



# The Integrator

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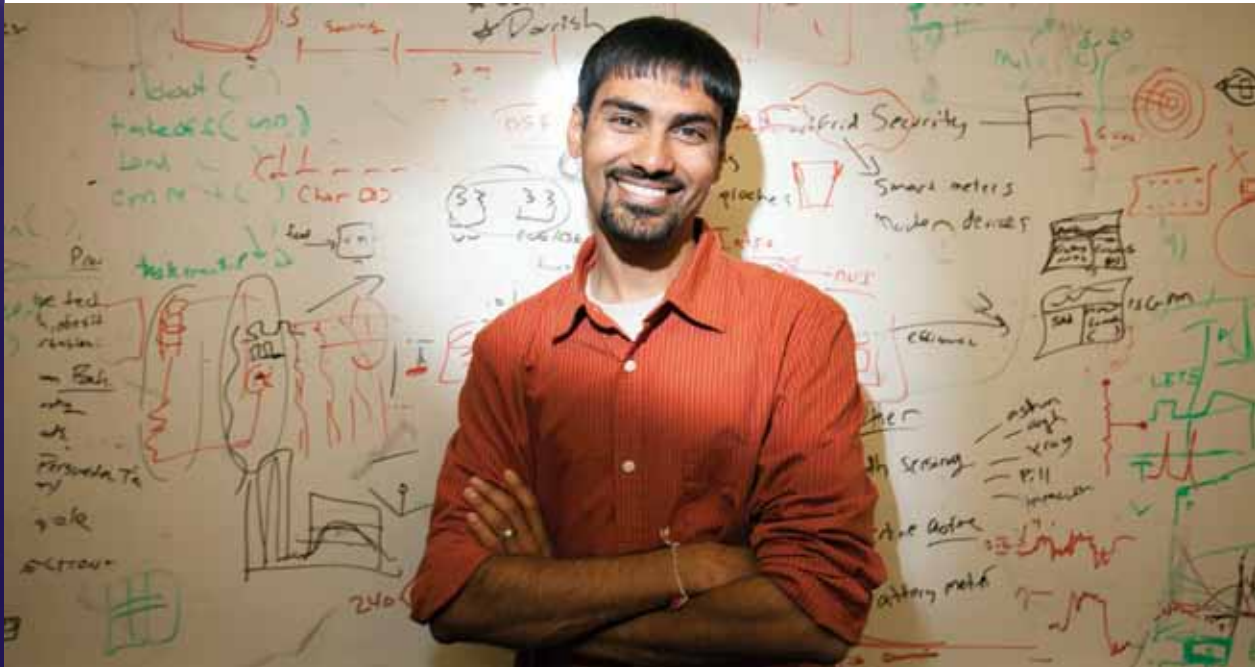
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## Patel Wins 2011 MacArthur Fellowship

Shwetak Patel, assistant professor of electrical engineering and computer science and engineering has been named a 2011 MacArthur Fellow. Often referred to as the "Genius Award," this five-year, \$500,000 grant was awarded to Patel for "inventing low-cost, easy-to-deploy sensor systems that leverage existing infrastructures to enable users to track household energy consumption and to make the buildings we live in more responsive to our needs."

Patel was one of 22 individuals across the nation honored with the prestigious award this year. MacArthur Fellowships are awarded to "individuals who show exceptional creativity in their work and the prospect for still more in the future." The selection criteria included exceptional creativity, a track record of significant achievement, and showing promise for important future advances. Fellowships are given without specific reporting requirements or obligations with the intent of encouraging awardees to pursue their most innovative ideas without restriction.

"We're all so proud of Shwetak and his recent accomplishment," says Vikram Jandhyala, Professor and Chair. "We are indeed fortunate to have someone so innovative teaching and inspiring our students and helping nurture tomorrow's creative electrical engineers and computer scientists."



Courtesy the John D. & Catherine T. MacArthur Foundation

# Message from the Chair

I am honored to have this opportunity to serve the UW EE community in my new role as chair of the department. Joining me in this effort are professors Bruce Darling, Jenq-Neng Hwang, and John Sahr as our associate chairs for education, research, and advancement and infrastructure, respectively. Together, along with our students, staff, alumni, and friends, we will continue to build upon the excellent work and strong foundations set by the outgoing administration. I would like to sincerely thank our previous chair Leung Tsang, and associate chairs Jim Ritcey and Sumit Roy for their selfless work, dedication, and successes in leading the department.

Some of the important topics we would like to make headway on over the next few years include enhancing our professional and degree programs to meet the huge needs of industry and academia, high-tech and IP-rich startups, programs for advancement, and building large-scale research programs and centers. In doing so, our ultimate goal is to cultivate a “people-oriented culture” where we build shared meaning while respecting individuality—a place that UW EE alumni will be proud to call their Alma mater.

