ENGINEERING @

Northeastern

2012–2013

ECONOMIC ENGINES

Northeastern entrepreneurs create and build the jobs of the future

Northeastern University
College *of* Engineering

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A MEASURE OF OUR IMPACT

I can think of no better way to introduce myself as dean than in an issue of *Engineering@Northeastern* devoted to the impact our college makes in advancing growth and innovation, in the U.S. and around the world.

In our cover story, we highlight the role Northeastern engineering graduates have played and continue to play in fueling the American economy—as leaders of many of the country's biggest and best-known companies, and as innovators and entrepreneurs. As most of you probably know, this is no coincidence. Innovation and entrepreneurship powered by experiential learning are in our DNA, and I am confident that our college will continue to drive new ideas and new ways of working and living in the world.

Knowledge creation and the desire to innovate are tied directly to use-inspired research. Within these pages, you'll find a sampling of some of the important work being conducted by our faculty, with particular focus on challenges in health, security, and sustainability. You'll also learn about the advanced research our students pursue, ranging from devices that aid stroke survivors to an energy-control system that powers down homes.

We also wish to take special note of the contributions of our proud alumni, whose philanthropic support is helping ensure Northeastern's place in the top tier of engineering schools. In the alumni pages, you'll read about the achievements of two—Arthur Zafiropoulo and William DiPietro—whose generosity and support provide a road map for us all.

Finally, if you'd like to learn more about my background and about the inspiring achievements of our faculty—including Thomas Webster, our new chair of chemical engineering—please turn to "Faculty Advancement" on page 20.

I am excited to join you, and thrilled at the opportunities we have to make a new impact in the world every day. I invite you to share your thoughts, questions, and ideas, and to follow us throughout this coming year of accomplishment.

Sincerely,

Nadine Aubry
Dean

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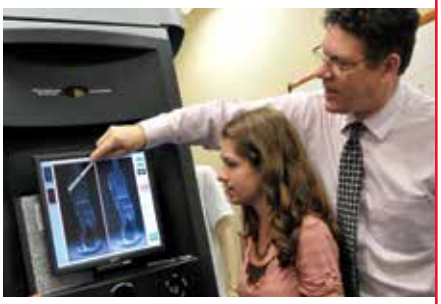
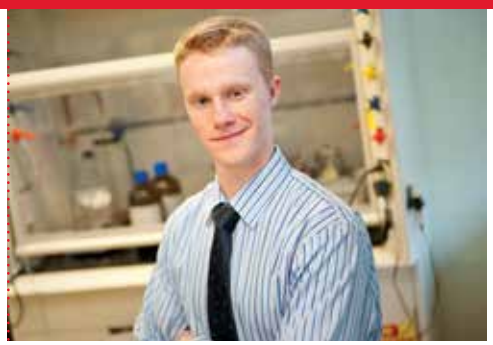
inside





By the Numbers

800
Companies Employing COE Co-op Undergraduate and Graduate Students (in 33 states and around the globe)

24
Active Research Grants of More Than $1 Million Led by COE Faculty
2011–2012

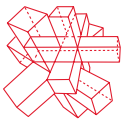
20
Prestigious NSF CAREER and Young Investigator Awards Won by COE Faculty (including one PECASE award)
2006–2012

8
Federally Funded National Engineering Research Centers of Excellence
2011–2012

ECONOMIC

YOUNG ALUMNI KEITH BERTOLINO AND MATTHEW KOWALSKI HAVE BEEN ENTREPRENEURS SINCE HIGH SCHOOL, BUT IT TOOK THE COLLEGE OF ENGINEERING TO MAKE THEM JOB CREATORS.

ENGINES



Keith Bertolino and Matthew Kowalski have been entrepreneurs since high school, but it took the College of Engineering to make them job creators.

The cofounders of Cipher Tech Solutions, Inc., each started a tech support company in high school, and then combined their small businesses after meeting through Northeastern's IEEE student chapter.

They launched Cipher Tech Solutions in 2006 with a handful of part-time workers, running the company as a sideline while they attended classes. Six years later, they employ 17 people, most of them Northeastern engineering and computer science alumni, working in digital forensics, or recovery of digital information from devices such as phones or computers.

Kowalski, a 2007 graduate in electrical and computer engineering, and Bertolino, who completed his BS in electrical engineering in 2008 and his MS in engineering management in 2009, are members of a new generation of Northeastern entrepreneurs. But they also represent a long-standing College of Engineering tradition: leadership in the kind of innovative businesses that provide solutions and build tomorrow's economy.

Degrees of Success

A July 2011 U.S. Department of Commerce publication notes that engineers and their fellow STEM (science, technology, engineering, and math) professionals have "an outsized impact on a nation's competitiveness, economic growth, and overall standard of living."

The Center on Workforce and Education, an independent nonprofit research and policy institute, followed up with a report observing "the STEM workforce will remain central to our economic vitality well into the future."

In short, engineering skills are in high demand, creating opportunities for new engineering graduates to build businesses of their own.

More than 2,500 Northeastern engineering graduates have founded or served as CEOs of successful organizations, including EMC, Raytheon, and Textron.

Northeastern engineers have always made those opportunities work for them. More than 2,500 Northeastern engineering graduates have founded and served as CEOs of successful organizations, including Fortune 500 companies EMC, Raytheon, and Textron.

Following that same path, young engineering alumni today, like Kowalski and Bertolino, are starting businesses soon after they graduate, creating jobs for themselves and for others.

The university's growing ecosystem of entrepreneurship—centers of education and research innovation connected to student-run ventures such as the Husky Start-up Challenge and IDEA—is feeding this trend. Meanwhile, Northeastern's more traditional career-building strengths, such as co-op and faculty mentoring, remain a critical part of the equation.

Kowalski, who serves as Cipher Tech's chief technology officer, says their former Northeastern professors help them identify promising students to fill co-op and permanent positions in the company's Boston, New York, and Maryland offices—an advantage when competing for talent with bigger, better-known firms.

"Most of our connections are from Northeastern, and co-op is the reason we are where we are today," says CEO Bertolino, who earned his master's through the Gordon Engineering Leadership Program.

As a result of Bertolino's co-op position with General Dynamics at the Department of Defense, the cofounders shifted their company's focus to digital forensics. Today, the firm develops custom tools that support government efforts to fight terrorism,

Continued on page 5

Q&A

founder FUNDER facilitator

Winslow Sargeant has done it all since he completed his BS in electrical engineering at Northeastern in 1986: earned a PhD, founded and funded successful technology companies, overseen small-business innovations research at the National Science Foundation. Now the chief counsel for advocacy at the U.S. Small Business Administration, he offers a broad perspective on engineers and job creation.

How are engineers, innovation, and job creation connected?

Job creators are problem solvers, and engineers are trained to look at real-world problems and come up with solutions. They create companies and products, and that creates jobs.

How do you determine whether an engineering idea will result in a successful and growing company?

You have to ask the tough questions: Is there a need for this? Is it economically feasible? It's not enough to solve a problem in a lab or a garage; you need feedback from the market. Engineers need to understand the competition and what differentiates their solution in terms of both product and cost. They need to make sure the end result will meet consumers' needs.

What might be the next great engineering idea to open up new job opportunities?

That's the unknown and what's so exciting. We see the merging of IT with healthcare and clean technology. We are able to operate at the nanoscale and add computing to open a world of opportunities for people who are creative.

Are the opportunities for engineers in small businesses or large, established companies?

Start-ups and small businesses have created 65 percent of all new jobs. Now, these companies will grow to be large; Facebook, Twitter, and Google all started as small businesses.

There's a shortage of engineering talent, so this is a very exciting time to be an engineer. It touches on the American dream: Someone has an idea and is able to turn it into products and services, and this turns into jobs and wealth. ■

Continued from page 3

investigate crimes, and prevent cyber intrusions. Bertolino says, "In a year or two, we expect to be much closer to 30 employees, and we'll probably have 50 a year later. We're never content, so we'll always keep growing."

Leading Growth

At a time when the U.S. economy is struggling to recover from the Great Recession of 2008 and 2009, the job-creation role of engineers is more important than ever.

"Most of the economy in the United States relates to transferring money, not creating wealth," says Bernard Gordon, H'07, engineer, inventor, and entrepreneur. "Wealth creators are people who create something where there was nothing before."

Northeastern's engineering alumni—among them the founders and CEOs of more than 500 companies—are adept at wealth creation. The college's track record of educating business leaders spans generations, from young entrepreneurs like Kowalski and Bertolino to pioneers like Robert Marini, E'54, the retired chairman and CEO of the environmental engineering consulting firm Camp Dresser & McKee.

George Sakellaris, MS'75, has founded multiple businesses. He says of his most recent, the energy services company Ameresco, "This company alone has created almost 1,000 jobs. We've added 50 to 100 people per year for the past several years."

Tealeaf Technology CEO Rebecca Ward, who graduated from Northeastern's engineering technology program in 1991 (see "Sustainable Solutions" on page 6), says her San Francisco–based software firm has a sustainable growth model that has generated jobs even during the bad economy.

