

ENGINEERING @

Northeastern

WINTER 2013-14



SECURING THE FUTURE

One of just 12 universities nationwide to lead a Department of Homeland Security Center of Excellence, Northeastern Engineering has established itself as a dominant force in the security domain.

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EXPERTS P. 12

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PHILANTHROPY P. 20

Northeastern University
College of Engineering



northeastern

College of Engineering

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MESSAGE FROM THE DEAN

Dear Friends,

The publication of this edition of *Engineering @ Northeastern* marks an important milestone—my first full year as dean of the College of Engineering. As 2013 draws to a close, I can proudly say that it has been a tremendous year.

The college has continued its strong momentum on every front, as evidenced by the statistics on the facing page. Our feature story on security (see page 4) also reflects this upward trend. Northeastern Engineering is consistently recognized for its innovative security research, as well as for the contributions that our educational and professional development programs make to industry and government. The renewal of ALERT as a national Center of Excellence is a particular highlight; Northeastern is just one of 12 US universities awarded this distinction by the Department of Homeland Security.

Our success stems from a sustained commitment to—and investment in—the Northeastern Engineering experience. A key to this effort is the philanthropic support our alumni provide, most recently through Northeastern’s billion-dollar *Empower* fundraising campaign, launched in 2013 to support students, faculty, and research innovation. Their generosity is advancing the goals and dreams of the next generation of engineers. For example, the Michael J. and Ann Sherman Center for Engineering Entrepreneurship Education, launched last fall, will elevate our students’ engineering skills and business savvy (see page 21).

We also continue to transform our research infrastructure to maintain Northeastern’s innovation leadership. A 220,000-square-foot interdisciplinary science and engineering building, scheduled to open in 2016, will provide state-of-the-art labs and meeting spaces that foster collaboration across disciplines and enhance student opportunities for research. I invite you to take a virtual walk through the new facility at northeastern.edu/iseb.

These are just some of the exciting developments within the college, with many more in store for 2014 and beyond. I hope you find this issue of *Engineering @ Northeastern* enlightening, and I look forward to sharing our future successes.

Sincerely,

Nadine Aubry
Dean of Engineering
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vital statistics: 2013 Accomplishments

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As security challenges grow in breadth and complexity, Northeastern Engineering takes a leadership stance.

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53 fellows of national professional societies, including the American Society of Mechanical Engineers (**13**), Institute of Electrical and Electronics Engineers (**12**), and National Academy of Engineering (**3**)

30 prestigious Young Investigator Awards received by current faculty, including one Presidential Award

53 faculty hires since 2008, including **12** in 2013

} faculty

1427: average SAT score of incoming freshman class, up **125** points since 2008

2956 undergraduates, up **45%** since 2008

2007 graduate students, up **85%** since 2008

\$10.1 MILLION: total new philanthropic gifts and pledges directed to the College of Engineering from **2,307** alumni, parents, faculty, staff, and friends

} students & alumni

8 federally funded multi-university research centers

105 patent applications filed, up **20%** in one year

} research & innovation

SECURING THE FUTURE

AT NORTHEASTERN, SECURITY IS MORE THAN JUST THE LATEST BUZZWORD.

Security is a critically important concept that brings together diverse teams of faculty and student researchers from across the College of Engineering. Working collaboratively with one another—as well as with government agencies, academic institutions, and leading corporations—they are pioneering new concepts that help predict, prevent, and recover from a range of unexpected, potentially devastating events.



WHEN MOST OF US HEAR THE WORD “SECURITY,” WE THINK OF UNIFORMED GUARDS, AIRPORT SCANNERS, OR TERRORIST ATTACKS SUCH AS 9/11 AND THE BOSTON MARATHON BOMBINGS.

While physical safety is one definition of security, experts agree that true security is an even broader concern, covering emerging threats as well. For example, leading cybersecurity researchers are figuring out new ways to combat online attacks, which can range from consumer identity theft to the breaching of military databases. According to a recent report from McAfee and the Center for Strategic and International Studies, such attacks may represent a \$500 billion annual cost to the global economy in the form of lost intellectual property, increased insurance expenses, recovery processes, and reputation damage.

There is also a growing area of security research focused on protecting people, physical structures, and natural resources from the devastating effects of natural disasters such as floods, hurricanes, and tornados. As climate change accelerates and these events occur with greater frequency, equal energy is being focused on disaster recovery and the preventative steps that can be taken to minimize damage and protect human life. As the global population reaches 9 billion by 2050—with many people living in poor, underdeveloped regions that are vulnerable to weather events—there is a critical need to protect food and water sources before disaster strikes.

In the area of security research that grabs the most headlines—terrorist attacks—experts are focusing on next-generation technologies that go beyond traditional body scanners and video surveillance tools. Leaders in this field are developing increasingly sophisticated technologies that detect unusual human behaviors that might signal an attack, as well as creating a stronger physical infrastructure that increases resilience when an act of terrorism does occur. With worldwide terrorism incidents increasing dramatically since 2006, researchers are focusing their energies on surprising new ways to predict and mitigate these events.

As these security threats grow in both diversity and frequency, industry and government are growing increasingly concerned. The White House Office of Science and Technology Policy, the Federal Reserve, and the National Association of Manufacturers are just a few of the key players actively driving security policy and investment at the enterprise, state, and national levels.

Within this climate of pressing challenges, one fact remains unchanged: the College of Engineering at Northeastern is an established global center for advanced research and development in this field.

Northeastern: Safety in Numbers

Across every engineering department, Northeastern faculty, researchers, and students are leading the global security community. In fact, Northeastern Engineering boasts more than 35 faculty focused on security research in key disciplines such as materials, data informatics and video analytics, sensing and imaging, and cyber-physical systems.

Why has Northeastern Engineering emerged as a leader in the global security industry? There are a number of reasons. The strong multidisciplinary focus of the university makes it easy to bring together world-leading experts in the diverse fields needed to study this complex topic—including engineering, physics, economics, management, public policy, computer science, and psychology.

“The collaborative culture within the university encourages our research teams in the College of Engineering to reach beyond traditional boundaries and access the expertise they need—whether it exists in another academic department, another college, a government agency, or a corporate think tank,” says Nadine Aubry, Dean of the College of Engineering.

ALERT Center of Excellence Renewed by Department of Homeland Security, One of Just 12 in Nation With This Distinction

Since 2008, the Awareness and Localization of Explosives-Related Threats (ALERT) Center of Excellence has been a flagship of Northeastern Engineering’s strength in security research and education. Among the many ALERT success stories is its collaboration with the Transportation Security Administration (TSA), which has worked closely to test and validate ALERT’s surveillance technologies such as those developed by **Octavia Camps** (see page 11). This work has not gone unnoticed; last summer ALERT researchers briefed TSA Administrator **John Pistole** on their progress (background photo), and received an award for research and innovation from **Michael Young**, Federal Security Director of the Ohio Transportation Security Administration.

In August 2013, ALERT was again chosen by the Department of Homeland Security (DHS) as the Center of Excellence for explosives detection, demonstrating the federal agency’s confidence in Northeastern Engineering. With DHS backing (including **funding of \$18.5 million over five years**), ALERT Director and Electrical and Computer Engineering Professor **Michael Silevitch** will lead a team of researchers from a dozen institutions around the country. Working with government and industry, the ALERT team will continue to effectively respond to the challenges of this mission-critical area.

Learn more at northeastern.edu/alert

SECURING THE FUTURE *continued*

“As security issues increase in complexity, traditional approaches no longer apply,” Aubry continues. “We need to assemble new, more diverse teams that leverage our collective expertise to tackle such sophisticated challenges as national resource protection, data security, disaster recovery, and the identification and tracking of terrorism suspects. The multidisciplinary culture we’ve created in the College of Engineering is the perfect environment to develop the truly innovative solutions needed to address this critical challenge—and safeguard the world’s population.”