As we enter this new academic year, we have some exciting news and achievements to share with you. Shwetak Patel, assistant professor of EE and CSE, was awarded the prestigious MacArthur Fellow. He is one of 22 people honored with the “genius” award this year, and only 15th the person to have received this award at the UW. Along with professor David Allstot’s Mac Van Valkenburg award from the IEEE, and professor Jeffrey Bilmes’ former student Xiao Li’s TR-35 award, this shows the breadth and depth of high quality work at UW EE in established and new careers as well as in mentoring.

Last August, UW EE celebrated the installation of Daniel Kirschen as the inaugural holder of the Donald W. and Ruth Mary Close Professorship. Don (BSEE '37) and Ruth Mary (BS Accounting '38) were proud Husky alumni, and this event celebrated UW EE’s future in the power industry made possible by the Close’s generosity and loyal commitment to UW.

We also welcome our latest faculty member, Kai-Mei Fu, who joins the EE and Physics departments at UW this fall, from the HP Labs in Palo Alto. Her research has potential applications in quantum information processing, spintronics, and biological sensing.

I am looking forward to serving and working with all of you in building shared meaning while we nurture tomorrow’s creative electrical engineers. I truly believe that electrical engineering holds a special place in the future we all share, with influence on practically every technology that we encounter in our workplaces, in entertainment and education, and in medicine and defense.

I am now the proud father of a three-month old boy, who will perhaps be a future EE given that my wife is a UW EE alumna as well.

I am proud to be a HuskEE!

**Vikram Jandhyala**  
Professor and Chair





From left to right: Ruth Mary Close, Professor Daniel Kirschen, former EE Chair Leung Tsang, and Dean Matt O'Donnell at the Close Professorship Installation Event.

## Close Professorship Installation Event: Daniel Kirschen


An August event at the UW Club celebrated the installation of Daniel Kirschen as the inaugural holder of the Donald W. and Ruth Mary Close Professorship. The Close Professorship was established by their generous gift in 2006 and supports EE faculty in the power industry.

Don Close graduated in 1937 with a degree in electrical engineering and was founder of the Donald W. Close Company. Ruth Mary Close received her degree in accounting in 1938. Seventeen members of the Close family accompanied Ruth Mary to witness the installation. Frank Close, son of Don and Ruth Mary, CEO of Guardian Security, delivered remarks regarding the vision of his father and mother.

Frank conveyed that as Huskies, his parents shared a passion for the University of Washington. Don wanted to involve UW students in exploring the challenges of electricity as a power source while gaining hands-on experience through interaction with industry. After Don passed away in 2006, Ruth Mary fulfilled his commitment to establish an endowed professorship that would enhance the department's ability to attract and

retain stellar faculty with a research focus on electrical energy.

In his remarks to the audience, former chair Leung Tsang concurred noting, "Endowed professorships enable our faculty to explore topics of research in depth, provide freedom to take risks that will result in discovery, and reduce the number of hours spent seeking funding, which in turn increases productivity."

An international search was launched to find the right candidate for the Close Professorship. The committee was comprised of both College of Engineering faculty and industry partners. Members included: Bruce Darling (EE), Mohamed El-Sharkawi (EE), Mani Soma (EE), Alan Borning (CSE), Judy Ramey (HCDE), Mani Venkata (EE Affiliate), Mani Vadari (Battelle Energy Technology), and Gary Swofford (Puget Sound Energy). The search concluded last spring when Daniel Kirschen, professor of electrical energy systems and head of the Electrical Energy and Power Systems research group at the University of Manchester (UK) accepted the position. "Receiving a professorship is a great opportunity and a great honor," said Kirschen. 

# A Wireless Heart:

## *Reduces Infection, Improves Quality of Life*

Imagine a future where patients could install transmission coils in their homes and workplaces to create zones where an artificial heart could receive uninterrupted power. Currently, patients with implanted heart pumps are at high risk of serious infections and rehospitalization because today's heart pumps are powered by transcutaneous cables that protrude from the abdomen. A "wireless heart" would completely eliminate the power cord, reducing the risk of infection and improving the patient's quality of life.

Joshua Smith, associate professor of computer science and electrical engineering, colleagues from the UW, and Dr. Pramod Bonde, a heart surgeon at the Yale School of Medicine, have developed a wireless power system for left ventricular assist devices (LVADs). The technology uses a new form of inductive power transfer, in which carefully tuned transmitting and receiving coils share power, and the system automatically tunes itself to keep efficiency high even as range and orientation change.

