. Yuan, C. Zhao, Z.-R. Di, W.-X. Wang, and Y.-C. Lai, "Exact controllability of complex networks," *Nature Communications 4*, 2447, 1-9 (2013).

M. Wu, R.-Q. Su, X.-H. Li, T. Ellis, Y.-C. Lai, and X. Wang, "Engineering of regulated stochastic cell fate determination," *Proceedings of the National Academy of Sciences (USA) 110*, 10610-10615 (2013).

G.-L. Wang, L. Huang, Y.-C. Lai, and C. Grebogi, "Nonlinear dynamics and quantum entanglement in optomechanical systems," *Physical Review Letters 112*, 110406, 1-6 (2014).

R.-Q. Su, Y.-C. Lai, X. Wang, and Y.-H. Do, "Uncovering hidden nodes in complex network in the presence of noise," *Scientific Reports 4*, 3944, 1-7 (2014).

Cun-Zheng Ning, *Professor; Ph.D., University of Stuttgart; cning@asu.edu; 480-956.7421; Research expertise: Nanophotonics, nanowires, surface plasmons and nanolasers, nanomaterials detectors and solar cells, modeling and simulation of optoelectronic devices, quantum optics and two-photon lasers, geometric phases, stochastic resonances.*

Cun-Zheng Ning joined ASU in 2006 as a full professor from NASA Ames Research Center and University Affiliated Research Center (UARC) of University of California, where he was a senior scientist, group leader in nanophotonics and task manager in nanotechnology. He was an ISSP visiting professor at University of Tokyo in 2006. In 2013 he was a Guest Professor at Technical University Berlin and Tsinghua University in Beijing. Professor Ning has published over 170 journal papers and given over 150 invited, plenary, or colloquium talks. He holds three U.S. patents with two pending. He was an associate editor of *IEEE Journal of Quantum Electronics* (2001-2003) and a guest editor of several special issues of IEEE and OSA journals. He has served as chair or a committee member of several IEEE and OSA conferences.

Honors and Distinctions: CSC Technical Excellence Award 2003; CSC Civil Group Presidential Award 2001; MRJ Award for Technical Achievement 2000; NASA Group Achievement Award 1999; NASA Space Act Patent Award, 2005, 2007; IEEE/LEOS Distinguished Lecturer Award, 2007-2009. Fellow of the Optical Society, Fellow of IEEE

SELECTED PUBLICATIONS

C.Z. Ning, "What is Laser Threshold?" *IEEE J. Select. Top. Quant. Electron.*, 1503604, 19 (2013)

C.Z. Ning, "Semiconductor nanolasers (A tutorial)," *Phys. Stat. Sol. B*, 247, 774-788, 2010

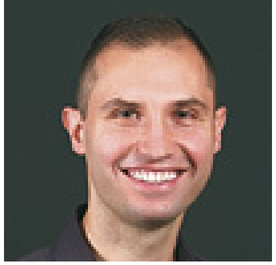
K. Ding, M. Hill, Z.C. Liu, L. J. Yin, P. J. van Veldhoven, and C.Z. Ning, "Record performance of electrical injection subwavelength metallic-cavity semiconductor lasers at room temperature," *Opt. Express, 21*, 4728(2013)

C.Z. Ning, "Semiconductor Nanowire Lasers", in J.J. Coleman, A.C. Bryce, C.Jagadish, editors: *Semiconductors and Semimetals, vol. 86*, Academic Press, 2012, pp.455-486

Debin Li and C. Z. Ning, "All-semiconductor active plasmonic system in mid-infrared wavelengths," *Optics Express*, vol. 19, no. 15, pp. 14594-14603, 2011.

Hua Wang, Minghua Sun, Kang Ding, Martin T. Hill, and Cun-Zheng Ning, "A top-down approach to fabrication of high quality vertical heterostructure nanowire arrays," *Nano Letters*, vol. 11, pp. 1646-1650, 2011

K. Ding and C. Z. Ning, "Metallic subwavelength-cavity semiconductor nanolaser" (invited review). *Light: Science and Applications* (Nature Publishing), 1(7),e20(2012)



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Honors and distinctions: Donald O. Pederson IEEE Trans. on CAD Best Paper Award (2012), Best Paper Award of IEEE Trans. on VLSI Systems (2011), Intel Strategic CAD Labs Research Award (2012), Outstanding Dissertation Award from the European Design Automation Association (EDAA) (2008).

SELECTED PUBLICATIONS

Umit Ogras and Radu Marculescu. "Modeling, Analysis and Optimization of Network-on-Chip Communication Architectures," *Lecture Notes in Electrical Engineering*, vol. 184, Springer, 2013.

U. Y. Ogras, R. Z. Ayoub, M. Kishinevsky, D. Kadjo, "Managing mobile platform power," *Proc. of Intl. Conf. on Computer Aided Design*, pp. 161-162, Nov. 2013. (Invited paper)

U. Y. Ogras, P. Bogdan, R. Marculescu, "An Analytical Approach for Network-on-Chip Performance Analysis," *IEEE Trans. Comput.-Aided Des. Integr. Circuits Syst.*, vol. 29, pp. 2001-2013, Dec. 2010. (IEEE D.O. Pederson Trans. On CAD Best Paper Award)

U. Y. Ogras, R. Marculescu, D. Marculescu, E. G. Jung, "Design and Management of Voltage-Frequency Island Partitioned Networks-on-Chip," *IEEE Trans. Very Large Scale Integr. (VLSI) Syst., Special Section on Networks-on-Chip*, vol. 17, pp. 330-341, March 2009.(IEEE T-VLSI Best Paper Award)

R. Marculescu, U. Y. Ogras, L.-S. Peh, N. E. Jerger, Y. Hoskote, "Outstanding Research Problems in NoC Design: System, Microarchitecture, and Circuit Perspectives," I*EEE Trans. Comput.-Aided Des. Integr. Circuits Syst.*, vol. 28, pp. 3-21, Jan. 2009.

Sule Ozev, *Associate Professor; Ph.D., University of California, San Diego; sule.ozev@asu.edu; 480-660.5273; Research expertise: self-test and self-calibration for wireless transceivers, analysis and mitigation of process variations for mixed signal and digital circuits, fault-tolerant and reconfigurable heterogeneous systems, mixed signal circuit testing.*

Sule Ozev received her BS degree in electrical engineering from Bogazici University, Turkey, and her MS and Ph.D. degrees in computer science and engineering from University of California, San Diego in 1995, 1998, and 2002, respectively. Ozev joined the electrical engineering faculty in August 2008. She is an associate editor for *IEEE Transactions on VLSI Systems* and serves on various program committees, including IEEE VLSI Test Symposium (2008-2015), IEEE/ACM Design Automation Conference (2007-2009), IEEE International Test Conference (2007-2013), IEEE International Conference on Computer Design (2004-2015), and IEEE European Test Symposium (2006-2015). She is the Program Chair of International Conference on Computer Design (2013-2014) and was the general chair for IEEE International Mixed-Signals, Sensors, and Systems 2009. In 2006, Ozev received the NSF CAREER Award. She has published over 100 papers and holds one U.S. patent.

Honors and Distinctions: Best paper award, VTS 2014, Honorable mention award, VTS 2013, Honorable Mention award, International Test Conference, 2011, Best student paper award, International Test Conference, 2009, Best Paper Award, European Test Symposium, 2009; IBM Faculty Award, 2007; NSF CAREER Award, 2006; Best Paper Award, ICCD, 2005; Best Dissertation Award, University of California, San Diego, 2003; VLSI Test Symposium TTTC Naveena Nagi Award, 2002; IBM Corporation Co-operative Fellowship Award, 2000-2002; UCSD Flaviu Cristian Research Award, 1999-2001.

SELECTED PUBLICATIONS

Yilmaz, E.; Ozev, S.; Butler, K. M., "Adaptive Learning Based Importance Sampling for Analog Circuit DPPM Estimation," to appear in *IEEE Design and Test of Computers*.

Ender Yilmaz, Sule Ozev, and Kenneth M. Butler, "Per-device Adaptive Test for Analog/RF Circuits Using Continuous Process Monitoring", *TVLSI*, June 2013

Yilmaz, E.; Nassery, A.; Ozev, S., "Built-In EVM Measurement With Negligible Hardware Overhead," to appear in *IEEE Design and Test of Computers*.

Yilmaz, E.; Ozev, S.; Butler, K. M., " Efficient Process Shift Detection and Test Realignment", Computer-Aided Design of Integrated Circuits and Systems, *IEEE Transactions* on, v.32, n.12, pp.1934- 1942, 2013.

Welch, David, Sahil Shah, Sule Ozev, and J. Blain Christen. "Experimental and Simulated Cycling of ISFET Electric Fields for Drift Reset." *IEEE Electron Device Letters, 34*, no. 3 (2013): 456-458.

Nassery, Afsaneh, Osman Emir Erol, Sule Ozev, and Marian Verhelst. "Test Signal Development and Analysis for OFDM Systems RF Front-End Parameter Extraction." *IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems 31*, no. 6 (2012): 958-967.

Yilmaz, E.; Ozev, S., "Test Application for Analog/RF Circuits With Low Computational Burden," *IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems*, vol.31, no.6, pp.968,979, June 2012.

Joseph Palais, *Professor Emeritus; Ph.D., University of Michigan; joseph.palais@asu.edu; 480-965.3757; Research expertise: fiber optic communications, holography, and distance education.*

Joseph Palais joined the faculty in 1964 and is the School of Electrical, Computer and Energy Engineering Graduate Program Chair. He is also the academic director for the Online and Professional Programs for Global Outreach and Extended Education of the Ira A. Fulton Schools of Engineering. He has published a textbook on fiber optics. The book (in English and in translation) has been used in classes worldwide. He has contributed chapters to numerous books, written over 40 research articles in refereed journals, and presented more than 35 papers at scientific meetings. He has presented over 150 short courses on fiber optics.

Honors and Distinctions: Daniel Jankowski Legacy Award; IEEE Life Fellow; IEEE Educational Activities Board Meritorious Achievement Award; IEEE Phoenix Achievement Award; University Continuing Education Association Conferences and Professional Programs Faculty Service Award.

SELECTED PUBLICATIONS

J. Palais, *Fiber Optic Communications*, 5th ed., Upper Saddle River: Prentice-Hall, 2005. Translations: Korean, Chinese, Persian, Japanese and Syrian.

George Pan, *Professor; Ph.D., University of Kansas; george.pan@asu.edu; 480-965.1732. Research expertise: Computational electromagnetics, high-speed electronics packaging, magnetic resonant imaging RF coil design and analysis, inverse scattering, rough surface scattering, millimeter-wave antenna systems.*

George Pan joined the ASU faculty in 1995 as a professor and the director of the Electronic Packaging Laboratory. He has written three book chapters, published 70 research articles in refereed journals and presented 110 papers at national/international conferences. He has offered short courses on wavelets in electromagnetics at Moscow State University, the University of Canterbury, CSIRO in Sydney, IEEE Microwave Symposium, Peking University, the Chinese Aerospace Institute, the 13th Electric Performance of Electronic Packaging (EPEP), Beijing University of Aeronautics and Astronautics, and National Central University of ROC. His book, *Wavelets in Electromagnetics and Device Modeling* (©2003), was among John Wiley's best-selling titles. He is an associate editor of the *IEEE Transactions on Antennas and Propagation,* and associate editor of the J*ournal of Computational Electronics.*

Honors and Distinctions: IET Fellow; IEEE Senior Member; Outstanding Paper Award, Government Microcircuit Applications Conference, Nov. 1990.