Another engineering alumnus, Jerald Fishman, MS'71, is president and CEO of Analog Devices, Inc., the high-performance signal processing technology manufacturer, named one of the world's 100 most innovative companies by Thomson Reuters in 2011. It is also among the biggest employers on the 2012 Boston Globe 100 list, with more than 9,000 employees.

> WEALTH CREATORS ARE PEOPLE WHO CREATE SOMETHING WHERE THERE WAS NOTHING BEFORE.
>
> — Bernard Gordon, H'07

"There's still a sweet spot for people with an engineering skill set," says Fishman. "Even with the recession and economic uncertainty, we try to hire college graduates every year."

Marini has seen his former firm, now known as CDM Smith, grow from 18 to nearly 6,000 employees—an expansion that also created construction industry jobs.

Engineers have always played a critical role in economic growth, says Marini, because "they come up with ideas that are creative and turn them into products. Look at the iPad. Look at any hospital today; engineers designed the MRI, the CT scan. This creates jobs."

Entrepreneurial Focus

Today's engineering innovators are more likely to turn their creative ideas into businesses as well as products, thanks to a growing focus on engineering entrepreneurship. As the *New York Times* wrote in March 2011, "Many of the most talented engineers want to be the next Mark Zuckerberg, not work for him."

That goal is well within reach for engineers today, because, as *Inc.* magazine reported last February, "the technical skills required to execute the next groundbreaking idea are more in demand than ever before. If you are an entrepreneurial engineer, the world is yours for the taking."

Raytheon CEO William Swanson points to the changing nature of business itself. Speaking at Northeastern's CEO Breakfast Forum in February 2012, Swanson noted "virtually every business is technology dependent today."

The college offers a degree program that prepares engineers for this new world: the Gordon Engineering Leadership Program, named for its founding benefactor, Bernard Gordon.

Continued on next page

If anyone knows engineers and what they can accomplish, it's Gordon, who not only launched Analogic and other successful companies, but also was responsible for the first high-speed analog-to-digital converter and life-changing technologies such as the fetal monitor.

As he noted in a recent issue of *Northeastern Magazine*, "What other group is as necessary for the creation of jobs and societal wealth as the engineering profession?"

The engineering leadership program is built on that premise. It combines course work with mentoring, speakers, and an industry-sponsored challenge project that requires students to show exactly how their sponsoring company can transform an engineering innovation into a commercial product.

At a time when more CEOs and business founders hold engineering degrees than hold MBAs, the Gordon program seems very much in line with the current economic landscape.

What contributes to engineers' success in business? Engineering alumni point to their problem-solving abilities, math skills, creative thinking, and willingness to take risks.

"Good engineers look at a problem and say there must be a solution. They tend to be very disciplined, determined, and organized," says Sakellaris. "Engineers also have an easy time learning the business aspects of a company because their courses are technical and complex."

Fine-tuning the point, Gordon says of engineering leaders, "Some people will take risks and some won't, but there's a factor beyond that. There's a difference in personality and drive."

GOOD ENGINEERS LOOK AT A PROBLEM AND SAY THERE MUST BE A SOLUTION. THEY TEND TO BE VERY DISCIPLINED, DETERMINED, AND ORGANIZED.

— George Sakellaris, MS'75

WHAT OTHER GROUP IS AS NECESSARY FOR THE CREATION OF JOBS AND SOCIETAL WEALTH AS THE ENGINEERING PROFESSION? — Bernard Gordon, H'07

Sustainable

Rebecca Ward considers engineers uniquely qualified to solve business needs before the marketplace identifies them. She explains, "They can come up with a technology, create it, and take it to market. You found companies around that, and it creates jobs."

Ward ought to know: She's both an engineer and the CEO of Tealeaf Technology, Inc., a San Francisco–based company offering analytics software that helps Fortune 100 and other large organizations manage their customers' online experience. Ward, who earned her BS in engineering technology at Northeastern in 1991, became CEO in 2004 and continues following IBM's recent acquisition of the company.

"I joined Tealeaf Technology when it was still a small company. It was an opportunity to scale the company," says Ward. "As a CEO, you want to make sure you're building a business that's sustainable in good times and bad times.

SOLUTIONS

If you do that, you continually create jobs. We've been able to grow even in the current economic environment."

Ward attributes her professional success to the demand for engineers and her willingness to assume new responsibilities. She started in a technical role with Xerox and later became vice president of product management and engineering at BBN/GTE Internetworking; group president of engineering, marketing, and product development at Digex; and entrepreneur in residence at Foundation Capital.

"Engineering is one of the broadest roles out there, and it provides a fabulous platform to create things," Ward says. "It's a great field to study and to help build the economy." ■

LEVERAGE in the Job Market

Explaining how college students can best align their major with employment trends, *Money* magazine recently wrote, "One word: engineering."

Engineers' skills and attributes give them leverage in the job market—and if starting salaries are any indicator, Northeastern graduates enjoy a particular advantage.

Of all new graduates in 2012, engineering majors were most in demand and had the highest median starting salary—$58,581, according to a National Association of Colleges and Employers report.

Northeastern's new engineering graduates are outperforming the national numbers. In 2011, their median starting salary was $60,600; computer and chemical engineering majors topped $70,000. They're working for companies such as Analog Devices, Apple, Bloomberg, EMC, General Dynamics, Merck, MITRE, Procter & Gamble, and Raytheon. As in past years, many graduates were offered and accepted positions with their former co-op employers.

Jerald Fishman, MS'71, president and CEO of Analog Devices, a manufacturer of high-performance signal processing technology, says, "We look for people who are smart, perceptive, and technically oriented. Northeastern co-op students usually work out well for us because they really want to work. They become engineers because they want to be engineers."

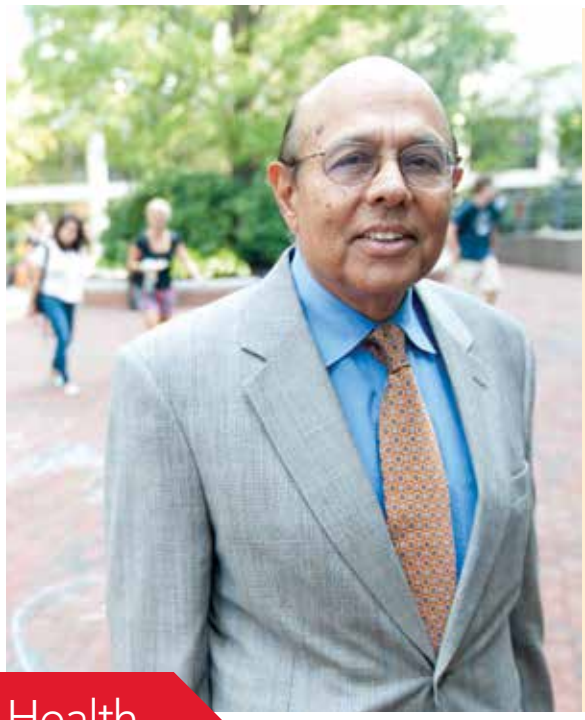
According to the U.S. Bureau of Labor Statistics projections, the future looks just as bright. The agency estimates that engineering positions will grow 11 percent through 2018, and there won't be enough new graduates to fill them.

It makes engineering alumnus Sy Sternberg, MS'68, H'12—retired New York Life Insurance Company CEO and chairman emeritus of Northeastern's Board of Trustees—seem prophetic.

Speaking to a Parents' Weekend audience in 2008, Sternberg declared, "You show me a successful Fortune 500 company, and I'll show you an employer who values the talents of engineering graduates." ■

Spotlight on Faculty Research

Northeastern's College of Engineering faculty members pursue use-inspired interdisciplinary research, with a focus on discovering solutions to global challenges in health, security, and sustainability, as well as exploration in emerging areas of scientific inquiry. There are few limits to the applications of their research, as they engage in studies that range from applying systems engineering principles that improve healthcare systems, to redesigning the structure of the Internet, to helping develop the next generation of electric-power transmission grids. Here are highlights of some of the transformative work our faculty are undertaking.



Engineering Solutions to Healthcare

Vinod Sahney, professor of mechanical and industrial engineering, thinks the healthcare industry can learn a lot from airplane pilots. "Every pilot knows that before you take off, you go through a checklist, regardless of how many years you have been flying," says Sahney, who notes that similar techniques can be applied in hospitals and operating rooms to cut down on problems and mistakes. Sahney's scholarship focuses on solving the healthcare crisis by using the principles of systems engineering to improve treatment, patient safety, and quality of care. His research reflects his experience as senior vice president at Blue Cross Blue Shield of Massachusetts and at the Henry Ford Health System and his doctorate in industrial engineering and operations research. According to Sahney, the healthcare industry has yet to modernize the way it treats patients, tracks inventory, and schedules appointments. He is working through various federally funded research centers at Northeastern to develop systems engineering solutions to broad healthcare problems.