The landmark research taking place at Northeastern has resulted in the creation of a number of internationally recognized centers of excellence in security research. For example, the US Department of Homeland Security (DHS) recently announced **the renewal of Northeastern’s Awareness and Localization of Explosives Related Threats (ALERT) Center as a DHS Center of Excellence** (see sidebar, page 5).

Northeastern also enjoys close partnerships with—and close physical proximity to—businesses that lead the global security industry. Fostered in part by Northeastern’s George J. Kostas Research Institute for Homeland Security (see sidebar below), researchers in the College of Engineering have partnered with companies such as Raytheon and Rogers Corporation to develop game-changing security innovations. These exciting collaborations have only added to Northeastern’s reputation as an international powerhouse of security research and development.

Finally, the College of Engineering at Northeastern has created one of the world’s most robust training grounds for tomorrow’s security thought leaders. In 2012, Northeastern was recognized as a **National**

Center of Academic Excellence in Cyber Operations by the National Security Agency for its ability to provide students with the advanced technical training and skills they need to tackle emerging cyber threats. Northeastern is only one of four universities nationwide to earn this distinction.

Northeastern has also been selected as a **National Center of Academic Excellence in Information Assurance Research by the US Department of Homeland Security and the National Security Agency**. Masters and PhD programs in Information Assurance are helping to secure the global information grid by providing students with information assurance expertise from a variety of relevant disciplines, including engineering.

Attacking Security Challenges on All Fronts

In the following pages, you’ll learn more about the committed efforts of faculty, researchers, and students from across the College of Engineering to combat the increasingly complex problem of security. While these efforts deserve our attention and commendation, they represent only a small fraction of the groundbreaking research happening every day, across the college, that is helping to increase our shared understanding of security-related issues.

You can expect these and numerous other research developments at Northeastern to impact your own security in the future—in ways both large and small, hidden and visible. Whether you are online, in the air, or on the ground, research happening today in the College of Engineering promises to make you safer tomorrow. ■

Northeastern’s Kostas Research Institute: Advancing Security, Enhancing Partnerships

Founded in 2011 by a generous gift from alumnus **George J. Kostas**, E’43, H’07, and his family, the Kostas Research Institute (KRI) is a linchpin of Northeastern’s interdisciplinary, collaborative approach to security research. This approach is reinforced by the broad experience of KRI leadership, including Co-Directors **Peter Boynton** (former commissioner of the Connecticut Department of Emergency Management and Homeland Security) and **Steve Flynn** (former president of the Center for National Policy), as well as **David Luzzi** (former dean of engineering and chair of the Air Force Office of Scientific Research Scientific Advisory Board) who was tapped to direct Northeastern’s strategic security initiative in 2011.

What sets KRI apart as a strategic asset for Northeastern is its unique ability to co-locate university and industry researchers together in one facility to address security-related challenges. The most recent firm to take advantage of this feature is Rogers Corporation, which has established the Rogers Innovation Center at KRI. Drawing on the dual strengths of Northeastern and Rogers—a global leader in advanced materials and components for consumer and power electronics, transportation, telecommunications, and defense systems—the 4,000-square-foot Rogers Innovation Center will accelerate the transition of basic security research to application and commercialization. Rogers will also fund basic research housed at KRI, such as the specialty magnetic materials work being done by Engineering Professors **Vincent Harris** and **Nian Sun**.

Using the convening authority that comes from its collaborative environment, KRI has hosted dozens of meetings that bring together the security community, such as the first Materials Genome Initiative New England Regional Workshop (October 2013, jointly organized with the White House Office of Science and Technology Policy) and New England Chapter of the National Defense Industrial Association.

“One of the college’s greatest strengths is its research environment, which gives faculty, students, and researchers a platform for innovation and knowledge creation. Because of George Kostas, we now have a facility that builds on this strength and declares Northeastern’s leadership in the cutting edge field of homeland security.”

— Nadine Aubry, Dean of Engineering

Auroop Ganguly

Stronger Resilience to a Changing Climate

Auroop Ganguly is confounded by the way many people discuss climate change. “For some reason, it’s a topic that’s driven by passion and emotion instead of being based on rational, scientific study” he says.

Yet, according to Ganguly, an Associate Professor of Civil and Environmental Engineering, this fact-based approach is exactly what’s needed to adequately prepare for future impacts such as temperature extremes, sea level rise, melting polar ice caps, water scarcity, and more frequent hurricanes. Ganguly’s research sponsors in military and government agencies—such as the Department of Defense, Nuclear Regulatory Commission, and Department of Energy—have clearly articulated this need. Because of recent events, there is also a growing public demand to understand and anticipate future climate trends.

“Hurricane Sandy was a wake-up call for many people, because it demonstrated the real, potentially devastating effects of natural forces. It also brought the issues of adequate preparedness and resilience to the forefront,” says Ganguly, who joined Northeastern from Oak Ridge National Laboratory, where he was a senior member of the research staff. “We can’t make informed decisions about how to engineer transportation systems and other physical infrastructures—or ensure water, food, and energy security—without a scientific basis.”

Ganguly’s nationally recognized Sustainability and Data Sciences (SDS) Lab develops novel ways to address knowledge gaps in climate change preparedness and policy. In his research—which has been published in *Nature Climate Change* and other respected scientific journals—Ganguly leverages the power of data, statistics, models, and physics to develop practical insights that can form the basis for action. However, this is a complex challenge.

“In modeling future weather hazards under changing climate conditions, I am studying processes that are both unpredictable and complex, and increasingly so over space and time. In addition, the data from remote sensors and computer models is massive and growing,” Ganguly explains. “Based on this enormous data volume—and despite the large element of uncertainty—I try to extract credible insights about climate change from potentially elusive indicators. My success is measured by the degree to which these insights can inform critical policy and preparedness decisions.”

RE·SIL·IENCE (noun)

the ability of a system to return to its original state after being disturbed

“I’ve been trained as a civil engineer, in hydrology and climate, and in computational data sciences. My professional experience spans academia, the private sector, and a government lab. My work at Northeastern brings all that background to bear,” says Ganguly. “To ensure the security of our planet under multiple stressors such as climate, land use, and population change, we need to fill critical ‘science gaps’ and provide a basis for intelligent decisions. At its heart, addressing these national and global priorities is the ultimate goal of my research.” ■



Yunsi Fei

Building Safer, Stronger Hardware

Today's proliferation of viruses and malware has created widespread awareness of the need to build secure software. However, few of us consider the security of the hardware systems that underlie not only our personal computers, but also our home security systems, automotive electronics, bank cards, and other components of our everyday lives.

To prevent our most personal information—such as account numbers, Social Security numbers, and access passwords—from being immediately visible, all of these technologies include an underlying code that scrambles this data. Known as a cryptographic operation, the code embedded in these systems is itself vulnerable to a new type of crime: side-channel attacks.

What are side-channel attacks? **Yunsi Fei**, Associate Professor of Electrical and Computer Engineering, explains, “As a computer chip carries out a critical encryption operation—such as storing your PIN code or password—unfortunately, it is whispering or leaking secret related information. Even weak signals can still be captured and exploited by sophisticated adversaries. Once hackers have this coded information, they carry out mathematical analysis to infer the secret key embedded in the hardware that is hiding your private information. This analysis attack can be done in a matter of minutes.”

