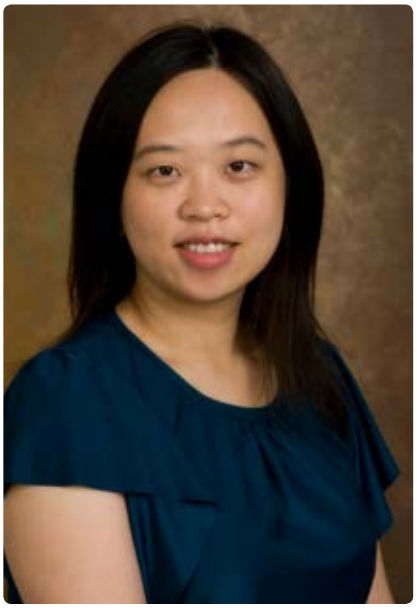
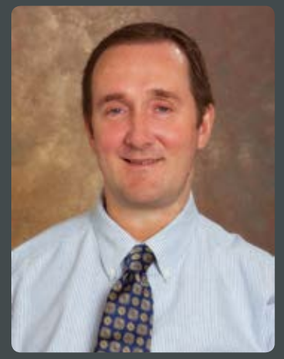
2012 | Electrical & Computer Engineering ***CURRENTS***

INSIDE: *Read about the Cybersecurity Initiative and learn how OpSIS is leading the silicon photonics revolution — two of many Electrical & Computer Engineering department endeavors.*





MESSAGE FROM THE CHAIR

KENNETH E. BARNER

It is my pleasure to share the latest ***Currents***, highlighting news and achievements from UD's Department of Electrical and Computer Engineering (ECE). UD ECE continues to make significant advances by hiring faculty members who are driving revolutions in our dynamic field, leading an array of national and international research programs, and continuously improving our educational offerings – efforts garnering the recognition of our peers.

We moved up 18 places, to 57th nationally, in the 2012 ***U.S. News & World Report*** academic engineering discipline rankings, which represents a three-year improvement of 22 places. This ascension is consistent with other national and international rankings that reflect quantitative improvements in our education and research programs, as well as growing peer recognition of the quality and impact of our programs.

Representative of UD's leadership at the dynamic boundaries of the ECE field is the recent addition of Prof. ***Michael Hochberg*** to our faculty. Prof. Hochberg's research interests are in silicon photonics and large-scale photonic-electronic integration. Among his most notable accomplishments is the establishment of OpSIS, which advances the field of optoelectronics by bringing prototyping capabilities to startup companies and academic research groups.

Department-wide research initiatives continue to expand, with UD ECE faculty members now leading $17M in annual research expenditures fueling a wide array of research programs that graduated 16 Ph.D. students over the last year. ***Dr. James Mutitu*** is an exemplar of our outstanding UD ECE Ph.D. graduates — his dissertation on *Light Trapping in Thin Film Solar Cells Using Photonic Engineering Device Concepts* earned him the **Allan P. Colburn Prize** for the most outstanding dissertation in Engineering and Mathematical Sciences.

The undergraduate student population continues to grow, with more than 250 students enrolled in the Electrical Engineering and Computer Engineering degree programs. The class of 2012 was the first set of students to participate in the new full-year ECE Capstone Design Projects course, which featured team projects spanning conceptual design through prototyping and evaluation. Many projects were company-derived and sponsored, with corporate partners directly mentoring student teams.

We look forward to the 2013 opening of the Interdisciplinary Science and Engineering Lab (ISE Lab), which features a 10,000 square-foot cleanroom that will further propel UD ECE's national leadership in nanofabrication, silicon-photonics and semiconductor device fabrication. The facility will also make possible new research thrusts, such as at the biology nano-device boundary. Multiple faculty hires are planned in the next five years to advance these strategic areas.

The achievements of UD ECE students, faculty and alumni are manifold. The following pages showcase just some recent highlights. I am extremely proud of these accomplishments and I am confident that, as UD ECE continues on its strategic path as a field leader, even greater achievements will be realized.

I thank our many alumni, friends and industry partners who have provided the support that is integral to our efforts for excellence in education and research. As always, please feel free to contact me at barner@udel.edu with your ideas for further UD ECE accomplishments.

Kenneth E. Barner, Ph.D.
Professor and Chair
Electrical and Computer Engineering

Be sure to *like* the *University of Delaware Electrical and Computer Engineering Department* Facebook page!

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In this issue...

- Content Direction: Kenneth Barner
- Design, Photography & Writing: Office of Communications & Marketing
- Printing: University Printing

UNIVERSITY OF DELAWARE
Electrical & Computer Engineering

2012–2013
DISTINGUISHED LECTURE SERIES

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"Photonic Integrated Circuits: Past, Present, and Future"

Visit www.ece.udel.edu for webcasting and details.

Co-Sponsored by the Delaware Bay IEEE

Computers as Storytellers

Contextual learning research may help military in foreign regions

UD assistant professor of electrical and computer engineering **KRISTINA WINBLADH** is putting a new twist on the time-honored tradition of storytelling by developing a contextual learning system to train soldiers bound for foreign regions.

"Much of the noncombat work soldiers do abroad involves securing and maintaining peace in highly populated civilian areas," notes Winbladh. "Yet, while our soldiers have excellent combat training, they are equipped with little social training."

"In the military, misunderstandings can cost innocent lives," she continues. "Storytelling is powerful because it puts information into context, something current military training scenarios lack."

Winbladh's work is funded through a 2011 Young Faculty Award from the Defense Advanced Research Projects Agency (DARPA), the research arm of the U.S. Department of Defense. The two-year grant, totaling $299,000, supports Winbladh and her research team in their effort to create both the system's architectural structure and a collection of stories that serve as background for soldiers to better understand and cope with events falling outside their assigned tasks or training.

Details gathered from soldiers' interactions with the local civilians help teach other soldiers about various cultures or regions. This "body of knowledge" prepares our forces, and the people with whom they interact, to remain safer in unfamiliar situations.

"In this case, it also has the potential to build up trust between soldiers on peacekeeping missions and the people they are trying to protect," says Winbladh, one of 39 scientists nationwide selected for funding from a pool of more than 400 DARPA applicants.

Known as iMuse (Interactive Mode-based Use-case and Storytelling Environment), Windbladh's interactive software system translates stories soldiers share of their experiences to a format that can be processed by computer algorithms.

Experiments with different virtual reality engines, event-based simulators and information retrieval techniques are helping Windbladh's team enhance the system to better aid storytellers.

For example, iMuse allows soldiers to formulate a story using predefined concepts and actions, and then ask questions to clarify and refine the story. Sequences of events that occur often are tagged for reuse, creating a drag-and-drop menu of options new storytellers can use to quickly enter their data.

New storytellers have access to a catalogued case library of story models that they can use to plan and develop their own narratives. While designed with the military in mind, the software system offers many possible uses.

"The format for the end-user is deliberately undefined," Windbladh explains. "The point is that the information should be in a format that can be translated by a machine for use in many different contexts, including software development, virtual reality scenarios, game engines and business applications."

About the researcher

Kristina Windbladh chairs the College of Engineering's Master of Science in Software Engineering (MSSE) Program Committee. MSSE is a new joint graduate degree offered by the Departments of Electrical and Computer Engineering and Computer and Information Sciences.

Article by Karen B. Roberts | Photo by Ambre Alexander

"Much of the noncombat work soldiers do abroad involves securing and maintaining peace in highly populated civilian areas. Yet, while our soldiers have excellent combat training, they are equipped with little social training."

--Kristina Winbladh

HIV treatment solutions

Professor's model-based approach helps minimize treatment failure for those with HIV

Effective long-term treatment for patients living with HIV is complicated. Drug resistance is the leading cause of treatment, and the development of new strains of the virus is common.

RYAN ZURAKOWSKI, assistant professor of electrical and computer engineering, has developed a treatment method to reduce the risk of future failures in patients who have already experienced failure with their HIV treatment protocol.

Patients are often treated with three-drug regimens that are highly effective at suppressing the virus in the long term. However, some patients become resistant to one or all three components of their regimen.

When this happens, the patient must switch to a new regimen.

Zurakowski and his group are developing model-based approaches that minimize the risk of treatment failures for patients who are switching therapies by considering the contributions of viral load to the probability of failure.

Viral load measures the status of a patient's infection level.

People with a high HIV viral load have a significantly higher chance of carrying a strain of HIV that will be resistant to subsequent medication regimens. This resistance can severely limit the patient's treatment options.

"We are developing methods that would allow us to reduce the number of viral load measurements required without significantly decreasing the achieved reduction in risk," says Zurakowski. "We are also developing ways to use the existing databases of HIV drug resistance mutations in order to choose the best drug combinations."

Early results indicate that when a treatment fails, steps should be taken to reduce the viral load before switching to a new regimen. Starting treatment at a lower level of infection will significantly lower the chances of developing resistance.

For those who experience multiple failed therapies, Zurakowski also found that constructing a temporary "mix and match" regimen from previously failed combinations may minimize the risk of additional treatment failure.

If successful, Zurakowski's research could help clinicians design and customize optimal treatment plans for transitioning patients whose antiviral regimen has failed to an alternate set of medications.

"The mathematical tools which are traditionally applied to aerospace, robotics and electrical design problems are equally applicable to problems of medical modeling and treatment planning," Zurakowski explains.

Zurakowski's research is documented in a paper entitled "Optimal Antiviral Switching to Minimize Resistance Risk in HIV Therapy," recently published in ***PLoS One***, a peer-reviewed online science publication of the Public Library of Science. It has also been featured in the ***AIDS Beacon***, an online publication provided by Light Knowledge Resources, an independent Internet publishing company based in Princeton, N.J.