SELECTED PUBLICATIONS

J. Griffith and G. Pan, "Time Harmonic Fields Produced by Circular Current Loops," *IEEE Trans. Magnetics*, vol. 47, no. 8, pp. 2029-2033, August 2011.

Z. Guo, G. Pan and H. Pan, "Unified Formulation for Multiple Vias with or without Circular Pads in High Speed Interconnects," *IEEE Trans. Advanced Packaging*, vol. 1, no. 8, pp. 1226-1233, August 2011.

J. Griffith and G. Pan, "Electromagnetic Fields Generated by Arbitrarily shaped Current Loops," *IET Sci. Meas. Technol.*, vol. 6, iss. 4, pp. 298–305, June 2012.

Z. Huang, G. Pan and K. Chen, "A Synchronized Multi-Grid Time Domain Method via Huygens Sub-gridding and Implicit Algorithms," *IEEE Trans. Antennas and Pro*pg., vol. 61, no. 5, pp. 2605-2614, May 2013.

Le Wang and G. Pan, "Coifman Wavelets in 3D Scattering from a Calibration Target Consisting of Doubly Periodic Sharp Metal Cones," *IEEE Trans. Antennas and Propg.*, vol. 61, no. 9, pp. 4665-4674, Sep. 2013.

G. Lei and G. Pan, "Integral identities for bi-Laplacian problems and their applications to vibrating plates," *Hokkaido Mathematical Journal*, vol. XLII, no. 3, pp. 425-443, Oct. 2013.

Antonia Papandreou-Suppappola, *Professor; Ph.D., University of Rhode Island; papandreou@asu.edu; 480-965.7881; Research expertise: time-varying signal and system processing, statistical processing for detection, estimation and tracking, and signal processing algorithm development in biomedical, biological, structural health monitoring, and wireless communications systems.*

Antonia Papandreou-Suppappola joined the ASU faculty as an assistant professor in 1999 and was promoted to associate professor in 2004 and professor in 2008. She served as Member-at-Large of the IEEE Signal Processing (SP) Society Board of Governors (2010-2012); Technical Area Chair for array processing and statistical signal processing of the 2010 Asilomar Conference on Signals, Systems, and Computers; Special Sessions Chair of the 2010 IEEE International Conference of Acoustics, Speech and Signal Processing; General Chair of the 2008 Sensor Signal and Information Processing Workshop; Guest Editor for the January 2009 special issue on Waveform-Agile Sensing and Processing for the *IEEE Signal Processing Magazine*; Associate Editor for the *IEEE Transactions on Signal Processing* (2005-2009); Technical Committee Member of the IEEE SP Society on Signal Processing Theory and Methods (2003-2008); and Treasurer of the IEEE SP Society Conference Board (2004-2006).

Honors and Distinctions: IEEE Fellow; 2013 Fulton School of Engineering Award; 2010 Bob Owens Memorial Best Paper Award in IEEE Workshop on Signal Processing Systems; 2009 Top 5% of Fulton School of Engineering Teaching Excellence Award; 2008 IEEE Phoenix Section Society SenSIP Center Research Award; 2005 Fulton School of Engineering Teaching Excellence Award; 2003 IEEE Phoenix Section Outstanding Faculty for Research Award.

SELECTED PUBLICATIONS

S. Edla, N. Kovvali, and A. Papandreou-Suppappola, "Electrocardiogram signal modeling with adaptive parameter estimation and cardiac classification using sequential Bayesian methods," *IEEE Transactions on Signal Processing*, vol. 62, no. 10, pp. 2667-2680, May 2014.

D. Chakraborty, N. Kovvali, A. Papandreou-Suppappola, and A. Chattopadhyay, "An adaptive learning damage estimation method for structural health monitoring," *Journal of Intelligent Material, Systems and Structures*, 1045389X14522531, pp. 1-9, first published on April 2014.

M. Seaver, A. Chattopadhyay, A. Papandreou-Suppapola, S. B. Kim, N. Kovvali, C. R. Farrar, M. H. Triplett and M. M. Derriso, "Workshop on transitioning structural health monitoring technology to military platforms," *Journal of Intelligent Material, Systems and Structures*, vol. 24, no. 17, pp. 2063-2073, November 2013.

L. Miao, J. J. Zhang, C. Chakrabarti, and A. Papandreou-Suppappola, "Efficient Bayesian tracking of multiple sources of neural activity: Algorithms and real-time FPGA implementation," *IEEE Transactions on Signal Processing*, vol. 61, pp. 633-647, February 2013.

A. Papandreou-Suppappola, J. Zhang, B. Chakraborty, Y. Li, D. Morrell, S. P. Sira, "Adaptive waveform design for tracking," Chapter 16, *Waveform Design and Diversity for Advanced Radar Systems*, (F. Gini, A. De Maio, and L. Patton, Eds.), IET Peter Peregrinus, pp. 407-444, 2012.

Stephen M. Phillips, *Professor and Director of the School; Ph.D., Stanford University; stephen.phillips@asu.edu; 480-965.6410; Research expertise: applications and integration of microsystems including micro-electromechanical systems (MEMS), microelectronics, microactuators, neural recording and neural stimulation; applications of systems and control including adaptive control, control of microsystems, prosthetics, feedback control over nondeterministic networks.*

Stephen M. Phillips received a BS degree in electrical engineering from Cornell University and MS and Ph.D. degrees in electrical engineering from Stanford University. From 1988 to 2002, he served on the faculty of Case Western Reserve University. From 1995 to 2002, he also served as director of the Center for Automation and Intelligent System Research, an industry-university-government collaborative at Case. In 2002, he joined the faculty of Arizona State University as professor of electrical engineering. He was appointed electrical engineering department chair in 2005 and director of the School of Electrical, Computer and Energy Engineering in 2009. He has held visiting positions at the NASA Glenn Research Center and the University of Washington. He has served as an ABET program evaluator and is a professional engineer registered in the state of Ohio.

SELECTED PUBLICATIONS

Narendra V. Lakamraju, Sameer M. Venugopal, Stephen M. Phillips, David R. Allee, "Embedded Microelectromechanical Systems Sensor and Related Devices and Methods," US Patent 8,610,223 B2, Issued December 17, 2013

Stephen M. Phillips, David R. Allee, Narendra Lakamraju, "Passive Flexible-Substrate Blast Sensor Array," International Microelectronics and Packaging Society (IMAPS) Device Packaging Conference, Scottsdale, AZ, 2012

Stephen M. Phillips; Konstantinos Tsakalis; Ravi Gorur; "On the implementation of ABET feedback for program improvement," *Proceedsing of the ASEE Annual Conference and Exposition*, Vancouver, BC, 2011

Karthikeyan Ramamurthy, Jayaraman Thiagarajan, Prasanna Sattigeri, Michael Goryll, Andreas Spanias, Trevor Thornton, and Stephen Phillips, "Transform domain features for ion-channel signal classification," *Journal of Biomedical Signal Processing and Control*, vol. 6, no. 3, pp. 219-224, 2011.

Narendra V. Lakamraju, Sameer M. Venugopal, David R. Allee, Stephen M. Phillips, and Barry P. O'Brien, "Flexible shock sensor tag with integrated display," Army Science Conference, Orlando, FL, Dec., 2010.

Narendra V. Lakamraju, Sameer M. Venugopal, David R. Allee, Stephen M. Phillips, "Shock wave pressure sensor on PEN substrate," IEEE Sensors Conference, Hawaii, Nov. 2010.

Sattigeri, P.; Thiagarajan, J.J.; Ramamurthy, K.N.; Konnanath, B.; Mathew, T.; Spanias, A.; Goryll, M.; Thornton, T.; Prasad, S.; Phillips, S.; "Signal processing for biologically inspired sensors," Communications, Control and Signal Processing (ISCCSP), 4th International Symposium on, pp 1-5, Cyprus, March, 2010.

Ahmad T. Al-Hammouri, Vincenzo Liberatore, Michael S. Branicky, and Stephen M. Phillips, "Complete Stability Region Characterization for PI-AQM," *SIGBED Review*, vol. 3 no. 2, pp 1-6, ISSN 1551-3688, April 2006.

B. Mi, H. Kahn, F. Merat, A. H. Heuer, D. A. Smith, and S. M. Phillips, "Static and electrically actuated shaped MEMS mirrors," *Journal of Microelectromechanical Systems*, vol. 14, no. 1, pp. 29-36, 2005.

Martin Reisslein, *Professor; Ph.D., University of Pennsylvania ; reisslein@asu.edu; 480-965.8593; Research expertise: Multimedia streaming, multimedia traffic characteristics, metro and access fiber/wireless networks, and engineering education.*

Martin Reisslein joined the ASU faculty in 2000. He received a Dipl.-Ing. in electrical engineering from FH Dieburg, Germany, in 1994, an MSE in electrical engineering from the University of Pennsylvania in 1996 and a Ph.D. in systems engineering from the University of Pennsylvania in 1998. He has published over 120 journal articles. He has a Google Scholar h-index of 38 and a Web of Science h-index of 20. He serves as Associate Editor for the *IEEE Transactions on Education*, the *Computer Networks Journal*, and *Optical Switching and Networking*.

Honors and Distinctions: NSF CAREER Award, 2002; Editor-in-chief, IEEE Communications Surveys and Tutorials, 2002-2007; ACM Senior Member, ASEE Member, IEEE Fellow; IEEE Communication Society 2009 Best Tutorial Paper Award.

SELECTED PUBLICATIONS

X. Wei, F. Aurzada, M.P. McGarry and M. Reisslein, "EIBT: Exclusive Intervals for Bulk Transfers on EPONs," *IEEE/OSA Journal of Lightwave Technology*, vol. 31, no. 1, pp. 99–110, January 2013.

A. Pulipaka, P. Seeling, M. Reisslein, and L.J. Karam, "Tra c and Statistical Multiplexing Characterization of 3-D Video Representation Formats," *IEEE Transactions on Broadcasting*, vol. 59, no. 2, pp. 382–389, June 2013.

A. Mercian, M.P. McGarry, and M. Reisslein, "O ine and Online Multi-Thread Polling in Long-Reach PONs: A Critical Evaluation," *IEEE/OSA Journal of Lightwave Technology*, vol. 31, no. 12, pp. 2018–2028, June 2013.

M.S. Kiaei, K. Fouli, M. Scheutzow, M. Maier, M. Reisslein, and C. Assi, "Low-latency Polling Schemes for Long-Reach Passive Optical Networks," *IEEE Transaction on Communications*, vol. 61, no. 7, pp. 2936-2945, July 2013.

J. Reisslein, A.M. Johnson, K.L. Bishop, J. Harvey, and M. Reisslein, "Circuits Kit K-12 Outreach: Impact of Circuit Element Representation and Student Gender," *IEEE Transactions on Education*, vol. 56, no. 3, pp. 316-321, August 2013.

A.M. Johnson, J. Reisslein, and M. Reisslein, "Representation Sequencing in Computer-basedEngineering Education," *Computers & Education*, vol. 72, pp. 249-261, March 2014.

A. Mercian, M.P. McGarry, and M. Reisslein. "Impact of Report Message Scheduling (RMS) in 1G/10G EPON and GPON," *Optical Switching and Networking*, vol. 12, pp. 1-13, April 2014.

M. Reisslein, B. Rinner, and A.K. Roy Chowdhury, "Smart Camera Networks [Guest Editors' Introduction]," *IEEE Computer*, vol. 47, no. 5, pp. 23-25, May 2014.

X. Wei, F. Aurzada, M.P. McGarry, and M. Reisslein, "DyCaPPON: Dynamic circuit and packet passive optical network," *Optical Switching and Netw.*, vol. 13, pp. 135-147, July 2014.