“There are cybercriminals around the world who are, right this minute, attempting to figure out our personal secret information,” adds Fei. “If they succeed in unlocking this code, suddenly they have instant access to our homes, cars, and bank accounts. They can also steal our identities—an invisible crime which can take years to discover.”

In her Energy-Efficient and Secure Systems Lab, Fei concentrates on building embedded hardware systems that resist side-channel attacks. By quantitatively modeling various systems and modes of attack, she can understand their interactions and create hardware safeguards. Fei's detailed mathematical models reveal the critical operating parameters that underlie hardware functionality—pinpointing weaknesses that might let an attacker in.

Recognizing the critical importance of her work, the National Science Foundation recently awarded Fei and her co-investigators two three-year grants—an \$800,000 research grant and a \$500,000 development grant from the highly competitive Major Research Instrumentation Program. This funding will lead to both a fundamental understanding of hardware systems' weaknesses, as well as the development of a completely unique instrument that will allow hardware security researchers to test their systems' security from anywhere in the US.

MAL·WARE (noun):
Malicious computer software that interferes with normal computer functions

Fei happily acknowledges that, if her research is successful, its results will be invisible—but yet important to most people. “All of us open our garage doors, start our cars, or retrieve cash from the ATM machine without ever considering the hardware functionality that underlies all these activities,” says Fei. “While my new security measures may not be noticed, it's gratifying to think that I may be saving millions of people from unseen cyber attacks every day.” ■



Engin Kirda

Thinking Like a Hacker

From mass thefts of consumer credit card data to the WikiLeaks scandal, few topics today generate as much buzz as cybersecurity. While entire industries have sprung up to combat computer viruses, database hacking, identity theft, and other cybercrimes, Engin Kirda applies a novel approach: looking inside the mind of a hacker to prevent many of these crimes before they occur.

Kirda is the Director of Northeastern's Institute for Information Assurance, as well as the Sy and Laurie Sternberg Associate Professor for Information Assurance. With joint appointments in Computer and Information Science and Electrical and Computer Engineering, he brings a multidisciplinary approach to cybercrime that reflects the complexity of this issue.

"Of course, cybersecurity has many technical aspects, such as finding and exploiting the vulnerabilities in a computer program," says Kirda. "But there is a human component as well, which makes cybersecurity a thrilling intellectual challenge. What is the motivation of hackers? Why do people click on certain links, but not others? Making the online world safer means addressing both technology and human behavior."

Kirda's ongoing research in his Secure Systems Lab has helped him to understand, and thwart, the efforts of cybercriminals. With funding from the Department of Defense, Symantec Corporation, and others, he has developed several software products that automatically address online threats. Kirda's most recent research looks at how Android apps on employees' personal smartphones might provide a gateway to highly sensitive government and corporate networks.

To prepare the next generation of cybersleuths, Kirda teaches a popular class in which Northeastern students learn how to think like hackers, even launching attacks on computer networks that are specially constructed for the course. Says Kirda, "We look at hacking case studies and ask ourselves, 'What vulnerabilities were

exploited? How could the attack have been prevented via better technology or user education?' We also try to replicate the actual crime."

According to Kirda, hackers are becoming increasingly sophisticated, as well as more ambitious in the scope of their attacks. More and more *Fortune* 500 companies are being targeted by advanced, coordinated attacks.

"Today, everything is connected, which makes everyone potentially vulnerable," Kirda notes. "With the advent of social media and online shopping, people are putting their entire lives on the Internet. Companies like Lockheed Martin have billions of dollars in intellectual property residing on their mainframes. We have national resources like nuclear reactors that are increasingly controlled by computer systems. This problem is not going away. In fact, it's only going to grow. To manage cybercrime, we need to stay one step ahead of attackers—and put practical safeguards in place that are based on their proven patterns of behavior." ■

HACK (verb):

To gain access to a computer file or network illegally or without authorization



Jose Martinez-Lorenzo

Detecting Suicide Bombers

Around the world, there has been a well-publicized growth in the incidence of suicide bombings. In a crowded public space, it is extremely challenging to detect an individual wearing a improvised explosive device (IED) who is intent on inflicting mass injuries such as the Boston Marathon bombers, who carried their bombs in backpacks through the crowd.

Creating innovative IED detection methods is the focus of **Jose Martinez-Lorenzo**, an Assistant Professor with dual appointments in the Department of Mechanical and Industrial Engineering and the Department of Electrical and Computer Engineering.

“It’s relatively easy to identify an explosive device when someone is standing inside a body scanner or walking through a metal detector—because radar is being applied to a willing subject, at a near distance,” says Martinez-Lorenzo. “The challenge with suicide bombers is that they place themselves in crowded public areas where they can easily hide themselves. Clearly, we need new scanning systems that are capable of detecting devices over large areas, at a great distance.”

In his Mechanical and Electromagnetic Waves Lab—and in collaboration with his colleagues from the DHS Center of Excellence ALERT at Northeastern—Martinez-Lorenzo is investigating the use of millimeter-wave radar to detect body-worn IEDs at distances up to 50 meters.

PAS·SIVE SCAN·NING
(verb)
using an array of
transmitting/receiving
antennas to visualize
people at a
distance

Using specially designed mirrors and long-range millimeter-wave radar signals, Martinez-Lorenzo is able to obtain information about people within a public space from different angles. The millimeter-wave mirrors act as artificial surfaces that enhance the ability of the radar system to detect security threats.

In addition to customized mirrors, Martinez-Lorenzo uses data-processing software equipped with novel “compressive sensing” algorithms, which analyze the return signals using a minimal amount of data, flag the potential presence of an individual wearing an explosive device, and generate a three-dimensional radar image that identifies where on the body the device is located. This detection is possible because the features associated with human flesh or clothing in a radar image are different than those of an IED, which is typically constructed of cylindrical metal pipes or explosives like TNT. Preliminary computational simulations have shown promising results.

As Martinez-Lorenzo perfects the use of millimeter-wave radar for this application, he is already looking ahead to next-generation ways to employ the technology. A series of radar systems operating with multiple mirrors acting as artificial surfaces could be linked together and combined with other technologies—like the video analytics being developed by **Octavia Camps** and other ALERT colleagues (see page 11)—to provide protection over a much broader area and track potential terrorists as they move. Martinez-Lorenzo recently received funding from the National Oceanic and Atmospheric Administration (NOAA), teaming with researchers at MIT to extend this work to broader environmental monitoring. Says Martinez-Lorenzo, “This emerging network of physical security systems could be a critical new weapon in the global war against terrorism.” ■





Octavia Camps

Making Airports Safer

We're all familiar with the stringent safety measures provided by the US Transportation Security Administration (TSA) when we enter the secure boarding area of an airport. It's impossible to miss the ID checks, luggage screens, and full-body scans.

But have you ever noticed the TSA officer silently holding the door open as you *exit* the secure zone after your flight? The critical job of this officer is to prevent anyone from entering through this door. There is also a security camera trained on this area, with another TSA guard in a distant control room monitoring the live feed.

While most people fail to notice the security protocols, protecting this exit is high on the agenda of **Octavia Camps**, Professor of Electrical and Computer Engineering. "The current tools rely on human surveillance, which is fallible," says Camps. "It's very easy for humans to become bored or distracted after hours of the same activity—so there is a real risk that they will miss an event of importance."