About the researcher

Ryan Zurakowski is affiliated with the Delaware Biotechnology Institute and holds appointments within the Department of Mathematical Sciences and the Biomedical Engineering program. His research centers on nonlinear control theory and applications, specifically in mathematical biology and medicine.

Article by Gabriella Chiera
Photo by Ambre Alexander

Need for SPEED

The project's goals are threefold:

- Determine how the new many-core computer processors change the way programs run on computers.
- Examine whether traditional compiler optimization techniques are still relevant.
- Develop new techniques to accelerate program performance.

UD engineer tackles new hurdles in computer optimization

XIAOMING LI, associate professor of electrical and computer engineering, is principal investigator of a three year, $259,000 grant from the National Science Foundation (NSF) to improve optimization techniques that will make computer programs and smart phones—even video games—run faster, using fewer resources.

The project is the result of an evolution in the computer world from single-core to many-core processors, which are now considered the main computation engine for both everyday computer applications and high-performance computing.

"The main performance issue in the new many-core era is helping a multitude of threads to optimally share—not compete for—resources, says Li, an assistant professor of computer engineering.

"This subtle, but fundamental change in the goal of compilation leads to the overhaul of performance modeling, program profiling and the selection of compiler transformations and their parameter values in traditional compilers." He explains, "That overhaul is the essence of our project."

Compilers are software tools that translate programs written in high-level programming languages, such as C or Java, into a format that can run directly on computer hardware. The efficiency of the translation determines how fast a program runs.

Traditional compilation technology is largely designed to maximize the single-thread performance found on single-core processors. When applied to programs on the new generation of many-simple-core processors—which routinely run hundreds or even more threads simultaneously—these same strategies fail, slowing down performance.

This is because while many-core processors employ a simple architectural design, they rely heavily on the sheer number of cores to deliver high performance. By contrast, with single-core-based computer processors, resource sharing among threads is limited because each thread has its own core and own power resource.

Li's research will balance the choice of compilation configurations between the performance of a single thread and the overall performance of all threads in the program.

Li's team will systematically study the strategies needed to adapt existing compiler and code optimization techniques to the new many-simple-core processors, and develop new techniques to specifically improve resource allocation on the new architecture.

"The key," he says, "is maximizing resource utilization, i.e., computation power, without creating a resource bottleneck."

About the researcher

Xiaoming Li also holds a 2008 National Science Foundations (NSF) prestigious Faculty Early Career Development Award, which supports his research and education program for a similar optimization code project for high-performance computing platforms.

Article by Karen B. Roberts
Photo by Ambre Alexander

Electronic battlefield

Grant helps UD professor improve electronic receivers used for military applications

CHRISTOPHER SCHUETZ, assistant research professor of electrical and computer engineering, says the modern electronic battlefield is getting crowded.

The crowding, he says, is the result of an increasingly diverse set of threats over an expanding range of frequencies. This expansion places additional demands on modern electronic warfare (EW) receivers and sensors used to identify and classify these threats.

As missions become more challenging, the military must keep pace with systems that can perform tasks cost-efficiently and with less size, weight and power. That's where Schuetz comes in.

"The military's next generation of aircraft are migrating to small, unmanned vehicles that cannot accommodate the same weights and payloads they have in the past," he says, "which is necessitating integrated systems that are increasingly capable of performing multiple functions within the same platform."

Schuetz, a research assistant professor in electrical and computer engineering, was recently awarded a 2012 Air Force Young Investigator grant from the Department of Defense to develop advanced optical techniques that will enable next-generation electronic warfare devices for military applications.

One of only 48 scientists and engineers selected nationwide, Schuetz proposes a new approach that collects radiofrequency (RF) radiation signals and converts them into optical signals, which use light to transmit information. The benefit, he says, is the ability to process and route signals using lightweight fiber optics and optical lenses.

Fiber optics are flexible, transparent fibers made from strands of glass that are thinner than a human hair. Durable and lightweight, they reliably transmit across great distances.

"People don't generally appreciate that when they make a phone call with their cell phone or watch a movie on Netflix, that data is traveling across an optical fiber – a piece of glass that is only about 100 microns thick, but has incredible information-carrying capacity," he says.

Building on his graduate work at UD, Schuetz has already developed an imaging system that can visualize radiation emitted from a source, similar to how an infrared camera sees in the dark. The difference is that Schuetz' imaging technology can spot objects through varying conditions including cloud, fog, sand and clothing, making it useful for detecting items that emit radiation, such as cell phones and radar systems, which are of particular interest for the military.

The system works by converting the energy from RF systems that operate at a scale of centimeters to optical wavelengths that function on the nanoscale. He believes the work will enable a new class of optically-enabled EW receivers that can simultaneously receive, analyze and respond to information in real-time, potentially providing the military an advantage in the battlefield.

"The ability to locate threats and to avoid or work around them is critical to military success in combat," says Schuetz.

Additionally, he says the work could also result in new technologies to improve standoff detection equipment, such as the full body scanners found in airports, by enabling the scanners to work at distances rather than only up-close. For example, building it into the infrastructure along an airport corridor or in the hallways of a building could eliminate the need for individual scanning.

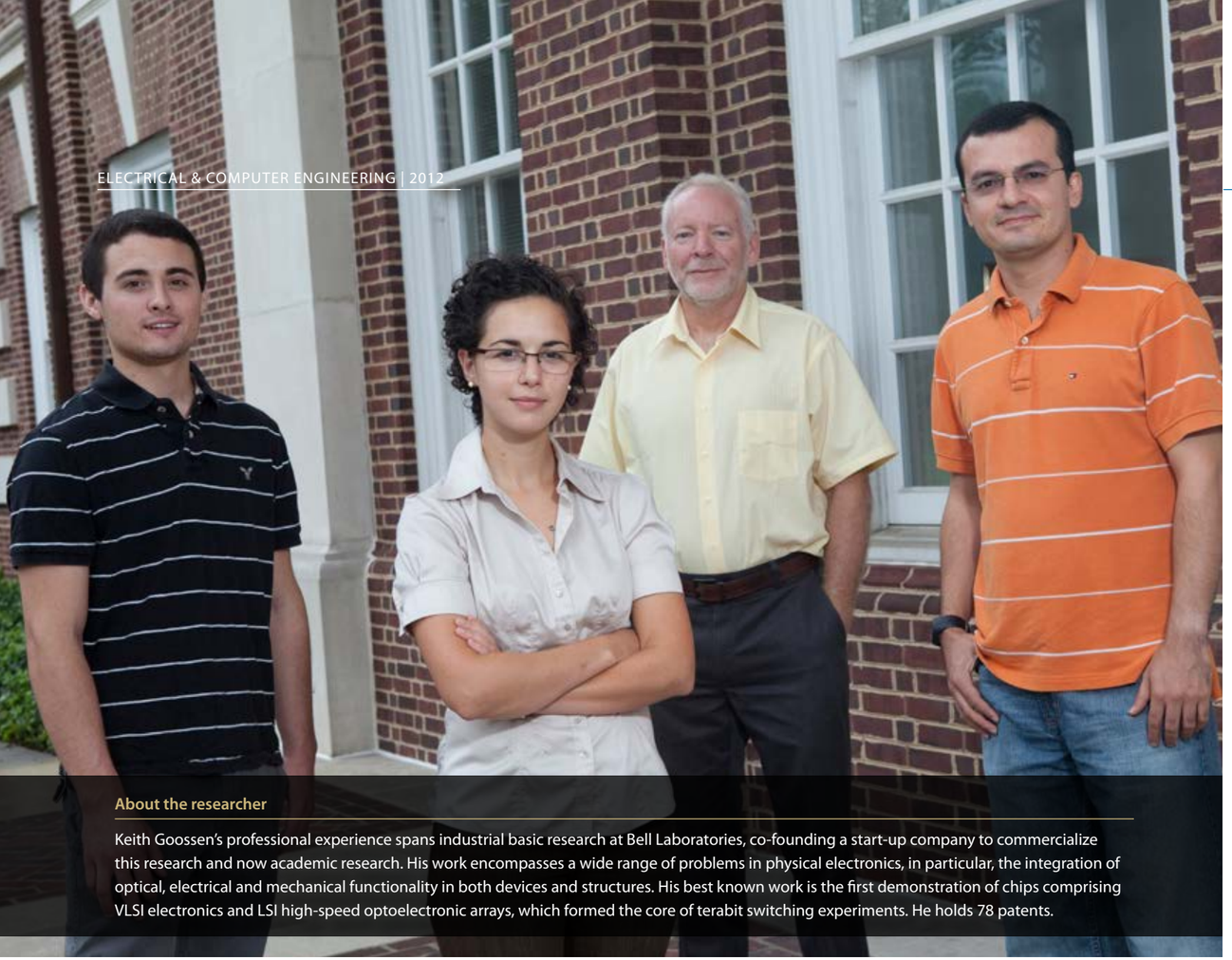
"It might even be embedded in artwork hung on a wall," says Schuetz.

Article by Karen B. Roberts
Photo by Evan Krape

ABOUT THE RESEARCHER

Christopher A. Schuetz joined UD's Department of Electrical and Computer Engineering as a research assistant professor in 2012. He has more than a decade of experience in optics and radio frequency technologies, particularly in the areas of millimeter-wave detection and imaging, polymer waveguide technology and analog photonic links and processing.

A UD alumnus, Schuetz earned his master's and doctoral degrees in electrical engineering at UD in 2005 and 2007, respectively. He received his bachelor's degree in electrical engineering with a minor in physics from Virginia Tech in 1997.