R.R. Tyagi, F. Aurzada, K.-D. Lee, S. Kim, and M. Reisslein, "Impact of Retransmission Limit on Preamble Contention in LTE-Advanced Network," *IEEE Systems Journal,* in print, 2014.

F. Aurzada, M. Levesque, M. Maier, and M. Reisslein, "FiWi Access Networks Based on Next-Generation PON and Gigabit-Class WLAN Technologies: A Capacity and Delay Analysis," *IEEE/ACM Transactions on Networking*, in print, 2014.

Armando A. Rodriguez, *Professor, Ph.D.; Massachusetts Institute of Technology; aar@asu.edu; 480-965.3712. Research expertise: Control of nonlinear distributed parameter systems, approximation theory, sampled data and multi-rate control, embedded systems, rapid prototyping, modeling, simulation, animation, and real-time control (MoSART) of Flexible Autonomous Machines operating in an uncertain Environment (FAME), integrated real-time health monitoring, modeling, and reconfigurable fault-tolerant controls; control of bio-economic systems, renewable resources, and sustainable development; control of semiconductor, (hypersonic) aerospace, robotic, and low power electronic systems.*

Prior to joining the ASU faculty in 1990, Armando A. Rodriguez worked at MIT, IBM, AT&T Bell Laboratories, and Raytheon Missile Systems. He has also consulted for Eglin Air Force Base, Boeing Defense and Space Systems, Honeywell, and NASA. He has published over 195 technical papers in refereed journals and conference proceedings. He has authored three engineering texts. Professor Rodriguez has given over 70 invited presentations—13 plenary—at international and national forums, conferences, and corporations. Since 1994, he has directed an extensive engineering mentoring research program that has served over 300 students. He has served as the co-director of an NSF-WAESO funded Bridge to the Doctorate Program involving 12 NSF fellows. He is currently serving on the following National Academies panels: Survivability and Lethality Analysis, Army Research Laboratory (ARL) Autonomous Systems.

Honors and Distinctions: AT&T Bell Laboratories Fellowship; Boeing A.D. Welliver Fellowship; CEAS Teaching Excellence Award; IEEE International Outstanding Advisor Award; White House Presidential Excellence Award for Science, Mathematics, and Engineering; ASU Faculty Fellow; ASU Professor of the Year Finalist; Ralf Yorque Memorial Prize.

SELECTED PUBLICATIONS

J. Dickeson, A. A. Rodriguez, S. Sridharan, and A. Korad, "Elevator sizing, placement, and control-relevant tradeoffs for hypersonic vehicles," AIAA-2010-8339, AIAA Guidance, Navigation, and Control Conference, Toronto, Canada, Aug. 2-5, 2010.

O. Cifdaloz, A. Regmi, J. Anderies, A. A. Rodriguez, "Robustness, vulnerability, and adaptive capacity in small-scale social-ecological systems: The Pumpa Irrigation System in Nepal," *J. of Ecology & Society*, vol. 15, no. 3, art. 39, 2010. [online] http://www.ecologyandsociety.org/vol15/iss3/art39/, 46 pp. (Ralf Yorque Memorial Prize)

J.M. Anderies, A.A. Rodriguez, M.A. Janssen, and O. Cifdaloz, "Panaceas, Uncertainty, and the Robust Control Framework in Sustainability Science," *Proceedings of the National Academy of Sciences (PNAS), Special Issue*, vol.104, no.39, 15194-15199, 2007.

Lalitha Sankar, *Assistant Professor; Ph.D., Rutgers University; lalitha.sankar@asu.edu; 480-965.4953; Research expertise: cyber-security and privacy in the Smart Grid, privacy of electronic data, information- theoretic privacy measures, applications of game theory to privacy problems, finite block-length source coding, distributed state estimation and optimal power flow with security and privacy guarantees in the Smart Grid.*

Lalitha Sankar received a BTech degree in engineering physics from the Indian Institute of Technology, Bombay, in 1992, an M.S. degree in electrical engineering from the University of Maryland in 1994, and a Ph.D. degree in electrical engineering from Rutgers University in 2007. From 2010-2012, she was an associate research scholar at Princeton University. From 2007-2010, Sankar was a postdoctoral fellow supported by the Princeton University Council on Science and Technology. Prior to her doctoral studies, she was a senior member of technical staff at AT&T Shannon Laboratories from 1995-2002. She received the NSF CAREER Award in January 2014, and an academic excellence award from Rutgers in 2008.

SELECTED PUBLICATIONS

L. Sankar, D. Mir, and J. Hu, “Towards generating differentially private synthetic graphs for the electric grid,” *Proc. IEEE Control and Decision Conference*, Dec. 2014.

J. Liang, O. Kosut, and L. Sankar, “Unobservable attacks on AC state estimation and their physical consequences,” *Proc. IEEE Power and Energy Systems General Meeting*, Washington DC, Jul 27-31, 2014.

O. Kosut and L. Sankar, “New results on third order coding rate for fixed-to-variable source coding,” *Proc. International Symposium on Information Theory*, Honolulu, HI, Jun 29-Jul 4, 2014.

L. Sankar, S. Raj Rajagopalan and H. V. Poor, “Utility-privacy tradeoff in databases: An information-theoretic approach,” *IEEE Transactions on Information Forensics and Security, Special Issue on Privacy and Trust Management in Cloud and Distributed Systems*, vol. 8, no. 6, June 2013.

R. Tandon, L. Sankar and H. V. Poor, “Lossy discriminatory source coding: Side-information privacy,” *IEEE Transactions on Information Theory*, vol. 59, no. 9, Sept. 2013.

L. Sankar, S. R. Rajagopalan, S. Mohajer and H. V. Poor, “Smart meter privacy: A theoretical framework,” *IEEE Transactions on Smart Grid*, vol. 4, no. 2, pp. 837-846, June 2013.

L. Sankar, W. Trappe, K. Ramachandran, H. V. Poor and M. Debbah, “The role of signal processing in meeting privacy challenges,” *IEEE Signal Processing Magazine, Special Issue on Cyber-security and Privacy*, vol. 30, no. 4, Sept. 2013.

O. Kosut and L. Sankar, “Universal fixed-to-variable source coding in the finite block-length regime,” *Proc. of the IEEE International Symposium on Information Theory*, Istanbul, Turkey, July 7-12, 2013.

Marco Saraniti; *Professor; Ph.D., Technische Universität München; marco.saraniti@asu.edu; 480-965.2650; Research expertise: Computational electronics and biophysics.*

From 1996 to 1998, Marco Saraniti was a faculty research associate with the electrical engineering department of Arizona State University. He joined the electrical and computer engineering department of the Illinois Institute of Technology, Chicago, in 1998, where he was awarded the tenure in 2004, and was promoted to the rank of full professor in June 2007. He joined the faculty of the School of Electrical, Computer, and Energy Engineering of ASU in August 2007. He is the author and coauthor of four book chapters, four technical reports, and more than 90 publications. His current research focuses mainly on computational electronics applied to the simulation of semiconductor devices and biological structures. His recent scientific work covers the following fields: the development of Monte Carlo and cellular automaton techniques for 2-D and 3-D simulation of semiconductor devices, simulation and engineering of semiconductor devices, and the development of numerical methods for the modeling and simulation of membrane proteins.

SELECTED PUBLICATIONS

M. Saraniti, “Artificial cells: Designing biomimetic nanomachines,” *Nature Nanotechnology*, no. 3, pp. 647-648, 2008.

A. Marino, D. K. Ferry, S. M. Goodnick, and M. Saraniti, “RF and DC characterization of state-of-the-art GaN HEMT devices through cellular Monte Carlo simulations,” *Physics Status Solid*i, vol. 7, no. 10, pp. 2445-2449, July 2010.

F. A. Marino, D. Cullen, D. Smith, M. McCartney, and M. Saraniti, “Simulation of polarization charge on AlGaN/GaN high electron mobility transistors: Comparison to electron holography,” *Journal of Applied Physics*, vol. 107, no. 5, p. 054516, Mar. 2010.

P. Joshi, A. Smolyanitsky, L. Petrossian, M. Goryll, M. Saraniti, T. J. Thornton, “Field effect modulation of ionic conductance of cylindrical silicon-on-insulator nanopore array,” *Journal of Applied Physics* ,vol. 107, no. 5, pp. 054701-054701-6, Mar. 2010.

D. Guerra, D. K. Ferry, M. Saraniti, and S. M. Goodnick, “Millimeter-wave power amplifier circuit-device simulations through coupled Harmonic Balance-Monte Carlo particle-based device simulator,” I*EEE MTT-S International Microwave Symposium Digest,* 2012, 10.1109/MWSYM.2012.6258430, 3 pp., 2012 IEEE/MTT-S International Microwave Symposium, pp.17-22 , 2012.

S. M. Goodnick and M. Saraniti, “Modeling and Simulation of Terahertz Devices,” invited paper in *IEEE Microwave Magazine*, 13(7), pp. 36-44, 2012.

D. Guerra, M. Saraniti, D. K. Ferry, and S. M. Goodnick, “Linearity analysis of millimeter wave GaN power transistors through X-parameters and TCAD device simulations,” *2013 IEEE MTT-S International Microwave Symposium Digest* (MTT 2013), 4 pages, 2013.

F. A. Marino, B. Tierney, R. Akis, M. Saraniti, and S. M. Goodnick, “Incorporating 2D quantum effects into full band Monte Carlo simulations of QWFETs,” 2013 13th IEEE Conference on Nanotechnology (IEEE-NANO), DOI10.1109/NANO.2013.6721009, pp. 67-70, 2013.

Jae-sun Seo, *Assistant Professor; Ph.D., University of Michigan, Ann Arbor; jaesun.seo@asu.edu; 480-727.2660; Research expertise:digital/mixed-signal circuit design, VLSI design for neuromorphic computing and machine learning, integrated voltage regulators, high-speed on-chip transceivers.*

Jae-sun Seo joined ASU in 2014. He received the B.S. degree from Seoul National University in 2001, and the M.S. and Ph.D. degree from the University of Michigan in 2006 and 2010, respectively, all in electrical engineering. From January 2010 to December 2013, he has been with IBM T. J. Watson Research Center, where he worked on energy-efficient integrated circuits for high-performance processors and cognitive computing chips. His current areas of research include on-chip voltage regulators and integrated power management, machine learning and neuromorphic hardware design, and on-chip communication circuits. He serves on the technical program committee for ISLPED.

Honors and Distinctions: IBM Major Outstanding Technical Achievement Award, 2012; IBM Invention Achievement Award, 2011; Samsung Scholarship Foundation Fellow, 2004-2009

SELECTED PUBLICATIONS

Y. Liu, P. Hsieh, S. Kim, J. Seo, R. Montoye, L. Chang, J. Tierno, and D. Friedman, “A 0.1pJ/b 5-10Gb/s Charge-Recycling Stacked Low-Power I/O for On-Chip Signaling in 45-nm CMOS SOI,” IEEE International Solid-State Circuits Conference, pp. 400-401, February 2013.

B. Rajendran, Y. Liu, J. Seo, K. Gopalakrishnan, L. Chang, D. Friedman, and M. Ritter, “Specifications of Nanoscale Devices & Circuits for Neuromorphic Computational Systems,” *IEEE Transactions on Electron Devices*, vol. 60, no. 1, pp. 246-253, January 2013.

J. Seo, D. Blaauw, and D. Sylvester, “Crosstalk-Aware PWM-Based On-Chip Links with Self-Calibration in 65nm CMOS,” *IEEE Journal of Solid-State Circuits*, September 2011, vol. 46, no. 9, pp. 2041-2052, September 2011.