Funded through the ALERT Center, as well as the National Science Foundation and the Department of Defense, Camps' research is based on a simple but incredibly valuable premise: complement human efforts with intelligent video surveillance tools that

SUR·VEIL·LANCE (noun)

a watch kept over
a person or group,
especially a
suspect

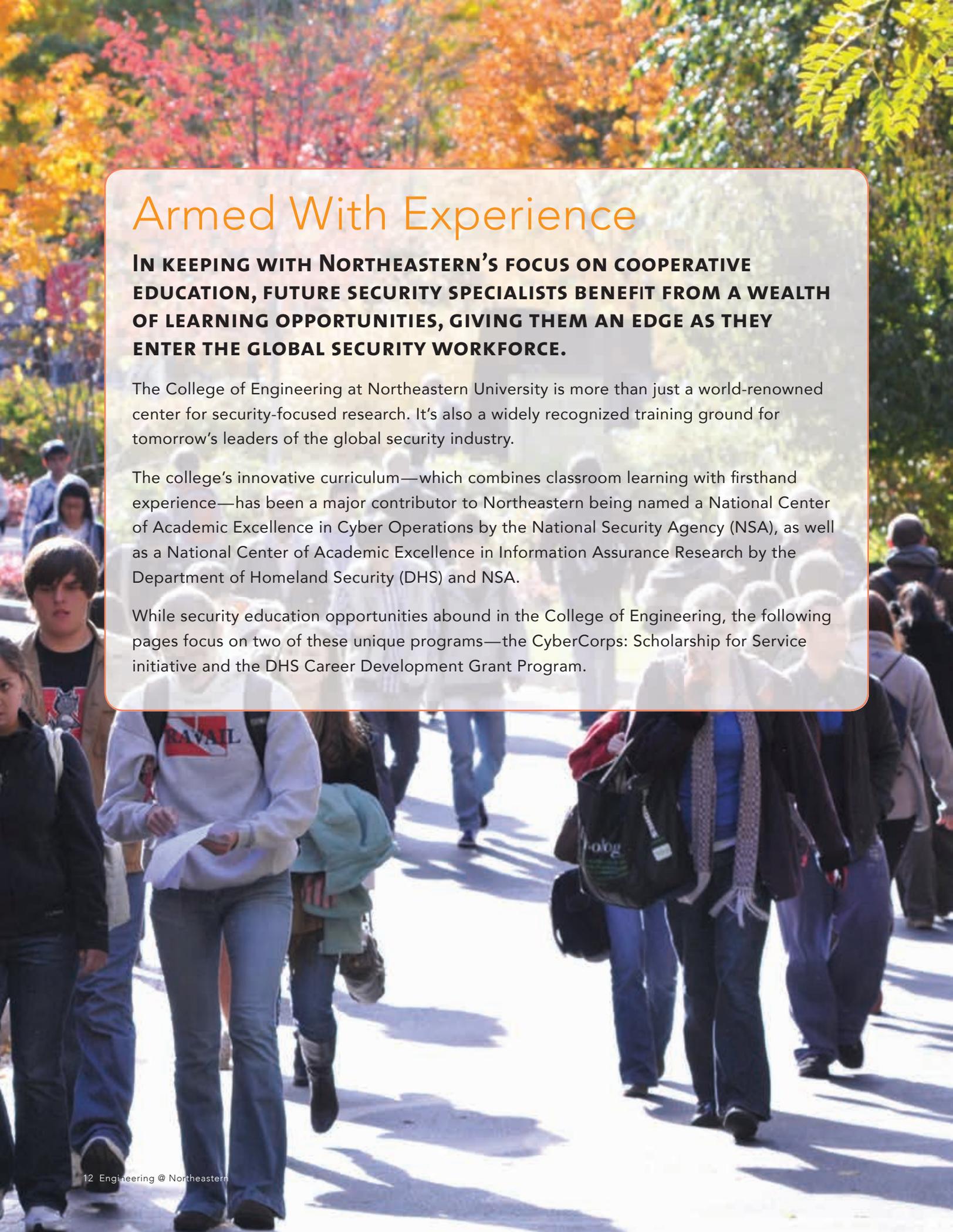
mathematically detect people moving toward the exit door. Because such tools rely on objective algorithms—not subjective observation—there is a much greater probability that they will identify abnormal behavior, even across hours of repetitive footage. These smart tools identify any movement toward the exits in real time, then immediately alert TSA agents who can intervene before the door is breached.

"In the wake of the Boston Marathon bombings, we saw firsthand the power of the network of video cameras that exist all around us today," says Camps. "The bombers were identified based on their appearance in passive surveillance video—but unfortunately this retrospective process required hours of forensic investigation. My research transforms our existing video cameras into smart, proactive tools that flag suspicious behavior at a very early stage."

Camps' innovative surveillance system is already installed at Cleveland Hopkins International Airport, where it has undergone rigorous testing by the TSA. As this technology moves toward global adoption, Camps is already investigating the next phase: networked cameras that follow flagged individuals over time. "Imagine a team of smart cameras, communicating with one another as a suspicious person moves through an airport—exponentially increasing the safety of this large public space," says Camps.

"It's incredibly rewarding for me to work on an issue that is obviously of critical importance to millions of air passengers every day—and has broad implications for public safety outside airports as well," Camps concludes. ■





Armed With Experience

IN KEEPING WITH NORTHEASTERN'S FOCUS ON COOPERATIVE EDUCATION, FUTURE SECURITY SPECIALISTS BENEFIT FROM A WEALTH OF LEARNING OPPORTUNITIES, GIVING THEM AN EDGE AS THEY ENTER THE GLOBAL SECURITY WORKFORCE.

The College of Engineering at Northeastern University is more than just a world-renowned center for security-focused research. It's also a widely recognized training ground for tomorrow's leaders of the global security industry.

The college's innovative curriculum—which combines classroom learning with firsthand experience—has been a major contributor to Northeastern being named a National Center of Academic Excellence in Cyber Operations by the National Security Agency (NSA), as well as a National Center of Academic Excellence in Information Assurance Research by the Department of Homeland Security (DHS) and NSA.

While security education opportunities abound in the College of Engineering, the following pages focus on two of these unique programs—the CyberCorps: Scholarship for Service initiative and the DHS Career Development Grant Program.

CyberCorps: Filling a Critical Talent Gap

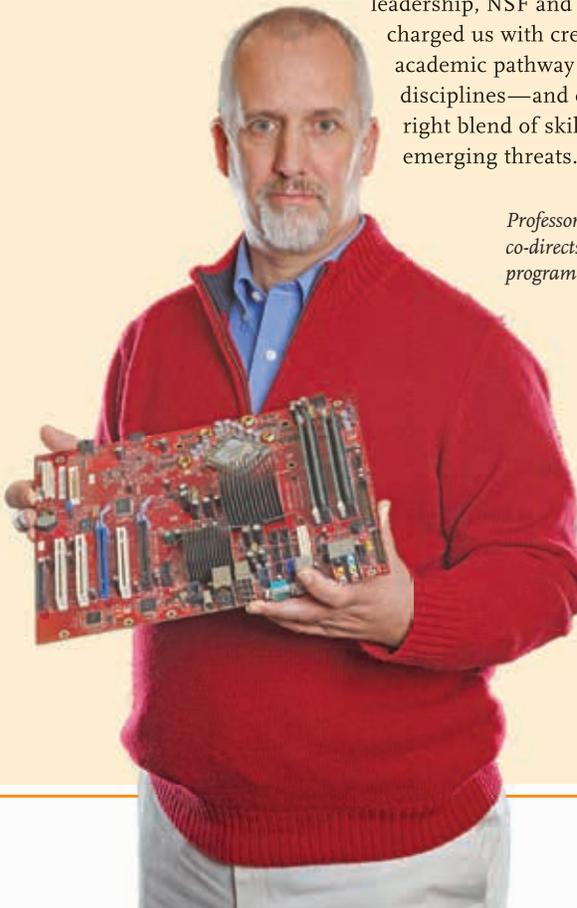
In the face of growing acts of online terrorism and cybercrime, the US government is struggling to recruit a new generation of security experts who can defend our nation's most critical information assets. To address its current shortage of qualified applicants, the US Office of Personnel Management (OPM) has created an innovative program called CyberCorps: Scholarship for Service.