About the researcher

Keith Goossen's professional experience spans industrial basic research at Bell Laboratories, co-founding a start-up company to commercialize this research and now academic research. His work encompasses a wide range of problems in physical electronics, in particular, the integration of optical, electrical and mechanical functionality in both devices and structures. His best known work is the first demonstration of chips comprising VLSI electronics and LSI high-speed optoelectronic arrays, which formed the core of terabit switching experiments. He holds 78 patents.

Sustainability solutions

UD wins $1 million grant to train energy efficiency experts

The University of Delaware receives $1 million from the U.S. Department of Energy to continue its Industrial Assessment Center (IAC), an experiential learning student program that saves area manufacturers an average of $90,000 each per year in energy efficiencies.

Through UD-IAC, graduate and undergraduate students gain practical experience in assessing small- and medium-sized manufacturing industries for large-scale energy saving opportunities, including energy efficiency improvements, waste reduction and pollution prevention measures, and productivity improvements.

Jointly supported by the Department of Electrical and Computer Engineering and the Center for Energy and Environmental Policy (CEEP), the IAC targets companies within 150 miles of UD's Newark campus whose energy costs exceed $100,000 annually.

Since 2006, faculty and students involved in the program have performed 80 assessments on companies between Washington, D.C. and New York–one of the most important industrial corridors in the nation.

"This region accounts for manufacturing outputs valued at nearly $254 billion, enabling the UD-IAC's work to have far-reaching impact," remarks **KEITH GOOSSEN**, professor of electrical and computer engineering, who directs the UD-IAC.

A typical plant assessment results in eight efficiency recommendations, three to four of which are implemented. The average energy savings per plant is 7,745 MMBTU, which equates to a 10-20 percent cost reduction per plant, per year – on average $90,000. (MMBTU represents one million British thermal units.)

"Energy efficiency is the cleanest method to meet our energy needs," adds John Byrne, a renowned authority on climate change and director of CEEP. "The Center for Energy and Environmental Policy is pleased to see this grant renewed and stands ready to work under Professor Goossen's leadership, to enable participants from Delaware's small- and medium-scale industrial sector to significantly cut energy costs while lowering the state's pollution."

Even small reconfigurations recommended during an audit can produce immediate results. In one case, simply adjusting an air compressor setting from "idle" to "off" when not in use resulted in significant savings.

"Just flipping a switch saved the company $13,000 per year," says Goossen.

Training Leaders

For students, the training is mainly technical and involves one-on-one or group meetings, and the hands-on work of conducting audits with Goossen or Ralph Nigro, the center's assistant director.

Upon completion of six audits, students receive a certificate from the Department of Energy, designating them energy efficiency experts and placing them ahead of their peers in the energy job market. The IAC's success, says Goossen, is measured both in savings to the companies audited and in student success after graduation.

"Roughly 85 percent go into the energy field, where their expertise is in high demand," he says.

UD also offers an academic minor in sustainable energy, which includes coursework in both alternate and renewable energy, as well as energy conversion and energy efficiency. Student enrollment in the minor averages 100 students, demonstrating the interest in this emerging field.

"Negawatts" reduce energy demands

UD has been heavily involved in energy research for many years, with numerous faculty conducting technical and policy research in renewable energy, fuel cells, hydrogen, climate change, energy economics and the societal impacts of energy consumption. But Goossen says the reality is that these resources are not coming to market quickly enough.

"Energy efficiency serves as an important bridge between society's current fossil fuel consumption and the energy alternatives of tomorrow," says Goossen. "We call it 'negawatts' – a form of alternative energy that does not produce a new energy source, but instead reduces energy demands."

"We are training future energy engineers to understand the important economic and energy policy implications of their work, and the interconnections between technology and policy."

Article by Karen B. Roberts
Photo by Ambre Alexander

UD-IAC Named DOE Center of Excellence

The United States Department of Energy's (DOE) Industrial Technologies Program has named the University of Delaware's Industrial Assessment Center (UD-IAC) its 2012 Center of Excellence. This distinction identifies UD-IAC as the best of the 24 participating centers nationwide.

DOE cited the energy savings achieved by industrial plants which implemented recommendations provided during an UD-IAC audit among the reasons for selecting the center. It also highlighted the program's academic performance in producing student-trainees equipped to efficiently audit and make successful recommendations.

"The University of Delaware IAC has consistently ranked among the top performing centers. Under Dr. [Keith] Goossen's leadership since joining the program in 2007, the center has trained and graduated dozens of exceptionally qualified engineers, conducted more than 100 assessments and saved small- and medium-sized industrial facilities in the Delaware region more than $6 million a year. Keith is a huge asset to the IAC program, and I was extremely pleased to present him with the Center of the Year Award," says John Smegal, the workforce development lead for the U.S. DOE's Industrial Technologies Program.

WORLD-CLASS scientist

Gao selected to European consortium of high-performance computing

University of Delaware professor **GUANG GAO** has been selected to join a consortium of worldwide experts working to address high-performance computing challenges.

The consortium, called TERAFLUX, is the first international effort of its kind to bring together top specialists in data flow for high-performance computing from the United States and Europe. TERAFLUX includes 10 European partners. UD is the first and only U.S. participant.

The reviewers called Gao, Distinguished Professor of Electrical and Computer Engineering at UD, "a world-class scientist whose work is highly complementary to the existing project consortium."

Additionally, they cited the work of his research team at UD's Computer Architecture and Parallel Systems Laboratory (CAPSL) with leading companies in the computer architecture field toward new technology dimensions considered valuable to the consortium.

The TERAFLUX project aims to design system software that will improve the runtime of computer applications – which means faster computer applications and increased processing speed, items critical to parallel computing architectures.

The proposed partnership merges the TERAFLUX project's work on data flow, transactional memory and architecture simulators, with Gao's complementary work on codelets and many-core architectures at UD.

THE PROJECT'S REACH

Gao's group will develop a fine-grain execution model called the Codelet Model, a dataflow-based model for many-core architectures.

According to Roberto Giorgi, principal investigator on the grant and professor at the Universita' Degli Studi Di Siena, in Siena, Italy, this work may broaden the project's reach beyond high performance computing to include life sciences or earth sciences.

"This represents a targeted breakthrough in scalable models of computation and contributes to the long-term vision for high-performance computing, particularly as it relates to exascale parallel computers," Giorgi explains.

Gao and his CAPSL colleagues traveled to Munich, Germany in June for the inaugural gathering of all collaborators.

"This international collaboration will foster a unique partnership among the participating groups and will elevate the effect that UD, and Gao in particular, have in this important area of high performance computing," remarks **KENNETH BARNER**, professor and chair of the Department of Electrical and Computer Engineering.

Gao hopes the consortium will eventually expand to include participants beyond the U.S. and Europe.

"I hope it also will attract international graduate students and post-doctoral research scientists to UD," he says.

Article by Karen B. Roberts
Photo by Evan Krape

UD partners with U.S. Aberdeen Proving Ground to advance research, education and economic development

Part-time UD graduate level courses at Aberdeen Proving Ground (APG) in Maryland are helping federal government and defense contractor engineers study better ways to protect U.S. troops and advance Army innovation.

The UD courses, offered on-site at the U.S. Army Research, Development and Engineering Command (RDECOM) headquarters under a cooperative research and development agreement provides the hands-on practical applications lab. A modified engineering curricula allows students to tailor their studies with an eye toward future employment at Aberdeen.

MARK MIROTZNIK, associate professor of electrical and computer engineering and coordinator of the APG courses, says UD is steadily increasing the selection and number of classes offered there, and hopes to add courses via video teleconferencing for those outside APG.

Last spring, 43 graduate students enrolled in UD courses through APG.

Now in its third year, the partnership has already yielded about 20 research projects on topics including composite materials, embedded electronics systems, power and energy, orthotic devices for wounded warriors, cybersecurity and intelligence, surveillance and reconnaissance. Two examples: the development of advanced "conformal" antennas that would replace inefficient, outmoded whip antennas on military vehicles, such as the Mine-Resistant Ambus-Protected armored vehicle developed at the height of the Iraq War to better shield troops from roadside bomb explosions; and antennas embedded in the skin of an armored vehicle that would be part of a roadside bomb detection system.

Joseph Deroba, chief engineer for the IIWD's Radar and Combat Identification Division at Aberdeen, is earning his doctorate in digital signal processing – a pursuit central to understanding advanced radar technology and one not available prior to the UD-Army agreement. He is studying with UD Engineering Alumni Professor **DENNIS PRATHER**, a former Army Research Laboratory engineer himself.

Newark to Aberdeen corridor becomes cradle of technological innovation

Both UD and RDECOM see the agreement as a driver of economic development that will turn the area between Aberdeen and Newark into a cradle of the technical innovation demanded by an ever more high-tech military. The former ordnance test facility is now home to thousands of high-income, white-collar government and contractor jobs with thousands more defense contractor and spinoff jobs outside its gates.

UD's Science Technology and Advanced Research (STAR) Campus, to be constructed on grounds of the former 272-acre Chrysler Newark Assembly Plant, will focus on national security and defense, as well as energy and environmental technologies, and health and life sciences.

Readying UD grads for high-tech government jobs

The amended engineering curricula ensures graduates in specialties valued by Aberdeen have taken the proper course mix, which helps the Army streamline its ability to hire UD grads. Six have already landed jobs at Aberdeen and UD has placed more than 20 paid summer interns at Aberdeen-based commands, according to **DAVID WEIR**, UD's director of the Office of Economic Innovation and Partnership. Those who complete the Student Career Experience Program are eligible for a noncompetitive hire when they earn their bachelor's degree. Another advantage, notes Weir, "They already have a government security clearance."