J. Seo, B. Brezzo, Y. Liu, B. Parker, S. Esser, R. Montoye, B. Rajendran, J. Tierno, L. Chang, D. Modha, and D. Friedman, “A 45nm CMOS Neuromorphic Chip with a Scalable Architecture for Learning in Networks of Spiking Neurons,” IEEE Custom Integrated Circuit Conference, September 2011.

J. Seo, R. Ho, J. Lexau, M. Dayringer, D. Sylvester, and D. Blaauw, “High-Bandwidth and Low-Energy On-Chip Signaling with Adaptive Pre-Emphasis in 90nm CMOS,” *IEEE International Solid-State Circuits Conference*, pp. 182-183, February 2010.

Jennie Si, *Professor; Ph.D., University of Notre Dame; si@asu.edu; 480-965-6133; Research expertise: learning and approximate dynamic programming, estimation and filtering of stochastic processes, neural networks, neurophysiological basis for control, cortical neural information processing, and brain machine interface.*

Jennie Si received her BS and MS degrees from Tsinghua University, Beijing, China, and her Ph.D. from the University of Notre Dame, all in electrical engineering. She joined the ASU faculty in 1991, where she is currently a professor.

Honors and Distinctions: Listed in several Marquis Who's Who publications since late 1990s; NSF/White House Presidential Faculty Fellow, 1995; Motorola Excellence Award, 1995; NSF Research Institution Award, 1993; IEEE Fellow, 2008; Past associate editor of *IEEE Transactions on Automatic Control*, *IEEE Transactions on Semiconductor Manufacturing*, and *IEEE Transactions on Neural Networks*; Action Editor of *Neural Networks*; General Chair of the 2007 International Joint Conference on Neural Networks; General Co-Chair of the 2014 World Congress on Computational Intelligence.

SELECTED PUBLICATIONS

Hongwei Mao, Chenhui Yang, Glen Abousleman, and Jennie Si. "Automatic detection and tracking of multiple interacting targets from a moving platform," *Optical Engineering*. 53(1): 013102-013102. 2014.

Chenhui Yang, Yuan Yuan, and Jennie Si. "Robust spike classification based on frequency domain neural waveform features," *Journal of Neural Engineering*, 10(6): 066015. 2013.

Yuan Yuan, Chenhui Yang, and Jennie Si. "The M-Sorter: an automatic and robust spike detection and classification system," *Journal of Neuroscience Methods*. 210: 281-290, 2012.

Feng Liu, Jian Sun, Jennie Si, and Shengwei Mei. "A Boundedness Result for the Direct Heuristic Dynamic Programming," *Neural Networks*, 32: 229-235. 2012.

Chenhui Yang, Byron Olson, and Jennie Si. "A multiscale correlation of wavelet coefficients approach to spike detection," *Neural Computation*. 23(1): 215-250. 2011.

Baohua Li and Jennie Si, "Approximate robust policy iteration using multilayer perceptron neural networks for discounted infinite-horizon Markov decision processes with uncertain stationary transition matrices," *IEEE Trans. on Neural Networks*, vol. 21, no. 28, pp. 1270-1280, 2010.

L. Yang, J. Si, K. Tsakallis, and A. Rodriguez, "Direct heuristic dynamic programming for nonlinear tracking control with filtered tracking error," *IEEE Transactions on Systems, Man, and Cybernetics, Part B*, 2009.

Brian Skromme, *Professor; Ph.D., University of Illinois, skromme@asu.edu; 480-965.8592. Research Expertise: Compound semiconductor materials and devices, especially wide bandgap materials for optoelectronic, high frequency, high-power, and high-temperature applications; optical characterization of semiconductor materials, development of GaN and SiC-based materials and devices.*

Brian Skromme joined the ASU faculty in 1989, where he is presently a professor in solid-state electronics. From 1985 to 1989, he was a member of the technical staff at Bellcore. He has written over 120 refereed publications in solid-state electronics.

Honors and Distinctions: Eta Kappa Nu, Young Faculty Teaching Award, 1990-1991; Golden Key National Honor Society Outstanding Professor Award, 1991; Listed in Marquis's Who's Who in America.

SELECTED PUBLICATIONS:

B. J. Skromme, A. Sasikumar, B. M. Green, O. L. Hartin, C. E. Weitzel, and M. G. Miller, "Reduction of low-temperature nonlinearities in pseudomorphic AlGaAs/InGaAs HEMTs due to Si-related DX centers," *IEEE Trans. Electron Devices*, vol. 57, no. 4, pp. 749-754, 2010.

Y. Wang, P. A. Losee, S. Balachandran, I. B. Bhat, T. P. Chow, Y. Wang, B. J. Skromme, J. K. Kim, and E. F. Schubert, "Achieving low sheet resistance from implanted p-type layers in 4H-SiC using high temperature graphite capped annealing," *Mater. Sci. Forum*, vol. 556-557, pp. 567-571, 2007.

Y. Wang, M. K. Mikhov, and B. J. Skromme, "Formation and properties of Schottky diodes on 4H-SiC after high temperature annealing with graphite encapsulation," *Mater. Sci. Forum*, vol. 527-529, pp. 915-918, 2006.

A. Mahajan and B. J. Skromme, "Design and optimization of junction termination extension (JTE) for 4H-SiC hHigh voltage Schottky diodes," *Solid State Electron*, vol. 49, pp. 945-955, 2005.

L. Chen, B. J. Skromme, R. F. Dalmau, R. Schlesser, Z. Sitar, C. Chen, W. Sun, J. Yang, M. A. Khan, M. L. Nakarmi, J. Y. Lin, and H.-X. Jiang, "Band-edge exciton states in AlN Single crystals and epitaxial layers," *Appl. Phys. Lett.*, vol. 85, pp. 4334-4336, 2004.

Andreas Spanias, *Professor; Ph.D., West Virginia University; spanias@asu.edu; 480-965.1837; Research expertise: digital signal processing, multimedia, speech and audio coding, adaptive filters, real-time processing of sensor data, DSP for media applications.*

Andreas Spanias joined ASU in 1988. He has published more than 70 journal and 200 conference papers and contributed several book chapters. He authored two textbooks in DSP and audio coding and six Morgan-Claypool Lecture Series research monographs. He has served as associate editor of *IEEE Transactions on Signal Processing*, as the general co-chair of the IEEE ICASSP-99 and as vice-president of the IEEE Signal Processing Society (SPS). He received the 2005 IEEE SPS Meritorious Service Award. He is currently associate director of the ASU School of Arts, Media and Engineering (AME), Director of the SenSIP Center and Industry Consortium which is an NSF I/UCRC, PI of a major multi-university NSF program and Co-PI on the NSF AME IGERT. He is a book series editor for Morgan-Claypool Lecture Series. He co-authored two US patents with six more pending.

Honors and Distinctions: IEEE Fellow; 2004 IEEE Distinguished Lecturer; IEEE Donald G. Fink Prize for paper "Perceptual Coding of Digital Audio," 2002; Intel Advanced Personal Communications Award, 1997; Intel Research Council: Award, 1996; Intel Award for Leadership & Contributions to the 60172 Architecture, 1993; the mobile iPhone/iPad app iJDSP (jdsp.asu.edu) won the Premier award in Oct. 2012 by the UC-Berkeley NEEDS panel (the Premier award is co-sponsored by Microsoft Research, Wiley and TechSmith)

SELECTED PUBLICATIONS

S. Sandoval, V. Berisha, R. Utianski, J. Liss, A. Spanias, "Automatic assessment of vowel space area," *J. Acoust. Soc. Am.*, Vol 134, El1-El5, Nov. 2013.

A. Fink, A. Spanias, P. Cook, "Derivation of a new banded waveguide model topology for sound synthesis," *J. Acoust. Soc. Am.*, Volume 133, Issue 2, pp. EL76-EL81 (2013).

S. Dasarathan, C. Tepedelenlioglu, M. Banavar, and A. Spanias, ``Non-Linear Distributed Average Consensus using Bounded Transmissions," *IEEE Trans. on Signal Processing*, vol. 61, no. 23, Dec. 2013

M. Banavar, C. Tepedelenlioglu, and A. Spanias, "Distributed SNR Estimation with Power Constrained Signaling," *IEEE Trans. Signal Processing*, vol. 60, pp. 3289-3294, 2012.

M.K. Banavar, A.D. Smith, C. Tepedelenlioglu, and A. Spanias, "On the Effectiveness of Multiple Antennas in Distributed Detection over Fading MACs," *IEEE Trans. Wireless Communications*, vol. 11, pp. 1744-1752, May 2012.

G. Wichern, X. Jiachen, H. Thornburg, B. Mechtley, and A. Spanias, "Segmentation, indexing, and retrieval for environmental sounds," *IEEE Transactions on ASLP*, vol. 18, pp. 688-707, 2010.

C. Tepedelenlioglu, M.K. Banavar, and A. Spanias, "On the Asymptotic Efficiency of Distributed Estimation Systems with Constant Modulus Signals, *IEEE Tran. on Information Theory*, vol.57, pp.7125-7130, Oct. 2011.

Meng Tao, *Professor; Ph.D., University of Illinois at Urbana-Champaign; meng.tao@asu.edu; 480-965.9845; Research expertise: semiconductor surfaces, interfaces and thin films; terawatt-scale photovoltaics for solar energy conversion; chemical vapor deposition and its derivatives; electrochemistry for solar-grade silicon; and high-temperature silicon electronics.*

Meng Tao's current research covers a wide range of topics in solar photovoltaics, such as 1) Earth-abundant chalcogenides as active layer and transparent electrode in next-generation photovoltaics; 2) terawatt-scale silicon photovoltaics, including electrorefining for solar-grade silicon and substitution of silver electrode with aluminum; 3) high-temperature silicon electronics for power management in renewable energy systems; and 4) distributed storage of solar electricity through a metal/metal oxide cycle. He joined ASU in 2011 as a professor of electrical engineering, and heads The Laboratory for Terawatt Photovoltaics.

Honors and Distinctions: South Central Bell Professorship, 2001; College of Engineering Outstanding Young Faculty Award, 2004; University Outstanding Research Award, 2011. Dr. Tao also played a critical role in the establishment of the U.S. Photovoltaic Manufacturing Consortium under SEMATECH.

SELECTED PUBLICATIONS

M. Tao, *Terawatt Solar Photovoltaics—Roadblocks and Opportunities* (Springer 2014).

M. Tao, "Impurity Segregation in Electrochemical Processes and Its Application to Electrorefining of Ultrapure Silicon," *Electrochimica Acta*, vol. 89, pp. 688-91 (2013).

M. Tao, D. Udeshi, N. Basit, E. Maldonado, and W.P. Kirk, "Removal of Dangling Bonds and Surface States on Si(001) Surface by a Monolayer of Se," *Applied Physics Letters*, vol. 82, pp. 1559-61 (2003).

G. Song, M.Y. Ali, and M. Tao, "A High Schottky Barrier of 1.1 eV between Al and S-Passivated p-Type Si(100) Surface," *IEEE Electron Device Letters*, vol. 28, pp. 71-3 (2007).

M. Tao, "A Kinetic Model for Metalorganic Chemical Vapor Deposition from Ga(CH3)3 and AsH3," *Journal of Applied Physics*, vol. 87, pp. 3554-62 (2000).

Nongjian (NJ) Tao, *Professor; Ph.D., Arizona State University; Director, The Biodesign Institute, Bioelectronics and Biosensors; njtao@asu.edu; 480-965.4456; Research expertise: chemical and biological sensors, molecular and nano electronics, mobile health devices, wireless sensors.*

NJ Tao joined the ASU faculty as a professor of electrical engineering and an affiliated professor of chemistry and biochemistry in August 2001. Before that, he worked as an assistant and associate professor at Florida International University. He has 10 patents, and published more than 200 refereed journal articles and book chapters, which have been cited ~10,000 times. He has given over 200 invited and keynote talks worldwide.