Health

The Cell: An "Engineerable Entity"

Associate professor of chemical engineering Anand Asthagiri can think of several reasons why a scientist would want to get behind the wheel of a cell, what he calls "the ultimate driving machine." Having the ability to move a cell from Point A to Point B could revolutionize tissue engineering and transform the understanding of various diseases, he says. "It's a complex problem but I think we can make headway on it if we think about the cell as an engineerable entity." Asthagiri and postdoctoral researcher Keiichiro Kushiro have been working on simple means of designing "traffic patterns" to guide cell movement. One way cells can be encouraged to move in a particular direction occurs naturally in our body, such as when our immune system responds to attacks. Cells move by sticking and crawling on an adhesive surface using regulatory molecules. And if the surface is uniformly adhesive, they'll just move randomly, Asthagiri says. But if you present the cells in a gradient of chemoattractant, they'll move toward that but without fine control of where they go. In previous work, the researchers defined a set of micropatterns that could constrain the movement of cells over an adhesive surface, using certain patterns to provide directionality. This time the team explored a hybrid of two micropatterns and found more directionality than they expected. They are now investigating why the combination of two shapes makes for a more controllable system, setting up "traffic patterns" of various shapes to explore ways in which the method can be tuned to cause more directed cell movements. "We are excited because this opens two very interesting avenues of opportunity: One is learning more about the fundamentals of how cells move and exploiting it. The other is on the application side, asking if we could use this to send some cells one way and other types of cells another." If the latter proves true, then cancer cells could separate themselves from noncancerous cells and newly differentiated stem cells could go exactly where they're needed in a tissue graft.

Using Systems Biology to Study Cells

Using nanofluidic electrochemical detection and optics as an improved method for studying individual bacterial cells, Edgar Goluch, DiPietro Assistant Professor of Chemical Engineering, has won a grant from the National Science Foundation to investigate the effects of external stimuli, static heterogeneity, and the role of chemical communication in bacterial populations. Of particular interest are the physical and biochemical changes the cells undergo when exposed to various external factors, such as pH and temperature changes, buffer concentration, surface modification, and drug molecules. The long-term objective of this research is to provide an integrated chip-in-a-lab platform for systems biology experiments, where researchers will be able to stimulate and monitor hundreds of individual cells simultaneously. This broadly applicable platform will revolutionize the field of systems biology by providing label-free chemical information for potentially thousands of individual cells simultaneously. The fundamental questions being investigated will give insight into the behavior and interactions of bacterial cells, which can then be applied to biotechnology, medicine, and environmental research.

Mapping the Human Genome

While the cost of DNA sequencing has dropped significantly over the last few years due to the evolution of next-generation sequencing instruments, there is still the need for new technologies that can significantly reduce cost, labor, and time associated with acquiring DNA sequencing information using a fully automated platform. As part of the National Institutes of Health's Genome Project, chemical engineering professor Elizabeth Podlaha-Murphy has joined Steven Soper of the University of North Carolina and colleagues from Louisiana State University to create a device using nanowires that will screen RNA and DNA sequences. The strategy uses nanoscale sensors that read the identity of mononucleotide bases from their characteristic flight-time through a two-dimensional nanochannel fabricated in a thermoplastic via low-cost nanoprint lithography and other replication-based techniques. The low cost of the fluidic systems results not only from the use of replication technologies to produce the fluidic network spanning multiple size scales, but also from the simple and highly parallel strategies used to produce the nanoscale component required for this chip.

Redesigning the Internet

Edmund Yeh wants to give the architecture of the Internet a makeover—and he's fully aware of the magnitude of this endeavor. Yeh, associate professor of electrical and computer engineering, is part of an interdisciplinary research team from nine institutions that received a grant from the National Science Foundation, as part of the Future Internet Architecture Program, to redesign the way the Internet is structured. Yeh says the web currently operates like a telephone network by making connections between individual computers. But millions of people who access the Internet through iPads and smartphones have caused this structure to become inefficient. He suggests the Internet should operate like a warehouse, in which information is stored within the network itself. The new structure would revolve around the content being distributed online rather than around the users who send and receive it. Yeh's research also provides a network science perspective on challenges ranging from wireless network cybersecurity to smart power grids. He was named a Humboldt Research Fellow, an award sponsored by the German government and the Alexander Von Humboldt Foundation. In his fellowship, he will develop better wireless technologies that improve on the current 4G Long Term Evolution standards—the cutting-edge wireless communications protocol based in part on Yeh's work on dynamically allocating transmission power and rate in wireless cellular networks.

Cybersecurity and the New Digital Threats

The work of Engin Kirda, the Sy and Laurie Sternberg Interdisciplinary Associate Professor for Information Assurance and director of the Institute for Information Assurance, has been focused on Internet security issues and how to find vulnerabilities in websites and Internet applications to create more secure applications and better virus-detection techniques. But technologies are evolving as quickly as the malicious software they are designed to combat. Kirda believes that in order to tame the Internet—that is, "to keep it in check"—vulnerabilities need to be addressed through a variety of practical solutions. "One thing I have learned over the years is that security problems are not only technical problems. There is a very social aspect to all these issues," he says. Kirda's software is useful for detecting malicious behavior and for locating the command and control (C&C) servers orchestrating that behavior. Destroying the command center shuts down activity across a network of infected machines instead of trying to address individual attacks. Kirda received a grant from the National Science Foundation to develop tools to identify malicious C&C connections and potentially block and disrupt communication.

U.S. Secretary of Homeland Security Janet Napolitano visited campus in November, touring the ALERT center with Professor Carey Rappaport (right) and other faculty, and meeting with President Joseph E. Aoun, Dean Nadine Aubry, and other university leaders to discuss Northeastern's security research.

Security

Research Center Spotlight: ALERT

Northeastern's security research profile was among the chief topics of discussion when Secretary of Homeland Security Janet Napolitano visited the university on Veterans Day 2012. Her itinerary included a visit to ALERT (Awareness and Localization of Explosives-Related Threats), one of the college's national centers of excellence. A partnership of national and international academic, industrial, and government entities, ALERT strives to provide ultrareliable security screening, improve the ability to detect explosives at a distance, and develop unequivocal pre- and postblast mitigation techniques. The center conducts transformational research, develops new technologies, and offers educational programs to accomplish this mission.

In seeking to improve reliability in screening passengers and luggage at airports for explosives and other threats, ALERT has developed devices and methods for screening people that lower the false alarm rate while minimizing the burden on the equipment operators. ALERT is also working on technologies that do a better job of imaging carry-on and checked bags by using a combination of advanced reconstruction algorithms, computer tomography, and X-ray technologies.

ALERT's research to detect explosives at greater distances focuses on devices such as radar equipment that will beam electromagnetic waves at a subject and observe the returned signal to see if the subject might be wearing a concealed man-made object—which might potentially be a suicide bomber vest. Study is also under way on human behavioral and motion sensing as part of a hybrid system that would employ multiple detection modalities to combine information about both the physical properties of explosives and the actions of those wearing them. Developing video analytics to screen individuals in crowds for anomalous behavior is an example of research in this area.

Investigation of pre- and postblast mitigation looks to strengthen structures in an effort to minimize the impact of a blast and to protect individuals more effectively against shrapnel and collapsed buildings. Investigation is also proceeding on the design of blast-resistant materials that mimic effective structures that occur in nature.

ALERT is also pursuing fundamental research in the nature of explosives themselves to determine what aspects of a material make it a particularly effective explosive on both the macro- and the nanoscale.

Boosting Efficiency of the Electric Grid

Electrical and computer engineering researchers Ali Abur and Hanoch Lev-Ari have been awarded a five-year grant from the National Science Foundation and the U.S. Department of Energy to develop the nation's next generation of electric-power transmission grids. The grant will be used to establish the Center for Ultra-wide-area Resilient Electric Energy Transmission Networks (CURENT). The center is the seventh federally funded national research center awarded to the College of Engineering in the last four years. The researchers plan to develop a real-time monitoring application for the smart-grid system, designed to minimize blackout rates and improve energy efficiency in bulk power transmission and usage. "Maintaining efficient and resilient operation of the power transmission of the grid becomes increasingly challenging as the number of renewable resources increases," says Abur, campus director of Northeastern's CURENT site. The center, housed at the University of Tennessee, Knoxville, will serve as a hub for researchers from around the world. In addition to Northeastern, other organizations represented are Rensselaer Polytechnic Institute, Tuskegee University, and several international partners. More than three dozen industry partners will be affiliated as well.

Swimming in That "Dirty" Water

The Charles River has a long history of pollution. But taking a dip was common practice until the 1950s, when people started to realize that industrial waste and sewage runoff were making swimming hazardous. Since 2004, civil and environmental engineering associate professor Ferdi Hellweger has been working to make the river swimmable again. The New England Region of the Environmental Protection Agency recently honored him with an Environmental Merit Award for his effort.