Adapted from articles on www.army.mil
Photo resource: www.army.mil

ECE's Farber named to Internet Society Board of Trustees

The Internet Society, a nonprofit organization founded in 1992 to provide leadership in Internet-related standards, education and policy, has named University of Delaware professor **DAVID FARBER** to its Board of Trustees.

Known to many as "the grandfather of the Internet," Farber is a Distinguished Policy Fellow in the Department of Electrical and Computer Engineering.

While a member of the UD ECE faculty from 1977-1988, he helped develop CSNET, a network that linked computer science departments at academic institutions across the country and provided a bridge from the Department of Defense's ARPANET to the modern Internet.

Farber went on to become the Alfred Fitler Moore Professor of Telecommunication Systems at the Moore School and professor of public policy at the Wharton School, University of Pennsylvania. He served as the chief technologist at the Federal Communications Commission (FCC) from 1999–2000 and, most recently, as Distinguished Career Professor of Computer Science and Public Policy at Carnegie Mellon University. He rejoined UD in 2011.

Today, his work focuses on the translation of technology and economics into policy, particularly in the areas of net neutrality (a principle that advocates no restrictions by Internet service providers) and spectrum management (the process of regulating the use of radio frequencies). Other areas of his work include the impact of multi-terabit communications and new computer architecture innovations on future Internet protocols and architectures.

Article by Karen B. Roberts | Photo by Kathy Atkinson

Leadership training

Engineering educators gather at UD for spring ASEE meeting

Engineering educators from throughout the mid-Atlantic region gathered at UD in April for the American Society for Engineering Education's (ASEE) 2012 spring mid-Atlantic meeting.

Featuring the kickoff address, "First things first: First an engineering student, then an engineer," by **RAY LANDIS**, dean emeritus of engineering, computer science and technology at California State University, Los Angeles, the event featured best-practices in first-year teaching and curriculum design; integrating transfer students; recruiting women and minorities; recruiting high school students; and keeping students in engineering programs.

Keynote speaker **ANDY LAU**, associate professor of Engineering with Penn State University, spoke on "Design for a better tomorrow," explaining how good design requires both the "know how" and the "know why." UD's **MICHAEL VAUGHAN**, senior assistant dean of engineering academic affairs, led the plenary session, "EGGG101: Introduction to Engineering...the UD approach to early engineering education."

Prior to the meeting's commencement, UD hosted a special engineering academic leadership workshop offering current and aspiring deans strategies for handling the demands of leadership challenges. The workshop was organized by **CHARLES BONCELET**, UD's associate chair for undergraduate studies in electrical and computer engineering, and **KENNETH E. BARNER**, department chair, to help deans model effective leadership behavior, develop an action plan to integrate and implement leadership characteristics into new or preexisting activities, and establish exemplary engineering programs within their respective institutions.

"Leading an academic department or college requires a different thinking and mindset than being a contributing faculty member," acknowledged Barner. "This conference gave new leaders the training needed to take on this new role and realize their full potential as confident leadership figures."

Adapted from an article by Zac Anderson

Cars packing power

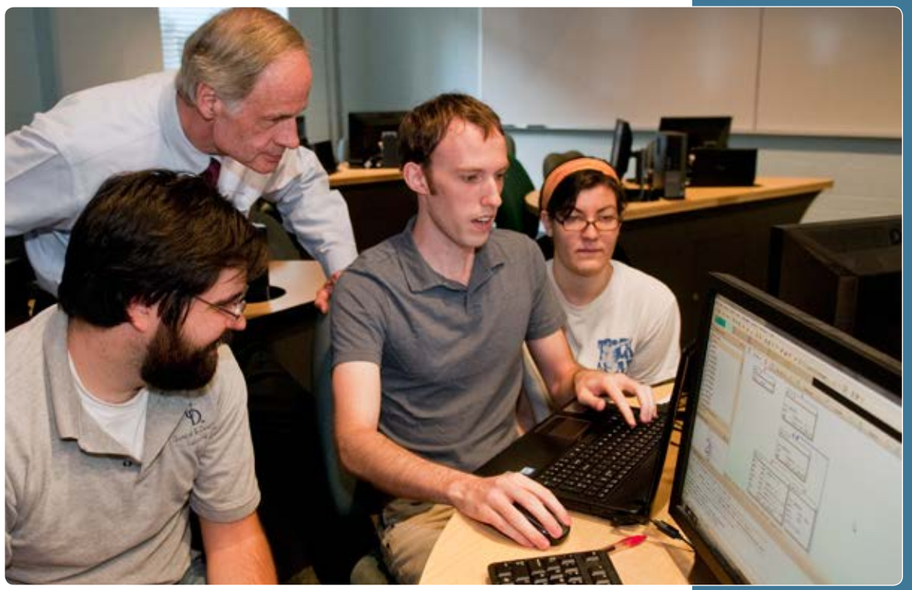
V2G sends electricity from cars to power lines

Electric vehicles are an important step in energy independence for many countries. However; electric vehicles carry a price premium over gasoline-powered cars due to the added cost of electric batteries. One way to offset the increased cost of electric vehicles is to utilize "vehicle to grid" or V2G power. Invented at the University of Delaware 10 years ago by Professor **WILLETT KEMPTON**, V2G technology enables an electric vehicle to become an energy source capable of generating and regulating power for the electrical grid. Cars contain a large amount of power. A properly designed electric-drive vehicle equipped with V2G technology can put out more than 10kW, the average electricity draw of 10 houses. Allowing electric vehicles to supplement and regulate power to the electric grid can reduce brownouts and dependence on petroleum and other non-renewable resources.

The CVORG research group in UD's electrical engineering department has been working with Prof. Kempton to develop electric vehicle charging stations and electric vehicle electronics that enable these vehicles to implement V2G technology. Led by electrical and computer engineering professor **FOUAD KIAMILEV**, the V2G team at CVORG includes **NICK WAITE**, **RODNEY MCGEE** and **NICOLE WELLS**, among other student participants who design, test and implement V2G hardware. The project is backed by funding from the Department of Energy and commercial licensees of V2G technology.

UD launches regional initiative to expand cyber security training in Delaware, Maryland

The University of Delaware announced that it will mount a targeted cyber security initiative to develop cyber security-related course offerings and to establish a pipeline of graduates skilled in the theories and practices required to ensure the security of the world's and our own nation's computers and networks.



The project is funded through a $576,102 research grant from the National Science Foundation (NSF) Regional Cyber Security Education Initiative, of which $416,000 comes to UD.

According to **KENNETH BARNER**, electrical and computer engineering department chair and principal investigator on the grant, the project will be particularly important for Delaware and northern Maryland, "where there is a significant need for trained cyber security graduates critical to large regional employers in, for example, the financial services industry and the military."

Key partners in the project include Delaware Technical Community College (DTCC) and Harford Community College (HCC), which will establish integrated educational and outreach programs in partnership with UD, and leading government and industrial partners, including the Army Research, Development and Electronics Command (RDECOM), the Science Applications International Corporation (SAIC) and JP Morgan Chase.

According to **DAVID WEIR**, director of UD's Office of Economic Innovation and Partnerships, the NSF grant is the first step in a broader University initiative on cyber security.

"This is an unusual grant that will enable UD leadership and partners from private, public and academic institutions across two states -- Delaware and Maryland -- to begin to shape education, research and workforce development for the region," Weir says.

Under the grant, UD representatives will work with partner institutions to:

- Expand cyber security courses and a minor at UD that will teach students to design state- of-the-art secure software and systems,
- Establish a 2+2 program to allow second year DTCC and HCC student to transfer into a four-year UD computer science or computer engineering bachelors of science degree programs, and
- Establish cyber security outreach including an internship program, middle and high school student and teacher summer camps and bridge programs to energize and attract the next generation of cyber security professionals.

As the program develops, Barner and colleagues also envision initiating a master's degree in cyber security and potentially a 4+1 education program that would allow advanced undergraduate students to complete both a bachelor's and a master's degree with one additional year of study.

U.S. Sens. Thomas Carper and Christopher Coons and U.S. Rep. John Carney lent their support to the project in a joint announcement of the funding during a press conference held on UD's Newark campus.

"This initiative is a significant collaborative step in understanding and confronting the challenges in the ever-changing realm of cyberspace. I believe in the Cyber security Education Initiative, and I am committed to its success because our nation can't afford to risk the safety and security of our critical infrastructure," says Coons, who is a member of the Senate Judiciary Committee.

UD co-principal investigators on the grant include **ERROL LLOYD**, professor and chair, **CHIEN-CHUNG SHEN**, associate professor, and **JOHN CAVAZOS**, assistant professor, from computer and information sciences; and **STEPHAN BOHACEK** , associate professor, and **CHARLES COTTON**, professor, in electrical and computer engineering. **CARL JACOBSON**, UD vice president for Information Technologies, and his IT group will provide real-world expertise to the project, which Barner calls "an important asset to the program that will develop."

Article by Karen B. Roberts | Photo by Doug Baker

UD hosts 2012 U.S. cybersecurity challenge

To motivate new talent in this emerging field, the University of Delaware hosted 40 aspiring cyber security sleuths on campus as part of the U.S. Cyber Challenge's (USCC) Summer Cyber Camp program.

Led at UD by Prof. **CHASE COTTON**, the program featured one week of specialized cyber security training presented by college faculty and cyber security experts, including instructors from the SANS Institute, the largest source for information security training and certification in the world.