CyberCorps scholarships are funded through highly competitive grants awarded by the National Science Foundation (NSF). In 2012, Northeastern received a \$4.5 million NSF grant to extend its scholarship program in information assurance—the second time Northeastern has won a CyberCorps grant and a testimonial to the reputation of the university's program.

Through this initiative, students at Northeastern's Department of Electrical and Computer Engineering (ECE) and the College of Computer and Information Science receive full-tuition scholarships to study security-related topics. In return for each year of financial support, students must work for a year in an information assurance related government job following graduation. About 20 participants in the CyberCorps program at Northeastern—including Idriys Harris and Antonio Rufo, profiled at right—combine classwork in technology topics such as hardware security with hands-on work experience.

"It's challenging to train a new generation of security professionals, simply because the field is so multidisciplinary," says ECE Professor **David Kaeli**. "In recognition of Northeastern's security leadership, NSF and OPM have charged us with creating an academic pathway that spans disciplines—and creates the right blend of skills to address emerging threats."

Professor David Kaeli co-directs the CyberCorps program at Northeastern.



Idriys Harris, (E'12, currently pursuing his MS in Computer Engineering) has a dream of working for the US Central Intelligence Agency (CIA) or NSA. "Security is a fascinating industry because it is constantly changing and evolving," says Harris. "There is a commonality of problems, but each one is unique. The field is dynamic and intellectually challenging."

Harris applied theoretical concepts learned in Northeastern's CyberCorps curriculum during a summer internship with Draper Laboratory, a nonprofit research and development lab. There, he tested the security of embedded systems that underlie unmanned aerial vehicles (UAVs) and other important US endeavors.

"THE CYBERCORPS PROGRAM AT NORTHEASTERN HAS PROVIDED ME WITH INCREDIBLE OPPORTUNITIES TO BECOME PART OF THE US SECURITY COMMUNITY. OF COURSE I'M GRATEFUL FOR THE FINANCIAL SUPPORT, BUT ALSO THE CHANCE TO BEGIN BUILDING THE CONNECTIONS AND GAINING THE EXPERIENCE THAT WILL SERVE AS THE FOUNDATION FOR MY SUCCESSFUL CAREER IN SECURITY."

- Idriys Harris



Antonio Rufo, a Computer Engineering major in his senior year, is conducting a unique research project focusing on humans' susceptibility to cyber attacks as part of the CyberCorps curriculum.

"My work focuses on how the human brain responds to subtle online signals that encourage people to give up sensitive information such as PIN codes and passwords," explains Rufo. "By mapping brain waves as people reveal their private information, I hope to make their online experiences safer. I'm fascinated by making people's motivations visible through passive, invisible surveillance techniques."

Rufo feels these and other firsthand experiences give him a significant edge over other job candidates when he visits DEF CON—one of the world's largest information security conventions—and other networking events. "I believe my training at Northeastern provides me with a tremendous advantage over other undergrads who have no relevant work experience," says Rufo. ■

DHS Career Development Grants: An Elite Opportunity

The Awareness and Localization of Explosives Related Threats (ALERT) Center at Northeastern provides many opportunities for students to be exposed to leading-edge research. ALERT also provides graduate students in the College of Engineering with financial support via the Career Development Grant Program, funded by the Department of Homeland Security Science and Technology Directorate.

Each year, as part of the ALERT Career Development Program, four MS students in Electrical and Computer Engineering (ECE) are supported by Career Development Fellowships. These highly competitive awards cover full tuition costs, while also providing a monthly stipend.



Professor Carey Rappaport directs the DHS Career Development Grant Program.

Career Development Fellows engage in research, classwork, and professional development that relate specifically to the detection of explosives or other security threats. Their focused work at Northeastern is complemented by a summer research experience at a DHS laboratory, a private company engaged in DHS-related research, or other DHS-related facility.

“DHS Career Development Fellowships allow outstanding grad students to play an active role in some truly revolutionary research projects,” says ECE

Professor **Carey Rappaport**, who directs the program at Northeastern. “One of my jobs as a professor is to help prepare students to become leaders in the global security workforce. This initiative makes it much easier, because it provides students with practical, hands-on experience that makes them highly appealing to recruiters.”

Michael Collins, an ECE MS student, is in his second year as a DHS Career Development Fellow. Collins spent 10 weeks last summer at Los Alamos National Laboratory, working on critical research focusing on nuclear quadrupole resonance—an innovative technology with the potential to detect the presence of explosive devices hidden inside objects such as luggage or a human body.

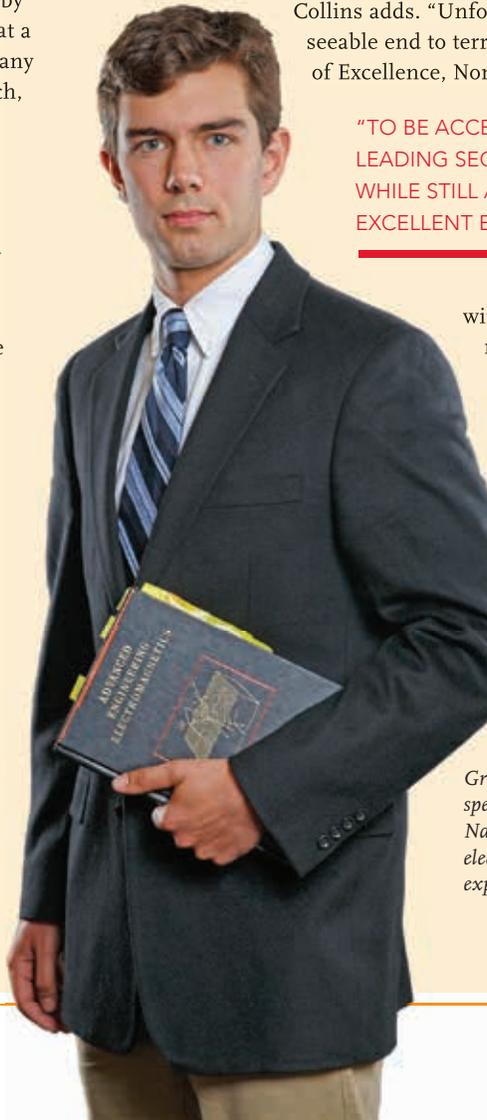
“Nuclear quadrupole resonance is a radio-frequency technique first developed in the 1950s which can detect the presence of certain solid materials, including many explosives,” explains Collins. “My research at Los Alamos was aimed at improving this technology so that it can be used in applications such as land mine detection, airport luggage screening,

or detecting swallowed explosive devices. My efforts focused on producing clear return signals from concealed bombs.”

According to Collins, the DHS Career Development Program enabled him to gain early entry into the global security field. “At Los Alamos, I was surrounded by highly qualified professionals—and they welcomed me into their creative research process,” says Collins. “They viewed me as a collaborator and colleague. To be accepted as part of a leading security research team while still a student was a truly excellent experience.”

“If I could think of one word to describe my graduate work at Northeastern, that word would be ‘relevant,’” Collins adds. “Unfortunately, there’s no foreseeable end to terrorism. As a DHS Center of Excellence, Northeastern has provided me

“TO BE ACCEPTED AS PART OF A LEADING SECURITY RESEARCH TEAM WHILE STILL A STUDENT WAS A TRULY EXCELLENT EXPERIENCE.”



with a phenomenal environment in which to not only learn, but to actively engage with challenging security problems. This wouldn’t be possible without our lab’s technical expertise and the network of world-class resources that the program has access to.” ■

Graduate student Michael Collins spent 10 weeks at Los Alamos National Laboratory, applying electromagnetics concepts to explosives detection challenges.