According to Hellweger, after decades of work by many people, the river is swimmable 70 percent of the time. But the problem, he explains, is pinpointing that time. He says the two main culprits preventing swimming in the river the remaining 30 percent of the time are fecal bacteria, such as *E. coli*, and toxic algae. Fecal bacteria originate in sewage, which can enter the river because of the way Boston's sewer system was originally designed with one set of pipes that move both rainwater and sanitary sewage to a treatment facility. Toxic algae, specifically cyanobacteria, grow in the river and proliferate when the temperature and nutrient conditions are just right. Hellweger is developing a computer program that can predict how swimmable the river will be from one day to the next. The governor of Massachusetts has appointed a commission to study the water quality with the hope of opening the river to swimming within five years. The Charles would be the first urban river in the country to welcome swimmers within the last several decades.

Centers and Major Initiatives

Awareness and Localization of Explosives-Related Threats (ALERT), a Department of Homeland Security Center of Excellence **www.northeastern.edu/alert**

The Bernard M. Gordon Center for Subsurface Sensing and Imaging Systems (Gordon-CenSSIS), an NSF Engineering Research Center **www.censsis.neu.edu**

New England Veterans Engineering Resource Center **www.coe.neu.edu/verc**

NIST Center for Versatile Onboard Traffic Embedded Roaming Sensors (VOTERS) **www.northeastern.edu/voters**

NSF Center for Health Organization Transformation (Industry-University Collaborative Research Center) **www.coe.neu.edu/healthcare**

NSF Center for High-rate Nanomanufacturing **www.northeastern.edu/chn**

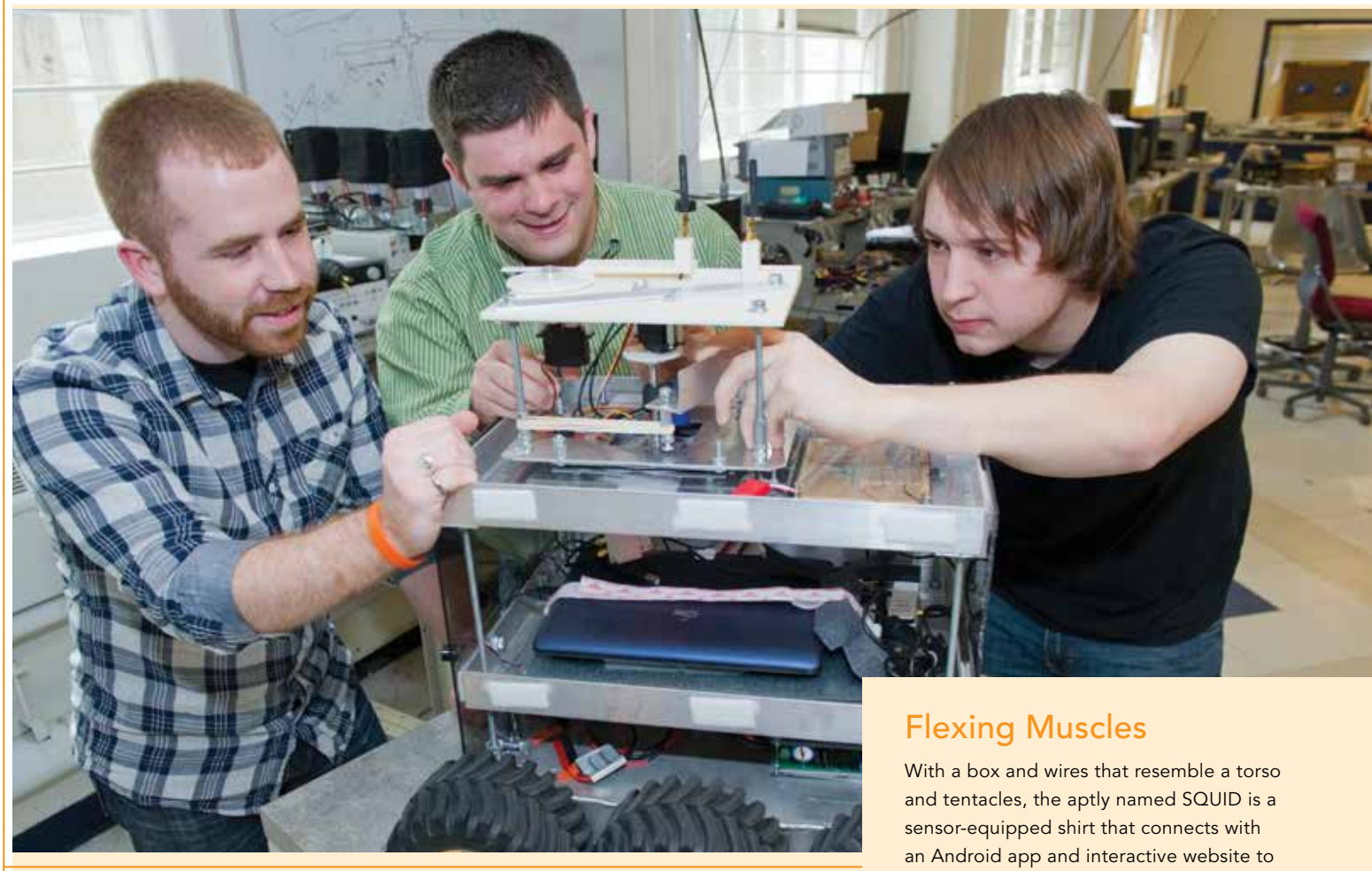
NSF-Department of Energy Center for Ultra-wide-area Resilient Electric Energy Transmission Networks (CURENT) **http://curent.utk.edu**

Puerto Rico Testsite for Exploring Contamination Threats (PROTECT), a National Institute of Environmental Health Sciences Center **www.northeastern.edu/protect**

Population Growth and Global Water Shortage

A century from now, the world will be a drier place. Population rise will lead to a greater demand for water, and climate change will decrease global rainfall, increase evaporation, and lower supply. There will be tangible impacts on society, from individuals hoping to quench their thirst to governments planning national security strategies and international trade routes. To address these issues, Auroop Ganguly, associate professor of civil and environmental engineering, and his colleagues have developed a computational model to predict future freshwater availability, based on both climate and global population change, part of a larger research project funded through the National Science Foundation. The model forecasts less water availability in the future, and while predictions of experts on population growth are far from certain, one of the major factors in demand for water is change in population. Although computer-based predictions of greenhouse gas emissions over the next century drive climate projections, the surprising new finding is that population growth, not climate change, tends to have the larger impact on water availability. The researchers found that the worst-case climate change scenario would increase water stress in 5 percent of the population, but that a worst-case population growth scenario would increase water stress in 13 percent of the population. For Ganguly, the results are deserving of more detailed analysis.

Student Innovation



Roving Robot to the Rescue

Locating and rescuing victims of natural disasters or participating in military missions that are too dangerous for soldiers is the job of a roving robot named WiLU. The robot's development was supported in part by a National Science Foundation Major Research Instrumentation grant awarded to an interdisciplinary team of Northeastern professors to develop wireless sensor networks that support key applications such as search and rescue by swarms of robots. Students contributed by creating a complex algorithm that enables the robot to locate people—or even bombs that are detonated—through mobile phones. The technology works through a smart antenna mounted atop WiLU that measures the signal strength of a mobile phone connected to a wireless network. Then, the robot autonomously determines the location of the object by adaptively forming beams to pinpoint the direction and location of the wireless signal source. Humans could also control the robot from remote locations. *Charles DiMarzio and Guevara Noubir, Advisors*

Flexing Muscles

With a box and wires that resemble a torso and tentacles, the aptly named SQUID is a sensor-equipped shirt that connects with an Android app and interactive website to bring an electronic advantage to exercise. Designed for physical training by athletes or amateurs looking to optimize their time at the gym, the device captures the electrical signals created by moving muscles and translates that into data that can be used to measure workouts and track progress over time. Bridging the disciplines of engineering and graphic design, as well as human physiology and sports medicine, the project involved the collaboration of advisors and students from the College of Engineering; the College of Arts, Media and Design; and Bouvé College of Health Sciences. A version of SQUID could make it to market. *Constantine Mavroidis, Mark Sivak, Greg Cloutier, Advisors*

More than ever before, Northeastern's undergraduate engineering students are working on problem solving in the real world, designing solutions that can save lives, money, and resources.

Wheeling in the Competition

A group of mechanical engineering students who designed, built, and raced an all-terrain vehicle placed fourth overall out of some 100 teams at Baja SAE, an intercollegiate design competition run by the Society of Automotive Engineers. The motorsports team, which also placed second in the competition's endurance race, has never had a more impressive showing. The team designed and fabricated nearly every aspect of the vehicle, except for a few components such as the brakes, tires, and shocks. The 450-pound, four-by-four off-road buggy was constructed to withstand the rigors of the grueling four-hour endurance race, considered the heart of the competition. The Northeastern Baja SAE club was started in 1985 and has earned 19 top-10 finishes in national competitions since 1999.