The camp focused on topics such as intrusion detection, penetration and forensics. A job fair enabled participants to network, and the final day culminated with a "capture the flag" competition and awards ceremony. Creators launched the events hoping to significantly reduce the shortage in the cyber workforce by serving as the premier program to identify, attract, recruit and place the next generation of cybersecurity professionals.

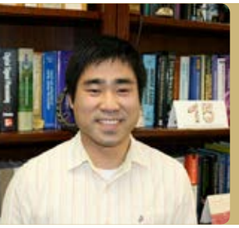
Participants in the week-long camp qualified in the USCC sponsored Cyber Quests, an online competition that measured student knowledge about a variety of information security disciplines.

More than one thousand college students and young professionals competed in the Cyber Quests competition. The winner was Enjolokee Jones of New Castle, Del., who finished with a score of 96.23 out of 100 and in a time of 0:55:14.

Delaware joins Virginia and California as the only three states to offer the cyber camp. The UD-hosted program was jointly sponsored by the State of Delaware, Wilmington University and Delaware Technical and Community College.

Article by Karen B. Roberts

U.S. Sen. Tom Carper and U.S. Rep. John Carney (front and center) with participants in the U.S. Cyber Challenge Delaware Camp 2012. Photo by Evan Krape.



Doctoral student's approach to wireless communications wins IEEE "best paper"

In today's techno-savvy society, consumers want to transmit large amounts of data quickly and easily. Whether it's posting pictures on Facebook while riding the train to work, emailing a document from the airport or monitoring wireless networks off-site, the motto is "wireless everywhere, all the time."

But how do engineers manage today's wireless communication networks effectively without increasing costs and transmission time?

According to third-year ECE doctoral student **GUBONG LIM**, the key may be reducing the amount of energy consumed while transferring data from one place to another.

His research to improve energy consumption to prolong the life of a wireless network or the operational time of electronic devices earned him the 2012 IEEE International Conference on Communications (ICC) Wireless Communications Symposium "best paper" award.

According to Lim, the key is identifying the optimal rate at which to transmit information. Most systems, he says, don't consider the energy consumed by the system, only the energy used in transmission.

"Multiple relays actually consume less energy than one-to-one transmission," he says.

Conventional systems, Lim says, operate on a one-transmitter and one-receiver system. Using cooperative beamforming, he envisions multiple mobile devices cooperating to transmit information to a single destination receiver.

His preliminary study results demonstrate that cooperative beamforming achieves not only a higher energy efficiency, but also greater efficiency over large distances.

Lim's results are documented in the winning paper, entitled "Energy Efficiency of Cooperative Beamforming in Wireless Ad-Hoc Networks," co-authored with **LEONARD CIMINI**, professor of electrical and computer engineering and Lim's faculty adviser.

Article by Karen B. Roberts

Scholastic excellence

Electrical engineering grad student earns national Eta Kappa Nu award

ROBERT HAISLIP, won honorable mention for the 2011 Eta Kappa Nu Outstanding Electrical and Computer Science Award.

Haislip, EE 2011, now studies circuit design in the department. He is a research assistant in the CVORG - CMOS VLSI Optimization Research Group, under **FOUAD KIAMILEV**, professor of electrical engineering. His research focuses on infrared microchip design, with heavy emphasis on hardware and firmware development.

Haislip's work on the WiiAssist—a modified Nintendo Wii remote and balance board that helps people with disabilities use computers—was featured last summer on the new G4TV cable and satellite television channel.

A member of Tau Beta Pi, the National Society of Collegiate Scholars and Alpha Lambda Delta, Haislip is also active musically, participating in the UD Jazz, Steel Drum and Pep Band ensembles.

"What sets Robert apart is his ability to succeed academically while actively participating in other activities," says **LEONARD J. CIMINI**, professor of electrical and computer engineering, who serves as adviser to the University's HKN chapter, Epsilon Omicron. "This is an indication of his intellectual capabilities, as well as his diligence, discipline and hard work."

This is the third year in a row that UD electrical engineering students have earned recognition in the competition recognizing "outstanding scholastic excellence and high moral character, coupled with demonstrated exemplary service to classmates, university, community and country."

Article by Gabriella Chiera | Photo by Ambre Alexander

Senior design

Sponsor support helps senior design students soar

Rigging up an old RC car into a robot that uses the global positioning system on an Android phone to locate and maneuver robots from one position to another—all while avoiding obstacles using a sonar-equipped sensor—sounds like something out of the 1980s television action series *MacGyver*.

Instead, it is an example of student ingenuity at work—a project by Team RC, one of 12 capstone senior design teams that traded in written assignments and exams for real-life engineering problems proposed by commercial and military engineers.

Working under the guidance of the ECE faculty mentors, students gained hands-on experience with devising, testing and presenting solutions to engineering challenges.

Offered over two semesters, students dedicate the fall semester to researching their problem and designing hardware and software prototype solutions. In the spring, they finalize their designs, assembly and product testing, measuring the project's outcome against their original goals.

In early May, the teams present their projects, sharing both setbacks and successes with their fellow peers.

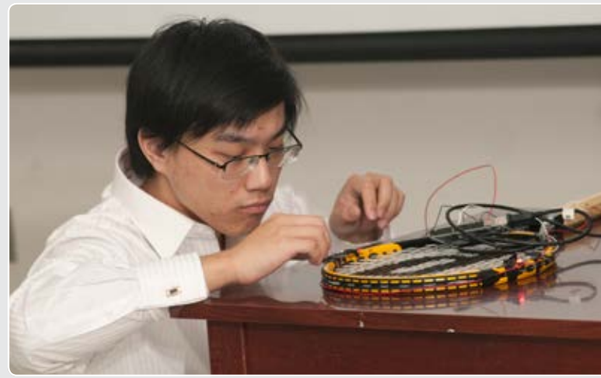
"It was a great feeling to see a physical result from the code we wrote, and especially nice to see it work the way we had initially envisioned," said **SCOTT MALINOWSKI**, a member of Team RC.

Among the other senior design projects were a Bluetooth-enabled smart remote that simultaneously controls multiple consumer devices; a flight control system for an autonomous unmanned aerial vehicle; and a bike generator with a smart battery to support off-grid power for developing countries.

According to **CHASE COTTON**, research scientist and ECE senior design coordinator, sponsorship from the U.S. Army Communications-Electronics Research, Development and Engineering Center; the Science Applications International Corporation (SAIC); and UD's Office of Campus and Public Safety, also played a key role in the students' success.

"Support from our sponsors allow the department to obtain robotic equipment; a software-defined radio laboratory; Android phones, sensors and high-end computers dedicated to the senior design experience," he explains. "Having these components and sub-systems on-hand enabled the teams to get started fast and to make quick design changes when needed. We are grateful for their support."

Article by Zac Anderson



Honors & Awards

TEACHING ASSISTANTS HONORED

Each semester, ECE recognizes two teaching assistants selected by the ECE Graduate Committee based on results of student evaluations. Recipients receive monetary prizes of $400 for the Best TA Award and $250 for the Outstanding TA Award.

2011 Best TA
Paul Delmar

2011 Outstanding TA
Felipe Gerlein

2012 Outstanding TA
John Hart

2012 Best TA
Ramsey Hazbun

UNIVERSITY GRADUATE AWARDS

Three ECE graduate students were recognized by the Office of Graduate and Professional Education.

Nuha Ahmed, a part-time Ph.D. graduate student, received the Graduate Scholars Award for her work in nanoelectronics, electromagnetics and photonics.

Elkin Garcia, a graduate student under the direction of Professor Guang R. Gao, earned the University Graduate Fellow Award for his work in supercomputing.

Tianyi Xu, who studies under the direction of Professor Xiang-Gen Xia, was honored with the University Dissertations Fellow Award for his work on signal and imagine processing.

These awards were established by the Office of the Provost to enable and support Ph.D. students to devote full attention to the completion of their doctoral dissertations. The fellowships and scholarships are given in recognition of the students' prior academic achievements, as well as the potential for future success in their respective fields of study.

KENNETH SCHMIEDER AWARDED BILL N. BARON FELLOWSHIP

In recognition of his contribution to the renewable energy field, Kenneth Schmieder has been selected as a recipient of one of the 2012 Bill N. Baron Fellowship awards.

A graduate student in the Department of Electrical Engineering, Ken's dissertation focuses on the application of predictive first-principles modeling of previously unexplored solar material systems and verification against experimental growth and device fabrication results. He has developed full III-V multijunction device fabrication recipes to predict and advance the ability to make better devices. In addition, he has applied advanced characterization techniques to novel two terminal and three terminal devices. Ken is a key investigator on an awarded international grant proposal.

The fellowship was established in honor of **BILL N. BARON**, who served the University of Delaware and the photovoltaic community from 1975 to 1992 as a scientist, manager and deputy director at the Institute of Energy Conversion. Throughout his professional life Bill was especially interested in students and their education. He devoted many hours to teaching both graduates and undergraduates how to carry out creative and effective research in photovoltaics.

Dissertation/ Thesis Titles

Fall 2011 – Summer 2012

Ph.D. Dissertation Titles

What Will Be the Role of Solar Hydrogen in Our Future Energy System?