Honors and Distinctions: Fellow, AAAS; Fellow, America Physical Society; Alexander von Humboldt Senior Research Award; Hellmuth Fisher Medal; NSF two-year extension for Special Creativity; Excellence in Research Award, Florida International University; AzTE Innovator of the Year; Molecular Imaging Young Microscopist.

SELECTED PUBLICATIONS

Xiaonan Shan, Ismael Díez-Pérez, Luojia Wang, Peter Wiktor, Ying Gu, Lihua Zhang, Wei Wang, Jin Lu, Shaopeng Wang, Qihuang Gong, Jinghong Li and N.J. Tao, "Imaging the electrocatalytic activity of single nanoparticles," *Nature Nano*, 7, 668–672(2012).

Wei Wang, Yunze Yang, Shaopeng Wang, Vinay J Nagaraj, Qiang Liu, Jie Wu and N.J. Tao, "Label-free measuring and mapping of binding kinetics of membrane proteins in single living cells", *Nature Chem.*, 4, 846-853(2012).

C. Bruot, J. Hihath, and N.J. Tao, "Mechanically Controlled Molecular Orbital Alignment in Single Molecule Junctions", *Nature Nano*, 7, 35-40(2012).

I. Diez-Perez, J. Hihath, T. Hines, Z.S. Wang, G. Zhou, K. Müllen, and N.J. Tao, "Controlling Single Molecule Conductance through Lateral Coupling of π-orbitals", *Nature Nano*, 6, 226-231(2011).

W. Wang, K. Foley, X.N. Shan, S.P. Wang, S. Eaton, V. J. Nagaraj, P. Wiktor, U. Patel and N.J. Tao, Electrochemical Impedance Microscopy Based on Plasmonics: A Study of Single Cells and Intracellular Processes", *Nature Chem.*, 3, 6, 226-231(2011).

I. Diez-Perez, Z.H. Li, J. Hihath, J. H. Li, C.Y. Zhang, X.M.Yang, L. Zang, Y. J. Dai, X. L. Feng, K. Muellen and N.J. Tao, "Gate-Controlled Electron Transport in Coronenes: Bottom-up Approach Towards Graphene Transistors", *Nature Comm.*, 1, 31(2010).

X. Shan, U. Patel, S. Wang, R. Iglesias, N. J. Tao, "Imaging Local Electrochemical Current Via Surface Plasmon Resonance", *Science*, 327, 1363-1366(2010).

S.P. Wang, X.N. Shan, U. Patel, X.P. Huang, J. Lu, J.H. and Li, N.J. Tao, "Label-free imaging, detection and mass measurement of single viruses by Surface Plasmon Resonance", *PNAS*, 107, 16028-16032(2010).

Cihan Tepedelenlioglu, *Associate Professor, Ph.D., University of Minnesota; cihan@asu.edu; 480-965.6623; Research expertise: Wireless communications, statistical signal processing, data mining for PV systems.*

Cihan Tepedelenlioglu joined the ASU faculty as an assistant professor in July 2001. He received his BS from the Florida Institute of Technology in 1995, an MS from the University of Virginia in 1998 and a Ph.D. from the University of Minnesota in 2001, all in electrical engineering. In 2001, he received the NSF CAREER award.

Honors and Distinctions: 2001 NSF CAREER Award; Member, Tau Beta Pi.

SELECTED PUBLICATIONS

K. Bai, and C. Tepedelenlioglu, " Distributed detection in UWB wireless sensor networks," *IEEE Trans. on Signal Processing*, vol. 58, no. 2, pp. 804- 813, Feb. 2010.

N. He and C. Tepedelenlioglu, "Fast and low-complexity synchronization for non-coherent UWB receivers," *IEEE Transactions on Wireless Communication.*, vol. 6, no. 3, pp. 1014-1023, Mar. 2007.

C. Tepedelenlioglu, "Maximum multipath diversity with linear equalization in precoded OFDM systems," *IEEE Transactions on Information Theory*. vol. 50, no. 1, pp. 232-235, Jan. 2004.

C. Tepedelenlioglu and R. Challagulla, "Low complexity multipath diversity through fractional sampling in OFDM," *IEEE Trans. on Signal Processing*, vol. 52, no. 11, pp. 3104-3116, Nov. 2004.

G. B. Giannakis and C. Tepedelenlioglu, "Basis expansion models and diversity techniques for blind equalization of time-varying channels," *Proceedings of the IEEE*, vol. 86, pp. 1969-1986, Oct. 1998.

Trevor Thornton, *Professo; Ph.D., Cambridge University, UK; t.thornton@asu.edu; 480-965.3808; Research expertise: Silicon-on-insulator MESFETs, molecular electronics and sensors, microelectro-mechanical systems (MEMS).*

Trevor Thornton joined the faculty in 1998 after having spent eight years at Imperial College in London and two years as a member of the technical staff at Bell Communications Research, New Jersey. He is currently the director of the Southwest regional node of the NSF-supported National Nanofabrication Infrastructure Network (NNIN). Professor Thornton has published more than 150 journal and conference papers and has seven issued patents related to the commercial development of CMOS compatible MESFETs.

Honors and Distinctions: Plenary lecture entitled "University Innovation: How Today's Academic Research Seeds Tomorrow's Commercial Breakthroughs" presented at the 38th International Symposium for Testing and Failure Analysis (ISTFA), November 12, 2012;

Best Student Paper Award presented at the 2009 High Temperature Electronics Network (HiTEN 2009) for paper entitled "250°C Voltage Compliant SOI MESFETs for High Power PWM Drive Circuits"; Recipient of ASU Co-Curricular Programs Last Lecture Award, 2001.

SELECTED PUBLICATIONS

W. Lepkowski, S. J. Wilk, A. Parsi, M. Saraniti, D. Ferry, and T. J. Thornton, "Avalanche breakdown in SOI MESFETs," *Solid-State Electronics*, vol. 91, pp. 78-80 (2014).

S. J. Wilk, W. Lepkowski, and T. J. Thornton, "32 dBm Power Amplifier on 45 nm SOI CMOS," *IEEE Microwave and Wireless Components Letters*, vol. 23, pp. 161-163 (2013).

W. Lepkowski, S. J. Wilk, J. Kam, T. J. Thornton, "40V MESFETs Fabricated on 32nm SOI CMOS," *IEEE Custom Integrated Circuits Conference (CICC 2013), Digest of Papers*, pp. 1-4, DOI: 10.1109/CICC.2013.6658399 (2013).

M. R. Ghajar, S. J. Wilk, W. Lepkowski, B. Bakkaloglu, and T. J. Thornton, "Backgate Modulation Technique for Higher Efficiency Envelope Tracking," *IEEE Transactions on Microwave Theory and Techniques*, vol. 61, pp. 1-9 (2013).

W. Lepkowski, S. J. Wilk, M. R. Ghajar, A. Parsi, and T. J. Thornton, "Silicon-on-Insulator MESFETS at the 45nm node," *International Journal of High Speed Electronics & Systems*, vol. 21, pp. 1250012 (2012).

W. Lepkowski, M. R. Ghajar, S. J. Wilk, N. Summers, and T. J. Thornton, "Scaling SOI MESFETs to 150-nm CMOS technologies," *IEEE Transactions on Electron Devices*, vol. 58,
pp. 1628-1634 (2011).

Konstantinos Tsakalis; *Professor; Ph.D., University of Southern California; tsakalis@asu.edu; 480-965-1467; Research expertise: applications of control, optimization, and system identification theory to semiconductor manufacturing, chemical process control, and prediction and control of epileptic seizures.*

Konstantinos Tsakalis joined the ASU faculty in 1988 and is currently a professor. He received his M.S. in chemical engineering in 1984, an M.S. in electrical engineering in 1985, and a Ph.D. in electrical engineering in 1988, all from the University of Southern California. He holds ten patents and has published one book, 51 journal and 109 conference papers.

Honors and Distinctions: Licensed chemical engineer, Technical Chamber of Greece; Member IEEE, Sigma Xi.

SELECTED PUBLICATIONS

Tsakalis, K. S., & Dash, S., "Approximate H∞ loop shaping in PID parameter adaptation," *International Journal of Adaptive Control and Signal Processing*, 27(1-2), 136-152, 2013.

K. Tsakalis and S. Dash, "Identification for PID Control," in *PID Control in the Third Millennium*, A. Visioli, R. Villanova Eds., Chapter 10, 283-317, Springer-Verlag London Limited, 2012.

K. Tsakalis, N. Vlassopoulos, G. Lentaris, and D. Reisis, "A control-theoretic approach for efficient design of filters in DAC and digital audio amplifiers," *Circuits, Systems and Signal Processing*, vol. 30, issue 2, pp. 421-438, Apr. 2011.

L. B. Good, S. Sabesan, S. T. Marsh, K. Tsakalis, D. M. Treiman, and L. D. Iasemidis, "Nonlinear dynamics of seizure prediction in a rodent model of epilepsy," *Nonlinear Dynamics, Psychology and Life Sciences*, vol. 14, no. 5, pp. 411-434, 2010.

S. Sabesan, L. B. Good, K. S. Tsakalis, A. Spanias, D. M. Treiman, and L. D. Iasemidis, "Information flow and application to epileptogenic focus localization from intracranial EEG," *IEEE Transactions on Neural Systems and Rehabilitation Engineering*, vol. 17, issue 3, pp. 244-253, June 2009.

N. Chakravarthy, K. Tsakalis, S. Sabesan, and L. Iasemidis, "Homeostasis of brain dynamics in epilepsy: A feedback control systems perspective of seizures," *Annals of Biomedical Engineering*, vol. 37, no. 3, pp. 565-585, 2009.

Pavan K. Turaga, *Assistant Professor, Ph.D., University of Maryland, College Park; pturaga@asu.edu; 480-965.3704; Research expertise: Computer Vision, Human Activity Analysis, Machine Learning, Rehabilitation and preventive interventions.*

Pavan Turaga joined ASU in fall 2011 as assistant professor with joint positions in the Arts, Media and Engineering programs and the School of Electrical, Computer and Energy Engineering. He obtained his Ph.D. in 2009 from the ECE Department at the University of Maryland, College Park under the guidance of Rama Chellappa. He then spent two years as a research associate at the Center for Automation Research, UMD. His research interests are in computer vision and machine learning with applications to human activity analysis and its applications in areas such as security, surveillance, media mining, and human health.

Honors and Distinctions: UMD Distinguished Dissertation award 2009, IBM Emerging Leader in Multimedia 2008.

SELECTED PUBLICATIONS

Q. Wang, P. Turaga, G. Coleman, T. Ingalls, "SomaTech: An Exploratory Interface for Altering Movement Habits," in *ACM CHI Conference on Human Factors in Computing Systems Extended Abstracts*, April 2014.

A. Sankaranarayanan, P. Turaga, R. Chellappa, R. G. Baraniuk, "Compressive Acquisition of Linear Dynamical Systems," *SIAM Journal of Imaging Sciences*, vol. 6, issue 4, 2013.

V. Venkataraman, P. Turaga, N. Lehrer, M. Baran, T. Rikakis, S. L. Wolf, "Attractor-Shape for Dynamical Analysis of Human Movement: Applications in Stroke Rehabilitation and Action Recognition," in International Workshop on Human Activity Understanding from 3D Data (HAU3D'13, held in conjunction with CVPR 2013), Portland, OR 2013.