"Most people's intuition about wireless power is that as the receiver gets further away, you get less power," Smith said. "But with this technique there's a regime where the efficiency doesn't change with distance."

In what Smith calls the "magic regime," power stays constant over distances about the same as the diameter of the coil—meaning a one-foot transmitter coil

could deliver consistent power over a distance of one to two feet, or a four-inch coil could transmit power over a distance of four to eight inches. That's not far, but it's enough to bridge the skin and tissue to reach a medical implant.

Researchers envision a vest that could hold an external transmitter coil connected to a power cord or battery. A small receiver coil implanted under the patient's skin would connect to a battery that holds enough power for about two hours, meaning the patient could be completely free for short periods of time to take a bath or go for a swim (current users of heart pumps cannot do either).

Longer term, the researchers imagine additional power transmitters placed under a patient's bed or chair, allowing patients to sleep, work or exercise at home unencumbered. **IE**



Researchers envision a future where patients would install transmission coils in their homes and workplaces to create zones where the implant would receive uninterrupted power.

Courtesy of P. Bonde, Yale School of Medicine

## Wirelessly Powered LVAD Project Wins Awards

EE graduate student Ben Waters was the lead author on a paper that won the Sezai



*Innovation Award at the 19th Congress of the International Society of Rotary Blood Pumps. The conference was held in Louisville, Kentucky last September. Waters is advised by associate*

*professor Josh Smith, and the award-winning paper is titled, "Promise of unrestricted mobility and freedom with wireless powering of a Ventricular Assist Device (VAD)," Benjamin Waters (UW EE), Alanson Sample (UW CSE), Joshua Smith (UW CSE & EE), Pramod Bonde (Yale School of Medicine).*

*The Wirelessly Powered LVAD Project also won the American Society for Artificial Internal Organs (ASAIO) Willem J. Kolff / Don B. Olsen Award in Washington, D.C. for most promising research in the development of artificial hearts.*

## 2011 Graduation Celebration

On June 10th UW EE held its annual Graduation Celebration to honor the class of 2011. This year the department recognized 161 Bachelor of Science degrees, 60 Masters of Science degrees, and 32 Doctorate degrees.

Carl Morgan (BSEE '68) addressed a crowd of 700 faculty, students and parents at EE's 2011 graduation ceremony in Kane Hall. In his speech, Morgan encouraged the students to address societal problems. He shared that through problem-solving efforts they would experience the full range of human emotions presented by such challenges.

As an entrepreneur, Morgan recalled that he was simultaneously brave and intimidated—scared one moment and frustrated the next. He began a journey of unanticipated emotions when he resolved to find a solution for the need of portable defibrillators. The solution resulted in a successful company, Heartstream, and brought him deep professional satisfaction and personal happiness. He hoped the same for the class of 2011. **IE**



From Left to Right: Gary Swofford (BSEE '68), 2010 commencement speaker, Dean Matt O'Donnell, and Carl Morgan (MSEE '76) 2011 commencement speaker.

## Alumnus Xiao Li:

### *Detecting Search Intent of Internet Users*

Searching for information on the Internet can be frustrating. Sometimes users will know what they're looking for, but can't figure out the exact word combinations to return the right results. Other times users will query specific keywords expecting to find certain information, but end up with results that only contain that keyword in it.

But what if a search engine could identify the task a user is trying to accomplish such as "buy a gift my wife would like" and provide relevant results pertaining to that task? Alumnus Xiao Li has been paving the way for next-generation search engines by detecting and understanding a user's intent with a search query. For this work, Li has been honored with Technology Review's TR35 Award.

Every year, MIT's Technology Review selects 35 innovators under the age of 35 across the globe who are opening up new possibilities in technology—Li has landed on this list of elite 35. "I'm so

proud of Xiao and all of her accomplishments," says Professor Jeff Bilmes, Li's faculty advisor. "It is especially rewarding to see former students making such an impact on the way we use technology."

Li's research interest in this field began as a graduate student working with Professor Jeff Bilmes on the "Vocal Joystick," a voice-based computer interface for individuals with motor impairments. The Vocal Joystick differs from conventional speech recognition systems because it exploits continuous aspects of the human voice, as though one is singing to a computer. The system maps such signals to trajectories in

the physical space, which are used to control mouse pointers, robotic arms, or other devices. The group performed many user studies on completing certain tasks while using the Vocal Joystick, such as drawing a circle on a computer screen, playing computer games, and operating a robotic arm to pick up objects.