- **Cory Budischak (2011)**
  Advisor – Keith W. Goossen

Robust Methods for Sensing and Reconstructing Sparse Signals

- **Rafael Carrillo (2011)**
  Advisor – Kenneth E. Barner

Characteristics of Germanium-Tin Photoconductor and Terahertz Microbolometers

- **Matthew Coppinger (2011**
  Advisor – James Kolodzey

Extensions of Compressed Sensing by Exploiting Prior Knowledge

- **Jose Ignacio Esnaola (2011**
  Advisor – Javier Garcia-Frias

A Tasking Framework to Handle Loadbalancing and Node Level Optimizations on Heterogeneous GPGPU Clusters

- **Jakob Siegel (2011)**
  Advisor – Xiaoming Li

Terahertz Pulsed Imaging With Adaptive Reconstruction Techniques

- **Zhuopeng Zhang (2011)**
  Advisor – James Kolodzey

Exploitation of Path Diversity in Cooperative Multi-Hop Wireless Networks

- **Jonghyun Kim (2012)**
  Advisor – Stephan Bohacek

Extrinsic Sprin Relaxation in Silicon Spin Transport Devices

- **Jing Li (2012)**
  Advisor – James Kolodzey

Multi-Scale Reflection Modulator-Based Optical Interconnects

- **Rohit Nair (2012)**
  Advisor – Michael W. Haney

Context-Aware Program Optimization

- **Murat Bolat (2012)**
  Advisor – Xiaoming Li

Light Trapping in Thin Film Solar Cells Using Photonic Engineering Device Concepts

- **James Mutitu (2012)**
  Advisor – Dennis W. Prather

Tideflow: A Dataflow-Inspired Execution Model for High Performance Computing Programs

- **Daniel Orozco (2012)**
  Advisor – Guang R. Gao

Design and Phenomenology of Polarization Sensitive Passive Millimeter-Wave Sensor Based on Optical Up-Conversion

- **John Wilson (2012)**
  Advisor – Dennis W. Prather

Modeling and Experimental Study on the Growth of Silicon Germanium Film by Plasma Enhanced Chemical Vapor Deposition

- **Lai Zhao (2012)**
  Advisor – Robert G. Hunsperger

Compressive Optical Imaging Systems

- **Yuehao Wu (2012)**
  Advisor – Dennis W. Prather

Design and Fabrication of a Compact Chip-Scale Optical Cross-Connect Enabled by Photonic Crystals for Optical Interconnects

- **Mathew Zablocki (2012)**
  Advisor – Dennis W. Prather

Master Thesis Titles

Fabrication of Micro and Nanophotonic Devices

- **Michael Roman (2011)**
  Advisor – Dennis W. Prather

OLSR and Approximate Distance Routing: Loops, Black Holes, and Path Stretch

- **Carlos Rodrigo Aponte (2012)**
  Advisor – Stephan Bohacek

Design of an Infrared Projector FPGA-Based Computer Architecture

- **Robert Haislip (2012)**
  Advisor – Fouad Kiamilev

Synthesis and Characterization of Silver Nanowires as a Transparent Conductive Electrode

- **Sergio Sepulveda Mora (2012)**
  Advisor – Sylvain G. Cloutier

Parallel Low-Overhead Data Collection Framework for a Resource Centric Performance Analysis Tool

- **Sunil Shrestha (2012)**
  Advisor – Guang R. Gao

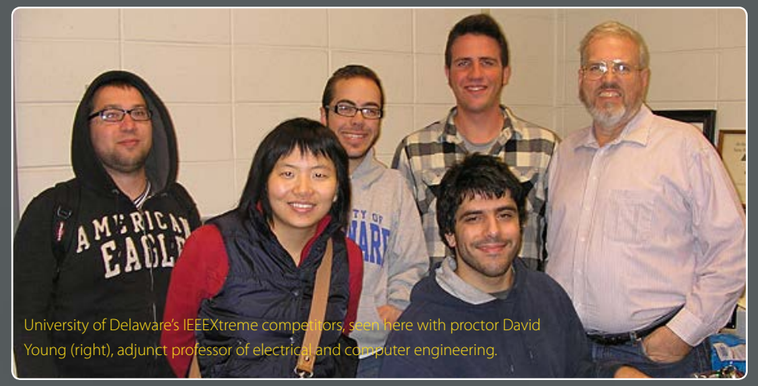
Design and Development of a 2-Color Infrared Emitter Array System

- **Robert Rehrig (2012)**
  Advisor – Fouad Kiamilev

Interested in hearing more?
Contact Ken Barner at barner@udel.edu

HAT TRICK POTENTIAL

UD undergraduates win second consecutive IEEEXtreme competition



University of Delaware's IEEEXtreme competitors, seen here with proctor David Young (right), adjunct professor of electrical and computer engineering.

The University of Delaware's IEEE student chapter is one step closer to scoring a computer programming hat trick in next year's IEEEXtreme student challenge, a 24-hour programming competition that pits student chapter teams across the globe against one another to solve complex programming problems.

With a 2010 win already under their belt, students in the Department of Electrical and Computer Engineering claimed the U.S. Mid-Atlantic region championship for the second year in a row in the IEEEXtreme 5.0 challenge on Oct. 22.

The UD team consisted of undergraduates **ERIC MCGRAW** and **STEPHEN ORLANDO**, who competed on last year's winning team, and newcomer **CHRIS KERWIEN**, who is an Honors Program student. They joined an impressive 1,500 teams from more than 350 universities around the world in the fifth annual competition.

A second UD team of electrical and computer engineering doctoral candidates, **SHA LI** and **MURAT BOLAT**, also competed, finishing fourth in the Mid-Atlantic region.

"After watching these students for 24 hours, I am very proud of their effort and achievement," says adjunct professor **DAVID YOUNG**, who serves as proctor to the group.

Brimming with potential, the UD team hopes to claim a hat trick in next year's competition with a third Mid-Atlantic success.

Article by Gabriella Chiera

Postdoctoral researcher **JAMES G. MUTITU** won the 2012 **Allan P. Colburn Prize** in Engineering and Mathematical Sciences for his dissertation "Light Trapping in Thin Film Solar Cells Using Photonic Engineering Device Concepts." The annual prize recognizes the best dissertation in engineering and mathematical sciences.

Mutito, who completed his doctoral degree in May, focused his research on applying photonic engineering device concepts to thin film silicon solar cells to increase the light-trapping capacity of the solar cells and, thereby, enhance overall cell efficiency. He designed and fabricated structures, such as photonic crystals, diffraction gratings and hybrid dielectric-metallic back surface reflectors, and applied them to the thin film silicon solar cell structures. Mutito's dissertation chair was endowed professor of engineering **DENNIS PRATHER**.

Mutito is currently working on a joint project between the Department of Electrical and Computer Engineering and UD's Institute of Energy Conversion incorporating these light-trapping concepts to copper indium gallium diselenide (CIGS) solar cells.

Singh's research on gene-protein networks inside living cells earns ***best thesis award***

ABHYUDAI SINGH, assistant professor of electrical and computer engineering with a joint appointment in biomedical engineering, earned the 2012 Best Thesis Award from the Center for Control, Dynamical Systems and Computation (CCDC).

The honor is awarded annually to a University of California Santa Barbara graduate student from the previous three years based on originality, creativity and anticipated impact of the thesis. Singh completed his doctoral work there in 2008. His thesis developed novel computational and mathematical methods for studying and characterizing complex networks of genes and proteins inside cells.

Singh, who joined the UD faculty in 2011, explains, "My doctoral thesis developed theoretical tools for predicting protein levels over time in individual cells. Using these tools, we uncovered feedback strategies that genes use to buffer deviations in protein levels due to the inherent random nature of biological processes."

Singh's current research interest lies in characterizing gene networks underlying disease systems, specifically pathogenic viruses, such as HIV. He says a better functional understanding of these networks will benefit drug therapy by guiding their design to systematically tweak interactions and change protein levels.

"Looking ahead, techniques developed in my thesis will be an important resource for the community for reverse engineering gene-protein networks, and linking failure in these networks with diseased states," he says.

"This very prestigious award speaks highly of our newest faculty member, as it comes from a very large center that produces a large number of high-quality Ph.D.s," says **KENNETH E. BARNER,** professor and chair of the Department of Electrical and Computer Engineering.