Road Tech

Ming Wang, professor of civil and environmental engineering

Meet **Ming Wang**. He and his team could revolutionize the very big—and expensive—problem of roadway maintenance. They're combining sensing technology and computer analytics to reveal structural defects in highways and bridges before they become hazardous.

Learn how Wang and our other faculty researchers are making the world's infrastructure more resilient. Northeastern University: making tomorrow happen.

northeastern.edu/tomorrow

Northeastern University

Making Tomorrow Happen



Faculty News and Honors



Hicham Fenniri is welcomed by Northeastern as Professor of Chemical Engineering. His research is focused on nanoscale materials for drug delivery, cell therapeutics, and regenerative medicine. Fenniri holds three degrees from Université Louis Pasteur: a BS in Chemistry and Biochemistry; an MSc in Supramolecular Organic Chemistry; and a PhD in Supramolecular Sciences and Engineering.

New Department Chairs



The College of Engineering welcomes **Sheila S. Hemami** as Chair of the Department of Electrical and Computer Engineering. A scholar recognized for

her contributions to robust and perceptual image and video communications, Hemami comes to Northeastern from Cornell University's School of Electrical and Computer Engineering. As a Professor and the School's Associate Director, at Cornell she played a leading role in faculty development. She initiated a junior-faculty mentoring program in engineering and spearheaded Cornell's National Science Foundation-funded ADVANCE program for the advancement of women faculty in science and engineering. A Fellow of the Institute of Electrical and Electronics Engineers (IEEE), Hemami has received numerous awards, including the C. Holmes MacDonald Award from Eta Kappa Nu,

the electrical and computer engineering honor society. Hemami holds a bachelor's degree in Electrical Engineering from the University of Michigan, as well as master's and PhD degrees from Stanford University.



Hanchen Huang is welcomed by the college as the new Chair of the Department of Mechanical and Industrial Engineering. Huang's work addresses

fundamental engineering and scientific issues in materials, mechanics, nanotechnology, and energy. His primary research interests include nanofabrication, nanomechanics, sustainable energy, and atomistic simulations. Most recently, Huang was the Connecticut Clean Energy Fund Endowed Professor in Sustainable Energy and a Professor of Mechanical Engineering at the University of Connecticut. Prior to that, he was a tenured Professor in the Department of Mechanical, Aerospace, and Nuclear Engineering at Rensselaer Polytechnic Institute. Huang holds a bachelor's degree

in Physics from Hebei Normal University, a master's degree in Theoretical Nuclear Physics from the Institute of Atomic Energy of the Chinese Academy of Sciences, and a PhD in Nuclear Engineering from the University of California at Los Angeles.

New Faculty



Edward Beighley has joined Northeastern as Associate Professor of Civil and Environmental Engineering. His research interests include hydrologic modeling and remote sensing for quantifying the impacts of climate variability and urbanization on the hydrologic cycle. Beighley holds BS and MS degrees in Civil and Environmental Engineering from Pennsylvania State University, as well as a PhD from the University of Maryland.



Eno Ebong joins the college as an Assistant Professor of Chemical Engineering. Her research focuses on identifying mechanically regulated cellular and

molecular targets to prevent, diagnose, and treat vascular disease. Ebong earned a bachelor's in Mechanical Engineering from Massachusetts Institute of Technology (MIT). She also holds master's and PhD degrees in Biomedical Engineering from Rensselaer Polytechnic Institute.



Adam Ekenseair has been named Assistant Professor in the Department of Chemical Engineering. Ekenseair's scholarship targets the successful synthesis and

application of novel polymeric biomaterials for drug delivery and tissue engineering applications. He holds a BS in Chemical Engineering from the University of Arkansas and a PhD in Chemical Engineering from the University of Texas at Austin.

In these pages, we celebrate the addition of new faculty to the College of Engineering, as well as recent honors won by those in our close-knit community. We welcome two new department chairs who will help lead the college into the future. Sadly, we also mourn the loss of our colleague and dear friend Yaman Yener. Though no longer with us, his many achievements—including recruiting and mentoring many outstanding students—will be felt for years to come.



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 four book chapters, holds three 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.



Loretta A. Fernandez is Assistant Professor of Civil and Environmental Engineering, with a joint appointment in the College of Science. Her work

targets the development of tools and sampling techniques for understanding transport processes and the biological availability of persistent organic pollutants. Fernandez holds a BA in International Relations from Tufts University and a BS in Civil Engineering from Northeastern. She also earned SM and PhD degrees in Environmental Chemistry at MIT.



Carlos Hidrovo joins the College of Engineering as Assistant Professor of Mechanical and Industrial Engineering. Hidrovo's research is focused on the

mechanics of microscale multiphase transport phenomena. He holds three degrees in Mechanical Engineering: a bachelor's and PhD from MIT, and a master's from the University of Illinois, Urbana-Champaign.



Jose Martinez-Lorenzo has been named Assistant Professor of Mechanical and Industrial Engineering, with a joint appointment in the Department of Electrical and

Computer Engineering. His interests lie in advanced multiwave modeling and sensing methods, applied to security screening and

biomedical systems. He earned MS and PhD degrees at the University of Vigo, both in Telecommunications Engineering.



Mark Patterson joins Northeastern as Professor of Civil and Environmental Engineering, with a joint appointment in the College of Science. His research

focuses on the biofluid engineering of autonomous underwater vehicles, environmental sensing, and the mechanics of marine organisms. Patterson holds bachelor's, master's, and doctoral degrees in Biology from Harvard.



Sandra Shefelbine is Associate Professor of Mechanical and Industrial Engineering. Her research explores bone biomechanics, particularly the multi-

scale 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, San Francisco.

REMEMBERING YAMAN YENER



Yaman Yener, Senior Associate Dean for Faculty Affairs in the College of Engineering, passed away on June 14 following a long illness. Born and raised in Ankara, Turkey, he held bachelor's and master's degrees in Mechanical Engineering from the Middle East Technical University and a PhD in Mechanical and Aerospace Engineering from North Carolina State University. Yener came to Northeastern as a Professor in the Department of Mechanical Engineering (now Mechanical and Industrial Engineering) in 1982, where he taught the full spectrum of undergraduate thermofluids courses and the graduate sequence in heat transfer, while guiding many

PhD students through their research. Yener was appointed Associate Dean for Research and Graduate Studies in 1992, and Senior Associate Dean for Faculty Affairs in 2010. His early commitment to recruiting and supporting international students helped to double the college's graduate student population over the past decade. A Fellow of the American Society of Mechanical Engineers, Yener was well-known for his research and teaching in the area of heat transfer. He wrote more than 70 technical and research papers, as well as co-authoring two popular graduate-level textbooks on this subject. Yener will be remembered as a true gentleman and a scholar who held the interests of the college and university paramount. He was a mentor to many young faculty colleagues, a friend to all faculty, a calming presence in any challenging situation, and a wise leader. Yener is survived by his mother Muteber; his wife Demet, Program Manager for Distance Learning in the College of Professional Studies; and his daughter Zeynep, a Northeastern alum who established the International Co-Op program at Bahçeşehir University in Istanbul that involves Northeastern. Yaman Yener will be dearly missed, though his positive impact at Northeastern will live on. *Family and friends have established a fund in his memory. Please contact MaeLynn Patten for more information at 617.373.7910 or m.patten@neu.edu.*

Notables

Select Recent Patent and Publication Highlights



Charles DiMarzio, Associate Professor of Electrical and Computer Engineering, earned a patent with colleagues at Caltech for their method of "Acoustic Assisted

Phase Conjugate Optical Tomography." He also was awarded a patent for his "Phase Subtraction Cell Counting Method," which accurately counts the cells in an embryo to increase the probability of a healthy transfer during infertility treatments.