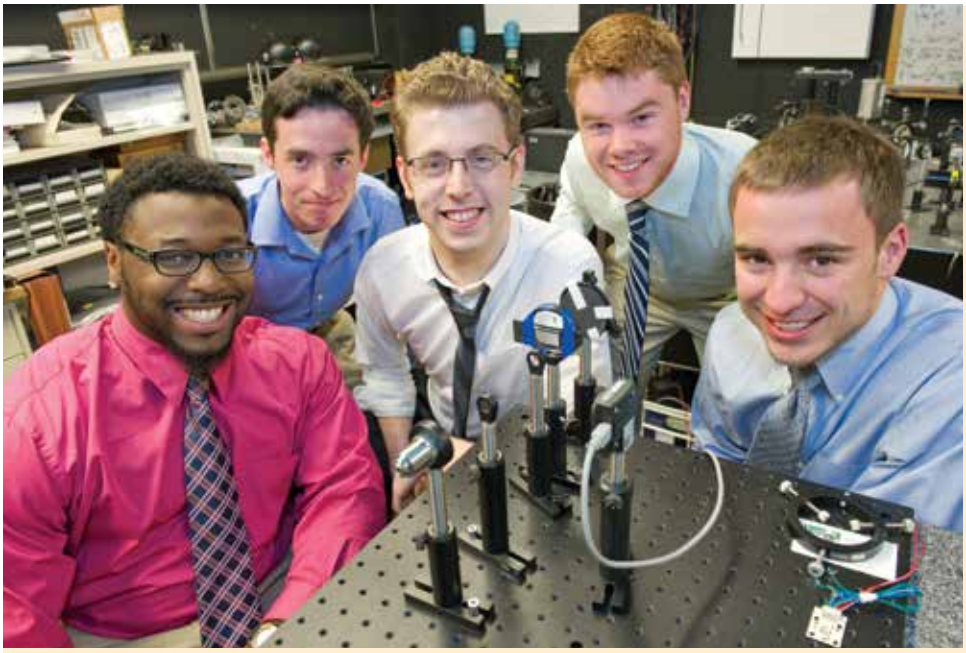
Don Goldthwaite and David Kaeli, Advisors

Scanning the Future

Research has been integral to mechanical engineering major Lyda Sallaway's Northeastern experience. In the summer following her freshman year, she secured a job conducting experiments on backscatter X-ray imaging technology, which is used to perform full-body scans at airports. The position came about through Northeastern's Investing in Tomorrow's Engineering Leaders (ITEL) program, which provides scholarships and mentoring to engineering students. Through ITEL, she connected with Richard Moore, the director of breast imaging research at Massachusetts General Hospital and a part-time lecturer at Northeastern, whose academic work centers on cancer screening and homeland security. Subsequently, Sallaway was one of seven students to participate in the ALERT Research Experiences for Undergraduates program, and under the direction of Moore, Sallaway scanned mannequins positioned on a rotating table to gain a deeper understanding of what scanned objects looked like in the backscatter machine and potential uses for the technology.

Richard Moore, Advisor

Student Innovation



Better Cancer Detection

Skin cancer is the most prevalent form of cancer in the U.S., and its diagnosis can be a long, tedious, and expensive process. With this in mind, students have developed a compact microscope that one day may help improve detection. The team of senior electrical and computer engineering majors built a "structured illumination microscope" as an alternative to the current method of diagnosis that involves taking a biopsy, freezing it, slicing the individual layers of skin, and examining them one by one. Instead, the microscope takes an image of the entire biopsy, which is fed into a filtering software program that creates a 3-D model that separates out each layer of the skin, making cancer detection much simpler and quicker. The project is a continuation of one begun by seniors the previous year, with this year's team focused on improving the processing speed and decreasing the microscope's size to make the device more clinically feasible. Students noted that their switch from high-powered lasers to LEDs cut the size of the microscope roughly in half, and reduced not only costs but also the power needed to operate the device. *Masoud Salehi and Charles DiMarzio, Advisors*

Solar Boat Makes Splash

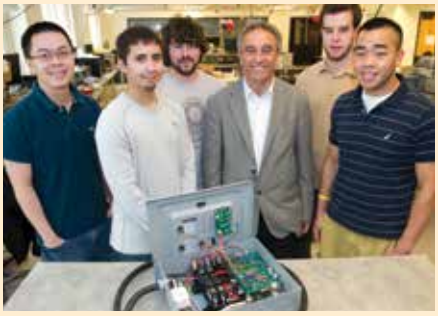
Integrating solar technology into recreational boating enabled a student team to shed light on the potential of green technology as they competed in Solar Splash 2011, which featured student entries from universities across the U.S. and overseas. The IEEE Power Electronics Society event is billed as the world championship of solar-electric boating. The team built the hull and conducted float tests, and added the solar panel system, propeller, electrical system, steering capabilities, and a drivetrain developed as part of a senior capstone design project. Among the challenges the team faced were incorporating and retrofitting complicated components and scrambling to fix a snapped drivetrain. Northeastern finished 15th, a good showing for its first entry, and plans are under way for sustaining student efforts to design, build, and test innovative approaches and applications of solar energy. *Richard Whalen, Advisor*

Boston's North End in Season

A team of six civil engineering seniors may have the answer to solving the traffic problems and pedestrian congestion that plague Boston's North End: seasonal, portable sidewalks. The students redesigned the neighborhood's Hanover Street as part of their "Engineering Essentials" capstone project and presented the plan to the North End community during a public meeting attended by city councilors and Boston's commissioner of transportation. Similar to those that have been used in New York City and San Francisco, the units would add seven feet of sidewalk space to both sides of the street for pedestrian and business use. In the winter, when foot traffic decreases, the sidewalks would be removed so that drivers could once again use the space to park, fulfilling the goal of a "complete street" with better balance of space for the movement of both people and goods. The design also included special commercial zones to discourage delivery vehicles from double-parking, proposed more accessible bike racks, and suggested reorganizing parking spots on Commercial Street to allow for additional parking. *Dan Dulaski, Advisor*

Powering Down at Home

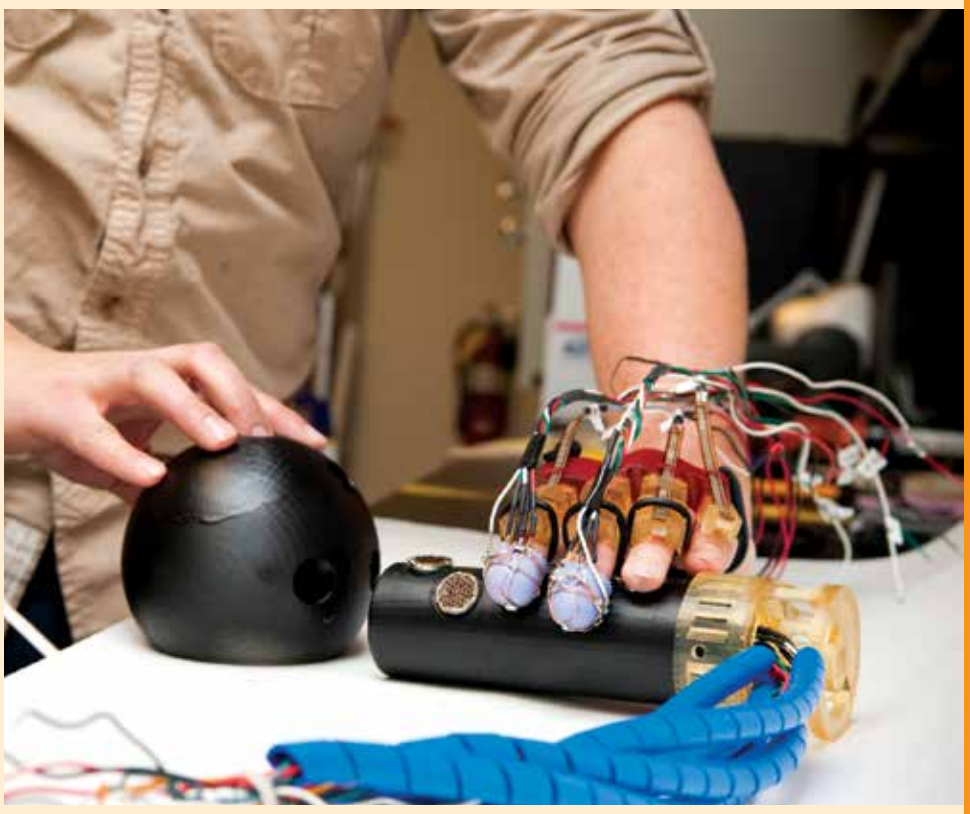
From TVs and stereos to dishwashers and toasters, our living rooms and kitchens are home to countless appliances continuously plugged in. While these items may be turned off, they remain in standby mode and draw power, even as their owners are at work or asleep. To reduce excess home power usage, students devised a home energy-control system that monitors power levels inside a particular home—or even throughout an entire apartment building or neighborhood—to save homeowners cash and help prevent widespread blackouts. The design incorporates a breaker box with an LCD screen and keypad that allows users to see how much power is being used in a particular room or even by a specific appliance. The keypad also enables users to set rooms and appliances at varying priority levels, determining when to shut them down during the day or night. If the device were installed in homes



or apartment complexes throughout a neighborhood, overall energy usage could be monitored and reduced if the power load being drawn from the grid neared a dangerous level. The device also includes a natural gas sensor, so if a gas leak were detected inside a home, the power would be shut off to prevent a possible explosion. *Bahram Shafai, Advisor*