Article by Alyssa Cella | Photo by Evan Krape

Yang wins UDRF grant

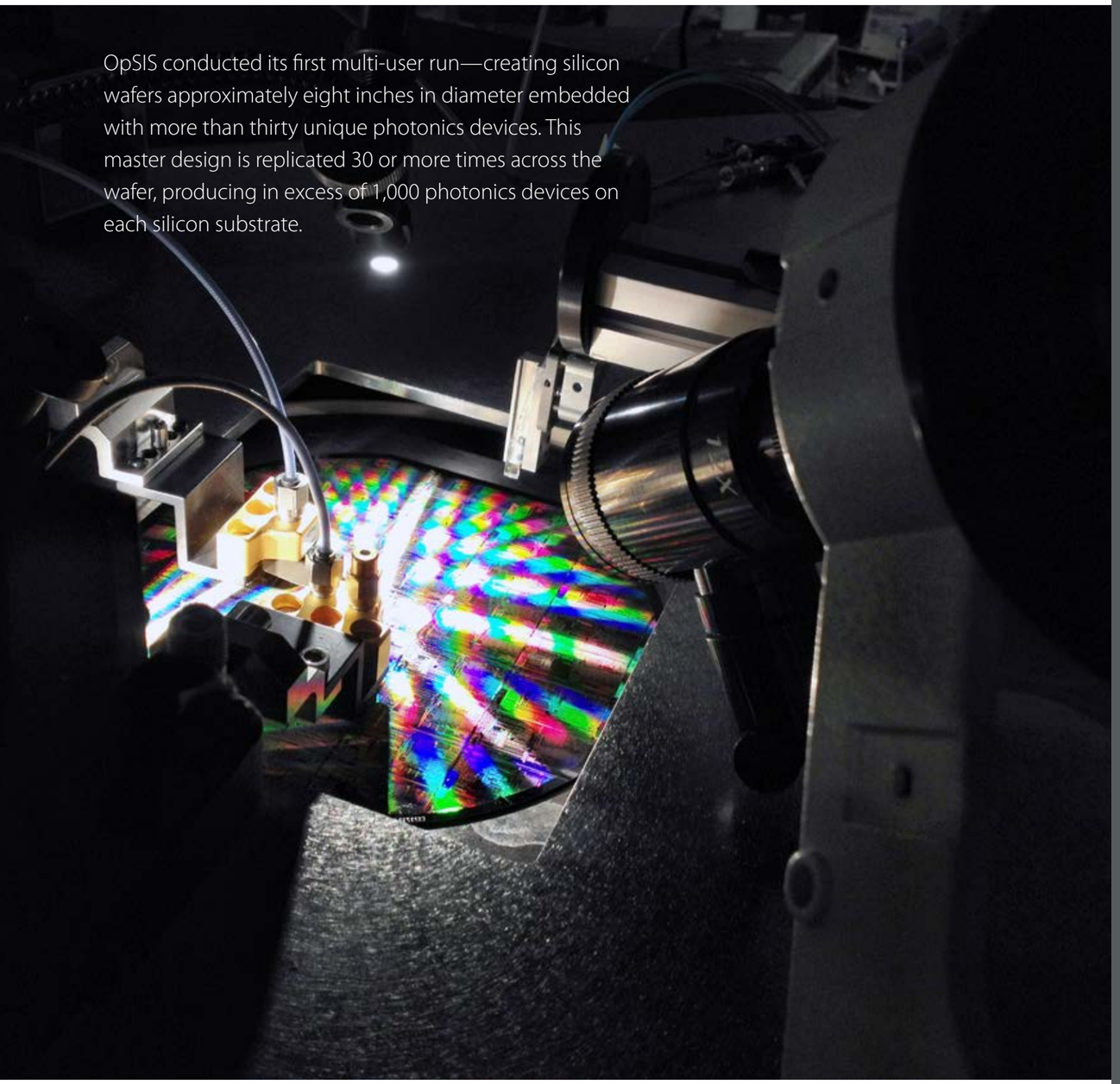
Efficient energy and thermal management

CHENGMO YANG, assistant professor of electrical and computer engineering, earned a University of Delaware Research Foundation (UDRF) grant for her work to "cool" hotspots in processors through the development of power-friendly code compression techniques and compiler-driven techniques capable of physically remapping hot registers before heat gets locally accumulated.

Yang, who joined the UD faculty in September 2010, focuses her research on the development of next generation multi/many core systems, with the consideration of reliability, thermal, power and computation efficiency. Her interests include fault-tolerant computer systems, multi/many core architectures, power- & thermal-aware architectures, on-chip communication & synchronization schemes, compiler-directed runtime optimizations, embedded system design, and hardware support for system security.

Chartered in 1955 as a private corporation to support University research, UDRF annually awards funding to early-career faculty for high-priority science and engineering projects. Eleven grants of $35,000 each were awarded in the latest competition. The foundation provides $25,000 toward each project, which is matched by $5,000 each from the provost and the awardee's college dean.

Excerpt from article by Tracey Bryant



OpSIS conducted its first multi-user run—creating silicon wafers approximately eight inches in diameter embedded with more than thirty unique photonics devices. This master design is replicated 30 or more times across the wafer, producing in excess of 1,000 photonics devices on each silicon substrate.

UD professor leads photonics revolution, helps research groups access high-tech foundry services

MICHAEL HOCHBERG, UD associate professor of electrical and computer engineering, is helping research groups access high-tech foundry services to test new ideas and devices.

An industry leader in silicon photonics and large-scale photonic-electronic integration, Hochberg is renowned for establishing Optoelectronic Systems Integration in Silicon (OpSIS), a high-tech foundry service for silicon photonics in which the community shares the cost of fabricating complex chip-scale systems across many projects.

In simplest terms, a foundry is a company or institution that builds something. One well-known example is the steel foundry, where iron ore is turned into steel beams and other items that are then shipped to different entities.

Using "shuttle runs," Hochberg says OpSIS can significantly reduce costs of building new silicon photonics devices, bringing prototyping capability for leading-edge photonics within reach of startups and academic research groups.

Earlier this month, OpSIS conducted its first multi-user run—creating silicon wafers approximately eight inches in diameter embedded with more than thirty unique photonics devices. This master design is replicated 30 or more times across the wafer, producing in excess of 1,000 photonics devices on each silicon substrate.

The unique devices include couplers, modulators, waveguides (optical equivalents of electrical plugs, switches, wires) and other photonic components with the potential to be attached to a fiber optics cable and used to route, control and manipulate light.

At UD, Hochberg's research team is conducting quality control testing to ensure that the optical circuits embedded in the silicon wafer perform as expected. Test structures built into the chip are used to isolate any non-performing devices to determine if fabrication error exists and to resolve problems for future production runs.

"The semiconductor industry has used the fabless manufacturing model, with specialized dedicated foundries performing the actual fabrication, for close to fifty years," explains John Wright, a researcher involved in the project. "We're taking a well-established concept and tool set and applying it to photonics."

"We are building the next wave in photonic circuits. Using a foundry service to aggregate different requests from smaller organizations, we are making it accessible to researchers, who previously wouldn't have access, to test new ideas and devices, work that may lead to future advances in photonics," continues Hochberg, who holds secondary appointments in materials science and engineering and chemical and biomolecular engineering at UD.

For UD and for researchers in the Department of Electrical and Computer Engineering in particular, this means first access to the three foundries currently working with OpSIS.

According to **DENNIS PRATHER**, College of Engineering Alumni Professor, OpSIS will help revolutionize the field of silicon photonics by enabling new structures and devices to go from conceptual ideas to actual test bed systems. Having Hochberg and OpSIS at UD, he says, enables the University to become "a driving force" in this dynamic field.

"We expect to see UD develop into a center of excellence in photonics," remarks **KENNETH BARNER**, professor and chair of the Department of Electrical and Computer Engineering.

About the researcher

MICHAEL HOCHBERG joined UD in 2012 as an associate professor in electrical and computer engineering, with secondary appointments in materials science and engineering and chemical and biomolecular engineering. He was previously an assistant professor of electrical engineering at the University of Washington. He is a recipient of the Air Force Office of Scientific Research Young Investigators award and the Presidential Early Career Award in Science and Engineering.

He earned a bachelor degree in physics and masters and doctoral degrees in applied physics from California Institute of Technology (Caltech), where he was awarded the Demetriades-Tsafka dissertation Prize in Nanotechnology, as well as a National Science Foundation Graduate Research Fellowship. Hochberg also holds a joint appointment at the National University of Singapore, with an attachment at the Institute for Microelectronics, A*Star. He is the co-founder of two companies, Simulant and Luxtera.

Article by Karen B. Roberts
Photo provided by OpSIS (Michael Hochberg)

Engineering honors

JAMES KOLODZEY, Charles Black Evans Professor of Electrical and Computer Engineering, was honored by technology giant IBM with the 2012 IBM Faculty Award. The award, given in May, recognizes his work to advance the fabrication of semiconductor materials and devices used for high speed integrated circuits in next generation computers and communications systems.

In 2005 and 2010, IBM donated two advanced reactors to Kolodzey's research laboratory at UD, enabling him to explore new processes for the epitaxy of novel semiconductors through chemical vapor deposition (CVD).

He plans to use funds from this recent award to explore new devices and materials, study new chemicals to modify the composition and doping of semiconductors and to selectively grow materials to form complex three dimensional structures.

In Memoriam

Jane S. Warter

(Hockessin, Del.)

JANE S. WARTER, wife of Peter J. Warter, University of Delaware professor emeritus of Electrical and Computer Engineering, died August 5, 2011 at the age of 79.

A well-known member of the UD campus community, Mrs. Warter was active in both Master Gardeners and the UD Women's Club. The Warters frequently hosted students at their summer home on Keuka Lake, New York.

Memorial contributions may be made to The Peter J. Warter Scholarship Fund, in care of the University of Delaware Office of Development, 83 East Main Street, Newark, DE 19716.

ALUMNI SPOTLIGHT

Social studying

Alum's social network ensures no student journeys through academics alone

In the alumni, faculty and staff track, **Nfoshare**, led by UD alumnus **Nikhil Paul** (right), was awarded $8,000. The startup also received an additional $500 based on results from an "Audience Choice" award.

Remembering all too well the challenges of working through a difficult major and feeling a sense of loneliness in studying academic material, UD alumna **NIKHIL PAUL** (EE 2009) created Nfoshare, an online platform that connects students directly to their professors, tutors and classmates to achieve real-time academic conversations any time.

His venture won the state of Delaware Business Plan Competition, leading Paul to partner with UD's Academic Enrichment Center (AEC) to pilot Nfoshare in 2011.

The pilot project involved 500 students and 25 classes from various majors with $1,000 from the AEC to support live tutor assistance to students on Nfoshare the night preceding exams. At the end of the two-and-a-half-month pilot, the site racked up more than 20,000 hits with average user times of up to 20 minutes. Success at that level was enough for Paul to quit his Fortune 500 corporate job and move his team's work to the University's Venture Development Center.