A. Srivastava, P. Turaga, S. Kurtek, "On Advances in Differential-Geometric Approaches for 2D and 3D Shape Analysis and Activity Recognition," Elsevier Image and Vision Computing, June 2012.

P. Turaga, A. Veeraraghavan, A. Srivastava, and R. Chellappa, "Statistical Computations on Grassmann and Stiefel Manifolds for Image and Video based Recognition," *IEEE Transactions on Pattern Analysis and Machine Intelligence*, Nov 2011.

Daniel Tylavsky, *Associate Professor; Ph.D., Pennsylvania State University; tylavsky@asu.edu; 480-965.3460; Research expertise: electric power systems, numerical methods applied to large-scale s ystem problems, parallel numerical algorithms, new educational methods and technologies, applying social optimization to power system markets, and transformer thermal modeling.*

Daniel Tylavsky is internationally known for applying computation technology to the analysis and simulation of large-scale power system generation/transmission problems. He also is an avid educator who uses team/cooperative learning methods in graduate and undergraduate education and is a pioneer in the use of mediated classrooms. He has been responsible for more than $3.5 million in research funding for both technical and educational research projects. He is a member of several honor societies and has received numerous awards for his technical work, as well as for work with student research.

Honors and Distinctions: Senior Member of IEEE, IEEE-PES Certificate for Outstanding Student Research Supervision (three times); six awards for outstanding research from the IEEE IAS Mining Engineering Committee; various awards for outstanding teaching.

SELECTED PUBLICATIONS

D. Shi, D. J. Tylavsky, N. Logic, "An Adaptive Method for Detection and Correction of Errors in PMU Measurements," *IEEE Transactions on Smart Grid,* Digital Identifier: 10.1109/TSG.2012.2207468, Dec 2012, pp. 1575-1583.

M. Zhang, Y. Li, D. J. Tylavsky, "Dynamic Loading of Substation Distribution Transformers in a Production Grade Environment," North American Power Symposium 2012, Champaign Illinois, Sep. 2012, pgs. 6.

Y. Qi, D. Shi, D. J. Tylavsky, "Impact of Assumptions on dc Power Flow Accuracy," North American Power Symposium 2012, Champaign Illinois, Sep. 2012, pgs. 6.

N. Li, D. Shi, D. Shawhan, D. J. Tylavsky, J. Taber, R. Zimmerman, "Optimal Generation Investment Planning: Pt 2:, Application to the ERCOT System," North American Power Symposium 2012, Champaign Illinois, Sep. 2012, pgs. 6.

D. Shi, D. Shawhan, N. Li, D. J. Tylavsky, J. Taber, R. Zimmerman, "Optimal Generation Investment Planning: Pt 1:, Network Equivalents" North American Power Symposium 2012, Champaign Illinois, Sep. 2012, pgs. 6.

D. Shi, D. J. Tylavsky, "An Improved Bus Aggregation Technique for Generating Network Equivalents" 2012 IEEE Power Engineering Society General Meeting, San Diego, CA, Jul. 2012, pgs. 8.

O. Amoda, D. J. Tylavsky, G. McCulla, W. Knuth, "Acceptability of Three Transformer Hottest-Spot Temperature Models," *IEEE Transactions on Power Delivery*, vol. 27, no. 1, Jan 2012, pp. 13-22.

D. Shi, D. J. Tylavsky, K. M. Koellner, N. Logic, and D.E. Wheeler, "Transmission line parameter identification using PMU measurements," *Euro. Trans. Electr. Power*, vol. 21, no 4, (Nov. 2011), pp. 1574-1588.

L. M. Beard, J. B. Cardell, I Dobson, F. Galvan, D. Hawkins, W. Jewell, M. Kezunovic, T. J. Overbye, P. K. Sen, and D. J. Tylavsky, "Key technical challenges for the electric power industry and climate change," *IEEE Trans. on Energy Conversion*, vol. 25, no. 2, pp. 465-473, June 2010,.

D. Shi, D. J. Tylavsky, K. M. Koellner, N. Logic, and D. E. Wheeler, "Transmission line parameter identification using PMU measurements," *Euro. Trans. Electr. Power*, vol. 20, pp. 1-15, 2010.

Dragica Vasileska, *Professor; Ph.D., Arizona State University; vasileska@asu.edu; 480-965.6651; Research expertise: semiconductor device physics, semiconductor transport, 1-D to 3-D device modeling, quantum field theory and its application to real nanoscale device structures, heating effects in nano-scale devices, current collapse in GaN HEMTs, optoelectronics including modeling of solar cells and photodetectors.*

Dragica Vasileska joined ASU in August 1997. She has published more than 180 refereed journal articles, 15 book chapters and presented over 200 articles in conferences in the areas of solid-state electronics, transport in semiconductors, and semiconductor device modeling. She is the third largest contributor in the NSF Network for Computational Nanotechnology's www.nanoHUB.org with a total of 380 contributions and 18 educational simulation modules. She is an author of four books (D. Vasileska and S. M. Goodnick, *Computational Electronics*, Morgan & Claypool, 2006; D. Vasileska, Editor, *Cutting Edge Nanotechnology*, March 2010; D. Vasileska, S. M. Goodnick and G. Klimeck, *Computational Electronics: From Semi-Classical to Quantum Transport Modeling*, CRC Press, June 2010; and D. Vasileska and S. M. Goodnick, Editors, *Nanoelectronic Devices: Semiclassical and Quantum Transport Modeling*, Springer, in press). She has given numerous invited and plenary talks. She is a senior member of IEEE and a member of Phi Kappa Phi.

Honors and Distinctions: Listed in Who's Who 2007; NSF CAREER Award, 1998; University Cyril and Methodius, Skopje, Republic of Macedonia, College of Engineering Award for Best Achievement in One Year, 1981-1985; University Cyril and Methodius, Skopje, Republic of Macedonia, Award for Best Student from the College of Engineering in 1985 and 1990.

SELECTED PUBLICATIONS

D. Vasileska, "Modeling Thermal Effects in Nano-Devices," *Microelectronic Engineering*, vol. 109 (9), pp. 163–167, 2013.

D. Vasileska, G. Klimeck, A. Magana, and S. M. Goodnick, "Tool-Based Curricula and Visual Learning," *Electronics*, vol. 17, no. 2, December 2013, pp. 95-104.

M. Nedjalkov, S. Selberherr, D. K. Ferry, D. Vasileska, P. Dollfus, D. Querlioz, I. Dimov, P. Schwaha, "Physical Scales in the Wigner-Boltzmann Equation," *Annals of Physics*, vol. 328, pp. 220-237, 2013.

B. Padmanabhan, D. Vasileska and S. M. Goodnick, "Current degradation in GaN HEMTs: Is Self-Heating Responsible?" *ECS (Electrochemical Society) Transactions*, vol. 49(1): pp.103-109, 2012.

G. Wirth, D. Vasileska, N. Ashraf, L. Brusamarello, R. Della Giustina and P. Srinivasan, "Compact Modeling and Simulation of Random Telegraph Noise Under Non-stationary Conditions in the Presence of Random Dopants," *Microelectronics Reliability*, Volume 52, Issue 12, December 2012, Pages 2955-2961.

K. Raleva, D. Vasileska, S. M. Goodnick, and M. Nedjalkov, "Modeling thermal effects in nanodevices," *IEEE Transactions on Electron Devices*, vol. 55, issue 6, pp. 1306-1316, June 2008.

K. Raleva, D. Vasileska, and S. M. Goodnick, "Is SOD technology the solution to heating problems in SOI devices?" *IEEE Electron Device Letters*, vol. 29, issue 6, pp. 621-624, June 2008.

Vijay Vittal, *Professor, Ph.D., Iowa State University; vijay.vittal@asu.edu; 480-965.1879; Research expertise: electric power, power system dynamics and controls, nonlinear systems, computer applications in power, sustainable energy, modeling and simulation of complex systems.*

Vijay Vittal joined the ASU faculty in 2005. Prior to ASU, he was an Anston Marston Distinguished Professor at the Iowa State University's, Electrical and Computer Engineering Department. In addition, he was a Murray and Ruth Harpole Professor and director of the university's Electric Power Research Center and site director of the NSF/IUCRC Power System Engineering Research Center (PSERC). Currently, he is the director of PSERC, headquartered at ASU. From 1993 to 1994, he served as the program director of power systems for the NSF Division of Electrical and Communication Systems in Washington, D.C. He was the editor-in-chief of the *IEEE Transactions on Power Systems* from 2005-2011. Vittal has published 145 articles in refereed journals, 118 refereed conference proceeding articles, eleven books and book chapters, and 13 research and technical reports.

Honors and Distinctions: IEEE Herman Halperin Transmission and Distribution Field Award, 2013; ASU Foundation Professor of Power Systems Engineering, 2013; Member, Ira A. Fulton Chaired Professor, 2005; National Academy of Engineering, 2004; Iowa State University College of Engineering Anson Marston Distinguished Professor, 2004; Foundation Award for Outstanding Achievement in Research, 2003; IEEE Fellow; IEEE Power Engineering Society Technical Council Committee of the Year Award, 2000-2001; Outstanding Power Engineering Educator Award, PES, IEEE, 2000; Warren B. Boast Undergraduate Teaching Award, 2000.

SELECTED PUBLICATIONS

V. Vittal and R. Ayyanar, *Grid Integration and Dynamic Impact of Wind Energy*, Springer, New York, 2013.

Chakhchoukh, Y., V. Vittal, G.T. Heydt, "PMU Based State Estimation by Integrating Correlation," *IEEE Transactions on Power Systems*, vol. 29, No.2, pp. 617-626, March 2014.

Fan, M., V. Vittal, G.T. Heydt, R. Ayyanar, "Preprocessing Uncertain Photovoltaic Data," *IEEE Transactions on Sustainable Energy*, vol. 5, no. 1, pp. 351-352, January 2014.

Liu, Y., V. Vittal, J. Undrill, J. H. Eto, "Transient Model of Air-Conditioner Compressor Single Phase Induction Motor," *IEEE Transactions on Power Systems*, vol. 28, No.4, pp. 4528-4536, November, 2013.

Zhang, S., V. Vittal, "Design of Wide-Area Power System Damping Controllers Resilient to Communication Failures," *IEEE Transactions on Power Systems*, vol. 28, No.4, pp. 4292-4300, November, 2013.

Lei Ying, *Associate Professor; Ph.D., University of Illinois at Urbana-Champaign; lei.ying.2@asu.edu ; 480-965.7003; Research expertise: stochastic networks including big data and cloud computing, cyber security, P2P networks, social networks and wireless networks.*

Lei Ying joined ASU in 2012 from Iowa State University where he was the Northrup Gruman Assistant Professor in the Department of Electrical and Computer Engineering. His research focuses on developing fundamental models and basic theories for the design and analysis of large-scale, complex and socially aware information networks.

Honors and distinctions: NSF CAREER Award, 2010; Defense Threat Reduction Agency Young Investigator Award, 2009

SELECTED PUBLICATIONS

R. Srikant and Lei Ying, *Communication Networks—An Optimization, Control and Stochastic Networks Perspective*, Cambridge University Press, 2014.

K. Zhu and Lei Ying. "A Robust Information Source Estimator with Sparse Observations." Proc. INFOCOM 2014, Toronto, Canada, April, 2014.

M. Ouyang and Lei Ying. "Approaching Throughput Optimality with Limited Feedback in Multichannel Wireless Downlinks," *IEEE/ACM Transactions on Networking*, vol. 21, no. 6, pp 1827-1838, December, 2013.

X. Kang, W. Wang, J. J. Jaramillo and Lei Ying, "On the Performance of Largest-Deficit-First for Scheduling Real-Time Traffic in Wireless Networks," *Proc. MobiHoc* 2013, Bangalore, India, July 2013.