Randall Erb, Assistant Professor of Mechanical and Industrial Engineering, published his efforts to replicate naturally occurring shape-changing materials

with synthetic hydrogel composites in *Nature Communications*.



Ahmed Busnaina, William Lincoln Smith Professor of Mechanical and Industrial Engineering, was awarded a patent for designing a "3D Nanoscale Circuit Interconnect and Method of Assembly by Dielectrophoresis."



Peter Furth, Professor of Civil and Environmental Engineering, was featured in a recent article in the *Boston Globe* called "A Cyclist's Mecca, With Lessons for Boston."

In the article, Furth discussed the positive features of the bicycle infrastructure used in the Netherlands, as well as the possibility of bringing this bike-friendly infrastructure to the United States. Read the article at bit.ly/furth.



Jeff Ruberti, Associate Professor of Mechanical and Industrial Engineering, was awarded a patent for a method of extracting samples from frozen specimens without having to

thaw the entire specimen. The method was developed in conjunction with Northeastern Mechanical and Industrial Engineering undergraduates who are also named on the patent. The patent is also the principal intellectual property behind the company CryoXtract (cryoextract.com).



Ashkan Vaziri, Associate Professor of Mechanical and Industrial Engineering, was featured on the back cover of a recent issue of the journal *Soft Matter*, which included

a paper he co-authored entitled "Localization of Deformation in Thin Shells Under Indentation." Vaziri was also featured in *Industry Week* in an article called "Taming the Nanotech Risks," which profiled Vaziri's simple methods to clean up after a nanoparticle spill.



Carmine Vittoria, COE Distinguished Professor of Electrical and Computer Engineering, and **Vincent Harris**, University Distinguished



Professor and William Lincoln Smith Professor of Electrical and Computer Engineering, were awarded a patent for creating an "Antenna Module Having Reduced Size, High

Gain, and Increased Power Efficiency."

Recent Honors



Jennifer Dy, Associate Professor of Electrical and Computer Engineering, and **Rebecca Carrier**, Associate Professor of Chemical Engineering, are two of

only 154 young engineers in the country to be invited to attend, respectively, the National Academy of Engineering's Frontiers of Engineering and Frontiers

of Engineering Education Symposia. These NAE symposia have proven an effective mechanism for the establishment of cross-disciplinary and cross-sector contacts among this country's future engineering leaders.



Matthew Eckelman, Assistant Professor of Civil and Environmental Engineering, was awarded the 2013 Laudise Young Researcher Prize from the

International Society for Industrial Ecology. This prestigious international award is given for outstanding achievements in industrial ecology by a researcher under the age of 36. In addition, Eckelman contributed to an important recent US Court of Appeals decision on the use of life-cycle assessment in regulating greenhouse gas emissions from transportation fuels.

Jerome Hajjar, Chair and Professor of Civil and Environmental Engineering, has been selected to be a Fellow of the Structural Engineering Institute (SEI) of the American Society of Civil Engineers (ASCE). SEI Fellows represent a select group of distinguished SEI

members who are noted leaders and mentors in the structural engineering profession.



Vincent Harris, University Distinguished Professor and William Lincoln Smith Professor of Electrical and Computer Engineering, received the Lee Hsun Award from the Chinese Academy of Sciences' Institute of Metal Research. This award is named for **Lee Hsun**, a pioneer in investigating the role of hydrogen in steels. It honors research scientists who have made important contributions to materials science and engineering, while promoting scientific cooperation and exchange.



David Kaeli, Professor of Electrical and Computer Engineering, has been named a Heterogeneous Systems Architecture Distinguished Professor by the HSA Foundation, an academic-industry consortium created to advance the industry specification, advancement, and promotion of the heterogeneous systems architecture (HSA). In addition, his Northeastern University Computer Architecture Research (NUCAR) Laboratory has been designated an Academic Center of Excellence by the foundation.



Fabrizio Lombardi, ITC Professor of Electrical and Computer Engineering, has been named the inaugural Editor in Chief of the new open-access journal, *IEEE Transactions on Emerging Topics in Computing*.

Transactions on Emerging Topics in Computing.



Allen Soyster, Professor of Mechanical and Industrial Engineering, received the Frank and Lillian Gilbreth Lifetime Achievement Award, which is the Institute of Industrial Engineers' highest and most esteemed honor.



Ron Willey, Professor of Chemical Engineering, is the recipient of the Norton H. Walton/Russell L. Miller Award in Safety/Loss Prevention, which is the highest honor from the Safety and Health Division of the American Institute of Chemical Engineers (AIChE).



Thomas Webster, Professor and Chair of the Chemical Engineering Department, was selected as a Fellow of the Biomedical Engineering Society (BMES), the largest society dedicated to biomedical engineering in the US. Webster has also been inducted as a Fellow of the American Institute of Medical and Biological Engineering (AIMBE). The AIMBE College of Fellows is composed of the top two percent of medical and biological engineers in the country.

Yiannis Levendis, COE Distinguished Professor of Mechanical and Industrial Engineering, has been awarded the 2013 George Westinghouse Gold Medal of the American Society of Mechanical Engineers for eminent achievement in the power generation field.



National Science Foundation recognizes Philip Larese-Casanova



Philip Larese-Casanova, Assistant Professor of Civil and Environmental Engineering, has received a prestigious CAREER Award from the National Science Foundation to support his research proposal entitled "Quantum Dot Degradation in Aquatic Environments." This five-year, \$404,000 grant will help Larese-Casanova to investigate how quantum dots degrade over time when they are released into the world's aquatic environments, with the

goal of understanding the long-term effects and remediation of nanomaterials that are widely distributed via product disposal or industrial waste streams. Quantum dots, semi-conducting nanocrystals with extraordinary electrical properties, play a prominent role in the next generation of consumer electronics and solar cells. With the projected market volume for nanomaterial-based products approaching trillions of dollars annually, handling these products and their waste will inevitably pose challenges to environmental health, particularly for metallic nanomaterials that may be toxic to aquatic organisms.

Dear Alumni and Friends,



Northeastern's College of Engineering is in a period of unprecedented momentum. The faculty and staff are invigorated by **Dean Nadine Aubry's** vision for our school, and her focus on innovation in our curriculum, programs, and research. We are driven to provide the education that the future of the field demands: **experiential** in practice, **entrepreneurial**

in spirit, and **global** in scale.

In the spring of 2013, Northeastern launched *Empower: The Campaign for Northeastern University*, our largest and most ambitious fundraising drive in support of students, faculty, and research innovation. Through the campaign, the College of Engineering will build on its excellence in experiential education and use-inspired research.

Empower ensures that we continue to push boundaries in cornerstone disciplines, boost financial aid, and expand co-op and service learning opportunities to prepare students to be leaders in a global world. It also enables us to attract and retain outstanding teachers and researchers who bring fresh insight to the College of Engineering. And it allows us to find solutions to real-world problems in health, security, and sustainability—enriching not just our campus, but our world.

Our alumni often tell me how proud they are to see the college receive public recognition for its programs, and that they appreciate our efforts to inspire young people from diverse backgrounds to pursue careers in engineering. They also share wonderful memories of the empowering, career-defining moments they experienced in the classroom, as part of a student group, or on co-op.