*"Our vision is for **Nfoshare** to be the second page open after Facebook for college students who are studying."*

––Nikhil Paul, EE '09, CEO/Founder of Nfoshare

"Nfoshare is at the forefront of a new wave of tech entrepreneurship that centers on changing and challenging an archaic approach to education," says Paul, who earned his bachelor's degree in electrical engineering in 2009. "With new technology incubators focused on rearing academic startups and NGOs like the Bill and Melinda Gates Foundation investment in education startups, for-profit academic initiatives are beginning to generate a lot of buzz."

Paul was recently named one of the first "Alumni Fellows" of the Venture Development Center according to Dan Freeman, director of the Horn Program in Entrepreneurship at UD. This new component of the Horn Program in Entrepreneurship provides support for recent alumni whose startups could benefit from co-location near the University. In exchange for a modest stipend, Paul is currently providing mentorship and advice to current students and assisting in the promotion of the program.

"Nfoshare is growing in different universities and using a social focus, we aim to increase student engagement time with the course material outside the classroom and ultimately lower the dropout rates in STEM courses," Paul says.

- Adapted from an article by Kathryn Meier | Photo by Duane Perry

DAVID L. MILLS (emeritus faculty) and **BEVERLY J.C. MILLS** (BAS '98), have endowed a Chair with preference for a female faculty member in the Electrical and Computer Engineering or Computer Information Sciences departments. The Mills Chair will support top teaching talent by a faculty member at the assistant or associate professor level.

"Choosing to support a female faculty chair was a matter of strategy," he explains. "A gift for a female chair might help the profession, as a whole, find ways of getting women into engineering. Women have brains as well as men. If we're not utilizing women engineers, we're not utilizing half the brain power."

A professor in UD's Department of Electrical and Computer Engineering from 1986-2008, David Mills continues to teach and lead research sponsored by such agencies as the NASA Jet Propulsion Laboratory, the Defense Advanced Research Projects Agency, and the National Science Foundation.

On their decision to support UD with this major gift, he acknowledged, "In our 25 years here at Delaware, Beverly and I have been well rewarded by my colleagues, and that was very valuable to me. We owe a great deal to Delaware and now we want to give something back."

Beverly Mills adds, "If it wasn't for the University of Delaware, we wouldn't be where we are. I'm grateful to see what it did for Dave in his career and personally."

You, too, can make a significant impact by giving back to the Department of Electrical and Computer Engineering. Visit: **www.udel.edu/makeagift** and simply designate *Electrical and Computer Engineering* as the recipient in the comment box.

For information on making contributions to the College of Engineering, please contact Armand Battisti, Director of Development, at (302) 831-7273 or by email to **aab@udel.edu**.

Research computing cluster named for UD professor emeritus

The Mills 5,000-processor, high performance computing (HPC) cluster that serves the needs of advanced research on campus is named in honor of David L. Mills, UD professor emeritus and a pioneer of the early Internet and its precursor networks.

Mills played an essential role in the development of the internetwork gateways and protocols that provide the backbone to today's Internet, and actively participated in the evolution of Internet protocol (IP), transmission control protocol (TCP), file transfer protocol (FTP), simple mail transfer protocol (SMTP), Telnet and other protocols on which modern researchers rely.

In particular, his Network Time Protocol (NTP) was essential to the early development of the ARPANet, which led to the modern Internet. The protocol enables precise time synchronization, without which online experiments could not be accurately measured and controlled, stock market buy and sell orders could not be timed and web streaming of video would be chaotic.

The protocol makes possible such online activities as aviation traffic control and monitoring, radio and TV programming launch and control, multimedia synchronization for real-time teleconferencing and traffic engineering.

As part of the group of researchers who helped build the Internet, Mills once said in an interview that the project "was great fun."

"The strangest thing about the whole process is that we were inventing email, file transfer protocols and remote interactive access, using the very infrastructure that we were developing," Mills says. "In other words, we were building the infrastructure so that we could build the infrastructure. I learned the most important lesson of my life from this experience – that people who are actually going to use services should be the ones to build them."

Article by Richard Gordon and Neil Thomas
Photo by Kathy F. Atkinson

ECE Advisory Council annual visit to campus

Idea exchange offers valuable insight to department leaders

Distinguished UD alumni and friends representing a cross-section of the electrical and computer engineering industry generously lend their expertise and provide valuable guidance to department leaders through their service on the Electrical and Computer Engineering Advisory Council. The Council's 16 members convene annually on campus to learn more about UD's program and offer counsel on proposed initiatives.

The annual meeting includes a state of the department address by chair Kenneth Barner; review of graduate and undergraduate programs, including an opportunity to meet with faculty and students; updates on special programs, such as the Aberdeen Proving Ground partnership; campus tours and an exchange with College of Engineering Dean Babatunde Oguannaike. The group also meets with the chair of the College of Engineering Advisory Council, currently held by Michael Bowman, chairman of the Board and CEO of the Delaware Technology Park, Inc.

The 2011 ECE Advisory Council meeting culminated with a presidential tailgate leading up to a Blue Hen football victory over Old Dominion University. This year's council visited campus Oct. 18-20 during Homecoming Weekend.

The department thanks Charles Johnson-Bey of Lockheed Martin Corporation and John Kelly of North Carolina A & T State University for their service to the council ending in 2011, and welcomes new members Janine Barbacane of Oracle, Tyler Barton of the U.S. Army CERDEC, John Ferriter of SAIC and Wayne Westerman of Apple.

ADVISORY COUNCIL MEMBERS

- **Janine Barbacane 2001 (BEE)**
  Systems Account Executive
  Oracle
- **Fil Bartoli**
  Chair, Electrical & Computer Engineering
  Lehigh University
- **Tyler Barton**
  Computer Engineer
  U.S. Army CERDEC
- **Karen Bloch 1985 (BSAS), 1997 (MEE) and 2004 (PHD)**
  Engineering Manager
  DuPont Company
- **Edward Coyle 1978 (BEE)**
  Electrical & Computer Engineering
  Georgia Institute of Technology
- **John Ferriter**
  SVP, Strategic Program Development
  SAIC
- **William Gardner 1989 (BEE)**
  Technical/Patent Consultant
- **Daniel Grim 1970 (BEE), 1972 (MEE), 1976 (PHD) - Engineering**
  Chief Technology Officer IT
  University of Delaware
- **Frederick Kitson 1974 (BEE)**
  EVP & Chief Technology Officer
  DTS, Inc.
- **Michael Lombardi**
  Deputy Director
  Intelligence & Information Warfare Directorate
  U.S. Army CERDEC
- **Kristofer Roe, Advisory Council Chair 1995 (BEE), 1997 (MEE), 2001 (PHD) - Engineering**
  Director, R&D Imaging
  Smiths Detection
- **Ray Sokola 1976 (BEE)**
  President
  Cellport Systems
- **Edward Szurkowski 1976 (BEE), 1978 (MEE), 1982 (PHD)**
  Founder/Managing Partner
  Blue Mill Group
- **Douglas Tipton**
  Chair, IEEE Delaware Bay Section
  IEEE MidAtlantic
- **Sean Wang 1992 (PHD) – Engineering**
  Founder & Managing Director
  B&W Tek, Inc.
- **Wayne Westerman 1999 (PHD) - Engineering**
  Senior Engineer
  Apple

ECE Alumnus Sean Wang among UD's 2011 Presidential Citation recipients

SEAN WANG, who earned a doctoral degree in electrical engineering from UD in 1992, was among eight University of Delaware alumni honored with the Presidential Citation for Outstanding Achievement last November during Homecoming Weekend.

Wang is chief executive officer of B&W Tek, a Newark, Delaware-based Iphotonics company producing analytical instrumentation, medical systems and lasers. He also co-founded and serves as chairman of the boards of Delaware companies BWTEK Lighting and Litecure.

UD President **PATRICK HARKER** said the honorees serve as role models, showing UD students that good things can result by complementing talent with hard work, discipline, passion and perseverance.

Adapted from an article by Jerry Rhodes

University of Delaware alumnus Deva Ramanan has been named one of *Popular Science* magazine's "Brilliant 10" Young Scientists for 2012.

University of Delaware alumnus **Deva Ramanan** has been named one of *Popular Science* magazine's "Brilliant 10" Young Scientists.

The designation places Ramanan on the magazine's annual "honor roll" of the 10 most promising scientist for 2012.

Ramanan, who earned his bachelor's degree in computer engineering at UD in 2000, is an associate professor of computer science at the University of California Irvine (UCI). There he is working to improve a computer's image recognition capability, or in simpler terms, a computer's ability to "see people."

He has devised a computational algorithm that allows computers to recognize three dimensional flat photography through software that "teaches" the computer to identify body parts and match them to a flexible human template.

It is work he believes could lead to advances in future computer vision systems, particularly in pedestrian-detection systems for self-driving cars, video game systems enhancements, even home monitoring for patients undergoing long-term rehabilitation.

Article by Megan Marschall | Photo courtesy of the University of California Irvine

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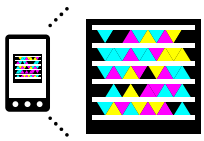

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UD ECE Advances in Rankings

The University of Delaware Electrical & Computer Engineering department's strong performance has yielded an 18 place improvement in the latest US News & World Report departmental rankings, which caps a 22 place improvement in just the past three years.

Looking for an old friend? Want to share your latest news? Searching for information on upcoming alumni events such as Homecoming? Now you can do it all in one place, ***UDconnection.com***. UD and the UD Alumni Association (UDAA) have collaborated to bring alumni a vibrant online community—so register and get active! The online community allows you to search the alumni directory, post class notes, update your contact information, and see if there are any upcoming alumni events in your area. You can also take advantage of networking opportunities and volunteer opportunities to get involved with your alma mater! Visit ***www.UDconnection.com*** today!