Help for Everyday Tasks

Everyday tasks such as picking up a glass, turning a doorknob, and unscrewing a soda bottle cap may become easier for stroke survivors, thanks to a poststroke rehabilitation glove designed by students to both increase hand strength and improve cognitive ability. With some 800,000 stroke cases occurring in the U.S. each year, and survivors requiring physical therapy and ongoing exercise to regain mobility and dexterity, "Excelsior" was developed using 3-D additive manufacturing with embedded sensors and can be customized to fit. To improve cognitive function, users match colored LEDs (light-emitting diodes) on the device's fingertips with those on external objects fashioned into household shapes, such as cups or doorknobs. In designing the prototype, the student-researchers interviewed physical therapists at Boston's Spaulding Rehabilitation Hospital to gain insight into patient needs. *Constantine Mavroidis and Richard Ranky, Advisors*



Whether it is testing pyrotechnic hardware for NASA or designing data-management solutions for clinical trials at Oracle, Northeastern co-ops apply their engineering principles and skills to finding real-world solutions.

Co-op Success Stories

Mission: Pyrotechnic Safety in Outer Space

Maureen Dutton **NASA**

Maureen Dutton, E'91, knew what she wanted to be since she was a child. "I was the youngest of three children and looked up to my big brother. He wanted to be an astronaut, so I wanted to be an astronaut," Dutton says. Math and science came easy to her, so she followed an engineering path to Northeastern in pursuit of her engineering degree. Before long, her dogged determination got her noticed at NASA's Johnson Space Center (JSC). "I found out who the co-op contact was and what I had to do to get a job there." Every quarter, she sent her résumé or transcript to JSC and checked in with the co-op coordinator. "My aim was to make sure JSC didn't forget about me, and that I didn't irritate the JSC co-op office." It worked. She completed three co-op tours at NASA, was hired straight out of Northeastern, and has worked at JSC for 22 years. She prefers to stay on the ground, though, rather than pursue her childhood dream of exploring space.

Dutton is pyrotechnic test director, responsible for testing, certifying, and qualifying the pyrotechnic hardware that aided in the space shuttle launches. She now performs the same mission-critical tasks for the *Orion* program, the next-generation deep-space vehicle. Her resolve has brought her fulfillment in life and work: "I say, 'Dare to live your dreams.' I did, and I'm loving every minute."

Managing Construction and a Career

Kristen Blackbird
GILBANE BUILDING COMPANY

For Kristen Blackbird, a senior civil engineering major, three co-ops with Gilbane Building Company solidified her desire to pursue construction management as a career. Gilbane was the general contractor for Northeastern's George J. Kostas Research Institute for Homeland Security, the secure, state-of-the-art research facility located on the university's campus in Burlington, Massachusetts, and funded by a $12 million investment from alumnus George J. Kostas, E'43, H'07. Blackbird was at the site every day, inspecting materials that arrived from subcontractors, taking notes and photos of the building's construction progress, and ensuring that particular sections of the building were installed correctly. She also worked with both the architect and subcontractors to answer questions about the building's design sketches, helped complete the building's LEED certification proposals, and prepared the project's closeout document. Recalling her work, Blackbird says, "I had this realization that the work I did really meant something important, that this building will be used for some incredible research and do great things for our university."

A More Sustainable World

Venkat Naupada
JOHNSON CONTROLS

As a consultant in energy solutions engineering for Johnson Controls, Venkat Naupada, who received his MS in energy systems in May 2012, is finding the right energy efficiency solution for his customers. Coming from India, he has long understood the importance of energy in our lives, but it was not until his co-op (May 2011 to April 2012) that he was able to put his ideas into action. "I dreamt of a career where I could contribute to the conservation of resources and make the world a more sustainable place," he says. Northeastern provided an opportunity for Naupada to become familiar with the intricacies of the energy industry while gaining an understanding that improvement and efficiency of energy systems are needed to make the world more sustainable. In his co-op at Johnson Controls, Naupada visited buildings and identified their energy conservation measures. While assisting senior engineers, he provided reports of findings and created complex energy-saving calculations.

This practical experience, along with the wide range of course work, helped Naupada develop an analytical skill set, problem-solving abilities, and the competence to work independently. He says, "The co-op experience gave me the opportunity to see project management and engineering economics in action, with various decisions directly influencing the energy consumption of a town, hospital, or school."

Nanoparticle Screening for a Cure

Sean Burns **DANA-FARBER CANCER INSTITUTE**

Small wonder that Sean Burns, E'13, spent 10 hours a day in a medical oncology laboratory at the Dana-Farber Cancer Institute, developing and improving nanoparticle screening methods for testing the effectiveness of potential drugs on cancer: His mother is a nurse, and several of his family members have battled the disease. "Cancer is something that has interested me throughout my life," says Burns, a chemical engineering major who plans to attend medical school. Burns was one of more than a dozen undergraduates from across the country participating in the Steamboat Foundation's 10-week Summer Scholars Program, which supports students who show potential for becoming leaders in their chosen field. Designing compounds on co-op with Millennium Pharmaceuticals, a Cambridge, Massachusetts–based biopharmaceutical company, prepared Burns for his role at Dana-Farber. He created more than 100 molecules over two six-month co-ops. "I was doing cutting-edge chemistry with new reagents and new chemicals that scientists have just begun using in this decade," he says.

As a Civic Engagement Program scholar, Burns has volunteered at Brigham & Women's Hospital and tutored local high-school students at SquashBusters, an on-campus afterschool urban youth development program. "Two of the biggest reasons I chose to attend Northeastern were its co-op program and the Civic Engagement Program," Burns says. "It sounded like a perfect place to be, and I couldn't be happier."

Engineering Software Solutions

Anisha Kukreja **ORACLE**

In Redwood City, California, Anisha Kukreja works on business intelligence reporting-based solutions for Oracle. As a principal consultant for Oracle's web-based clinical trial data-management product in the Health Science Global Business Unit, she designs functional and technical workflow for clients' custom reports requirements. It was a "mini" enterprise resource planning (ERP) system that she designed and implemented in one of her information systems (IS) courses that helped her land a graduate co-op in software engineering at Phase Forward (now Oracle) in 2010. Being actively involved in one of the releases of the product—she designed and developed standard reporting software, and identified and fixed some of the existing deficiencies in the product's data warehouse—made her stand out. She was hired full-time upon completion of her co-op in August 2010.

Kukreja notes that the focus of the IS courses is to encourage students to continue to self-learn while discussing business aspects and real-world cases during technical sessions. This combination, with emphasis on problem solving in the business domain, provides engineers with the tools to understand the technology and the skills to apply and make use of the technology in the outside world. "More importance is given to designing a better and effective solution than just implementing an efficient one," says Kukreja, who earned a master's degree in information systems in 2010. "It makes an engineer realize that just implementing good code is not what it takes to solve a business problem. But it's important to know what the users are looking for and the issues they face in their day-to-day decision making."

Faculty Advancement
NEW LEADERS FOR THE FUTURE

Nadine Aubry was appointed dean of the College of Engineering, effective September 1, 2012. An accomplished engineering scholar, she has amassed a powerful set of experiences in leadership and innovation at the frontiers of engineering research and education. In 2011 she was elected a member of the National Academy of Engineering, one of the highest professional honors accorded an engineer. She comes to Northeastern from Carnegie Mellon University, where she was Raymond J. Lane Distinguished Professor, University Professor, and head of the Department of Mechanical Engineering. At Carnegie Mellon, among her accomplishments were restructuring the graduate program; establishing dual PhD programs with institutions in Asia; renovating and upgrading research and teaching laboratories; doubling the budget; expanding the study abroad program; and founding the International Service-Learning Engineering Initiative, an experiential-learning program.

Her groundbreaking contributions to fluid dynamics have earned her the distinction of Fellow of the American Society of Mechanical Engineers, the American Physical Society, the American Institute for Aeronautics and Astronautics, and the American Association for the Advancement of Science.

She received a Diplôme d'Ingénieur from the National Politechnic Institute of Grenoble, France, and a master's degree from the Scientific and Medical University in Grenoble. She earned a doctorate from the Sibley School of Mechanical and Aerospace Engineering at Cornell University.

Thomas Webster is the new chair of the Department of Chemical Engineering, coming to Northeastern from Brown University. His research explores the use of nanotechnology in numerous applications, specifically, the design, synthesis, and evaluation of nanophase materials as more effective biomedical devices. He is the founding editor in chief of the *International Journal on Nanomedicine*, and he serves on the editorial boards of several journals. His lab group has been exceptionally productive, generating more than 9 textbooks, 48 book chapters, 306 invited presentations, 403 peer-reviewed articles, and 32 provisional or full patents, some of which led to the formation of companies. He has been named a Fellow of the American Association of Nanomedicine and the American Institute for Medical and Biological Engineering.