It is with their stories in mind that I'd like to pose a simple question: **what about Northeastern empowered you?** By joining us in supporting the *Empower* campaign, you can ensure that the next generation of industry leaders experience these same defining moments—fueling discovery, driving innovation, and transforming lives.

Best wishes,

MaeLynn Patten

**Associate Dean of Development and Alumni Affairs
College of Engineering**

Learn how you can support Northeastern and the College of Engineering through the *Empower* campaign at northeastern.edu/empower, or contact MaeLynn Patten at 617.373.7910 or m.patten@neu.edu.

Benefactors

The following donors are College of Engineering alumni and friends 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, 2013.

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Joanne M. Schneider Brooks
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Maureen Egan
Edward G. Galante, E'73
Francis A. Gicca, E'59
Bernard M., H'07, and Sophia Gordon
James W. Healy, E'54
Charles J. Hoff, MS'73
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Ellen Kariotis
George J. Kostas, E'43, H'07
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Marcia Ruderman
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Robert J. Shillman, E'68, H'00
Lorraine C. Snell
Sy Sternberg, ME'68, H'12
Arthur W. Zafiropoulo, E'61
Anonymous

The Huntington Society

The following donors are alumni and friends of the College of Engineering 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.

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Michael J. Sherman, E'68
Robert J. Shillman, E'68, H'00
Gordon H. Slaney, Jr., E'66, ME'73
Sy Sternberg, ME'68, H'12
Frank L. Tempesta, E'62, ME'64
Arthur W. Zafiropoulo, E'61
Anonymous (4)

Michael Sherman and Family Support Engineering Entrepreneurship

Based on his experience at Northeastern, **Michael Sherman**, E'68, believes strongly that theoretical classes should be complemented by engineering work. "As a student, you may know a lot about technology and science," he says. "But you really need to work collaboratively with other engineers on actual real-world challenges to prepare yourself for the practical business of engineering. I can honestly say that my own career success is due to my hands-on co-op experiences as an undergrad," says Sherman.

According to Sherman, his diverse cooperative education assignments at Northeastern prepared him to commercialize his ideas and create his own successful company, AES Corporation, which produces and installs leading-edge security products in 130 countries. "The ability to work in a professional team while I was still a student, solving real engineering problems, showed me that I could develop a product and achieve meaningful results. It changed my view of the world. It made me what I am today," Sherman adds.

Sherman and his family recently made a multi-million dollar commitment to create the Michael J. and Ann Sherman Center for Engineering Entrepreneurship Education. The Center will help students bridge the gap between engineering principles and well-designed products that serve real-world needs. Through collaborative, team-oriented courses ranging from introductory topics to product development and design, a speaker series featuring influential entrepreneurs and thought leaders, and industrial

partnerships, the Center will equip students to create marketable commercial concepts.

"It's not enough to have a great technical idea," explains Sherman. "You need to know what your product will cost to produce, what people will pay for it, and what benefits they will gain. Through the Sherman Center, I'm hoping to help good engineers become good businesspeople."

"If the Sherman Center had existed when I was at Northeastern, I would have avoided a lot of the rookie mistakes I made in getting my business off the ground," notes Sherman. "I'm hoping to create a much easier pathway for tomorrow's engineering entrepreneurs."



The Sherman Family. Pictured left to right: Jeffrey Kalish (son-in-law), Bonnie Sherman (daughter), Michael Sherman, Ann Sherman, Scott Sherman (son), Tricia Sherman (daughter-in-law), and four granddaughters show their Husky pride.

Success Leads Slaney to Help Others



Gordon H. Slaney, Jr., E'66, ME'73, has remained connected to Northeastern throughout his 40-year career as a civil and environmental engineer. "As I had success, I began asking myself how I got here. I made a list of all the family, educators, colleagues, and friends who supported me," says Slaney. "I thought about Northeastern and what I could do to give back."

As a result of this reflection, Slaney has made a generous gift to support faculty advancement at Northeastern University by establishing the Gordon Slaney Civil and Environmental Faculty Support Fund in the College of Engineering.

"When I was a student, Northeastern gave me the flexibility to earn my tuition costs by working on co-op, which allowed me to study the technical field I was interested in," says Slaney, who is a member of the Huntington Society. "I also had Civil Engineering professors—**Robert Meserve** comes to mind—who worked with me along the way, providing guidance in many ways. I want to give today's engineering faculty that same ability to create and strengthen their own programs."

Generous gifts like Slaney's empower Northeastern University to recruit the best faculty and students to perform groundbreaking research. By directing his gift to the *Empower* campaign, Gordon Slaney is helping the College of Engineering to seize the moment and establish itself as a leader in interdisciplinary research.

"As a civil engineer, I look to the end result of the built environment—the bridges of support that help people in their existence," Slaney notes. "What I'm doing is reversing the support role, and supporting those who supported me through the years."

Frank Palmer Speare Society

The Frank Palmer Speare Society honors the more than 500 alumni and friends who have provided a future gift for Northeastern through an estate provision, beneficiary designation, charitable gift annuity, charitable remainder trust, or other planned gift. These visionary supporters are providing for the College of Engineering's second century and beyond—ensuring that future generations of students will benefit from Northeastern's unique brand of learning, anchored in co-op.

Robert E. Allen, E'59
Robert B. Angus, E'47
George J. Antonucci, E'63, ME'65
Albert E. Baker, Jr., E'40
Charles T. Barooshian, E'59
Harry R. Bedell, Jr., E'50
Richard B. Bourne, Jr., E'69
Thomas W. Brahms, E'71
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Ralph R. Burwell, E'50
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Maurice Gertel, E'44
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George M. Jett, E'70
Donald Kerivan, E'49
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Walter I. Keyes, E'51, ME'57
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Elsie M. Mason, E'53
John A. Massa, E'59, ME'66
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Dean's Society | College of Engineering

Listed below are College of Engineering alumni and friends who have made gifts or pledge payments of \$1,000 or more to any College of Engineering designation, and College of Engineering alumni who have given to any Northeastern designation at that level during FY13 (July 1, 2012 through June 30, 2013). Every effort was made to ensure the accuracy of this list. Our apologies for any errors or omissions that have occurred.

KEY

*Deceased

PNT designates parents of a current student or 2013 graduate

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Bernard M., H'07, and
Sophia Gordon
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Robert J. Shillman, E'68, H'00, PNT
Sy Sternberg, ME'68, H'12
Arthur W. Zafriropoulos, E'61
Anonymous

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Frederick J. Emmett, Jr., ME'67

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Metri R. Metri, E'92, ME'95
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PNT
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Roger P. Day, E'75
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MBA'78
George D. Dick, LC'63, UC'67
Rita F. Fahy, LA'78, ME'89
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Edward J. Higgins, E'52
Peter T. Karassik, E'74
Scott D. Krentzman, E'89
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“Northeastern gave me an opportunity that was very significant in my life, and we want to ensure that future generations of students have access to an excellent education.”

Powering Opportunity

Robert Goldberg, E'59, credits co-op with providing him the means to afford a college education and for giving him unexpected insight into his intended career. “One extremely valuable thing I learned through co-op is that I did not want to become an engineer,” he shares. A Northeastern professional development seminar on patent law further convinced Bob to alter his career path.

After graduating from Northeastern, Bob earned his juris doctor from George Washington University while working for the U.S. Patent Office. He later returned to Boston and built a prosperous patent law career at a boutique firm.

In appreciation for everything Northeastern did to propel his professional successes, Bob, and his wife Fran, established the Robert L. Goldberg Scholarship to support chemical

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