W. Wang, K. Zhu, Lei Ying, J. Tan and L. Zhang. "Map Task Scheduling in Map Reduce with Data Locality: Throughput and Heavy-Traffic Optimality," *Proc INFOCOM 2013*, Turin, Italy, April 2013.

Hongbin Yu, *Associate Professor; Ph.D., University of Texas at Austin; yuhb@asu.edu; 480-965.4455; Research expertise: nanostructure and nano device fabrication and characterization, nanoelectronics, flexible and transparent electronics, transport in metallic and semiconducting nanostructures and molecules, quantum size effect in metallic and semi-conducting nanostructures, surface and interface physics and chemistry; integrated microwave devices.*

Hongbin Yu joined the ASU faculty in 2005. He received his Ph.D. in physics in 2001 from the University of Texas at Austin, and his MS in physics in 1996 from Peking University, P.R. China, and conducted his postdoctoral research at California Institute of Technology and University of California at Los Angeles.

Honors and Distinctions: Graduate Research Award, American Vacuum Society, 2001.

SELECTED PUBLICATIONS

Teng Ma, Hanshuang Liang, George Chen, Benny Poon, Hanqing Jiang, and Hongbin Yu, "Micro-strain sensing using wrinkled stiff thin films on soft substrates as tunable optical grating," *Opt. Express*, vol. 21, pp. 11994-12001, 2013.

Hao Wu, Shirong Zhao, Donald S. Gardner and Hongbin Yu, "Improved high frequency response and quality factor of on-chip ferromagnetic thin film inductors by laminating and patterning Co-Zr-Ta-B Films," *IEEE Transactions on Magnetics*, 49, 4176 (2013).

Tej Belagodu, Ebraheem Ali Azhar and Hongbin Yu, "Conductance Modulation of ZnO Nanowires through Surface Molecular Functionalization," *Nanoscale*, 4, 7030-7033 (2012).

Kevin Chen, Ebraheem Azhar, Teng Ma, Hanqing Jiang, and Hongbin Yu, "Facile large-area photolithography of periodic sub-micron structures using a self-formed polymer mask," *Appl. Phys. Lett.* 100, 233503 (2012).

Hongbin Yu, Ebraheem Ali Azhar, Tej Belagodu, Swee Lim, and Sandwip Dey, "ZnO Nanowire Based Visible-Transparent Ultraviolet Detectors on Polymer Substrates," *J. Appl. Phys.*, 111, 102806 (2012).

Wei Xu, Alan Chin, Laura Ye, Cun-Zheng Ning and Hongbin Yu, "Space-Charge limited Charge Transport in GaSb Nanowires," *J. Appl. Phys.* 111, 104515 (2012).

Wei Xu, Saurabh Sinha, Tawab Dastagir, Hao Wu, Bertan Bakkaloglu, Donald S. Gardner, Yu Cao, and HongbinYu, "Performance enhancement of on-chip inductors with permalloy magnetic rings," *IEEE Electron Device Letter*, vol. 32, issue 1, pp. 69-71, 2011.

Baoquan Ding, Hao Wu, Wei Xu, Hongbin Yu, and Hao Yan, "Interconnecting cold islands with DNA origami nanotubes," *Nano Lett.*, vol. 10, 33073, 2010.

Cunjiang Yu, Kevin O'Brien, Yong-Hang Zhang, Hongbin Yu, and Hanqing Jiang, "Tunable optical gratings based on buckled nano-scale thin films on transparent elastomeric substrates," *Appl. Phys. Lett.*, vol. 96, 041111, 2010.

Hongyu Yu, *Associate Professor; Ph.D., University of Southern California; hongyuyu@asu.edu; 480-747.7454; Research expertise: sensor devices, such as acoustic transducers, inertial sensors, and fluidic sensors, and integrated sensor systems, such as flexible, stretchable and deformable platforms.*

Hongyu Yu joined ASU in 2008 holding a joint position at the School of Earth and Space Exploration and the School of Electrical, Computer and Energy Engineering. He received his BS and MS degrees in electronics engineering from Tsinghua University, Beijing, China, in 1997 and 2000, respectively, and a Ph.D. degree in electrical engineering from the University of Southern California in 2005. His research area is focused on MicroElectroMechanical Systems (MEMS) and other micro systems for earth and space exploration and consumer electronics. His research is to provide portable platforms, consumer electronics and instruments for and scientists to explore a variety of earth environments and space science, such as micro seismometer and bio-chemistry liquid sensors for planetary exploration. His current projects also include the manufacture of high energy density lithium ion batteries and deformable electronics (including origami electronics) as a universal platform for consumer products.

SELECTED PUBLICATIONS

R. Tang, H. Huang, H. Tu, H. Liang, M. Liang, Z. Song, Y. Xu, H. Jiang, and H. Yu, 2014, "Origami-enabled Deformable Silicon Solar Cells," *Applied Physics Letters*, 104, 083501

Z. Song, T. Ma, R. Tang, Q. Cheng, X. Wang, D. Krishnaraju, R. Panat, C. K. Chan, H. Yu, and H. Jiang, 2014, "Origami Lithium-ion Batteries," *Nature Communications*, 5:3140 doi: 10.1038/ncomms4140

E. Kim, H. Tu, C. Lv, H. Jiang, H. Yu, and Y. Xu, 2013, "A robust polymer microcable structure for flexible devices," *Applied Physics Letters*, 102, 033506

Y. Wang, T. Ma, H. Yu, and H. Jiang, 2013, "Random Analysis on Controlled Buckling Structure for Energy Harvesting," *Applied Physics Letters*, 102, 041915

H. Huang, B. Carande, R. Tang, J. Oiler, D. Zuitsev, V. Agafonov and H. Yu, "A Micro Seismometer based on Molecular Electronic Transducer Technology for Planetary Exploration," *Applied Physics Letters*, Vol.102, no. 19, Article Number: 193512; DOI: 10.1063/1.4806983 Published: May 13 2013.

E. Kim, H. Tu, C. Lv, H. Jiang, H. Yu, and Y. Xu, "A Robust Polymer Microcable Structure for Flexible Devices," *Applied Physics Letters*, 2013: 102(3) pp:1-4 Article Number: 033506; DOI: 10.1063/1.4788917.

H. Huang, V. Agafonov and H. Yu, "Molecular Electric Transducers as Motion Sensors: A Review," *Sensors*, 2013, 13(4), 4581-4597; DOI: 10.3390/s130404581.

Junshan Zhang, *Professor; Ph.D., Purdue University; junshan.zhang@asu.edu; 480-727.7389; Research expertise: network optimization/control, cyber-physical systems with applications to smart grid, wireless networks, mobile social networks, stochastic modeling and analysis.*

Junshan Zhang joined the ASU faculty as an assistant professor in August 2000. He received the BS degree in EE from HUST, China, in 1993, an M.S. degree in mathematical statistics from the University of Georgia in 1996, and a Ph.D. degree in electrical and computer engineering from Purdue University in 2000. He is the recipient of a 2003 NSF CAREER Award and a 2005 ONR YIP award. He was general chair for IEEE Communication Theory Workshop 2007 and TPC co-chair for INFOCOM 2012. He is currently a Distinguished Lecturer of the IEEE Communications Society.

Honors and Distinctions: IEEE fellow; 2003 NSF CAREER Award; 2005 ONR YIP Award; IEEE INFOCOM 2009 Best Paper Award runner-up; IEEE ICC 2008 Best Paper Award; IEEE INFOCOM 2014 Best Paper Award runner-up.

SELECTED PUBLICATIONS

Xu Chen, Xiaowen Gong, Lei Yang, and Junshan Zhang: "A Social Group Utility Maximization Framework with Applications in Database Assisted Spectrum Access," IEEE INFOCOM 2014.

Xu Chen, Brian Proulx, Xiaowen Gong, and Junshan Zhang: "Social trust and social reciprocity based cooperative D2D communications," *ACM MobiHoc 2013*: 187-196

Lei Yang, Hongseok Kim, Junshan Zhang, Mung Chiang, and Chee Wei Tan: "Pricing-Based Decentralized Spectrum Access Control in Cognitive Radio Networks," *IEEE/ACM Trans. Networking* 21(2): 522-535 (2013)

Miao He, Vijay Vittal, and Junshan Zhang: "Online dynamic security assessment with missing PMU measurements: A data mining approach," *IEEE Transactions on Power Systems*, 2013; 28(2):1969-1977.

Miao He, Junshan Zhang, and Vijay Vittal: "Robust online dynamic security assessment using adaptive ensemble decision-tree learning," *IEEE Transactions on Power Systems*, 2013; 28(4):4089-4098.

P. S. C. Thejaswi, J. Zhang, S. Pun, V. H. Poor, and D. Zheng, "Distributed opportunistic scheduling with two-level channel probing," *IEEE/ACM Transactions on Networking*, 1464-1477 (2010).

Yong-Hang Zhang, *Fulton Entrepreneurial Professor; Director, Center for Photonics Innovation; Dr. rer. nat., Max-Planck-Institute for Solid States and University Stuttgart, Germany; yhzhang@asu.edu; 480-965-2562; Research expertise: optoelectronic materials and devices such as solar cells, laser diodes, and photodetectors.*

Yong-Hang Zhang joined the faculty in 1996 from Hughes Research Laboratories. He has published about 250 book chapters and research articles in refereed journals and conference proceedings, has eight issued U.S. patents, and has edited three conference proceedings and authored or co-authored more than 300 invited and contributed conference presentations.

Honors and Distinctions: OSA Fellow, IEEE Senior Member; Innovation and Excellence in Laser Technology and Applications Award from Hughes Research Labs; Chair and Co-chair of numerous international conferences and workshops.

SELECTED PUBLICATIONS

J. Fan, L. Ouyang, X. Liu, J. K. Furdyna, D. J. Smith, and Y.-H. Zhang, "GaSb/ZnTe double-heterostructures grown using molecular beam epitaxy," *Journal of Crystal Growth*, J. of Cryst. Growth 371 (1), 122–125 (2013).

S. H. Lim, J.-J. Li, E. H. Steenbergen, Y.-H. Zhang, "Luminescence coupling effects on multi-junction solar cell external quantum efficiency measurement," *Progress in Photovoltaics: Research and Applications*, 21, 344–350 (2013).

E. H. Steenbergen, B. C. Connelly, G. D. Metcalfe, H. Shen, M. Wraback, D. Lubyshev, Y. Qiu, J. M. Fastenau, A. W. K. Liu, S. Elhamri, O. O. Cellek, and Y.-H. Zhang, "Significantly improved minority carrier lifetime observed in a long-wavelength infrared III-V type-II superlattice comprised of InAs/InAsSb," *Appl. Phys. Lett.* 99, 251110 (2011).

D. Ding, S. R. Johnson, S.-Q. Yu, S.-N. Wu, and Y.-H. Zhang, "A Semi-Analytical Model for Semiconductor Solar Cells," *J. Appl. Phys.* 110, 123104 (2011).

S. Wang, D. Ding, X. Liu, X.-B. Zhang, D. J. Smith, J. K. Furdyna, and Y.-H. Zhang, "MBE growth of II/VI materials on GaSb substrates for photovoltaic applications," *J. of Cryst. Growth*, vol. 311, pp. 2116, 2009.