Webster holds a BS in chemical engineering from the University of Pittsburgh and a master's and doctorate in biomedical engineering from Rensselaer Polytechnic Institute.

New Faculty

Steven Cranford, Assistant Professor, Civil and Environmental Engineering, focused his doctoral research on multiscale molecular dynamics and computational mechanical characterization of novel nanoscale systems, both synthetic and biological. He studied civil and structural engineering before joining the Laboratory of Atomistic and Molecular Mechanics at Massachusetts Institute of Technology, where he earned his doctorate.

Randall Erb, Assistant Professor, Mechanical and Industrial Engineering, focuses his research on structure/property relationships in composites and ceramics, magnetic manipulation, and colloidal physics. He has coauthored three book chapters, holds two patents, and has contributed to journals such as *Nature* and *Science*. He holds a PhD from Duke University and was a postdoctoral researcher at ETH in Zürich. He will join the Northeastern faculty in January 2013.

Yun Raymond Fu, Assistant Professor, Electrical and Computer Engineering, conducts interdisciplinary work in machine learning, social media analytics, human-computer interaction, and cyberphysical systems. He contributes to journals, books, and international conferences, and serves as associate editor and reviewer of several journals. He is a senior member of IEEE, a member of AAAI, and a life member of ACM, SPIE, and the Institute of Mathematical Statistics. He earned his PhD at the University of Illinois at Urbana-Champaign and spent two years as a scientist at Raytheon BBN Technologies.

Jacqueline Griffin, Assistant Professor, Mechanical and Industrial Engineering, develops mathematical models for multi-objective resource allocation in healthcare systems engineering. Her research includes applications in hospital operations, public health, and humanitarian logistics. She earned her PhD at Georgia Institute of Technology.

Yongmin Liu, Assistant Professor, Mechanical and Industrial Engineering and Electrical and Computer Engineering, researches nanoscale materials and engineering, nano photonics, nano devices, and nonlinear and quantum optics of metallic nanostructures. His research has been published in *Science*, *Nature*, *Nature Nanotechnology*, *Nature Communications*, *Physical Review Letters*, and *Nano Letters*. He received his PhD from the University of California, Berkeley.

Jörg Rügemer, Associate Professor, Civil and Environmental Engineering, has worked for both Frank O. Gehry and Bothe Richter Teherani; is an associate member of the American Institute of Architects; and has received 14 placements in international architectural and urban competitions. His research focuses on highly energy-efficient and cost-effective buildings, design strategies, and postoccupancy building monitoring. He holds an MArch from the Southern California Institute of Architecture and a Diplom-Ingenieur Architekt from the University of Applied Sciences in Cologne, Germany.

Two members of the National Academy of Engineering. Founding editor in chief of an international journal on nanotechnology. Author/coauthor of more than 400 technical publications. A former Raytheon scientist. Author of scientific articles published in the journals *Science* and *Nature*. These are the leaders who have joined the faculty of the College of Engineering in recent years and built upon the abundant talent already in place.

Matthias Ruth, Professor, Civil and Environmental Engineering, focuses his research on dynamic modeling of natural resource use, industrial and infrastructure systems analysis, and environmental economics and policy. His theoretical work draws from engineering, economics, and ecology, while his applied research utilizes methods of nonlinear dynamic modeling as well as adaptive and anticipatory management. He is a founder of *Ecological Economics*, serves on the boards of scientific organizations, and is a founding coeditor of *Urban Climate*. He holds a PhD from the University of Illinois at Urbana-Champaign.

Sandra Shefelbine, Associate Professor, Mechanical and Industrial Engineering, will be joining the faculty in January 2013. Her research explores bone biomechanics, particularly the multiscale mechanics of bone and how mechanical loads influence bone in growth, aging, and disease. She previously headed the bone biomechanics lab at Imperial College, London. She received a PhD in mechanical engineering from Stanford University and did postdoctoral research at the Institute for Biomechanics in Ulm, Germany, and in the Department of Radiology at the University of California in San Francisco.

Promotion

Nader Jalili, Professor, Mechanical and Industrial Engineering, directs Northeastern's Piezoactive Systems Laboratory, where multidisciplinary research is being conducted in piezoactive micro/nano systems with applications ranging from precision manipulation to imaging and sensing. He is author/coauthor of more than 300 peer-reviewed technical publications. A fellow of the American Society of Mechanical Engineers, his contributions include serving as general chair (2011) and program chair (2007) of ASME IDETC/CIE, associate editor of two ASME journals, and chair of several ASME technical committees. He has received national and international awards for his teaching, research activities, and leadership in professional services. He received his PhD from the University of Connecticut.

Tenure

Yunsi Fei, Associate Professor, Electrical and Computer Engineering, researches hardware-oriented security, mobile computing, underwater sensor networks, adaptable and efficient computer architecture, and integrated circuit and embedded system design automation. She received an NSF Faculty Early Career Development (CAREER) award and holds a PhD in electrical engineering from Princeton University.

Vinod Sahney, Professor, Mechanical and Industrial Engineering, focuses on applying the principles of systems engineering to optimize treatment, patient safety, and quality of care. He taught health policy and management at the Harvard School of Public Health and served as a senior executive of Blue Cross Blue Shield of Massachusetts and the Henry Ford Health System. He has been elected to both the Institute of Medicine and the National Academy of Engineering and has written more than 50 publications, including coauthoring *Reengineering Health Care: Building on CQI*. He earned a PhD from the University of Wisconsin, Madison.

Edmund Yeh, Associate Professor, Electrical and Computer Engineering, focuses on wireless network cybersecurity, future Internet architecture, network information theory and coding, smart power grids, network economics, and cross-layer optimization of wireless networks. He holds a PhD in electrical engineering and computer science from Massachusetts Institute of Technology. He received an Army Research Office Young Investigator Award.

Tenure and Promotion

Deniz Erdogmus, Associate Professor, Electrical and Computer Engineering, has expertise in information theoretic and nonparametric machine learning and adaptive signal processing, specifically focusing on cognitive signal processing, including brain interface and assistive technologies. He serves as associate editor of several publications, including *IEEE Transactions on Signal Processing*, *Transactions on Neural Networks*, *Signal Processing Letters*, and *Elsevier Neurocomputing*. He received a PhD from the University of Florida.

Andrew Gouldstone, Associate Professor, Mechanical and Industrial Engineering, focuses on the mechanics of heterogeneous systems, including sprayed coatings, rapidly quenched thin films, and lungs. His technique of choice to probe these systems is indentation, the topic of his 2005 NSF Faculty Early Career Development (CAREER) award. He earned a PhD at Massachusetts Institute of Technology, worked as an NIH postdoctoral fellow in the physiology program at the Harvard School of Public Health, and served on the faculty at Stony Brook University before joining Northeastern.

April Gu, Associate Professor, Civil and Environmental Engineering, focuses her research on application of biotechnology for water quality improvement; biological treatment processes and bioremediation; ecotoxicology and toxicity assessment; and biosensors for water quality monitoring. In 2009, she received an NSF Faculty Early Career Development (CAREER) award, and she was the recipient of the 2011 Søren Buus Outstanding Research Award from the College of Engineering. She recently was given the 2012 Excellence in Review Award from *Environmental Science & Technology* by the American Chemical Society. She earned a PhD at the University of Washington.

Rifat Sipahi, Associate Professor, Mechanical and Industrial Engineering, has been studying systems with time delays for more than a decade. He was the lead author of an overview paper presenting a dynamic snapshot of the field of control systems with time delays, which was featured on the cover of *IEEE Control Systems* magazine in February 2011. He earned a PhD at the University of Connecticut and was a postdoctoral fellow at Université de Tecnologie de Compiègne, in Compiègne, France.

NOTABLES

Patents

Ahmed Busnaina and **George Adams,** Mechanical and Industrial Engineering; **George McGruer,** Electrical and Computer Engineering
Bistable nanoswitch

Gregory Kowalski,
Mechanical and Industrial Engineering
Ultra-sensitive temperature sensing and calorimetry

Gregory Kowalski and **Jeff Ruberti,**
Mechanical and Industrial Engineering
Nanoloom for controlling polymer assembly

Constantine Mavroidis,
Mechanical and Industrial Engineering
Instrumented handle and pedal systems for use in rehabilitation, exercise, and training equipment
Gear-bearing drive
Electro-rheological fluid device for use in brakes and actuators
Virtual ankle and balance trainer system

Honors

Akram Alshawabkeh, Civil and Environmental Engineering, was named a Fellow of the American Society of Civil Engineers in recognition of his outstanding contributions to the profession.

Vincent Harris, Electrical and Computer Engineering, is among the world's most-cited scientists for the period from 2000 to 2010. His top 50 papers have been cited on average more than 44 times.