"We found that users are sometimes frustrated because they were either novice users, or they didn't know how to optimally control their voice to achieve their goals," says Li. "So we asked ourselves—can we build a system that better understands a user's intent



I am enormously grateful to my advisor Jeff Bilmes and many other EE faculties for teaching me everything I know about research, and for empowering me with the necessary skill set.



based on the data collected in our user studies?" This is how Li began using machine learning techniques on user intent.

After receiving her PhD in 2007, Li joined the Speech Research Group at Microsoft. Li's research has produced key models and algorithms that are used in several specialized services of Microsoft's search engine, Bing. She built machine learning models that leverage a large amount of a user's past search activities, and generalize patterns to predict a user's intents in future queries. More importantly, Li's approach to intent understanding requires minimum human effort in the loop, which makes the development process more scalable.

Li says her research philosophy is simple: observe and generalize. "I observe how users interact with a search engine, and what web documents they clicked on after issuing their queries. By analyzing such information at a large scale, we can learn a great deal about user intent."

For example, consider the query, "best Italian restaurant near downtown waterfront." The technology Li developed would not only understand that the intent of this query is to "find restaurant," but it also extracts the meanings of individual terms, such as "best," which refers to rating, "Italian," which refers to cuisine type, and "downtown waterfront," which refers to location. With such infor-

mation, a search engine would be able to route the query to a specialized search module (in this case a restaurant search) and return the most relevant and essential answers instead documents that merely contain all these keywords.

Li attributes much of her career success to the people she worked with during her days as a student. "I am enormously grateful to my advisor Jeff Bilmes and many other EE faculties for teaching me everything I know about research, and for empowering me with the necessary skill set," says Li.

After working at Microsoft Research for over four years, Li has embarked on a new adventure at Facebook Inc. as a research scientist. **EE**

## Alumni on the Radar - EE Class Notes

**We'd like to hear from you! Check out our Alumni Connections web page to read a complete list of updates from your former classmates, or to provide your own:**

[www.ee.washington.edu/people/alumni/index.html](http://www.ee.washington.edu/people/alumni/index.html)

### **Chi Shing Chin, BSEE '11**

**Seattle, WA** – Chin is interested in developing iPhone applications, and hopes to one day start a company and hire people to develop new apps.

### **Loreli Joy Zamora Floresca, BSEE '11**

**Seattle, WA** – Graduating from the UW was a great honor for Floresca. It wasn't the obstacles that Floresca remembered but rather the triumphs. With all the hype in green energy in the electrical engineering field, Floresca knows that she is well equipped to implement her hopes and ambitions in the power industry. Big thanks to the UW!

### **Balbir Singh, MSEE (PMP) '11**

**Renton, WA** – The PMP is an excellent path for engineers in the work force who want to strive for and achieve a master's degree with busy work schedules. This program has given Singh the motivation to look

outside the box to further explore previous endeavors that have succumbed to the pressures of work and life balance.

### **Karen Archer Perry, BSEE '82**

**Seattle, WA** – Perry is happy to be back in Seattle with her husband of 25 years and two daughters: one of which is in high school, and the other at Haverford College in Philadelphia. She now works at the Bill & Melinda Gates Foundation as a Senior Program Officer in the US Libraries Program to ensure that people have access to computers and the internet through their public library. Previously, she worked for 25 years at Lucent, Bell Labs and AT&T in New Jersey before her "second career" took off working to create public interest broadband projects and bridge the digital divide. Perry also contributed to the National Broadband Plan, Connecting America at the FCC.

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## Dr. Eric Michielssen to Deliver Ishimaru Lecture

The annual Akira Ishimaru Lecture will feature Dr. Eric Michielssen, University of Michigan professor in Electrical Engineering and Computer Science. Dr. Michielssen will present his lecture titled, "Transient Electromagnetic Simulation: Recent Advances and Future Directions" on the University of Washington campus, **Tuesday, November 15th at 10:30am**, in the Electrical Engineering Building, Room 105. The lecture is open to the community.

Dr. Michielssen is an NSF Early Career Award winner (1995) having received his PhD from the University of Illinois in 1992. His area of expertise is in development of fast frequency and time domain integral-equation-based techniques for analyzing electromagnetic phenomena, and the development of robust optimizers for the synthesis of electromagnetic/optical devices. Most recently, Dr. Michielssen has been recognized with the Xerox Award for faculty research. He has also served as associate editor for the IEEE Transactions on Antennas and Propagation.

The lectureship honors Dr. Akira Ishimaru, EE professor emeritus. His research in wave propagation and scattering in random media has affected critical areas of modern life—healthcare, communications, national defense. The endowed lectureship was made possible through the generous lead gift of Ray West, EE PhD '81, and others who valued the education and research experience shared with Dr. Ishimaru. 