Yanchao Zhang, *Associate Professo; Ph.D., University of Florida; yczhang@asu.edu; 480-727.0039; Research expertise: network and distributed system security, wireless networking, and mobile computing.*

Yanchao Zhang joined Arizona State University in June 2010 as an associate professor in the School of Electrical, Computer, and Energy Engineering. Before coming to ASU, he was an assistant professor of electrical and computer engineering at the New Jersey Institute of Technology from 2006 to 2010. He is an editor of *IEEE Transactions on Mobile Computing*, *IEEE Transactions on Vehicular Technology*, and *IEEE Wireless Communications Magazine*. He also routinely serves as a TPC member for major international conferences such as INFOCOM, ICDCS, ICNP, MobiHoc, PerCom, NDSS, SECON, MASS, and WiSec.

Honors and Distinctions: NSF CAREER Award, 2009.

SELECTED PUBLICATIONS

Rui Zhang, Jing Shi, Yanchao Zhang, and Chi Zhang, "Verifiable privacy-preserving aggregation in people-centric urban sensing systems," *IEEE Journal on Selected Areas in Communications, Special Issue on Emerging Technologies in Communications*, vol. 31, no. 9, pp. 268-278, September 2013.

Rui Zhang, Jinxue Zhang, Yanchao Zhang, Jinyuan Sun, and Guanhua Yan, "Privacy-preserving profile matching for proximity-based mobile social networking," *IEEE Journal on Selected Areas in Communications, Special Issue on Emerging Technologies in Communications*, vol. 31, no. 9, pp. 656-668, September 2013.

Rui Zhang, Jinxue Zhang, Yanchao Zhang, and Chi Zhang, "Secure crowdsourcing-based cooperative spectrum sensing," IEEE International Conference on Computer Communications (INFOCOM'13), Turin, Italy, April 2013.

Jingchao Sun, Rui Zhang, and Yanchao Zhang, "Privacy-preserving spatiotemporal matching," IEEE International Conference on Computer Communications (INFOCOM'13), Turin, Italy, April 2013.

Jingchao Sun, Xu Chen, Jinxue Zhang, Yanchao Zhang, and Junshan Zhang, "SYNERGY: A Game-Theoretical Approach for Cooperative Key Generation in Wireless Networks," IEEE International Conference on Computer Communications (INFOCOM'14), Toronto, Canada, April 2014.

Yuji Zhao, *Assistant Professor; Ph.D, University of California, Santa Barbara; Yuji.Zhao@asu.edu; Research expertise: photonics and electronics; MOCVD growth and device applications of III-nitride semiconductors, including LEDs, lasers, solar cells, and power transistors; nanofabrication and nanoscale characterizations; wide-bandgap semiconductors and oxides; new physics, materials, and devices for future solid-state electronics.*

Yuji Zhao received the B.S. degree in Microelectronics from Fudan University, China in 2008, and the Ph.D degree in Electrical and Computer Engineering from University of California, Santa Barbara (UCSB) in 2012. Prior to joining ASU in 2014, he was an Assistant Project Scientist in the Materials Department and Solid State Lighting and Energy Center (SSLEC) at UCSB. Dr. Zhao has worked extensively on III-nitride materials and devices, with more than 50 conference and journal publications, one book chapter, and over 10 patents, and has won Outstanding Research Award from UCSB for a record four consecutive times (2010 to 2013). His work on III-nitride LEDs and lasers was recognized with a Most Cited Article of the Year Award from *Applied Physics Express*, an Editor's Pick of the Year Award from *Applied Physics Letters*, a Best Paper Award from CLEO, and was featured in over 100 international news outlets with over 5 languages, including *Science*, *Nature Photonics*, *Optical Society of America*, *Compound Semiconductors*, and Yahoo.

SELECTED PUBLICATIONS

Y. Zhao, S. H. Oh, F. Wu, Y. Kawaguchi, S. Tanaka, K. Fujito, J. S. Speck, S. P. DenBaars, and S. Nakamura, "Green semipolar (20-2-1) InGaN light-emitting diodes with small wavelength shift and narrow spectral width," *Appl. Phys. Express*, vol. 6, 062102 (2013).

Y. Zhao, F. Wu, C. Y. Huang, Y. Kawaguchi, S. Tanaka, K. Fujito, J. S. Speck, S. P. DenBaars, and S. Nakamura, "Suppressing the void defects in the long wavelength semipolar InGaN quantum wells by growth rate optimization," *Appl. Phys. Lett.*, vol. 102, 091905 (2013).

Y. Zhao, Q. Yan, D. Feezell, K. Fujito, C. G. Van de Walle, J. S. Speck, S. P. DenBaars, and S. Nakamura, "Optical polarization characteristics of semipolar (30-31) and (30-3-1) InGaN/GaN light-emitting diodes," *Opt. Express*, vol. 21, A53 (2013).

Y. Zhao, Q. Yan, C. Y. Huang, S. C. Huang, P. S. Hsu, S. Tanaka, C. C. Pan, Y. Kawaguchi, K. Fujito, D. Feezell, C. G. Van de Walle, J. S. Speck, S. P. DenBaars, and S. Nakamura, "Indium incorporation and emission properties of nonpolar and semipolar InGaN quantum wells," *Appl. Phys. Lett.*, vol. 100, 201108 (2012).

Y. Zhao, S. Tanaka, C. C. Pan, K. Fujito, D. Feezell, J. S. Speck, S. P. DenBaars, and S. Nakamura, "High-power blue-violet semipolar (20-2-1) InGaN/GaN light-emitting diodes with low efficiency droop at 200 A/cm2," *Appl. Phys. Express*, vol. 4, 082104 (2011).

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Shane Johnson, Research Scientist; Ph.D., University of British Columbia. *Epitaxial growth of III-V and II-VI materials and devices, optical and electronic properties of semiconductors, and semiconductor device physics, including III-V-bismuth materials for optoelectronic devices, lasers for communication, sensing, and imaging applications, and high-efficiency multi-junction photovoltaic solar cells.*

Darryl Morrell, Associate Professor; Ph.D., Brigham Young University. ***Engineering pedagogy, engineering applications of probability theory, particularly decision theory.***

Jitendran Muthuswamy, Associate Professor; Ph.D., Rensselaer Polytechnic Institute. *Microelectromechanical systems (MEMS) for neural communication and multifunctional neural prosthesis.*

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Daniel Rivera, Professor; Ph.D., California Institute of Technology. *Life cycle and hierarchical issues in process control systems identification, robust process control.*

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Guoliang Xue, Professor, Ph.D., University of Minnesota. *Survivability and security in mobile social networks and smart grid, and optimization and economic approaches to network applications.*

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Stephen D. Howard, Defense Science and Technology Organization

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Jun Shen, JS Technologies

Raymond Tsui, Raydis LLC

Seth Wilk, SJT Micropower

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Stay in touch with news about Fulton Engineering and ECEE at our news site, Full Circle (fullcircle.asu.edu). Do you have your own news to add to the ECEE section of Full Circle? Share your news with us at fultonweb@asu.edu.

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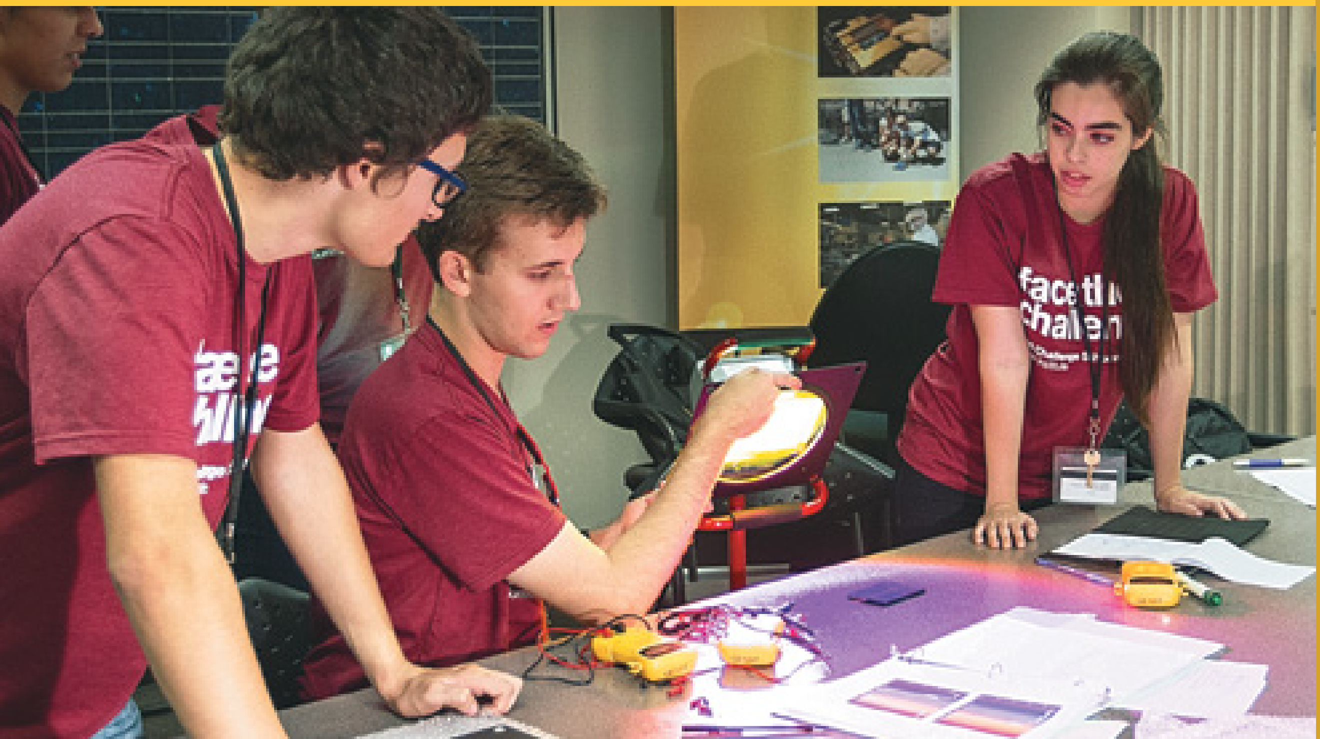

IMPACT and Fulton Difference Award Nominees

Loriann Brichetto
Margaret Creedon
Rebecca Davis
Theo Eckhardt
Clayton Javurek
Jenna Marturano
Cynthia Moayedpardazi

ASU Service Recognition

30 years: Constantine Balanis, David Ferry
25 years: Andreas Spanias, Konstantinos Tsakalisr
20 years: Nina Millmyn
15 years: Tolga Duman
10 years: Farah Kiaei
5 years: Stuart Bowden, Julie Castro, Bill Dauksher Theo Eckhardt, Christiana Honsberg, Liang Huang, Sule Ozev

ASU SUN Awards

Sabrina Beck
Julie Castro
Bill Dauksher
Rebecca Davis
Laura DiPaolo
Theo Eckhardt
Emily Fassett
Theresa Herr
Sayfe Kiaei
Esther Korner
Lauren Levin
Thomas Lewis
Darleen Mandt
Jon Martin
Maya Martin
Jenna Marturano
Cheryl McAfee
Toni Mengert
Michele Nobles
Stephen Phillips
Evie Selberg
Trevor Thornton

Electricity is the lifeblood of modern society, powering everything from cities to pacemakers. With demand increasing, the electricity generating system faces challenges. Quantum Energy and Sustainable Solar Technologies is facing those challenges and inspiring the next generation of engineers. QESST addresses the growing demand for electricity by building an innovative system that breaks away from the waste and inefficiencies of unsustainable fossil fuels and generates power using our favorite sustainable and unlimited resource: the Sun.

QESST outreach coordinators work with K-12 students — and their teachers — in their classrooms, at community events and summer day camps. They are developing and distributing culturally relevant photovoltaic education, engineering curriculum and interactive displays. At events around the state, high school students build and race solar cars.

QESST was established at ASU in 2011 as an NSF-DOE funded Engineering Research Center.

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