Nader Jalili, Mechanical and Industrial Engineering, was elected a Fellow of the American Society of Mechanical Engineers.

Brad Lehman, Electrical and Computer Engineering, was named by Princeton Review as one of the top 300 professors in the country influencing the lives of their students.

Matteo Rinaldi, Electrical and Computer Engineering, is the recipient of a $300K DARPA (Defense Advanced Research Projects Agency) Young Faculty Award.

Papers, Publications, Journals

Anand Asthagiri, Chemical Engineering, was featured in *Biophysical Journal* for his work in determining the effect of growth factors on cell-cell adhesion.

Auroop Ganguly, Civil and Environmental Engineering, had his paper about rainfall extremes over India published in the February 2012 issue of *Nature Climate Change*; his work is highlighted on the National Science Foundation website.

April Gu, Civil and Environmental Engineering, is a recipient of the 2012 *Environmental Science & Technology* Excellence in Review Award for her contributions to the journal over the past year.

Surendra Gupta, Mechanical and Industrial Engineering, has published a book titled *Green Supply Chain Management: Product Life Cycle Approach*, which was selected as Book of the Month by *Industrial Engineer* magazine.

Beverly Jaeger, Richard Whalen, Susan Freeman, and **Stanley Forman** won Best Paper at the 2012 ASEE Annual Conference, for "Service-Learning vs. Learning Service in First-Year Engineering: If We Cannot Conduct First-Hand Service Projects, Is It Still of Value?"

Laura Lewis, Chemical Engineering, was featured in *National Geographic* for her work with ARPA-E in creating a rare earth–free magnet currently found only in meteorites.

Hameed Metghalchi, Mechanical and Industrial Engineering, became editor in chief of the ASME *Journal of Energy Resources Technology* on January 1, 2012.

Ashkan Vaziri, Mechanical and Industrial Engineering, was featured on physicsworld.com for research published in *Physical Review Letters* on his work in determining the wrinkling properties of pressurized elastic membranes under tension.

Ron Willey, Chemical Engineering, received the Bill Doyle Best Paper Award at the 2012 AIChE Loss Prevention Symposium, for modeling a 2007 reactor explosion at T2.

Mishac Yegian and **Akram Alshawabkeh,** Civil and Environmental Engineering, were featured in *Civil Engineering* for their upcoming field tests using induced partial saturation (IPS) to prevent soil liquefaction during earthquakes.

NSF CAREER Awards

Ashkan Vaziri, *Mechanical and Industrial Engineering, has received a $400K National Science Foundation CAREER grant for his work developing predictive theoretical and computational methods to understand the mechanical deformation of biomimetic systems and for performing detailed experiments at the micro- and the nanoscale. The creation of new knowledge about the mechanics of biomimetic materials is expected to have broad implications in the development of multifunctional materials, surface engineering and coatings, tissue engineering, nanotechnology, and optics.*

Deniz Erdogmus, *Electrical and Computer Engineering, has been awarded a five-year, $505K National Science Foundation CAREER grant for his work in signal models, channel capacity, and information rate for noninvasive brain interfaces. This award will support his research aimed at improving current brain-computer interface technology to enable people with severe speech and physical impairments to live independent and productive lives.*

Dear Alumni and Friends,

Over a century ago, the College of Engineering was the first of Northeastern's schools to adopt the signature cooperative education program. Today, more of our students than ever before participate in co-op and experiential learning—in professional work, research, and service. Through distinctive initiatives, we are providing a robust platform for empowering talented scholars to address global challenges in key areas of health, security, and sustainability.

Under the new leadership of Dean Nadine Aubry, the College of Engineering is making strategic investments to position Northeastern as a leading use-inspired research university. Our superior educational model, state-of-the-art facilities, and pioneering partnerships with industry, government, and other academic institutions all contribute to excellent end results: Because of their Northeastern degrees, engineering students and alumni are securing competitive employment offers and are creating job opportunities worldwide. During this academic year, we look to continue our momentum through the support of university leaders, alumni engagement, and a promise to advance the college's rich ecosystem of entrepreneurship and innovation.

With an abiding commitment to teaching and research, the College of Engineering is solidifying its status within the top tier of the world's engineering schools. As you read more about the achievements of our students and faculty, and the inspiring stories of generosity in these pages, I encourage you to consider how you or your organization can connect with, engage with, and further support the college and Northeastern. With our alumni, faculty, and leadership acting in alignment, the possibilities are limitless.

MaeLynn Patten
Director of Development and Alumni Affairs
College of Engineering

Learn how you can support Northeastern and the College of Engineering through a planned gift. Please visit, **www.northeastern.edu/giftplanning**, *or contact* **Owen Devine**, *gift planning officer, at* **617.373.7951** *or* **giftplanning@neu.edu**.

Benefactors

The following donors are College of Engineering alumni who have made a lifetime commitment of $1 million or more to Northeastern University, or friends who have made a $1 million or higher lifetime commitment to the College of Engineering, by June 30, 2012.

Leora Beaton
William DiPietro, E'42
Edward G. Galante, E'73
Francis A. Gicca, ME'59
Bernard M. Gordon, H'07, and Sophia Gordon
James W. Healy, E'54
Carl R. Hurtig, E'48, H'74
George S. Kariotis, E'44, H'88
George J. Kostas, E'43, H'07
Farla Krentzman
Irving M. Levine, E'57
Richard Lord, E'74
Anthony R. Manganaro, E'67, H'08
Roger M. Marino, E'61, H'96
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Anonymous

The following donors are College of Engineering alumni currently in the Huntington Society or donors whose gift in support of the college qualifies for Huntington Society membership. Huntington Society members are Benefactors or have committed $100,000 or more within a single year; the membership period is five years.

Paul G. Burda, E'64, UC'69
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William DiPietro, E'42
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Arthur Zafiropoulo

California resident Arthur "Art" Zafiropoulo was born and raised in Medford, Massachusetts, to parents who had come to the United States from Greece and passed on a genetic inclination for engineering and the value of hard work. Today, Zafiropoulo is the CEO and chairman of Ultratech, an award-winning Silicon Valley–based company that develops, manufactures, and markets photolithography and laser thermal processing. Founded in 1979, Ultratech is a leader in advanced packaging and laser processing.

In 2011, through his $2.5 million contribution to Northeastern, the Art Zafiropoulo Endowed Chair in Engineering was established. It is a testament to his abiding dedication and commitment to supporting the college. "The fundamental strength of a research university begins with recruiting and retaining professors who are dedicated to transforming the lives of students through teaching and research," Zafiropoulo says. "I think it's important that Northeastern have the resources it needs to attract the best students. That begins with attracting the best faculty."

Zafiropoulo's convictions about philanthropy show his appreciation for the education he received and for the path his life has taken. "We did not have a lot growing up; however, we always had access to good schooling. Today I give back for the many rewards I've received. The future of individual lives, and the future of our nation, depends on quality education."

By endowing a chair, Zafiropoulo has created a lasting legacy that links his name in perpetuity to excellence in research and teaching. He encourages others to follow his lead, "This gift is a small step toward making a large impact. I hope others will take this step with me."

William DiPietro

Although William DiPietro graduated from Northeastern's chemical engineering program 70 years ago, his presence and legacy continue to inspire and support students and faculty. The founder and president of Vacuum Specialties, Spectro-Film, and TEK Specialties, Inc., DiPietro has donated generously to his alma mater, helping to solidify the College of Engineering as one of the most competitive programs in the country.

The Massachusetts native attributes his confidence and work ethic to concepts he acquired while attending Northeastern. "I was always a little anxious to approach new challenges," he says. "My early training and co-op work experiences convinced me to work harder, and ultimately made me a better student."

Among his contributions are the William O. DiPietro Scholarship (1967), the William O. DiPietro Engineering Legacy Scholarship (2000), and the endowed DiPietro Engineering Scholarship (2006). To support junior chemical engineering faculty, he established the William O. DiPietro Professorship in 1988. The current DiPietro Assistant Professor is Edgar Goluch, who is working on the development of detection strategies tailored for the micro- and the nanoscale, with emphasis on biological systems. "Mr. DiPietro's funding has allowed numerous experiments and critically needed preliminary results to compete for external funds," Goluch says.

In addition, two Northeastern facilities bear the DiPietro name: the DiPietro Solid State Electronics Laboratory in the Dana building (1975) and the DiPietro Laboratory in the Snell Engineering building (1984). For his contributions and commitment, DiPietro was presented the Outstanding Engineering Alumnus Award in 2000.

Edgar Goluch (left) with William DiPietro

Did You Know that the Wireless Club W1KBN is Northeastern's oldest campus student organization? Founded in 1922, it's still going strong today. Alumni interested in learning about the club or in renewing and starting "connections" are encouraged to go to www.wireless.neu.edu or to contact club advisors **Michael Silevitch (K1PEV), m. silevitch@neu.edu,** or **David Potter (K1MBO), d.potter@neu.edu.**

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